

COMPENDIUM ON COMPREHENSIVE RISK MANAGEMENT APPROACHES



Enhance the understanding of, and promote, comprehensive risk management approaches (assessment, reduction, transfer, retention), including social protection instruments and transformational approaches, in building long-term resilience of countries, vulnerable populations and communities

Executive Committee of the Warsaw International
Mechanism for Loss and Damage

September 2019

TABLE OF CONTENTS

TABLE OF CONTENTS	2
LIST OF CASE STUDIES	3
INTRODUCTION AND MANDATE.....	4
APPROACH AND STRUCTURE	5
A. RISK ASSESSMENT	6
B. RISK REDUCTION.....	15
C. FINANCIAL RISK TRANSFER	30
D. RISK RETENTION	49
E. TRANSFORMATIONAL APPROACHES	60
F. ENABLING ENVIRONMENT	65
REFERENCES.....	72
ANNEXES	77

LIST OF CASE STUDIES

RISK ASSESSMENT	
Pacific Catastrophe Risk Assessment & Financing Initiative (PCRAFI)	8
Malawi Spatial Data Platform (MASDAP) Geonode	10
Community-based climate vulnerability assessment	11
Central American Probabilistic Risk Assessment (CAPRA)	12
Climate change risk assessments under the SECURE Water Act	13
CALCHAS – An integrated analysis system for the effective fire conservancy of forests	14
RISK REDUCTION	
Disaster Risk Management Legislation in the Philippines	18
Joint National Action Plan (JNAP)	20
Caribbean Hurricane Early Warning System	21
Radio Stations for Transmission of Drought Warnings in Kenya	23
National Programme For Community Empowerment in Urban Areas in Indonesia	24
Productive Safety Net Programme (PSNP)	25
Implementation of the integrated Master Plan for Coastal Safety in Flanders	27
Multi-Hazard Approach to Early Warning System in Sogn og Fjordane, Norway	28
FINANCIAL RISK TRANSFER	
Philippine Crop Insurance Corporation (PCIC)	33
Mongolia Index Based Livestock Insurance Project (IBLIP)	34
Climate Risk Adaptation & Insurance in the Caribbean: Livelihood Protection Policy	36
“Fondos De Aseguramiento” Self Insurance Funds: Small Farmer Mutual Crop & Livestock Insurance	37
Uruguay Hydro Energy Insurance	39
Caribbean Catastrophe Risk Insurance Facility (CCRIF)	41
African Risk Capacity (ARC)	42
MultiCat Bonds	44
Climate bond financing adaptation actions in Paris	46
Climate Bonds Initiative/Resilience Bonds	47
RISK RETENTION	
R4 Rural Resilience Initiative	51
Mexico’s Natural Disaster Fund (Fondo De Desastres Naturales - FONDEN)	53
Remittances in Samoa	55
Marshall Islands Funds	57
Village Savings & Loan Associations (VSLA) by CARE International	58
Operation of the Portuguese Contingency Heatwaves Plan	59
TRANSFORMATIONAL APPROACHES	
Re-greening of the Sahel	62
Thames Estuary 2100 Plan	63
Planned Relocation in Carteret Islands in Papua New Guinea	64
ENABLING ENVIRONMENT	
Global Index Insurance Facility (GIIF)	67
Contingent Credit Facility (CCF) of the Inter-American Development Bank (IDB)	68
Community Disaster Resilience Fund (CDRF)	69
Desalination – a California perspective	70

INTRODUCTION AND MANDATE

The Executive Committee of the Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts (Excom), at its 3rd meeting (April 2016), requested the secretariat to develop, in two stages, a paper-based compendium in order to deliver the expected results of activity (a) of Action Area 2 of the initial two-year workplan of the Executive Committee.¹

Action Area 2 of the initial two-year workplan of the Executive Committee focuses on *“Enhancing the understanding of, and promote, comprehensive risk management approaches (assessment, reduction, transfer, retention), including social protection instruments and transformational approaches, in building long-term resilience of countries, vulnerable populations and communities.”*

Activity (a) of this action area calls for *“Identification of good practices and lessons learned, including with respect to policies and data standards, instruments such as insurance and social protection, and transformational approaches, to facilitate comprehensive risk management. The expected result of this activity is identification of good practices and lessons learned.”*

The Excom also requested that the relevant results of the work under Action Areas 5 and 7 of the initial two-year workplan of the Executive Committee to be taken into account in the second stage of the development of the compendium.

Action Area 5 of the initial two-year workplan of the Executive Committee focuses on enhancing the understanding of the capacity and coordination needs with regard to preparing for, responding to and building resilience against loss and damage associated with extreme and slow onset events, including through recovery and rehabilitation.

Action Area 7 of the initial two-year workplan of the Executive Committee focuses on encouraging comprehensive risk management by the diffusion of information related to financial instruments and tools that address the risks of loss and damage associated with the adverse effects of climate change to facilitate finance in loss and damage situations in accordance with the policies of each developing country and region, taking into account the necessary national efforts to establish enabling environments. These financial instruments and tools may include: comprehensive risk management capacity with risk pooling and transfer; catastrophe risk insurance; contingency finance; climate-themed bonds and their certification; catastrophe bonds; and financing approaches to making development climate resilient, among other innovative financial instruments and tools.

Further to the guidance of the Executive Committee provided to the secretariat, this compendium contains a collection of good practices and lessons learned in relation to comprehensive risk management approaches at different levels, without attempting to draw a comprehensive landscape, and taking into account the specific needs of developing countries that are particularly vulnerable to the adverse effects of climate change. The compendium also contains key findings from the two sets of questionnaires regarding national systems and/or processes currently in place for conducting and coordinating analyses of climate risk and loss and damage associated with the adverse effects of climate change, taking into account extreme and slow onset events. Those questionnaires were undertaken under Action Area 5 of the initial two-year workplan of the Executive Committee.

The initial compendium was reviewed by the Excom, at its 4th meeting (September 2016). The Excom further requested to increase the number of developed country-case studies. It also agreed that the Technical Expert Group on Comprehensive Risk Management (TEG-CRM) established under strategic workstream (c) of the five-year rolling workplan, review the compendium. At its first meeting (August 2019), the TEG on Comprehensive Risk Management provided further feedback into the draft compendium, leading to its finalization in September 2019.

¹ The initial two-year workplan is available at <<http://unfccc.int/8805>>.

APPROACH AND STRUCTURE

This compendium draws on ongoing relevant scientific and practical work in order to catalogue existing information and case studies on the topics in the context of Action Area 2.

In accordance with the guidance given to the secretariat, previous technical work undertaken in the context of the work programme on loss and damage under the Subsidiary Body for Implementation (2011–2013) served as a broad basis for compiling the compendium, in particular the ‘Literature review on the topics in the context of thematic area 2 of the work programme on loss and damage: a range of approaches to address loss and damage associated with the adverse effects of climate change’ (2012).²

In addition, the following sources were reviewed to further the compendium as per guidance by the Excom:

- Submissions³ of information on financial instruments made under Action Area 7 of the initial two-year workplan;
- Databases of the World Bank and subsidiary World Bank programmes, such as the Global Facility for Disaster Risk Reduction;
- Relevant chapters of IPCC reports;
- Relevant work undertaken by other UNFCCC bodies and/or programmes;
- Inputs from 28 non-Annex I Parties and eight organizations, provided through the aforementioned questionnaires⁴. The questionnaires inquired about the systems and/or processes currently in place in countries for conducting and coordinating analyses of climate risk and loss and damage associated with the adverse effects of climate change, taking into account extreme and slow onset events (see Annex II for the list of respondents).

Complementary desk-based research was also carried out based on publicly available publications.

The resulting compendium provides an overview of approaches to comprehensive risk management, including, risk assessment, risk reduction, financial risk transfer, risk retention, and transformational approaches, as well as an overview on enabling environment for these approaches.



Each of these broad categories of comprehensive risk management approaches is described, including in view of the various practices and how they are generally defined by the risk management community, followed by summaries of key findings, such as lessons learned and good practices. These are drawn from internationally recognised reports or from specific case studies and practices which are subsequently presented for each approach. Where applicable, brief summaries of key findings on relevant national capacities and support provided by organizations, from the aforementioned questionnaires are included at the end of the sections.

It should be noted that the examples of comprehensive risk management approaches and case studies to illustrate good practices related to these approaches contained in this compendium are not exhaustive; other varieties of approaches may exist.

² Available at <<http://unfccc.int/resource/docs/2012/sbi/eng/inf14.pdf>>.

³ Available at <<http://unfccc.int/9404>>.

⁴ Available at <<http://unfccc.int/9504>>.

A. RISK ASSESSMENT

Decision makers face the challenge of selecting appropriate ways to manage risks, including those associated with climate change impacts. These actors face constraints including time, budget, political and demographic considerations which determine how these choices are made. In order to manage risks appropriately, decision makers need to know about the risk itself. Decision makers need information about these three features to match possible approaches to manage risks comprehensively in view of their overall policy goals.

Thus, **risk assessment** is a foundational element of managing risks associated with climate change. Risk assessment is a set of methods that help characterise risks to inform risk management decisions and actions. It helps establish the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which societies depend. Risk assessment (and associated risk mapping) has at least three common features: a review of the technical characteristics of hazards such as their location, severity, frequency and likelihood of occurrence (probability); the **exposure** of people and structures or other assets to those hazards, and the susceptibility of people and assets to be harmed by a hazard (**vulnerability**). the analysis of exposure and vulnerability including the physical, social, health, economic and environmental dimensions; and the evaluation of the effectiveness of prevailing and alternative coping capacities in respect to likely risk scenarios. This series of activities is sometimes known as a risk analysis process (UNISDR, 2009).

Risk assessment may involve hazard mapping, assessments of the vulnerabilities and impacts, as well as the levels of risk tolerance in society. These could be carried out based on historical events. In some countries and regions, probabilistic risk models are developed to simulate the economic impact of extreme events. The development of a range of approaches to manage risk depends on risk assessment. For example, *ex-ante* risk financing programmes such as insurance and other financial risk transfer devices depend on the development of these probabilistic catastrophe risk models (Cummins and Mahul, 2009).

Hazard mapping is used to highlight areas that are affected by or vulnerable to a particular hazard, i.e. the potential occurrence of a natural or human-induced physical event that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, and environmental resources (IPCC, 2012; UNISDR, 2009).

In the context of climate change, a **vulnerability assessment** identifies the sensitivities of people and ecosystems to the impacts, and the existing capacities that can support adjustment to impacts related to current and plausible future impacts of climate change. Vulnerability assessment may include a range of methods to assess exposure, sensitivity, and adaptive capacity, such as analysis of historic and modelled climate data, livelihood surveys, crop models, and ecosystem studies. These are used to develop recommendations to provide planners with a guide to addressing vulnerability to climate change. Vulnerability assessments involve consultations with a wide range of stakeholders, such as community groups and policy makers, so that the design and implementation of the assessment incorporates local knowledge about climate change adaptation. Vulnerability assessments also serve to inform stakeholders about aspects of climate risks, and help them evaluate options that could minimise negative impacts and increase resilience.

Impact assessment is a process for undertaking a critical objective evaluation and analysis of data and information on the impacts of physical events, of disasters, and of climate change (IPCC, 2012). The level of potential losses that a society or community considers acceptable given existing conditions, including social, economic, political, cultural, technical and environmental determines the acceptable risk and is a basis of risk tolerance assessments. Measuring risk tolerance levels helps in the identification of structural and non-structural measures that can reduce possible harm to people, property, services and systems to a chosen tolerance level, according to formal or legal codes or “accepted practice”. These are based on known probabilities of hazards and other factors (UNISDR, 2009).

KEY FINDINGS

Over the last decade the **ability to model and assess risks has made significant progress**, which allows for rigorous analysis of the costs and benefits of decision-making on risk reduction, transfer, and retention.

Overall, in order to carry out risk assessment the following practices have been recommended (World Bank, 2014c):

- It is important for risk assessments to be dynamic, and to be conducted ahead of the manifestation of any risks that may be faced;
- Risk assessments should **take into account the broader context and consider multiple risks**; In order for risk assessments to be useful and effective, the target audience must be clearly determined in order to avoid over-engineering and over-resourcing;
- **Uncertainties and limitations of risk information** need to be clearly communicated;
- Risk information, and accompanying modelling metadata, need to be **scientifically rigorous, and open** for examination by independent reviewers;
- By encouraging and further developing the creation and use of **open data**, those undertaking risk assessments can help to improve the quality and availability of this data;
- Collaboration, **cross-disciplinary and also cross-sectoral** at all levels, helps to produce usable risk assessment products. Collaboration should, to the extent possible, involve communities to raise awareness and build consensus;
- A sense of ownership should be created among countries, communities, individuals and even volunteers (e.g. crowdsourcing data collection) throughout the risk assessment process, e.g. through their **active involvement in the assessment or data gathering** since ownership makes it more likely that actors will share and act upon the analysis;
- **Communicating risk information**, which is well targeted, timely and interactive, helps to raise awareness of potential impacts and hazards;
- **Innovation**, such as software for open-source risk and hazard mapping, promote progress in risk assessment.

Further findings from the case studies include:

- **High-level political support is critical** if risk assessments are to be developed successfully and result into risk management strategies;
- The process and results of risk assessments not only raise awareness and interest but can **mobilise certain stakeholders to take action**, e.g. insurance companies or other members of the private sector;
- Applying the same risk assessment approach to different but similar cases (e.g. different river basins) allows for **cross-scale monitoring and comparability**.

PACIFIC CATASTROPHE RISK ASSESSMENT AND FINANCING INITIATIVE (PCRAFI)⁵

REGION: PACIFIC	LEVEL: REGIONAL
DESCRIPTION	<p>The Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) Program was established in 2007 – then known as PCRAFI – Phase 1. This phase laid the technical foundation for the current PCRAFI Program, and provided the 15 Pacific Island Countries (PICs) participating in the initiative (the Cook Islands, the Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, the Republic of the Marshall Islands, Samoa, the Solomon Islands, Tonga, Tuvalu, Vanuatu, and Timor-Leste) with disaster risk assessment tools to help them better understand, model, and assess their risk to natural hazards.</p> <p>PCRAFI assembled, processed, developed, and organised the largest collection of geo-referenced data for population, assets, hazards, and risks modelling in the region (satellite imagery, topographic maps, bathymetry maps, surface geology maps, surface soil maps, land cover/land use maps, geodetic and fault data, historical catalogues of tropical cyclones and earthquakes). This data is stored in, and is accessible via the Pacific Risk Information System (PacRIS) which is one of the largest stores of country-specific geospatial information for the PICs. PacRIS also includes a regional historical hazard catalogue, and a database on historical loss from disasters. First responders and disaster managers use PacRIS's tools and information on people and affected areas in order to understand the potential level of risk to assets following an event (e.g. infrastructure and agriculture). PacRIS also makes available hazard maps, which are country-specific.</p> <p>Using PacRIS, PCRAFI conducted probabilistic hazard models for all 15 PICs for major perils such as tropical cyclones, earthquake, and volcanic ash. Based on the assessments the PCRAFI Program supported the development of integrated risk financing and insurance solutions for the reduction of the financial vulnerability of PICs to tropical cyclones with winds, storm surge, earthquake with ground-shaking, and tsunamis. To date, two out of the five PICs who have taken up the PCRAFI Insurance Program have received payouts relating to tropical cyclone events, totalling US\$3.2 million. Each payout was received within 10 days of the event, providing rapid-response financial instrument to support governments' ability to quickly respond to the disaster.</p> <p>PCRAFI also supported the development of disaster response planning applications in selected locations and a post disaster assessment tool. The PCRAFI Program also aims to engage in a dialogue with the PICs on integrated financial solutions for the reduction of their financial vulnerability to natural disasters and to climate change.</p> <p>As part of the current second phase of the PCRAFI Program (PCRAFI II), there will be an update to the regional risk information in PacRIS for the PICs, as most of the data is outdated. Data also looked at mostly urban areas, thus not necessarily surveying disaster prone areas. This update incorporate public datasets (eg: OSM) that have eventuated since phase 1, as well as data that has been collected in recent initiatives in the region and or generated during past major events e.g Tropical Cyclone Pam (2015), Tropical Cyclone Winston (2016), and Tropical Cyclone Gita (2018).</p>
HIGHLIGHTS	<ul style="list-style-type: none"> Studies under the PCRAFI result in a detailed understanding of the potential costs of disaster impact in the form of a country-specific catastrophe risk assessment. This assessment serves as a transparent basis for developing and pricing a sovereign disaster risk financing instrument. It has also captured the interest of local insurance companies, who would seek to use these models to build their own in-house capacity. Ultimately this capacity might lead to

⁵ Index number: # 224

	<p>increased uptake of insurance by individuals and so reduce the post-disaster financial draw on public funds.</p> <ul style="list-style-type: none"> • High-level political support is a critical factor for the success of PCRAFI, as are good relationships between the Ministries of Finance and National Disaster Management Offices. Conducting risk assessments and developing disaster risk financing strategies (DRFIs) has led to ministries discussing procedural improvements, and in the long run has improved their relationships. Furthermore, ensuring a DRFI strategy is aligned to regional frameworks, such as those on disaster risk management and climate change adaptation, facilitates rapid access to liquidity post-disaster. • Country risk profiles developed for each of the 15 PICs from the data contained in PacRIS established that the average annual loss caused by natural hazards across all 15 PICs is estimated at USD 284 million, or 1.7% of the regional GDP. • Resource requirements: This type of initiative requires significant resources, both human and financial to acquire, collate and process the data. • Potential for replication or scaling up: The PCRAFI Program – Phase II: Furthering Disaster Risk Finance in the Pacific scales-up regional collaboration to increase the financial resilience of Pacific Island Countries against natural hazards and their capacity to meet post-disaster funding needs. The five-year program (2016-21) is implemented in two tracks: I) the PCRAFI Facility and II) PCRAFI Technical Assistance, in collaboration with regional development agencies and the Disaster Risk Financing and Insurance Program (DRFIP) – a partnership between the Global Facility for Disaster Reduction and Recovery (GFDRR) and the World Bank Group.
Reference materials	<i>GFDRR, 2016; Morinière and Zimmerman, 2015; Rahman, 2014a; World Bank, 2013; World Bank, 2014a; World Bank, 2014c; World Bank, 2015b.</i>
Source	pcrafi.spc.int

MALAWI SPATIAL DATA PLATFORM (MASDAP) GEONODE⁶

REGION: AFRICA LEVEL: NATIONAL	
DESCRIPTION	<p>Malawi Spatial Data Platform (MASDAP) GeoNode was launched in 2012. It is an online tool administered by Malawi's National Spatial Data Centre and the National Statistics Office. It aims to identify risks and strengthen disaster risk management efforts. The online GIS data portal (beta version available at masdap.mw/) allows users to share, manage and use spatial data such as flood outlines, elevation data, soil types, population, roads, buildings and land-use datasets. This information can be visualised and shared as a map, and is particularly useful for pre-disaster planning. MASDAP is open-source and has a platform facilitating inter-agency information collaboration and enhanced public access for awareness-building, as well as research and decision making support.</p> <p>Since 2014, the Global Facility for Disaster Reduction and Recovery (GFDRR) has been working with Malawi's Department of Disaster Management Affairs (DoDMA) and others to add further datasets in order to strengthen MASDAP GeoNode with the aim to better identify disaster risks and reinforce disaster risk management practices in Malawi. GFDRR facilitated participatory mapping exercises with local communities in Nsanje and Chikwawa as a way to add in any missing map data. This data was subsequently uploaded and made available to inform disaster preparedness efforts.</p>
HIGHLIGHTS	<ul style="list-style-type: none"> • MASDAP data was used by the Government of Malawi for recovery efforts in 2015 following some of the worst flooding the country had ever seen. This ultimately helped to reduce Malawi's vulnerability to natural hazards by allowing the Government to make quick estimates to understand the spatial impact of the floods. • Through participatory mapping exercises, communities became more aware of the potential losses they could face, and the resilience building measures which could be put in place to mitigate the risks they faced which overall helped to better engage and prepare communities for flood disasters.
Reference materials	<i>GFDRR, n.d.; Rahman, 2016; Simpson, 2015.</i>
Source	masdap.mw

⁶ Index number: #186

COMMUNITY-BASED CLIMATE VULNERABILITY ASSESSMENT⁷

REGION: PACIFIC LEVEL: SUB-NATIONAL	
DESCRIPTION	<p>The Secretariat of the Pacific Regional Environment Programme (SPREP) developed a guide to community vulnerability and adaptation assessment and action (CV&A). It aims to assist community vulnerability and adaptation assessment work to be carried out by the four pilot Pacific Island Countries (Cook Islands, Fiji, Samoa, Vanuatu).</p> <p>The CV&A guide is a tool to understanding Pacific communities' vulnerability to climate change, variability and sea level change. The assessment focuses on current vulnerability to both climate and non-climate related factors, and on examining current adaptive capacity. It then includes evaluation of vulnerability to future climate related risks, involving key stakeholders in the evaluation process. This eventually leads to the formulation of adaptation policies that would strengthen adaptive capacity. The guide builds on the various participatory methodologies that have already been introduced into the Pacific.</p>
HIGHLIGHTS	<ul style="list-style-type: none"> • The development of CV&A guidelines contributes to the unique “bottom up” “learning-by-doing” vulnerability assessment approach which distinguishes the project from the scenario driven top-down approach which start with Global Climate Models and Regional Climate Models. • It also allows for traditional knowledge to be brought into the discussions, through the inter-activeness and inclusiveness of the approach taken. • Participatory processes are resource intensive: Community consultations take time, preparation, resource mobilisation, and disappointments if a community cannot receive the team due to prior commitments. • Based on project experience it is recommended that the CV&A guideline currently used by the National Community Vulnerability and Adaptation Assessment Team be endorsed as one of the main assessment tools used by government to carry out community vulnerability and adaptation assessments.
Reference materials	SPREP 2006
Source	http://www.pacificdisaster.net/pdnadmin/data/original/SPREP_2006_CVA.pdf

⁷ Index number: #234

CENTRAL AMERICAN PROBABILISTIC RISK ASSESSMENT (CAPRA)⁸

REGION: LATIN AMERICA & THE CARIBBEAN		LEVEL: REGIONAL	
DESCRIPTION	<p>The Central American Probabilistic Risk Assessment (CAPRA) was launched in 2008. The initiative aims to strengthen the capacity of institutions to assess, understand and communicate disaster risk related to earthquakes, tsunamis, cyclones, floods, landslides and volcanic hazards with the ultimate goal of integrating the information into development policies and programs.</p>		
	<p>In order to achieve this, CAPRA created a free assessment tool, alongside providing targeted practical capacity building for Central American government institutions, academics and practitioners. The CAPRA Programme offers a modular and free software platform to support experts and practitioners in probabilistic risk analysis.</p>		
	<p>The platform calculates risk based on multi-hazard mapping exposure and physical vulnerability data and makes use of cost-benefit analysis tools which supports proactive risk management. With that it also supports the design of risk-financing strategies.</p>		
	<p>The CAPRA Programme began as a partnership between the Centre for Coordination of Natural Disaster Prevention in Central America (CEPRENAC), the United Nations International Strategy for Disaster Reduction (UNISDR), the Inter-American Development Bank (IADB) and The World Bank.</p>		
HIGHLIGHTS	<ul style="list-style-type: none">• Risk information with the following qualities helps to maximise benefits for the end users:<ul style="list-style-type: none">• Targeted & strategic information: takes into account the objectives of the risk assessment, and is consistent with the context and needs of institutions.• Interdisciplinary information: can be created under an interdisciplinary and cross-institutional framework.• Dynamic information: considers new data as it becomes available from hazard models.• Accessible information: is available to decision makers, and when information owners clearly communicate with end-users.• Formal information: can be created under a recognised institutional and legal framework, which in turn legitimises the information’s use in policy design and decision making.• By virtue of participating in and leading the risk assessment process, institutions are more likely to have a sense of ownership over information, and thereby also understand the information’s qualities as well as uncertainties.• Government agencies can be limited significantly by a lack of technical capacity, and require support to produce risk information and undertake risk assessments. When capacity building programmes are well-targeted this not only strengthens their ability to build their own capacity, but also to use risk information in decision making.• Cross-institutional engagement and alignment of institutional priorities facilitate the exchange of expertise and information. For example, in Peru, collaboration between the Ministries of Economy and Finance and the Ministry of Education, as well as academic institutions allowed them to benefit from their combined forces and contributed to stronger National School Infrastructure Plans.		
Reference materials	CAPRA, 2016; Rahman, 2014d; World Bank, 2014c.		
Source	ecapra.org		

⁸ Index number: #70

CLIMATE CHANGE RISK ASSESSMENTS UNDER THE SECURE WATER ACT⁹

REGION: NORTH AMERICA LEVEL: SUB-NATIONAL	
DESCRIPTION	<p>The SECURE Water Act, established in 2009, recognizes that climate change poses a significant challenge to the protection of adequate and safe supplies of water. It authorizes the Bureau of Reclamation (Reclamation) to coordinate and partner with others to ensure the use of best available science, to assess specific risks to water supply, to analyse the extent to which water supply risks will impact various water-related benefits and services, to develop appropriate mitigation or adaptation strategies, and to monitor water resources to support these analyses and assessments. It authorizes Reclamation to carry out these assessments in major Reclamation river basins, including the Colorado, Columbia and Missouri rivers.</p> <p>In response to the Act, Reclamation has implemented the Basin Study Program which includes three components: (1) comprehensive studies to define options for meeting future water demands in river basins in the West where imbalances in supply and demand exist or are projected; (2) partnerships between science and resource management that together inform climate adaptation strategies; (3) West-Wide Climate Risk Assessments (WWCRAs) which complement the Basin studies by developing key data on climate-induced risks and impacts to Reclamation's operations (including climate projections and analyses of baseline water supply, water demand, water management operations, and environmental responses).</p> <p>These data provide a foundation for future Basin Studies, as well as for project-specific applications. WWCRAs also generate important information, tools, and guidance that support the integration of climate information into planning activities, consistent with Reclamation's Climate Change Adaptation Strategy.</p> <p>Reclamation has reported the outcomes of its assessments to Congress for the first time in 2011. The 2016 report has been prepared in response to the mandated reporting period of 5 years, following the 2011 report. The reports include assessments of climate change risks and how those risks could impact water operations, hydropower, flood control, and fish and wildlife in the western U.S.</p>
HIGHLIGHTS	First consistent and coordinated assessments of risks to future water supplies across eight major Reclamation river basins, identifying several increased risks to western U.S. water resources during the 21st century.
Reference materials	<i>Reclamation, 2016, West-Wide Climate Risk Assessments: Hydroclimate Projections. Technical Memorandum No. 86-68210-2016-01.</i>
Source	http://www.usbr.gov/climate/secure/docs/2016secure/wwcra-hydroclimateprojections.pdf

⁹ Index number: #342

CALCHAS – AN INTEGRATED ANALYSIS SYSTEM FOR THE EFFECTIVE FIRE CONSERVANCY OF FORESTS¹⁰

REGION: EUROPE LEVEL: SUB-NATIONAL	
DESCRIPTION	<p>An integrated forest fire analysis system (IFFAS) has been developed and established as part of the CALCHAS project (2010-2013) which aimed at improving the evaluation of hazards as well as the planning for and management of forest fires in two pilot areas (Troodos, Cyprus; Grammos, Greece).</p> <p>It uses a forest-fire simulation tool that is capable of estimating the evolution of a wild forest fire. The tool does this by using as inputs data on ignition risk, real-time meteorological data, the vegetation of the area and spatial information (iso-contours and ground elevation).</p> <p>Meteorological stations have been installed in the areas of the two pilot sites to feed real-time data into the online system. Structural characteristics on vegetation provide detailed information which is useful in knowing when environmental conditions are favorable for fire development. The fire simulator tool is then used to predict fire development and to help managing it.</p>
HIGHLIGHTS	<ul style="list-style-type: none"> • In order to increase stakeholder participation, local authorities such as fire services, civil protection, local communities as well as private citizens received training on the application of the simulator and management of the information obtained from it and were involved in the dissemination of the project results and the planning of further coping strategies. • The system is a useful tool for the responsible authorities at two levels: <ul style="list-style-type: none"> ○ At scenario level: (i) for personnel training purposes, (ii) for planning of the necessary fire conservancy infrastructures (fire monitoring stations, firebreak zones, water tanks, etc.). ○ At operational level: for decision making and coordination during forest fire incidents.
Reference materials	<i>European Climate Adaptation Platform</i>
Source	www.calchas.gr http://climate-adapt.eea.europa.eu/metadata/case-studies/calchas-an-integrated-analysis-system-for-the-effective-fire-conservancy-of-forests

¹⁰ Index number: #343

KEY FINDINGS FROM THE QUESTIONNAIRE¹¹

Seventy-eight percent of **countries** that responded to the questionnaire reported to conduct climate risk analysis, including of extreme weather events (67%), slow onset events (52%), displacement and migration (33%) and non-economic losses (24%). 37% of countries do this periodically (either over a period of 1-5 years or over a period of 6-10 years) and 48% undertake climate risk analysis also at a subnational level. 61% of countries include in their national risk analysis consideration of how vulnerable groups are exposed to the adverse effects of climate change (e.g. because of geography, socioeconomic status, livelihoods, gender, age, indigenous or minority status or disability).

Information that countries consider in their climate risk analysis include:

- Climate scenarios (81%), e.g. SRES; regional; downscaled global climate models; IPCC representative Concentration Pathways 8.5 and 4.5; regional and subnational climate models; scenarios modelled for UNFCCC National Communications;
- Scientific information (71%), e.g. IPCC; information generated by the national meteorological agencies; climate risk conceptual framework;
- Hydro-meteorological information (71%), e.g. rainfall/temperature data; information generated by national meteorological agencies; historic hydro-meteorological data;
- Climate services (52%), e.g. numerical weather prediction; weather and climate forecasts; scientific information generated by national meteorological agencies.

Key challenges reported in conducting climate risk analysis include:

- Data comparability and consistency and lack of linkage to systematic climate observation;
- Access to quantitative and long-term data, relevant to identification and prioritization of climate risk analysis (existing data is not comprehensive because analysis was done on a project basis or only focused on certain extreme events);
- Access to skilled personnel (esp. with skills in data collection and modelling);
- Lack of a common understanding of slow onset events;
- Lack of institutional frameworks and commitment amongst key stakeholders on issues related to slow onset events.

A **prominent challenge** faced by 93% of the countries is the **integration of long-term changes from extreme weather events and slow onset events in their risk analysis**. The main reasons include lack of funding, lack of capacity at the national level and lack of available data and information.

Almost all responding **organizations** support national/subnational governments in enhancing their capacities to access or generate scientific information required to conduct such assessments and underline that such **information is in most cases easily available at various levels**. An equally high number of organizations **incorporate the risk of loss and damage** associated with the adverse effects of climate change **into their risk analyses** (including of extreme weather events, followed by slow-onset events, followed by non-economic losses). Most use a specific methodology (e.g. probabilistic risk assessment, Climate Vulnerability and Capacity Analysis, market/gender assessments, Africa RiskView model).

Organizations face the following constraints when assisting countries with conducting climate risk analyses:

- Lack/insufficient knowledge, information and understanding of risks of loss and damage associated with the adverse effects of climate change (seven respondents);
- Difficulty analyzing risks of slow onset events vis-à-vis risks of extreme weather events;
- Lack of continuity due to changes of personnel in country, retaining trained staff;
- Technical capacity development and availability of climate data and information;
- Uncertainties and political instability.

Organizations mention that it is not completely understood at country level why risk assessments should be conducted, how results can be used and how they can be useful to make more informed decisions. As such, the most frequent needs in order to be able to initiate climate risk analysis at national level include training, finance, information, enhanced coordination, personnel, better access to global data, sharing good practices and improved planning processes.

¹¹ The key findings contained in this section are based on the inputs provided by 28 non-Annex I Parties and eight organizations in response to two sets of questionnaires regarding the systems and/or processes currently in place in countries for conducting and coordinating analyses of climate risk and loss and damage associated with the adverse effects of climate change, taking into account extreme and slow onset events, in the context of Action Area 5 of the initial two-year workplan of the Executive Committee.

B. RISK REDUCTION

Risk reduction represents another component of comprehensive risk management. It is the concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events (UNISDR, 2009).

Risk reduction can be achieved through a range of structural and non-structural measures.

Common **structural measures**, i.e. any physical construction to reduce or avoid possible impacts of hazards, or application of engineering techniques to achieve hazard-resistance and resilience in structures or systems, include dams, flood levies, ocean wave barriers, earthquake-resistant construction, evacuation shelters. Risk could be reduced substantially by **retrofitting** of existing hard infrastructure through reinforcement or upgrading of existing structures to become more resistant and resilient to the damaging effects of hazards.

Common **non-structural measures**, i.e. not involving physical construction but measures using knowledge, practice or agreements to reduce risks and impacts, in particular through policies and laws, public awareness raising, training and education. They include building codes, land use planning laws and their enforcement, research and assessment, information resources, and public awareness programmes (UNISDR, 2015).

Legislative measures, such as building codes and standards, are a set of ordinances or regulations and associated standards intended to control aspects of the design, construction, materials, alteration and occupancy of structures that are necessary to ensure human safety and welfare, including resistance to collapse and damage. Building codes can include both technical and functional standards. They should incorporate the lessons from international experience and should be tailored to national and local circumstances. A systematic regime of enforcement is a critical supporting requirement for effective implementation of building codes (UNISDR, 2015).

Planning is a management tool to help make decisions on the appropriate mix of risk reduction options. The plan is a guide to keep implementers on track and serves as documentation of the thoughts and considerations that formed the foundation of the planning process. The objective of planning is not to produce a comprehensive document but to develop a process. The process of planning for disaster risk reduction is a key factor in determining its success. Communities and local governments are more likely to be committed to the plan's implementation if they participated actively in its formulation.

Early warning systems are the set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities, and organizations threatened by a hazard to prepare and to act appropriately in a timely manner to reduce the possibility of harm or loss. A people-centred early warning system necessarily comprises four key elements:

- knowledge of the risks;
- monitoring, analysis and forecasting of the hazards;
- communication or dissemination of alerts and warnings; and
- local capabilities to respond to the warnings received (IPCC, 2012; UNISDR, 2009).

The extent of **broad-based societal awareness, and level of knowledge and education** about disaster risks, the factors that lead to disasters and the actions that can be taken individually and collectively to reduce exposure and vulnerability to hazards is a key consideration for risk reduction approaches. **Public awareness** is a key factor in effective disaster risk reduction. It is possible to foster awareness, for example, through the development and dissemination of information through media and educational channels, trainings, the establishment of information centres, networks, and community or participatory actions, and advocacy by senior public officials and community leaders.

KEY FINDINGS

Systems to reduce current climate risk are more successful if (IPCC, 2012):

- Risks are recognised as dynamic and are mainstreamed and integrated into development policies, strategies, and actions, and into environmental management;
- **Legislation** for managing disaster risks is **supported by clear regulations** that are effectively **enforced** across scales and complemented by other sectoral development and management legislations where risk considerations are explicitly integrated;
- Disaster risk management functions are coordinated across sectors and scales and led by organizations at the highest political level;
- **National development and sector plans include considerations of disaster risk;**
- Risk is quantified and factored into **national budgetary processes;**
- Decisions are informed by **comprehensive information** about observed changes in weather, climate, and vulnerability and exposure, and historic disaster losses, using a diversity of readily available tools and guidelines;
- **Early warning systems** deliver timely, relevant, and accurate predictions of hazards, and are developed and made operational in partnership with the public and trigger effective response actions;
- Strategies include a **combination of hard infrastructure-based approaches and “soft” solutions** such as individual and institutional capacity building and ecosystem-based responses.

Further findings from the case studies include:

- **Calamity funds** which can be used in support of disaster risk reduction or mitigation, prevention and preparedness activities, instead of only for response, relief and rehabilitation efforts, may receive broader political support given that resources are not tied up until a disaster occurs;
- Comprehensive risk management policies, structures, coordination mechanisms and programmes need to be **institutionalised with continuing budget appropriation** on disaster risk reduction from national to local levels, emphasising decentralisation of resources and responsibilities;
- The **presence of champions** with interest and commitment to adaptation and risk management can enhance the effective implementation of risk management strategies;
- **Simple and low-cost solutions** can be highly effective as in the case of community radios;
- Acceptance of risk reduction measures can be improved if they are combined with measures that provide more **readily visible benefits** (e.g. coastal protection with renovation of seaside promenade);
- **Pilot projects** are an effective means of demonstrating the effectiveness of risk reduction measures and raising the interest of decision-makers.

DISASTER RISK MANAGEMENT LEGISLATION IN THE PHILIPPINES¹²

REGION: ASIA		LEVEL: NATIONAL	
DESCRIPTION	<p>The Philippines Disaster Risk Reduction and Management Act of 2010 (DRM law) was enacted to develop a framework and allocate resources that would enable the national government, the local government units, and other stakeholders to build communities that can survive disasters. The DRM law repealed a 1978 law and has shifted the country’s DRM approach from reactive emergency management and disaster response, to proactive disaster risk reduction and management. It provides a comprehensive, all-hazard, multi-sectoral, inter-agency, and community-based approach to disaster risk management through the formulation of the National Disaster Risk Management Framework.</p>		
	<p>The National Disaster Risk Management Framework is the principal guide to all Disaster Risk Reduction and Management (DRRM) plans and activities in the country. It is reviewed every 5 years. Following the Framework, the National DRRM Plan should contain goals and objectives in disaster mitigation. The Philippines Office of Civil Defence is responsible for the formulation and implementation of this plan.</p>		
	<p>While the main overseeing and coordinating body is the National DRRM Council, DRM law empowers regional and local disaster management bodies in terms of responsibilities and funding. The regional DRRM councils are tasked to coordinate, supervise and evaluate the activities of provincial, city and municipal DRRM councils. As this function is also decentralised to the local level, communities design and integrate their own local plans according to national, regional and provincial frameworks and policies. DRM law also mandates the establishment of a Disaster Risk Reduction and Management Office in every province, city and municipality, and a Barangay Disaster Risk Reduction and Management Committee in every barangay (smallest administrative division in the Philippines).</p>		
	<p>The President approves the funds for the National DRRM Council. Local governments are to set aside at least 5% of their estimated revenue from regular sources for their DRRM councils. Of the local disaster management fund, 30% is allocated as Quick Response Fund, while the 70% is used for pre-disaster measures. During the onset of a typhoon, the Quick Response Fund serves as a stand-by fund for relief and recovery programs. The money may be used on pre-disaster preparedness programs, such as trainings, equipment, supplies and medicines. Premiums on calamity insurance are paid for post-disaster activities. Unexpended local DRRM fund adds up to a Special Trust Fund for the purpose of supporting DRRM activities of the local DRRM councils within the next 5 years.</p>		
HIGHLIGHTS	<ul style="list-style-type: none">• DRM law and its implementing regulations provide for the development of policies and plans and the implementation of actions and measures through a whole-of-society approach. These include good governance, risk assessment and early warning, knowledge building and awareness raising, the reduction of underlying risk factors and preparedness for effective response and early recovery, all of which are required to be gender responsive and sensitive to indigenous knowledge systems.• The “response-oriented” or “reactive” approach is evidenced by the widespread emphasis on post-disaster relief and short-term preparedness, such as forecasting and evacuation, rather than on mitigation and post-disaster support for economic recovery.• DRM law highlights the need for institutionalising DRM policies, structures, coordination mechanisms and programmes with continuing budget appropriation on disaster risk reduction from national to local levels.		

¹² Index number: #72

	<ul style="list-style-type: none"> • DRM law recognises local risk patterns and trends and decentralisation of resources and responsibilities and thus encourages the participation of NGOs, private sectors, community-based organisations and community members in disaster management. It calls for the mainstreaming of disaster risk reduction in physical and land-use planning, budget, infrastructure, education, health, environment, housing and other sectors. • DRM law provides for a calamity fund to be used in support of disaster risk reduction or mitigation, prevention and preparedness activities for the potential occurrence of disasters and not just for response, relief and rehabilitation efforts.
Reference materials	<i>Grantham Research Institute, 2010; Rey, 2015.</i>
Source	ifrc.org

JOINT NATIONAL ACTION PLAN (JNAP)¹³

REGION: PACIFIC		LEVEL: REGIONAL/NATIONAL
DESCRIPTION	<p>The Joint National Action Plan (JNAP) is an integrated action plan adopted by Pacific Island Countries (PICs) since 2010 for addressing climate change and disaster risk management.</p> <p>The development of JNAPs has been facilitated by the Secretariat of the Pacific Regional Environment Programme (SPREP) and the Secretariat of the Pacific Community (SPC) through its Applied Geosciences Division (SOPAC) and multilateral and bilateral development partners such as the United Nations Development Programme (UNDP), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the Government of Australia. Countries have also made efforts to systematically implement their JNAPs by accessing domestic resources and financial resources available through bilateral and multilateral Official Development Assistance (ODA) and climate change finances (CCF).</p> <p>One of the rationales for developing JNAPs is the lack of mainstreaming of climate change and disaster risk management (DRM). While all the JNAPs include priorities for mainstreaming at national, sectoral and community levels, these activities are yet to be implemented or, have been implemented but the outcomes have not been achieved.</p> <p>JNAPs are developed as part of a suite of national instruments to support a country's national development efforts for sustainable development and resilience. JNAP is a multi-sectoral plan that covers priorities for implementation of DRM and climate change adaptation (CCA) at the national level (including sector, provincial and outer islands). JNAPs could address both adaptation and mitigation such as the JNAPs of Tuvalu, Marshall Islands and Cook Islands, or only adaptation such as the JNAPs of Nauru, where the Nauru National Energy Strategy addresses mitigation through energy efficiency and renewable energy.</p> <p>The support to PICs in facilitating and supporting the development of a JNAP is based on country readiness and official requests to SPREP and SPC. Upon receipt of official requests both SPREP and SPC mobilise a regional support team (organization which is available to provide the requested support) and conduct discussions at national level prior to commencing implementation of the programme.</p>	
HIGHLIGHTS	<ul style="list-style-type: none"> • Key factors for success of JNAPs include: <ul style="list-style-type: none"> • Presence of champions with interest and commitment to CCA and DRM and integration (e.g. Tonga, Tuvalu); • Government endorsement for the JNAP concept (e.g. Tonga) and high-level government support and engagement in the JNAP development (e.g. Kiribati and Tonga); • Establishment of a 'formal' JNAP development governance arrangement, with clearly identified lead agency and supported by inter-agency task force or expert group (e.g. Kiribati, Tonga and Tuvalu). • The successful implementation of JNAP depends on the effectiveness of governance arrangement and availability of resources. • All countries note difficulties in getting access to baseline scientific and other data and experiential/traditional information, which are scattered across government agencies, NGOs and regional partners. 	
Reference materials	<i>Pelesikoti, 2013.</i>	
Source	sprep.org	

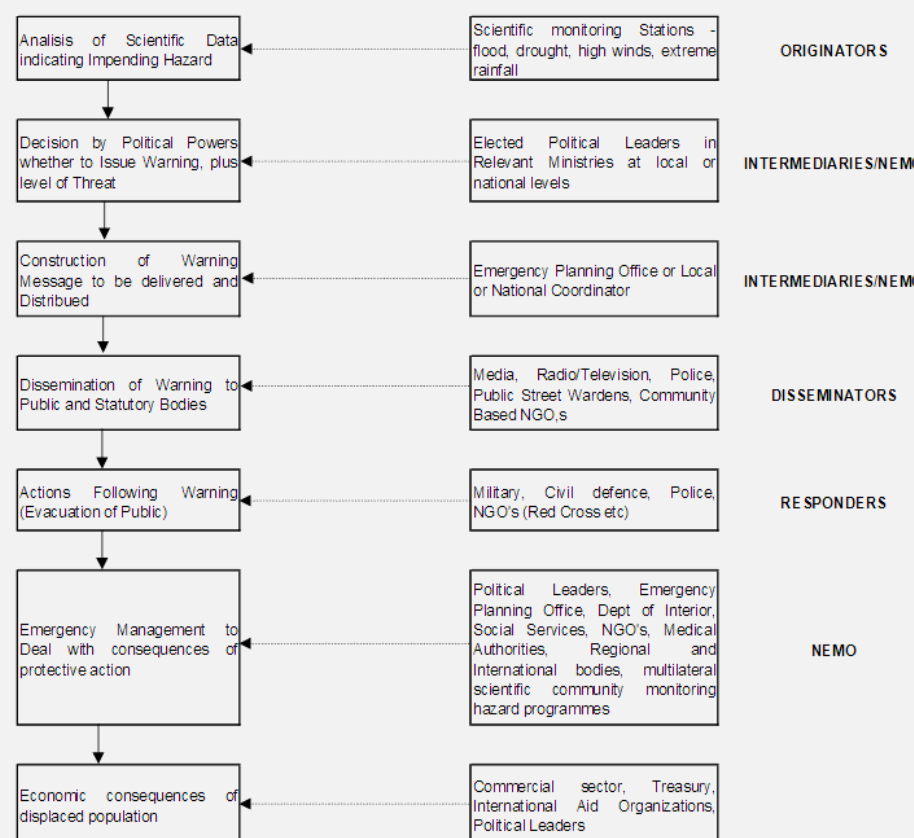
¹³ Index number: #303

CARIBBEAN HURRICANE EARLY WARNING SYSTEM¹⁴

REGION: LATIN AMERICA & THE CARIBBEAN	LEVEL: REGIONAL
---------------------------------------	-----------------

DESCRIPTION	<p>Experiences with hurricane early warning systems (EWS) have been positive in recent times, as increased community awareness of the hazard and EWS methods have reduced loss of life and property during events.</p> <p>Scientists, engineers, meteorologists, hydrologists, equipment manufacturers/suppliers and other practitioners at global and regional levels design, implement, operate and maintain the monitoring, forecasting and predicting systems in the Caribbean region. Institutions that they represent include, amongst others, US Military, NHC (National Hurricane Centre), NOAA (National Oceanic and Atmospheric Administration), UWI (University of the West Indies), CMO (Caribbean Meteorology Organization), and CCCCC (Caribbean Community Climate Change Centre).</p> <p>EWS for hurricanes and volcanoes, with the exception of some nationally installed weather radars, are virtually automatic. Regional engineers, scientists and disaster managers monitor these global warning systems via the internet (Hurricane tracking systems, Volcano alert systems) or automatically transmitted weather faxes, weather channels, and seismometers as well as with other tools and procedurally warn appropriate zone authorities and communities using telephone, e-mail, list serves, cellular text messaging and a range of other media options.</p> <p>Tele-metric equipment for hurricane monitoring, forecasting, predicting, warning and alerting operations include computers, radios, cell phones, satellite phones, sirens, bull horns and weather radar. An example how a warning flow within an early warning system could look like is shown below.</p>
-------------	--

Exemplary flow diagram of an Early Warning System



¹⁴ Index number: # 143

HIGHLIGHTS	<ul style="list-style-type: none"> · EWS are not simply about technical monitoring systems, or about sophisticated predictive and forecast computer models, or about transmitting information to the affected population and response agencies in accurate and timely fashion, but rather about well-coordinated and balanced combinations of all these aspects. They therefore essentially include technical, organizational, institutional, social, legal and other considerations to produce holistic systems; · Redundancy and diversity in EWS (especially alerting) technology has proven essential in transmitting early warning messages, since environmental conditions, social amenities (e.g. electricity), cultural nuances, educational standards and a host of other factors affect the type of application that will prove feasible for each community. A range of technologies from “high-tech” to “no-tech” is therefore needed to find a ‘match’ for every case.
Reference materials	<i>University of the West Indies, (n.d.)</i>
Source	http://www.mona.uwi.edu/cardin/virtual_library/docs/1042/doc14559.pdf

RADIO STATIONS FOR THE TRANSMISSION OF DROUGHT WARNINGS IN KENYA¹⁵

REGION: AFRICA		LEVEL: SUB-NATIONAL	
DESCRIPTION	<p>Garba Tulla Development Organization (GTDO) is a local community-based organization involved in community development initiatives in the semi-arid district of northern Kenya.</p> <p>In the Garba Tulla area, the community radio initiative began as a one base station and one mobile VHF (very high frequency) radio operation to coordinate emergency relief intervention during the severe drought of 1992. Over the years, more radios were added to the network which enabled the connection of nine villages. The community radio is a high frequency, long distance coverage VHF base station installed in each village, which links remote pastoral villages where other forms of telecommunication do not exist. The mobile station visits remote centres, monitors the situation, collects data and relays back the information to the GTDO base station which compiles the report and sends it to the Government and other aid agencies for action. This type of radio transmission enables to quickly identify the locations most in need and to act swiftly with an appropriate response.</p> <p>GTDO has a community decision-making structure called the Deedha Councils through which the need for the project was discussed and agreements reached. Once the responsibilities of the implementing agency and of the communities have been agreed, the equipment for the radio station (radios, antennae, solar panels, and all connections) was sourced by GTDO. The installation in all the villages took place within one day and was carried out by trained GTDO technicians. The community radio operators, usually two people, are trained on the radio operation code of conduct and proper documentation of all messages. The Deedha Council appoints one community member to monitor the progress and to report any anomaly or issue to the Council who then informs GTDO, which acts as a base station that regulates and coordinates all community stations. The strategy encompasses enforcement of strict discipline through the agreed upon code of conduct and the recording of the radio messages by the community radio operators. This is regulated by the base radio station at GTDO which takes care of the clear understanding of roles and responsibility of the beneficiary community in terms of maintenance, monitoring and sustenance of the radio operators.</p> <p>The project was implemented with initial support from UNICEF. An expanded phase was supported by the District Drought Monitoring and Management Project and the Catholic Organization for Relief and Development Aid (CORDAID). In addition to GTDO staff, 10 to 15 community volunteers in each of the nine villages are involved in the radio installation. Overall, the total number of beneficiaries is more than 30,000 people in the district of Garba Tulla.</p>		
HIGHLIGHTS	<ul style="list-style-type: none">• The VHF radio stations are a cost effective, handy tool for communication in remote locations. This radio communication has been used to link the various communities, development agencies and government departments in an innovative manner and thus enhance development collaboration.• Because of the high value attached to the radios by the communities, it was not difficult for GTDO to hand over the management of the radios to the respective communities to manage and pay the operators. Unlike other development initiatives, the communities were willing to perform this role without much hesitation.		
Reference materials	UNISDR, 2010.		

¹⁵ Index number: #248

NATIONAL PROGRAMME FOR COMMUNITY EMPOWERMENT IN URBAN AREAS IN INDONESIA¹⁶

REGION: ASIA		LEVEL: NATIONAL
DESCRIPTION	<p>The government of Indonesia, with support from the Global Facility for Disaster Reduction and Recovery (GFDRR) and the World Bank, has implemented the National Programme for Community Empowerment in Urban Areas which aims at empowering vulnerable communities and strengthening urban resilience against a wide range of risks triggered by natural disasters and climate change. This nationwide programme covers 10,922 urban wards reaching more than 100 million urban dwellers, including 20% of urban poor. It already employs more than 6,000 facilitators and 1,850 city coordinators and technical assistants who contribute to mainstreaming disaster risk management measures by providing advisory assistance to communities in urban management and local infrastructure development.</p> <p>GFDRR's support is helping the programme's delivery of training activities for facilitators and provides block grants for communities to undertake urgent disaster resilient measures to reduce the impacts of natural hazards. This technical assistance has already leveraged \$217 million in investments from the World Bank and the government of Indonesia to fund additional Community Driven Development (CDD) projects, nearly 80% of which is to be invested in resilient community infrastructure. The training of facilitators has contributed to the dissemination of disaster risk reduction best practices. It has also encouraged communities to integrate resilience-enhancing measures into neighbourhood infrastructure upgrades in urban areas, including evacuation routes, water retention drainage, landslide mitigation methods and eco-resilient settlements. The GFDRR-supported InaSAFE tool is facilitating community-based risk mapping, helping local decision-makers better understand hazard impacts and integrating disaster risk mitigation into local infrastructure projects.</p>	
HIGHLIGHTS	<ul style="list-style-type: none">• The participatory approach applied by the programme has allowed equipping and building the capacity of local decision-makers to conduct their own community risk mapping. As a result, community leaders were able to identify recurring natural hazards, enabling them to measure exposure to disaster risks before planning quick-impact mitigation activities, such as evacuation routes or water retention drainage facilities.• Pilot grants for undertaking resilience-enhancing measures have provided communities with a realistic showcase to persuasively demonstrate how infrastructure investments can be resilient to the most common hazards facing Indonesia.• These pilots demonstrate that densely populated settlements prone to landslides stand to benefit from being provided with preventive structural measures that are built with effective drainage systems, a robust design and a connectivity function to provide safe evacuation options for the community during flood or earthquake-triggered events.	
Reference materials	Rahman, S. (2015a).	
Source	gfdrr.org	

¹⁶ Index number: #150

PRODUCTIVE SAFETY NET PROGRAMME (PSNP)¹⁷ in ETHIOPIA

REGION: AFRICA

LEVEL: SUB-NATIONAL

DESCRIPTION

The Productive Safety Net Programme (PSNP) was launched in 2005 by the Government of Ethiopia, the World Food Programme (WFP) and development partners*. PSNP provides multi-annual predictable transfers, as food, cash or a combination of both, to help chronically food insecure people survive food deficit periods and avoid depleting their productive assets while attempting to meet their basic food requirements. Major causes of food insecurity in Ethiopia include land degradation, recurrent drought, poor and inadequate management of risk, population pressure, and subsistence agricultural practices dominated by rain-fed farming and characterised by low inputs and low outputs.

PSNP's major goals are to: (i) support the rural transformation process; (ii) prevent long-term consequences of short-term food inaccessibility; (iii) encourage households to engage in production and investment; (iv) promote market development by increasing household purchasing power.

The combination of cash and food transfers is based on season and need, with food given primarily in the lean season between June and August. Vulnerable households receive six months of assistance annually to protect them from acute food insecurity. Additionally, WFP extends food and cash assistance to an additional three months during periods when food insecure people are affected by unpredicted shocks.

PSNP provides cash and/or food transfers to households through two mechanisms: (i) chronically food insecure households with able-bodied adults receives a transfer for their participation in public work, such as rehabilitating land and water resources and developing community infrastructure, including rural road rehabilitation and building schools and clinics; (ii) chronically food insecure households who cannot provide labour to public works and have no other means of support are provided an unconditional transfer.

Households are considered chronically food insecure if they have received food aid assistance over the last three years. The programme has two components. The first component is the sub-projects which are determined locally by the beneficiary communities through an annual, participatory planning process. Communities use a watershed planning approach for determining appropriate projects. Projects are integrated so that many of the assets communities create help to sustainably rehabilitate the highly degraded environments which are one of the causes of food-insecurity. The second component is Direct Support, which provides grants to households who are labour-poor and cannot undertake public works.

The Ministry of Agriculture and Rural Development of Ethiopia is responsible for the management of the PSNP, with the Disaster Risk Management and Food Security Sector responsible for the overall programme coordination. The Ministry of Finance and Economic Development of Ethiopia oversees financial management of the programme and disburses cash resources to implementing federal ministries and to the regions based on the annual plan submitted by the Ministry of Agriculture and Rural Development. Within this framework, WFP provide technical assistance to the programme and supports the Government in procuring food stocks from abroad. Donor agencies have pooled their financing - both cash and in-kind contributions - and formulated a unified stream of technical advice in support of a single programme led by Government.

¹⁷¹⁷ Index number: #235

HIGHLIGHTS	<ul style="list-style-type: none"> • Programme coverage in terms of numbers of beneficiaries reached 4.83 million chronically food insecure beneficiaries in 2005, delivering 224,141 MT of food and approximately US\$50 million as cash transfers. As of 2006, PSNP coverage increased to approximately 7.2 million beneficiaries to cover the pastoral region of Afar. • PSNP has contributed significantly to improved food security in Ethiopia and has had a positive impact on the livelihoods of households. • PSNP public works have led to important improvements in rural infrastructure and have contributed to improved access to education and health services, enhanced water retention and reduced soil and water run-off; and protected land in area enclosures, which increases soil fertility and carbon sequestration. • The capacity of local governments to undertake participatory planning and implementation has been significantly strengthened through the program. • PSNP has provided important disaster response through contingency budgets at local and regional levels. • In addition to providing regular transfers, PSNP will support linking of clients to livelihoods services and opportunities. • PNSP provided for appropriate community consultation to ensure the relevance and ownership of the assets created and gave the responsibility for the selection of public works sub-projects to communities.
Reference materials	WFP, 2012; World Bank, 2016.

IMPLEMENTATION OF THE INTEGRATED MASTER PLAN FOR COASTAL SAFETY IN FLANDERS¹⁸

REGION: EUROPE		LEVEL: SUB-NATIONAL
DESCRIPTION	<p>The integrated Master Plan for Coastal Safety in Flanders, Belgium, was initiated in response to a study that showed that about one third of the Flemish coastline was not sufficiently protected against severe storm events and that sea level rise and other climate change related effects (e.g. changes in storm and precipitation intensity and frequency) could exacerbate this vulnerability.</p> <p>The objectives of the project were to:</p> <ul style="list-style-type: none"> • Improve defenses of the Flemish coastline to the level of protection against extreme storm events at 1:1000 years return period, including under a +30 cm sea level rise by 2050, together with a sustainable management plan; • Include societal participation and involvement of stakeholders to find balances in environmental, economic, social, cultural and recreational objectives within the boundaries of the natural dynamics of the coast. <p>The Master Plan included both soft and hard measures. Soft measures consisted of beach and dune nourishment. Beaches and dunes were monitored every year to adapt their management accordingly. Beach nourishment was managed using a 5-year plan in order to respond to still occurring erosion and cope with future sea level rise; the volumes needed for maintenance were estimated around 500.000 cubic meters per year.</p> <p>The Master Plan also foresaw the construction of storm walls to protect coastal cities and harbours (hard measures). An optimal design of these hard protection measures had been designed to minimize their height and optimize their spatial integration.</p> <p>The implementation phase of the plan lasted from 2011 – 2015 but continuous engagement according to the objectives of the plan is foreseen, particularly also with regard to monitoring and assessment of potential ecological effects of the interventions, e.g. beach nourishment.</p>	
HIGHLIGHTS	<ul style="list-style-type: none"> • Adoption of an integrated approach, based on the integration between soft (beach and dune nourishment) and hard (storm return walls, broadening of seawalls with stilling wave basin, storm surge barrier) protection measures; • As part of the integrated approach, a combination of protection measures with local requalification interventions, such as in the case of the city of Ostend, where coastal protection was integrated with the harbour improvement, the renovation of the seaside promenade and the construction of underground parking; • Adoption of a dual temporal vision, including both the short term view that aimed to improve the protection of currently critical areas and a long-term view (2050) aimed at providing the desired level of protection even in the future; • Wide stakeholder participation, during both the design and implementation phases of the Master Plan. 	
Reference materials	European Climate Adaptation Platform	
Source	http://www.kustveiligheid.be http://climate-adapt.eea.europa.eu/metadata/case-studies/implementation-of-the-integrated-master-plan-for-coastal-safety-in-flanders	

¹⁸ Index number: #344

MULTI-HAZARD APPROACH TO EARLY WARNING SYSTEM IN SOGN OG FJORDANE, NORWAY¹⁹

REGION: EUROPE LEVEL: NATIONAL	
DESCRIPTION	<p>Sogn og Fjordane is a coastal, mountainous region of Norway that boasts hundreds of thousands of tourist visits annually. Several communities in Sogn og Fjordane are facing numerous hazards such as flooding, avalanches, rock slides and other extreme weather events, that might be exacerbated by climate change. Great distances between peripheral communities and transport and communication infrastructure not accessible or available at times can make accessibility poor, thus making communities more vulnerable to extreme weather events.</p> <p>To respond to these challenge an early warning system was set and tested in Aurland municipality, part of the Sogn og Fjordane county. Aurland is a region of great natural beauty but has a somewhat challenging geography and topography that results in frequent storm surges, floods, landslides and avalanches occurrences that might increase with the effect of climate change on the increase in frequency and/or intensity of extreme weather events. The multi-hazard warning system would optimise rescue and other emergency services provided by the county. Due to tourism, it aims to be a cost-effective method reaching all people in the geographic area and not only residents.</p>
HIGHLIGHTS	<ul style="list-style-type: none"> • In order to establish a cost-effective early warning system, multi-hazard approaches are a prerequisite, as the costs of using and maintaining the system will be shared. • A location-based warning system can also represent an integrated tool for disseminating purely informative messages, such as general public information or various messages from local authorities. • Technical aspects of people-centred warning systems are at large readily available, whereas issues concerning confidentiality legislation and system regulations must be addressed before successfully implementing efficient location-based warning systems (e.g. legislative barriers in terms of confidentiality rules that prevent geographic data collected by telemobile companies from being shared publicly). • The project demonstrated that modern warning system technology can be combined with existing infrastructure and organizational patterns to enable local authorities to issue population warnings in a cost-effective and sustainable way. • There is not a defined lifetime for early warning systems as long as these are updated and maintained operational.
Reference materials	<i>European Climate Adaptation Platform</i>
Source	http://climate-adapt.eea.europa.eu/metadata/case-studies/multi-hazard-approach-to-early-warning-system-in-sogn-og-fjordane-norway

¹⁹ Index number: #345

With respect to different aspects of reducing climate risk, **countries** that responded to the questionnaire reported the following challenges:

- **Generation and application of data/projections/knowledge**, particularly regarding non-economic losses, economic losses, climate impacts on natural hazards at sector and sub-national levels, on vulnerability at sub-national level, and on natural hazards and vulnerability at national level;
- **Establishment of well-functioning national coordination mechanisms** to assess the adverse effects of climate change;
- **Estimation of the relevance of the adverse effects of climate change for the national disaster risk management.**

Reasons for the pronounced challenges in generating data and information include insufficient and unsystematic forecasting and data coverage, insufficient financial and human resources, and insufficient institutional frameworks.

Despite these challenges, 85% of countries reported to have comprehensive national disaster risk management processes/plans/strategies developed, into which the majority has integrated a climate risk analysis. However, they also reported on the following needs that would enable even stronger consideration of the adverse effects of climate change into national risk management: (i) finance, (ii) training/competence, (iii) methodologies, (iv) technology/software, (v) enhanced policies, (vi) enhanced ability to convince political leaders of the urgency or benefits, (vii) enhanced coordination/incentives for coordination.

All countries have national legislation or other national or sectoral policies and/or plans (e.g. a national adaptation plan) that enable links between dealing with the adverse effects of climate change and risk management (including disaster risk management).

Responding **organizations** confirmed similar challenges. Almost all organizations are providing assistance to countries in the implementation of comprehensive disaster risk management plans/processes. They indicate that their climate risk analyses are generally used by countries for national/subnational adaptation, risk management and development plans.

Some of their experiences and lessons learned include a need to:

- Develop accurate national and regional assessments analyzing the linkages between migration, environment, climate change and DRR;
- Establish regional institutions managed by member states with contributions from participating countries to sustain core services with catalytic funding support from development partners;
- Conduct thorough climate risk analysis to ascertain the country's true risk profile; national disaster risk management plans and actions should then be adjusted to detail how events of differing severity/ frequency levels will be dealt with including means of financing and the various ministries involved in implementation of the plan; governmental budgets need to incorporate the planned financing tools annually.

As part of comprehensive risk management, most of the organizations also provide support to countries for implementing the following **anticipatory action to reduce the risk of loss and damage**:

- Advocacy, coordination, normative guidance, partnership building, capacity development and monitoring;
- **Disaster risk reduction (DRR) and adaptation**, mostly related to extreme events, but also slow onset events (esp. drought);
- **Early warning systems** related to food security and nutrition;
- **Solutions allowing people to remain in situ** in areas exposed to adverse climate change impacts; or on solutions that assist and protect people on the move, facilitating mobility in an **orderly and dignified** way, provide early warning systems related to food security and nutrition.

²⁰ The key findings contained in this section are based on the inputs provided by 28 non-Annex I Parties and eight organizations in response to two sets of questionnaires regarding the systems and/or processes currently in place in countries for conducting and coordinating analyses of climate risk and loss and damage associated with the adverse effects of climate change, taking into account extreme and slow onset events, in the context of Action Area 5 of the initial two-year workplan of the Executive Committee.

C. FINANCIAL RISK TRANSFER

Financial risk transfer is a process of formally or informally shifting the financial consequences of particular risks from one party to another whereby a household, community, enterprise, or state authority will obtain resources from the other party after a disaster occurs, in exchange for ongoing or compensatory social or financial benefits provided to that other party (IPCC, 2012).

Financial risk transfer can occur informally within family and community networks where there are reciprocal expectations of mutual aid by means of gifts or credit, as well as formally where governments, insurers, multi-lateral banks and other large risk-bearing entities establish mechanisms to help cope with losses in major events. Such mechanisms include insurance and re-insurance contracts, catastrophe bonds, contingent credit facilities and reserve funds, where the costs are covered by premiums, investor contributions, interest rates and past savings, respectively (UNISDR, 2009).

Insurance is a common form of financial risk transfer used widely in industrialised countries with high density of financial and infrastructural assets, and in sectors worldwide such as agriculture. Insurance entities cover an agreed-upon risk in exchange for ongoing premiums paid to the insurer, for sharing and transferring risk among a pool of at-risk households, businesses, and/or governments (IPCC, 2012). Insurance aims to reduce the uncertainty of loss by pooling a large number of uncertainties so that the burden of loss is distributed as widely as possible (risk spreading). Generally, each policyholder pays a contribution to a fund, in the form of a premium, commensurate with the risk he introduces. The insurer uses these funds to pay the losses (indemnities) suffered by any of the insured (Cummins and Mahul, 2009).

To prevent an individual insurance entity from an inability to pay insurance claims in the event of catastrophic events, reinsurance is used (insurance for the insurers). When the total exposure of a risk or group of risks presents the potential for losses beyond the limit that is prudent for an insurance company to carry, the insurance company may purchase **reinsurance**. Reinsurance has advantages, including 1) levelling the results of the insurance company over a period of time; 2) limiting the exposure of individual risks and restricting losses paid out by the insurance company; 3) possibly increasing an insurance company's solvency margin (percent of capital and reserves to net premium income), hence the company's financial strength; and 4) enabling the reinsurer to participate in the profits of the insurance company, but also to contribute to the losses, the net result being a more stable loss ratio over the period of insurance.

Two broad types of insurance products are available for climate-related risks: Indemnity-based insurance and parametric insurance. Indemnity-based insurance requires a risk assessor to visit an affected site to assess damages caused by an insured hazard, and then determine an appropriate payout relative to premiums paid. Parametric insurance products forego the risk assessor step and makes payments based not on an assessment of the policyholder's individual loss, but rather on measures of a parametric index that is assumed to proxy actual losses. Parametric products are also called **index-based insurance**. They rely on the measurement of an objective and independent proxy, offer new opportunities to transfer the systemic components of crop losses caused by droughts, low temperatures or extended floods. It offers opportunities for the emergence of commercial agriculture insurance in low- and middle-income countries, both at the micro (farmer) and macro (government) level (Cummins and Mahul, 2009).

Micro-insurance provides protection of low-income people against specific perils in exchange for regular premium payments proportionate to the likelihood and cost of the risk involved. It provides rapid access to post-disaster liquidity, thus protecting livelihoods and providing for reconstruction. As insured households and farms are more creditworthy, insurance can also promote investments in productive assets and higher-risk/ higher-yield crops. In addition, insurance has the potential to encourage investment in disaster prevention if insurers offer lower premiums to reward risk-reducing behaviour (CGAP, 2013).

Sovereign risk financing allows countries to secure access to financial capacity when a disaster hits. Sovereign risk financing is particularly justified for countries for which potential losses caused by natural disasters are large relative to their national economies, or where the cost of mobilising post-disaster funding is high. A cost-effective sovereign risk financing strategy relies on an optimal layering of catastrophe risk, including establishment of a reserve fund to cover small and recurrent losses, contingent credit, and financial instruments such as reinsurance and catastrophe bonds (Cummins and Mahul, 2009).

Multi-country/Regional risk pooling is the aggregation of individual risks to manage the consequences of independent risks. Risk pooling is based on the law of large numbers. In insurance terms, the law of large numbers demonstrates that pooling large numbers of roughly homogenous, independent exposure units can yield a mean average consistent with actual outcomes. Thus, pooling risks allows an accurate prediction of future losses and helps determine premium rates. Regional catastrophe insurance pools can offer developing countries access to international reinsurance on competitive terms by pooling country-specific risks into a single, better structured portfolio. They create new business opportunities to the reinsurance industry, which may not have otherwise approached these countries on an individual basis because of the high transaction costs (Cummins and Mahul, 2009).

Risk-linked securities are innovative financing devices that enable insurance risk to be sold in capital markets, raising funds that insurers and reinsurers can use to pay claims arising from mega-catastrophes and other loss events. The most prominent type of risk-linked security is the **catastrophe risk (CAT) bond**, which is a fully collateralised instrument that pays off when 'triggered' in the event of a defined catastrophic event. Common types of triggers are loss-and-damage based triggers, which set a threshold based on the total insured or total economic losses experienced by a single firm (indemnity) or an industry (indexed), and parametric triggers, which are based on independent predetermined indicators, such as wind speed or storm surge height measured at specific locations. Catastrophe bonds include a special condition that states that if the issuer suffers a loss from a particular pre-defined catastrophe, then the issuer's obligation to pay interest and/or repay the principal is either deferred or completely forgiven. Funds may in some cases also contribute to raising funds for climate change adaptation and risk reduction.

Other risk-linked securities are climate bonds, resilience bonds and green bonds. **Climate bonds** are fixed-income financial instruments issued to finance or re-finance climate change-related projects (e.g. mitigation, adaptation or risk reduction). The issuing entity (multinational banks or corporations) guarantees to repay the bond over a certain period of time, plus either a fixed or variable rate of return. Investors are institutional entities (e.g. pension funds) or individuals. Climate bonds have the same credit risk and return profile as standards bonds.

KEY FINDINGS

Important factors for effective **risk transfer processes and markets** include (OECD, 2012):

- An overall **enabling environment** (see section below on enabling environments) - its absence is often a strong market barrier in developing countries;
- **Clarification of the allocation of disaster costs** so that all economic agents, including different levels of governments, assume responsibility for the risks they face and undertake actions to ensure that these risks are managed properly;
- Sound financial strategies with a carefully designed mixture of financial instruments, given respective contingent liabilities of each actor under the prevailing risk allocation;
- **Availability of reliable and consistent data on hazards**, exposures and vulnerabilities to reduce uncertainties characterising the risk assessment process and to lower the cost of risk transfer tools;
- A **well-developed financial sector** linked to formal international markets as well as to less formalized financial services for lower-income communities. Banks and insurers need to have **adequate levels of capital to absorb the costs of disasters** as well as **operational capacity** to pay claims promptly in the event of a disaster.
- **Private sector expertise and experience** in relevant markets. This proves invaluable to making decisions on the selection of service providers, pricing, policy conditions, and client relations.

Further findings from the case studies include:

- **Simplicity and flexibility** in product design helps people understand available products and encourages their purchase;
- **Local schemes** have the potential to **reduce high transaction costs**, e.g. in agricultural insurance, by maintaining geographical vicinity which enables members to monitor management of the crops, livestock or other aquaculture activities;
- **Communication, consultation and dialogue** with all relevant stakeholders are key to success of any risk transfer scheme;
- **Risk pooling** is more cost effective than emergency contingency funds;
- **Linking contingency planning with risk transfer** supports resilience building;
- **Success factors** for climate bonds include a clear financial framework, expert project managers attached to the various investment lines, well-structured use of proceeds, frequent reporting, collaboration and clear responsibilities.

PHILIPPINE CROP INSURANCE CORPORATION (PCIC)²¹

REGION: ASIA		LEVEL: NATIONAL	
DESCRIPTION	<p>The Philippine Crop Insurance Corporation (PCIC) is a government owned and controlled corporation (GOCC) created by virtue of PD 1467 in 1978, later on amended in 1980 and 1995. PCIC is an attached agency of the Department of Agriculture, and acts as the implementing agency of the government’s agricultural insurance program. The PCIC’s principal mandate is to provide insurance protection to farmers against losses arising from natural calamities, plant diseases and pest infestations of their palay and corn crops as well as other crops.</p> <p>The PCIC also provides protection against damage to/loss of non-crop agricultural assets including but not limited to machineries, equipment, transport facilities and other related infrastructures due to peril/s insured against. The primary beneficiaries are agricultural (and subsistence) farmers and fisher folk.</p> <p>The seven insurance products being administered and implemented are:</p> <ul style="list-style-type: none">• Crop insurance for rice• Crop insurance for corn• Livestock insurance program• Fisheries insurance programme• Non-crop agricultural asset insurance programme• High value commercial crop insurance• Accident and dismemberment security claim <p>The current five insurance programs are:</p> <ul style="list-style-type: none">• Rice crop insurance for the Department of Agriculture weather adverse rice areas• Farmers and fisher folk listed in the registry system for basic sectors in agriculture• Agrarian reform beneficiaries participating in the agrarian production credit programme and credit assistance programme for programme beneficiaries’ development• For subsistence farmers and fisher folk directly hit by typhoon Yolanda or Haiyan		
HIGHLIGHTS	<ul style="list-style-type: none">• Fully subsidised programs: Various fully-subsidised agricultural insurance programs were launched in 2012 (Sikat-Saka Programme and NIA-Third Cropping), 2013 (Weather Adverse Rise Areas Program) and 2014 (Registry System for Basic Sectors in Agriculture). All three programs target rice farmers only.• Targeted to the poor: About 71% of chronically poor households in the Philippines are in the agricultural sector. This agricultural insurance has been described as a safety net that enables agricultural producers, and particularly the transient poor, to recover quicker from shocks.		
Reference materials	<i>Congressional Policy and Budget Research Department, 2012; Philippine Crop Insurance Corporation, 2016; Philippine Institute for Development Studies, 2016; Reyes et al., 2009.</i>		
Source	pcic.gov.ph		

²¹ Index number: #9

MONGOLIA INDEX BASED LIVESTOCK INSURANCE PROJECT (IBLIP)²²

REGION: ASIA		LEVEL: NATIONAL
DESCRIPTION	<p>In 2006 the Government of Mongolia and the World Bank began a three-year pilot of the Index Based Livestock Insurance Project (IBLIP).²³ IBLIP worked to reduce the impact of livestock²⁴ mortality events from dzud²⁵ by combining self-insurance, affordable and sustainable market-based insurance and a social safety net. In so doing the project distributed the risk between the insured, private insurance companies and the Government of Mongolia/World Bank. In addition, the project had a few other objectives: it sought not to reward poor livestock management, while allowing insurance to work in concert with other initiatives with a clear role for government.</p> <p>Below are the details of how the risk was divided into essentially three layers with three different approaches:</p> <ul style="list-style-type: none"> • Herders would self-insure losses of up to 7% of the estimated value of their herd, as that scale of loss was unlikely to affect the viability of their business. • Larger losses were transferred to the private insurance sector. Any herder, irrespective of his herd size, was eligible to voluntarily purchase a commercial coverage called Base Insurance Product (BIP) from local private insurance companies, which were backed by the government. Premiums were calculated on the basis of the species and location of herds. In the event that disaster losses exceeded 7% of the herd value, insurers provided immediate liquidity to herders. • When losses exceeded 25-30% of herd value, the cost was borne by the government through a social safety net product, the Disaster Response Product (DRP). All herders were automatically registered for the DRP, where those without BIP had to pay a small administrative fee in order to receive a payout. <p>Initially the pilot programme was implemented in three provinces, insuring approximately 2,400 people, with over 14,000 insurance policies sold. The pilot was later extended to being a fully implemented project, and since 2012 all 21 provinces of Mongolia have had access to IBLIP.</p>	
HIGHLIGHTS	<ul style="list-style-type: none"> • A strong institutional and legal framework is required. Such a framework should produce an enabling environment which allows for the design and implementation of agricultural insurance programmes, while providing incentives for those at risk to purchase insurance policies. • Public private partnerships require the government to play an active role. Governments can support the layering and thus the distribution of risk, with some thought being given to the timing in the election cycle of that political support. Through IBLIP, governments learned that in order to layer risk in a cost effective manner, the losses from frequent, low impact events should be borne by farmers. The insurance industry can bear less frequent, more impactful losses, and with the international reinsurance market, backed by the government, bear the catastrophic losses. • The data management system underlying the index-based insurance should be efficient, transparent and fall in line with internationally accepted mechanisms. In order for the insurance mechanisms to be transparent, there needs to be a clear indication of how dzud is declared, and what triggers are in place which release individual forms of assistance. In addition, mechanisms are needed which prevent fraud and abuse. The database also needs to build on historical 	

²² Index number: #157

²³ Proposed by the World Bank, and in 2005 the Government of Mongolia entered into a credit agreement with the World Bank to implement IBLIP. IBLIP has been co-financed by the Japanese Government and the Swiss Agency for Development and Cooperation.

²⁴ In Mongolia herding accounts for more than 80% of GDP. Livestock includes: Cattle, yaks, sheep, goats, camels and / or horses.

²⁵ Dzud: a hazard characterised by drought, heavy snowfall, extreme cold, and windstorms which can occur at any time of year, but primarily from January to June.

	<p>information. In the case of IBLIP, the database needed to take into account annual adult mortality rates of livestock species.</p> <ul style="list-style-type: none"> • Outreach and education are essential. Mongolia's population had little previous experience and understanding of insurance. Furthermore, careful examination was needed of the readiness and capacity of those at risk to change their behaviour. To this end, extensive educational initiatives can serve to lay a foundation for micro-level insurance policies to be adopted. Practices such as direct marketing and educational outreach were found to be effective for IBLIP particularly in the pilot phase of the programme.
Reference materials	<i>Goodland and Mahul, 2011; Goodland, n.d.; IBLIP, 2007; Levin et al., 2007; Mahul and Skees, 2005; SREX, 2012; World Bank, 2009.</i>
Source	iblip.mn

CLIMATE RISK ADAPTATION & INSURANCE IN THE CARIBBEAN: LIVELIHOOD PROTECTION POLICY²⁶

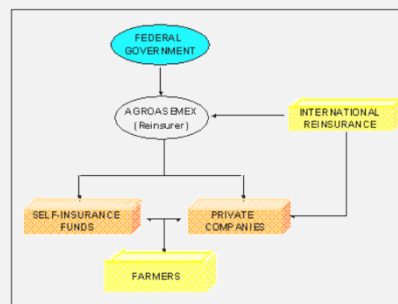
REGION: LATIN AMERICA & THE CARIBBEAN		LEVEL: REGIONAL
DESCRIPTION	<p>The Livelihood Protection Policy (LPP) is a weather-index based insurance policy designed specifically to help vulnerable, low-income individuals recover from the damage caused by strong winds and/or heavy rainfall during hurricanes and tropical storms. LPP provides timely cash payouts soon after a weather event, enabling policy holders to start rebuilding their lives in the wake of a natural disaster. LPP has been launched in Saint Lucia (2013), Jamaica (2013) and Grenada (2014).</p> <p>Payouts under this policy are based on a weather index, i.e. rainfall measured in (mm) and wind speed measured in (mph), which is reported by independent calculation agents. High wind speed and rainfall are monitored by the DHI (formerly known as Danish Hydraulic Institute). Since LPP payouts are linked to a weather index, there is no loss adjustment process and no claim process required i.e. actual damage to property is not assessed.. Payout is timely (within 14 days) and automatically transferred to the clients' bank accounts. Two sources of premiums have been established: (i) clients pay the premiums directly; and (ii) a credit union pays the premium for the basic protection and clients may choose to top-up their plan and add additional levels of protection through direct premium payment.</p> <p>LPP was developed by the Climate Risk Adaptation and Insurance in the Caribbean project. The project is implemented by the Munich Climate Insurance Initiative (MCII) in partnership with the Caribbean Catastrophe Risk Insurance Facility (CCRIF), and global reinsurer Munich Re. The CCRIF is a key project partner facilitating relationships and support with key regional and governmental stakeholders. It is part of the International Climate Initiative (ICI) and supported by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). The project's activities included the different steps in product design (i.e., weather data and risk modelling, trigger design, needs assessment, supporting the creation of an enabling environment, stakeholder alignment, etc.).</p>	
HIGHLIGHTS	<ul style="list-style-type: none"> • The simplicity and flexibility of LPP makes it easier for people to obtain the level of coverage suited for the individual needs. • As the concepts of micro-insurance and weather index insurance were new for most stakeholders of the project, the Climate Risk Adaptation and Insurance in the Caribbean project invested significant resources into awareness raising activities, such as workshops that were specifically aimed at developing the organizational capacity of local stakeholders to administer LPP. • Through a series of training courses, using participatory approaches, insurers, the distribution channels as well as other relevant stakeholders from the public sectors in Saint Lucia and Jamaica have developed a firm grasp on the technical design and process mechanisms of LPP. • SMS-based notifications alert policy holders to approaching weather events, allowing them to take precautionary measures and reduce exposure. • Insurance coverage through this project contributes to improving the credit worthiness of individuals in the long-term, enabling them to better access financial services. 	
Reference materials	<i>Ec global, n.d.; MCII, n.d.; EC Global Insurance</i>	
Source	ccrif.org	

²⁶ Index number: #177

“FONDOS DE ASEGURAMIENTO” SELF INSURANCE FUNDS: SMALL FARMER MUTUAL CROP & LIVESTOCK INSURANCE²⁷

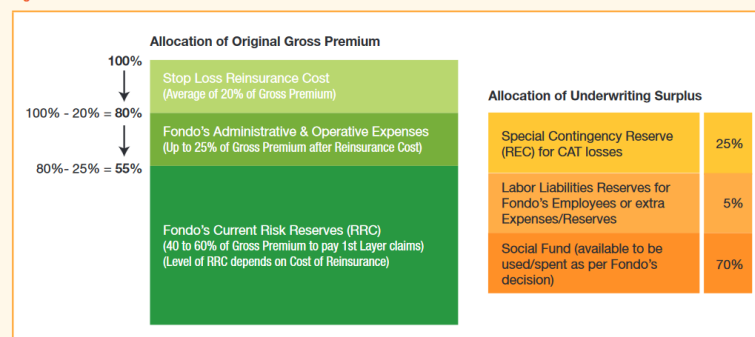
REGION: LATIN AMERICA & THE CARIBBEAN	LEVEL: SUB-NATIONAL
DESCRIPTION	<p>Self-Insurance Funds (SIFs) are a unique mutual insurance scheme operating through the “Fondos de Aseguramiento” programme in Mexico since 1988. The SIFs are legally registered small-scale crop and livestock producer mutual companies whose primary function is to provide group crop and livestock credit. The programme was conceived as a vehicle to provide small and marginal farmers, who have a similar risk profile, with collective access to credit. In 1992 there were 192 SIFs in existence, and by 2012, 388 SIFs were operating, with some 1.5 million hectares covered, representing 63.8 % of Mexico’s commercial, insured farmland.</p> <p>SIFs provide: (i) agriculture-related damage insurance (the basis cover insures against the producer’s investment in the crop or against loss of yield caused by weather perils, e.g. hail, disease, heat wave, drought, frost and low temperature, pests, excess rain, high winds and flooding); (ii) agriculture-related property insurance (the policy is a herd-based catastrophe mortality and disease cover which carries very low average rates), (iii) farmers’ life insurance; and (iv) accident/illness-related insurance. The crop and livestock products underwritten by the SIFs are eligible for federal government premium subsidies which average about 33% of the full premium.</p> <p>Fondos typically retain low levels of risk (normally up to 5 % of the insured sum), and are therefore dependent on affordable reinsurance on Agroasemex, the National Reinsurance Company.</p> <p>A key feature of the SIFs is the Stop Loss Reinsurance protection provided by Agroasemex to each SIF. Under the agreement between Agroasemex and the SIFs, Agroasemex is responsible for setting the premium rates for each crop and livestock programme and then for the provision of Stop Loss Reinsurance protection. The SIF is entitled to deduct 25% of original premium to cover its administration and operating expenses. The SIF retains an average 70% of the premium net of these expenses, equivalent to 52.5% of gross premium to settle retained claims. The remaining average 22.5% of gross premium is paid to Agroasemex as stop loss reinsurance premium.</p>

Figure 4: Layout of the Mexican Insurance System for the Rural Sector after the Public Policy Changes in 2001



²⁷ Index number: #341

Figure 1. Fondos Allocation of Gross Premium



Source: Authors. Note: SIF = Fondos.

In any underwriting year if the SIF generates an underwriting surplus (profit), 30 % of the surplus must be added to a special claims reserve for catastrophe events and the remaining 70 % is allocated to a social fund which may be divided among the SIF members to invest in income generating activities or to contribute towards crop and livestock insurance premiums. Social fund activities include increasing technical reserves, reducing the cost of insurance, strengthening the SIFs technical, operational or administrative areas or several other purposes that support agro-industrial activities in the community.

HIGHLIGHTS

- Unlike other farmer organizations which are established from the top down, the self-insurance funds are created by the **farmers' own initiative**, encouraged and supported by the government who is not trying to use or control them for political purposes.
- The main benefits of the SIFs approach are the **co-insurance among communities** (sharing of risk) and their deep knowledge of local conditions.
- SIFs operate under a **differentiated and unique legal framework** that has been designed to limit their risk taking capabilities and the amount of capital that they can accumulate.
- SIFs address high transaction costs, which is one of the main challenges of agricultural insurance, by maintaining geographical vicinity which enables members to monitor management of the crops, livestock or other aquaculture activities.
- SIFs have **served as example** of smallholder mutual crop and livestock micro-insurance and reinsurance in Nepal and have a potential for replication in developing countries.
- While SIFs have **strong local benefits**, they may not be always successful in reaching additional beneficiaries. In order to address this, a comprehensive agriculture insurance public-private partnership strategy is recommended for Mexico and would require high-level changes for SIFs and the incorporation of complementary insurance instruments to fill current gaps.

Reference materials

Ibarra, n.d.; ISDR and World Bank, 2009; Gurenko, 2004; Iturrioz, 2009. Iturrioz, 2009; Gurenko, 2004; World Bank, 2013b.

URUGUAY HYDRO ENERGY INSURANCE²⁸

REGION: LATIN AMERICA &
THE CARIBBEAN

LEVEL: NATIONAL

DESCRIPTION

Uruguay's state-owned public electric company, Administración Nacional de Usinas y Trasmisiones Eléctricas (UTE) generates more than 80% of its energy needs from hydropower plans. When rainfall and/or accumulated water reserves is low, UTE is forced to purchase alternative fuels (mostly oil and natural gas) to use as inputs for electricity production. When the price of oil is high, generation costs become very expensive, affecting UTE's bottom line, and creating problems for both consumers and the national budget.

In 2012, water shortages forced the company to purchase other sources of energy. The costs of supplying demand for electricity reached a record US\$1.4 billion, far exceeding the company's original projections of \$953 million. In order to cover the gap, UTE borrowed funds from the market, drew down the country's US\$150 million Energy Stabilization Fund, and increased rates to consumers. UTE needed to manage these risks. In response to public attention to the World Bank's intermediation of a weather derivative for Malawi, the Government of Uruguay asked the World Bank for technical support to hedge UTE's financial exposure to low rainfall and high oil prices.

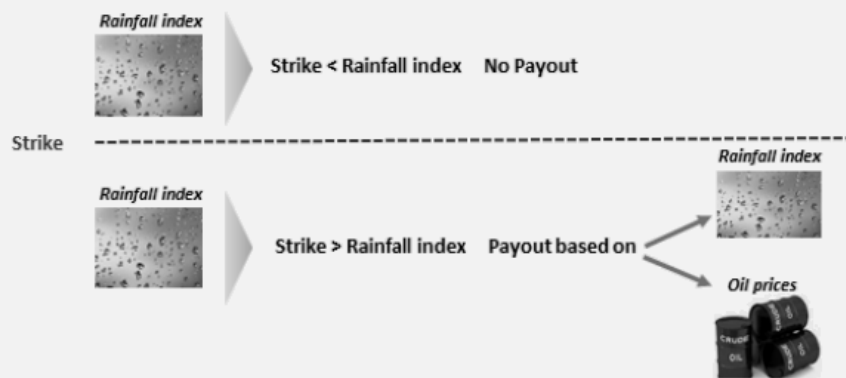
In 2013 the World Bank executed a \$450 million weather and oil price insurance transaction for UTE. The transaction insures the energy company for the next 18 months against drought and high oil prices. UTE's hydropower is dependent on water levels in two river systems in Uruguay and Brazil: the Rio Negro and the Rio Uruguay. To measure the extent of a drought and potential insurance payouts to the company, the transaction measures and collects daily rainfall data at 39 weather stations spread throughout the two river basins. If precipitation falls below the level set up as trigger of the contract, UTE will receive a payout of up to USD 450 million based on the severity of the drought and oil price levels. If oil prices are high, the payout will be larger to offset the high cost of fuel purchases.

This is the largest transaction in the weather risk management market and the first time that a public utility company has used this type of risk management tool. It is important to note that this contract is part of a broader legislative framework approved by the government of Uruguay to reduce UTE's vulnerabilities, including stabilisation funds and contingent financing with private banks. UTE is fully committed to a national plan for reducing vulnerability in the energy sector. The World Bank's involvement in this transaction is driven by its commitment to reducing vulnerability to contingent liabilities such as natural disasters, commodity price shocks and other risks.

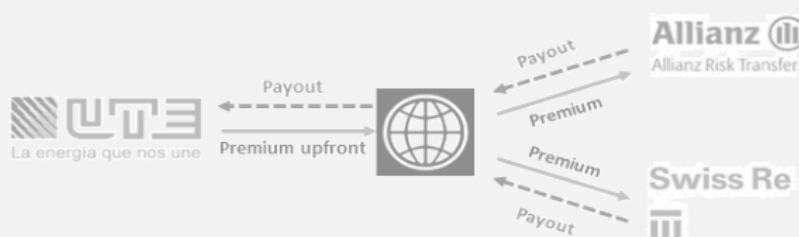
This transaction is replicable in other countries with limited data. The World Bank can execute such transactions across sectors — whether they relate to energy, agriculture or other kinds of disaster risk management — for sovereigns, sub-nationals or State-owned Enterprises in both IBRD and IDA countries.

Weather and oil price insurance

²⁸ Index number: #318



Transaction mechanism



- UTE will receive a payout from the World Bank if the weather index is below the pre-determined trigger
- The trigger was selected by UTE, based on coverage and cost considerations
- The amount of the payout depends on the level of the rainfall index and market oil prices at that time
- The World Bank entered into a mirroring agreement with Nephila/ Allianz and Swiss Re and effectively transferred the risk onto these entities.

HIGHLIGHTS

- Uruguay is highly dependent on hydropower for electricity and exposed to the risk of drought and high oil prices.
- The World Bank executed a \$450 million weather and oil price insurance transaction for the state-owned electric utility, which provides cost certainty to the energy company, budget stability to the government, and price stability to consumers.
- This is the largest transaction in the weather risk management market and the first time that a public utility company has used this type of risk management tool.

Reference materials

Navarro-Martin, 2014

Source

treasury.worldbank.org/bdm/pdf/Case_Study/Uruguay_Weather_Derivative.pdf

CARIBBEAN CATASTROPHE RISK INSURANCE FACILITY (CCRIF)²⁹

REGION: LATIN AMERICA & THE CARIBBEAN		LEVEL: REGIONAL	
DESCRIPTION	<p>CCRIF aims to reduce the financial vulnerability of countries by addressing their limited capacity to absorb the initial financial impact of disasters at a national level. In 2007 CCRIF became the world's first multi-national risk pool and the first to cover sovereign risk using parametric insurance. The 17 participating countries can purchase earthquake and hurricane catastrophe coverage at significantly lowered costs, which provides access to rapid liquidity following a disaster (i.e. within two weeks and for up to six months). A country's premium is related to the quantum of risk which it transfers to the Facility, and the payouts it can receive are calculated on the basis of the coverage conditions and the parameters of the event. Overall the Facility has made 13 payouts to eight governments for hurricanes, earthquakes and excess rainfall, which amount to US\$38 million in total.</p> <p>Since 2009 CCRIF also provides technical assistance, through which countries can receive grant support for capacity building initiatives, as well as for risk management projects. Through this CCRIF aspires to deepen countries' understanding of natural hazards and catastrophe risk in the region.</p>		
HIGHLIGHTS	<ul style="list-style-type: none">• Through CCRIF's approach to risk pooling, and value proposition, premiums are very competitively priced. CCRIF has a critical mass of participants, which diversifies the regional risk profile, and lowers the cost of insurance premiums (ca. 50% savings on purchased coverage compared to equivalent 'market' cost). Part of CCRIF's success can be attributed to proactive measures they have taken to keep premium costs as low as possible. Such measures include allowing countries to use their initial, one-off participation fee to count towards their premium payments. As a result, CCRIF out-performed its initial cost saving targets, attained financial sustainability more quickly than projected, while keeping premiums at the lowest possible price.• Communication, consultation and dialogue are key to success. By entering into a dialogue with decision makers on risk financing (e.g. regarding modelling for risk financing products), CCRIF has engaged with countries on their risk exposure, and so has prompted them to consider measures to avoid the creation of new risks. What is more, through initial consultations with a wide range of stakeholders and experts CCRIF has built up stakeholders' understanding of the Facility. CCRIF attribute being able to build the critical mass of participants needed to these consultations. Ongoing consultation is also used to gather inputs, ensuring the Facility is innovative, and responsive to the needs of participants. A final aspect of CCRIF communication measures is its ongoing multi-media communication (including public awareness programmes) with clients and others to increase understanding of its mission products, and value.• Private sector expertise and experience of relevant markets is a critical success factor. CCRIF made several strategic hires for their team, which included individuals with relevant industry experience. CCRIF found that when seeking to correct a market failure, experience in fields such as banking, asset management, catastrophe insurance, and reinsurance proves invaluable to making decisions on the selection of service providers, pricing, policy conditions, and client relations.• Other factors cited by CCRIF as contributing to its successes are the development of partnerships and alliances, through which it offers technical assistance and professional development activities; its leaders' track-record in stewarding public resources; and annual evaluations of products on offer.		
Reference materials	Anthony, 2013; Anthony, 2014; CCRIF, 2016; Ghesquiere and Mahul, 2012; UN-DESA, UNDP and IACG, 2010; World Bank, 2012a.		
Source	ccrif.org		

²⁹ Index number: #35

AFRICAN RISK CAPACITY (ARC)³⁰

REGION: AFRICA	LEVEL: REGIONAL
DESCRIPTION	<p>ARC, created under the African Union, is an integrated index-based sovereign risk insurance pool. It transfers the burden of weather risks away from governments enabling them to build resilience and better plan, prepare and respond to such risks. Currently, ARC offers coverage for drought risk, but aims to expand its offerings to tropical cyclones and flood in 2016 and 2017, respectively.</p> <p>In order to participate in ARC, countries must agree to several measures, including signing a Memorandum of Understanding for in-country capacity building. This involves customisation of Africa RiskView software to define the risk profile for the country, preparing a contingency plan for ARC payouts, and determining risk transfer parameters. The result is significant economic and welfare benefits for participating governments and their vulnerable households.</p> <p>ARC Insurance Company Limited (ARC Ltd), established in 2013, is the financial affiliate of ARC Agency and provides insurance to participating countries. It is a mutual insurance company owned by participating African governments and capital contributors. In the event of drought, participating countries receive funds within 2-4 weeks of the end of the growing season. Between 2014 and 2015 payouts totalling USD26 million reached over 1.3 million people across Niger, Senegal and Mauritania.</p> <p>During the 2015-2016 season, the risk pool expanded to include seven countries. ARC aims to reach 30 countries by 2020, providing nearly \$2 billion of coverage against drought, flood and cyclones, indirectly insuring 150 million Africans. The more rapid disbursement of ARC payouts (relative to the mobilisation of humanitarian assistance) in the aftermath of a shock can be instrumental in avoiding negative coping strategies and loss of productive assets.</p>
HIGHLIGHTS	<ul style="list-style-type: none"> • Risk pooling is more cost effective. Governments are much better able to afford premiums as ARC allows member states (MS) to pool and diversify weather risks across the continent. As a result, MS can save up to 50% compared to the cost of emergency contingency funds. • Linking early warning systems to the financial response mechanism. ARC's data platform provides early warning information, which determines when a payout should be triggered. Before transformative improvements in disaster responses can take place, it is necessary to have an implementable response mechanism and to link early warning systems, and reliable financing. • Building resilience by linking contingency planning with risk transfer. In the first instance, ARC supports MS in developing contingency plans, which improves their resilience and capacity to plan for and respond to natural disasters. This is achieved e.g. through longer-term investments in improvements to food security. Insurance payouts can then be used by governments in the implementation of contingency plans which thereby strengthens governance mechanisms. • Engaging stakeholders and building capacity. Engaging stakeholders from design through to implementation is very valuable. Giving MS ownership and allowing them to focus on their own country-specific needs when developing and implementing insurance tools makes these measures more effective. Furthermore, ARC puts in place memoranda of understanding (MOU) with each country, through which ARC staff work with in-country technical staff to build their capacity. Finally, it has been shown that early donor engagement can also be very valuable. • Rapid disbursement is more cost effective. If the harvest has failed ARC release insurance payouts (based on pre-defined rainfall triggers) within 2-4 weeks of the close of the agricultural growing season. This 'early assistance' prevents households from adopting negative coping strategies, such as depleting their

³⁰ Index number: #4

	<p>productive assets or skipping meals. By assisting households before the three-month mark, each £1 invested through ARC saves £4.40 in traditional humanitarian costs.</p> <ul style="list-style-type: none"> · Major climatic shifts driving up premiums is a challenge. ARC's new Extreme Climate Facility (XCF) aims to address this challenge from 2017 onwards by putting in place incentives for MS to invest more in risk reduction and resilience building. Countries will receive funding to implement pre-agreed climate adaptation plans, which will be based on an 'Extreme Climate Index'. The index will calculate their exposure to extreme events (e.g. heat waves, droughts, floods and cyclones). Finance will be triggered if the index surpasses certain thresholds. Payments amounting to more than \$1 billion over the next 30 years will be financed through climate change catastrophe bonds on the private capital markets.
Reference materials	<i>ARC, (2016a); ARC, (2016b); Blampied, 2016; Syroka, 2014; United States of America, 2016; Warner and Schäfer, n.d.</i>
Source	africanriskcapacity.org

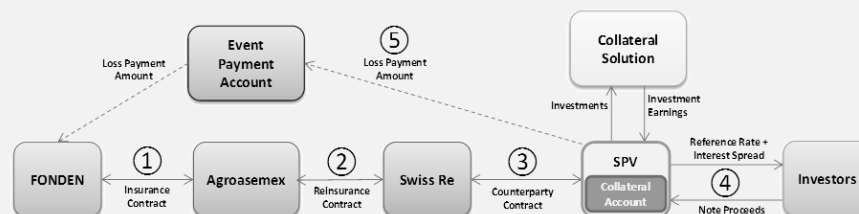
MULTICAT BONDS³¹

REGION: LATIN AMERICA & THE CARIBBEAN	LEVEL: INTERNATIONAL
DESCRIPTION	<p>The MultiCat Programme is a catastrophe bond issuance platform that allows governments to use a standard framework to buy insurance on affordable terms through the capital markets. It is part of a broad spectrum of disaster risk financing instruments offered by the World Bank Group to assist member countries in planning efficient responses to catastrophic events. The programme supports a wide variety of structures, including the pooling of multiple risks (earthquakes, floods, hurricanes and other wind storms) in multiple regions. Each bond issued under the platform carries the MultiCat brand name and uses a common documentation and legal and operational framework.</p> <p>The World Bank helps customise the bond transaction and acts as arranger, which significantly increases investor comfort. As arranger, it assists the country on its overall natural disaster risk management policy and any technical aspects related specifically to the transaction, and works together with other parties involved in the deal (underwriters, legal counsel, modelling agencies, and other service providers) to ensure a smooth and efficient execution process.</p> <p>Mexico is vulnerable to a number of natural hazards, including hurricanes, large earthquakes, floods, and volcanic eruptions. In 1985, two earthquakes of magnitudes 8.0 and 7.5, respectively, killed more than 10,000 people and destroyed 100,000 housing units in the country. When such natural disasters occurred, the government had to shift budgetary resources away from planned public infrastructure expenses into reconstruction efforts. To avoid this problem, in 1996 the government created a fund for natural disasters —FONDEN— to which it transfers budgetary funds for disaster relief and reconstruction efforts. In addition, Mexico developed an institutional framework for disaster preparedness involving risk assessment, risk reduction, the promotion of a culture of prevention, and insurance. With these initiatives, Mexico moved from an ex-post response to natural disasters to an ex-ante preparedness approach.</p> <p>FONDEN uses various instruments to support local states and entities in responding to natural disasters, including reserve funds and risk transfer solutions. In 2006, FONDEN issued a US\$160 million catastrophe bond (CatMex) to transfer Mexico's earthquake risk to the international capital markets. It was the first parametric cat bond issued by a sovereign.</p> <p>After the CatMex matured in 2009, Mexico decided to further diversify its coverage by pooling multiple risks in multiple regions. In October 2009, it issued a 3-year multi-peril cat bond using the World Bank's newly established MultiCat Program, which helps sovereign and sub-sovereign entities pool multiple perils in multiple regions and reduce insurance costs. In 2012, Mexico issued MultiCat 2012 as a successor with a larger coverage area and much more detailed structure than the 2009 transaction.</p> <p>The objectives were to:</p> <ul style="list-style-type: none"> • Transfer disaster-related risks to the capital markets and reduce pressure on public budgets; • Ensure that adequate funds are in place for relief activities; • Cover multiple perils. <p>In MultiCat 2009, Mexico issued a four-tranche cat bond (totalling US\$290 million) with a three-year maturity under the MultiCat Program. The issuer is a Special Purpose Vehicle (SPV) that indirectly provides parametric insurance to FONDEN against earthquake risk in three regions around Mexico City and hurricanes on the Atlantic and Pacific coasts. The subsequent MultiCat 2012 was a three-tranche cat bond, totalling US\$315 million, covering two additional regions (5 regions total) for</p>

³¹ Index number: #197

earthquake risk. The parametric triggers for earthquake and hurricanes were tailored to a greater degree than in the 2009 transaction. The cat bond will repay the principal to investors unless an earthquake or hurricane triggers a transfer of the funds to the Mexican government.

The bond was oversubscribed, with broad distribution among investors. With this bond, Mexico transferred a pool of disaster risk to the market for the first time; secured multi-year protection for the covered risks at a fixed price; and reduced potential pressure on public budgets. Mexico effectively locked in funding for disaster relief prior to the event happening, rather than relying only on public budgets after the event.



HIGHLIGHTS

- Mexico has proactively sought to benefit from global diversification by sharing risks with international capital markets.
- It was the first country to issue a multi-peril multi-region cat bond using the World Bank's MultiCat Program.
- The MultiCat Programme allowed Mexico to efficiently transfer a pool of disaster risk to the capital markets.

Reference materials

Abousleiman and Selenko, 2011; GFDRR, 2013.

Source

http://treasury.worldbank.org/bdm/pdf/MultiCat_ProductNote.pdf

CLIMATE BOND FINANCING ADAPTATION ACTIONS IN PARIS³²

REGION: EUROPE LEVEL: SUB-NATIONAL	
DESCRIPTION	<p>In order to finance climate projects according to the Paris Climate & Energy Action Plan, the City of Paris issued a climate bond worth € 300 million in 2015, with a running time until May 2031.</p> <p>The bond aims at private investors who consider it as a secondary advantage to invest in the sustainability of the city of Paris. They will receive a profit rate of 1.75% per year. 20% of the climate bond funds have been assigned to adaptation projects which will be implemented according to the city's Adaptation Strategy.</p> <p>Currently, two projects with a climate adaptation objective have been included in the bond and are being implemented: planting 20,000 trees in the city and creating 30 hectares of new parks by 2020. Both projects are aiming at reducing the urban heat island effect and increase thermal comfort within the city.</p> <p>The adaptation projects will not lead to direct financial benefits that will help reimbursing the investors, but through the mitigation projects in the bond and under the Paris Climate and Energy Action Plan, the City of Paris expects to reduce its energy consumption and thus generate extra revenue for the City. As it is not allowed to earmark revenues for specific expenditures (rule of non-assignment), this revenue will not be used directly to pay interest to the investors of the bond and repay them the full amount borrowed at the end of the bond term, but this will be paid out of the general City budget.</p> <p>In general, the selection of projects to be included in the bond is managed by the Finance Management Support Service (SGF) of the city in full collaboration with the Urban Ecology Agency of Paris and overseen by Vigeo, a non- financial rating agency. It is based on several criteria that are a combination of those brought forward by SGF and those which are usually used for Socially Responsible Investments.</p>
HIGHLIGHTS	<ul style="list-style-type: none"> • A climate bond was regarded as a profitable mechanism by the city to finance public projects because it consists of a wide variety of investor profiles (few investors are interested in bonds which are only climate-related) and requires transparency (leading to the need for efficient internal processes); • Success factors include a clear financial framework, expert project managers attached to the various investment lines, well-structured use of proceeds, frequent reporting, collaboration (including each participant, even external ones, in the process with clear responsibilities) and coordination by the financial office.
Reference materials	<i>European Climate Adaptation Platform</i>
Source	http://www.paris.fr/municipalite/action-municipale/paris-pour-le-climat-2148 https://www.climatebonds.net/2015/11/update-vive-paris-green-bond-mkt-builds-cop21-host-city-paris-issuing-inaugural-green-bond- http://climate-adapt.eea.europa.eu/metadata/case-studies/climate-bond-financing-adaptation-actions-in-paris

³² Index number: #346

CLIMATE BONDS INITIATIVE/ RESILIENCE BONDS³³

REGION: GLOBAL

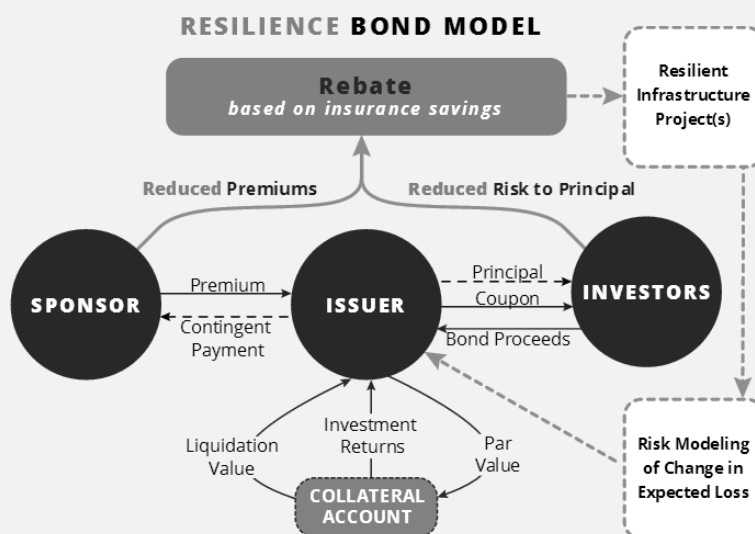
LEVEL: INTERNATIONAL

DESCRIPTION

Resilience bonds

Private sector leaders and members of the RE.bound programme have collaborated to design a framework for a new insurance-based product to generate capital for risk reduction projects. Swiss Re, The Rockefeller Foundation, RMS and re:focus partners explain that the resilience bond is designed to help manage the financial risk from catastrophes, while simultaneously promoting investment in infrastructure that mitigates physical risk.

Resilience bonds could offer both insurance and resilience benefits for disaster-prone cities. First, a resilience bond could provide financial protection for a city or public utility, like a traditional catastrophe bond. In addition, as cities or utilities invest in protective infrastructure, like seawalls or flood barriers, they could capture savings from the reduction in vulnerability by paying a lower risk premium to investors. Insurers commonly offer incentives to reduce risk, such as when a life insurer lowers premiums for policyholders who quit smoking or exercise regularly. The resilience bond would work on the same principle. The new framework is set out in the RE.bound report, 'Leveraging Catastrophe Bonds as a Mechanism for Resilient Infrastructure Project Finance', released on 9 December 2015.



In principle, resilience bonds can be structured similarly to conventional cat bonds except that they explicitly anticipate the impact that resilience projects can have on the chances of a trigger event occurring. In effect, resilience bonds are priced at two levels: one based on the chance of a trigger event without the resilience project; and one based on the chance of a trigger event with the resilience project. Assuming that the resilience project reduces the chance of a trigger event, then resilience bond investors should be willing to accept a lower coupon after the project is completed.

The difference in the coupon pricing represents the financial value that a resilience project provides by reducing the expected loss of bonds placed in the capital markets. Resilience bonds explicitly measure this value so it can be captured in the form of a resilience rebate.

Climate bonds

The Climate Bonds Initiative promotes investment in projects and assets necessary for a rapid transition to a low-carbon and climate resilient economy. The strategy is to develop a large and liquid Green and Climate Bonds Market that will help drive down the cost of capital for climate projects in developed and emerging markets; to grow aggregation mechanisms for fragmented sectors; and to support

³³ Index number: #48

	<p>governments seeking to tap debt capital markets. The Climate Bonds Initiative is the only organization in the world working solely to mobilise the largest capital market of all, the \$100 trillion bond market, for climate change solutions. The initiative is an investor-focused not-for-profit. Its work therefore is an open source public good and it falls into three work streams.</p> <p><i>Market tracking & Demonstration projects</i></p> <ul style="list-style-type: none"> • A core network development is the Climate Bonds blog, designed as both a journal of record for relevant bond issuance and as commentary style update on industry and government developments material to fixed income investment in climate solutions. • To overcome the perception of a niche market and demonstrate the opportunities available to investors, the Climate Bonds Initiative undertakes an annual survey of bonds outstanding globally related to climate change. The 2015 report showed \$597.7bn outstanding. Each year the report is presented in seminars in multiple countries and via briefings for banks and investors. <p><i>Developing trusted standards</i></p> <ul style="list-style-type: none"> • The Climate Bonds Standard and Certification Scheme is a Fair Trade-like labelling scheme for bonds. It is designed as an easy-to-use tool for investors and governments that assist them in prioritising investments that truly contribute to addressing climate change. The Standard is a public good resource for the market. Climate Bonds Taxonomy is the backbone of the standards work – it defines investments that are part of low carbon economy. The Climate Bonds Standard is overseen by a Board representing \$32 billion of assets under management <p><i>Providing policy models and advice</i></p> <ul style="list-style-type: none"> • Rapid change at very large scale will depend on a close working relationship between governments, finance and industry. The Climate Bonds Initiative is developing policy proposals for all three sectors, including: <ul style="list-style-type: none"> • How to boost bank lending to renewables by adapting the \$3 trillion covered bonds market to create renewable energy covered bonds. • Delivering on the promise of large-scale energy efficiency (e.g. getting to 85% of housing stock within 10 years). • Policy risk insurance for renewable energy bonds, to be provided by a consortium of governments.
HIGHLIGHTS	<ul style="list-style-type: none"> • The aim of the RE.bound Programme was to explore options for designing and structuring a new type of resilience bond to help communities improve their resilience to natural disasters. • The Climate Bonds Initiative is the only organization in the world working solely to mobilise the largest capital market of all, the \$100 trillion bond market, for climate change solutions. • The resilience bond will provide financial protection to, for example, a city and at the same time, the premium can be lowered if measures are applied to reduce the underlying risk.
Reference materials	<i>Climate Bonds Initiative, 2016; re:focus partners, llc, RMS and Swiss Re, 2015; Swiss Re, 2016.</i>
Source	climatebonds.net

KEY FINDINGS

Key findings regarding risk retention are (GFDRR and the Florida International University (2011)):

- Applying the risk layering concept, typical risks that may be retained by the insured party (government or affected populace) are those with **high frequency and low severity**, meaning those that are highly predictable and that cause mild damage (e.g., floods), in which cases the costs of insurance would outweigh its benefits;
- **Retaining risks could lead to liquidity problems** of a country after a disaster due to the required concerted disbursements – in this case, a country would need to consider risk financing or insurance instruments;
- **Risk retention instruments are subject to pressures from the political economy**, e.g. when annual appropriations to a reserve fund pile up due to a lack of disaster;
- **Government financial rules and procedures in many countries may not be conducive to a fast flow of funds after disasters** – e.g. budget allocations and reallocations usually need legislative approval which can be slow;
- In cases where disaster funds are separated from normal budgetary operations and are overseen by a **designated institution with systems for rapid dispersal, payouts could be relatively quick**;
- **Countries with a large debt burden should prefer risk transfer instruments** rather than risk retention instruments even for moderate frequency disasters since their revenue resources may not be able to sustain the additional debt.

Further findings from the case studies include:

- **Risk retention should be just one component** of comprehensive risk management at any one place alongside other measures of risk reduction and transfer;
- **The strategic and iterative integration of risk retention** and insurance can enhance a country's overall financial resilience;
- **Remittances** provide an effective, timely, targeted and flexible means of disaster recovery;
- **Success factors** of contingency plans include flexibility in responding to observed challenges and a good communication strategy.

R4 RURAL RESILIENCE INITIATIVE³⁴

REGION: AFRICA

LEVEL: SUB-NATIONAL

DESCRIPTION

The R4 Rural Resilience Initiative (R4) is a comprehensive risk management approach launched in 2011 by the World Food Programme (WFP) and Oxfam America to enable vulnerable rural households to increase their food and income security in the face of increasing climate risks.

R4 builds on the initial success of the Horn of Africa Risk Transfer for Adaptation (HARITA) initiative, pioneered in Ethiopia by Oxfam America, the Relief Society of Tigray (REST) and Swiss Re. R4 operates in Ethiopia, Senegal, Malawi and Zambia currently reaching over 200,000 people (32,000 with insurance) with four integrated risk management tools: (i) improved resource management through asset creation (risk reduction); (ii) insurance (risk transfer); (iii) livelihoods diversification and microcredit (prudent risk taking); and (iv) savings (risk reserves).

R4 offers a comprehensive risk management approach in the field of rural risk management by enabling the poorest farmers to pay for crop insurance with their own labour, while also integrating this with disaster risk reduction interventions and access to financial services. Communities learn new practices to decrease their vulnerability and expand livelihood options, and they invest in new seeds and fertiliser to boost production. Protected by insurance, families facing a drought or other shock no longer find themselves forced into desperate measures.



R4 works as follows:

- Farmers access weather index insurance by paying with their labour through Insurance-for-Assets (IFA) schemes. When a drought hits, compensation for weather-related losses prevents farmers from selling productive assets and stimulates faster recovery.
- IFA schemes are built into existing social safety nets, disaster risk reduction schemes, or WFP's Food Assistance for Assets (FFA) programme. Assets built through risk reduction activities, such as water and soil conservation, promote resilience by steadily decreasing vulnerability to disaster risks over time.
- By protecting farmers' investments in case of a bad season, R4 enables households to invest in remunerative enterprises, as well as in seeds, fertilisers and new technologies to increase their agricultural productivity.
- The initiative also enables participants to establish small-scale savings, which are used to build 'risk reserves'. In Senegal the initiative leverages on Oxfam America's Savings for Change (SfC) programme. Savings help build a stronger financial base for investing –but also act as a buffer against short-term needs and idiosyncratic shocks, such as illness and death.
- To ensure long-term sustainability, R4 contributes to the creation of rural financial markets, by building the capacity of farmers, local insurance companies, and micro-finance institutions and gradually transitioning farmers to pay for insurance in cash.

HIGHLIGHTS

- R4 helps **improving the resilience of smallholder farmers**. R4's comprehensive risk management approach contributes to farmers' food security in times of climate shocks. R4 achieves this by improving farmers' ability to invest in, and increase, agricultural production in 'normal' times while providing more diversified and 'safer' ways of storing the increased wealth generated from agriculture.

³⁴ Index number: #247

	<ul style="list-style-type: none"> • The first major impact evaluation of R4/HARITA in Ethiopia shows that insured farmers save more than twice than those without any insurance, and they invest more in seeds, fertiliser and productive assets, such as plough oxen. • Women, who often head the poorest households, achieved the largest gains in productivity, through investing in labour and improved tools for planting. • Addressing basis risk, which is an inherent challenge to index insurance programs, is fundamental, as it can generate farmers' distrust towards the insurance product and thus the overall initiative. R4 has been proactively working towards minimising this risk for R4 participants since its launch by continuously improving indices, strengthening the risk reserves component as a buffer for non-catastrophic events, improving farmers' understanding of indices and of trade-offs in insurance products. • The initiative envisions insuring 500,000 farmers by 2020.
Reference materials	<i>WFP and Oxfam America, 2015; WFP and Oxfam America, 2016.</i>

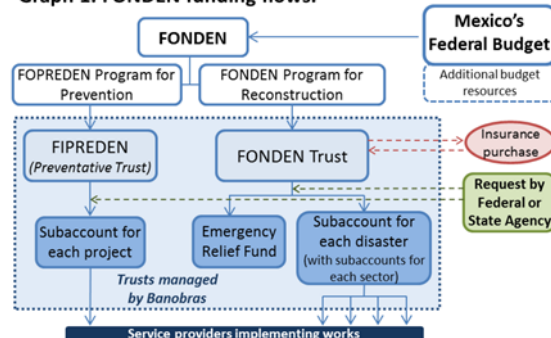
MEXICO'S NATURAL DISASTER FUND (FONDO DE DESASTRES NATURALES - FONDEN)³⁵

REGION: LATIN AMERICA & THE CARIBBEAN

LEVEL: NATIONAL

DESCRIPTION

Graph 1. FONDEN funding flows.



FONDEN, created in 1996, is a financial vehicle for post-disaster response and reconstruction to which the federal government allocates funds in advance of disasters. The fund allocates resources to financing disaster recovery, and seeks enhance financial

preparedness in the face of losses from disaster. This approach was adopted to help prevent imbalances in the federal government budget from dealing with catastrophes. The Engineering institute for FONDEN also developed a Loss Estimation for Federal Risk System (R-FONDEN). This software aims to estimate potential human and material losses that may occur from earthquake, flood or tropical cyclone events. It estimates losses on the basis of information of the main federal public infrastructure: hospitals, schools, roads and bridges, etc. In order to dedicate funds to all parts of the full DRM cycle the Government of Mexico (GoM) also created the Natural Disaster Prevention Fund (Fondo para la Prevención de Desastres Naturales, FOPRENDEN) in 2003 which uses government funding for preventive action.

The addition of FOPRENDEN facilitated GoM's transition from a system focused on response and reconstruction to one of preventive action and the protection of human security and national prosperity. Upon later review, GoM determined that FONDEN should only insure losses exceeding the budgets of the federal or local government. To that end, in 2006 Mexico pioneered the transferring of part of its catastrophe risk to the international reinsurance and capital markets.

HIGHLIGHTS

- **By strategically and iteratively integrating disaster risk financing and insurance, a country can increase its overall financial resilience.** In order to build an integrated disaster risk financing and insurance strategy from the bottom up, a government can first rely on risk retention approaches through budget mechanisms, e.g. reserves. Ideally these should be accompanied by contingent debt for less frequent, more severe events while also leveraging private sector risk transfer mechanisms. In the case the high risk layers, governments should seek access to immediate funds in the aftermath of a disaster through the reinsurance and capital markets. FONDEN is a good example of an iterative approach to diversifying funding sources, and thus enhancing overall resilience. Such an approach requires a good understanding by the government of the strength of its domestic capital market, and the degree to which it has access to international capital markets.
- **Promote resilience building.** FOPRENDEN streamlines investment and raises awareness of risk reduction, retention and transfer. FIPREDEN (the financial trust fund for FOPRENDEN) provides funding for multi-hazard risk assessment and other prevention projects, which together can, for example, facilitate the integration of disaster risk into urban planning.
- **Match finance to post-disaster needs.** The design of a funding mechanism determines the balance between the possible speed of disbursement in the immediate aftermath of a disaster and the overall accountability of financial flows. Accountability can be increased, for example, by establishing specific

³⁵ Index number: #124

	<p>funding windows for different recovery phases (e.g. emergency relief vs. reconstruction), where each window requires different access procedures.</p> <ul style="list-style-type: none"> · Empowering local entities to take ownership of disaster risks helps to build resilience. GoM recognised that while the decisions that primarily impact disaster vulnerability are being taken at the local level, disaster funding and expert knowledge are more readily available at the national level. In order to take this into account, GoM made the local disaster response and reconstruction costs the shared responsibility of federal and subnational governments. GoM also made provisions for federal resources to be dedicated to ex ante local risk management through FOPRENDEN, which helped empower local authorities to take ownership of their exposure, and reduce losses. · A well-defined inter-institutional framework is essential. Providing clear rules, e.g. through up-to-date guidelines, and channels for funding, allows for more timely and needs-based expenditures. This can be facilitated particularly by streamlined procedures and ongoing communication between agents.
Reference materials	<i>Cardenas et al., 2007; Ishizawa, Mahul and Yi, 2013; Hofliger et al., 2012; World Bank, 2012b.</i>
Source	preventionweb.net/go/28413

REMITTANCES IN SAMOA³⁶

REGION: PACIFIC

LEVEL: NATIONAL

DESCRIPTION

In Samoa, like in many Small Island Developing States (SIDS), remittances are important to sustain people's everyday needs. In times of disaster, affected populations may receive remittances very quickly, often providing more timely assistance than aid from government, non-governmental and international actors. After a tsunami which hit Samoa in 2009, 90 per cent of disaster-affected households received international remittances, and of these, 72 per cent received them within a week after the event. Even though telecommunications networks were affected, people lost their cell phones and road systems were severely damaged, 17.5 per cent accessed remittances the same day of the tsunami, 24.5 per cent within one and three days, and 30 per cent between three days and one week after the event. Remittance receivers could deal more easily with emergency needs, such as purchasing food and clothing or getting health-care treatments.

Remittances usually remain high long after the disaster. Following the tsunami, amounts received were higher than usual for six to seven months before coming back to standard levels. Results of the research indicate that remittances increased when government and nongovernmental assistance was low, and decreased when such external aid was more substantial, thus acting as a kind of safety net. The consistency of remittances through time represents one of the strengths of this mechanism. Clearly, the households that received higher amounts and/or regular remittances were better able to deal with emergency needs and recovered faster and better, such as by more quickly rebuilding their house, restarting agricultural production, and paying school fees, than the community members with no or reduced access to this resource. These findings fit with other studies undertaken in other countries.

Remittances represent a powerful mechanism to face disasters and have a propensity to reduce vulnerability. Yet, they are generally received by middle and upper-income families, the poorest usually having lower levels of access to the international labour market (e.g. low level of education, insufficient funds to pay for visa and transport, limited networks abroad) The findings of the study indicate that in a disaster context remittances tend to increase or at least reproduce both the inequalities and vulnerabilities existing within the community of origin. Following cyclone Evan, which hit Samoa in 2012, poor households with no access to remittances were often forced to adopt unsustainable livelihood strategies, such as limiting their food intake, selling the food not affected by the cyclone, using their savings, requesting credit from neighbours and/or extended family, and having to rely on assistance from non-governmental organizations.

Although the poorest generally have lower access to remittances, this mechanism has indirect economic and sociocultural benefits for the whole community. After both disasters, remittances allocated to the rebuilding of housing and agricultural production contributed to generating economic activity at the local and national levels (e.g. stimulating demand for labour, services and construction material). Moreover, remittances were used for funding the reconstruction of churches and other projects at the community level, thus contributing to the recovery and well-being of the village as a whole (including households receiving little or no remittances). In addition, remittances were sometimes shared with relatives or neighbours struggling to meet basic needs.

During and after the tsunami, migrants sent higher levels of remittances through informal channels instead of through the banking system and money transfer agencies. These "informal" remittances included goods, cash, and construction materials, which were shipped in containers and/or hand-carried. Remittances provide flexibility of use and can be utilised to fit people's specific requirements. When received in the form of cash, remittances can be used according to the

³⁶ Index number: #262

	<p>disaster affected households' priorities. Remittances in the form of goods had usually been communicated with distant relatives, thus addressing the receivers' needs (e.g. replacing lost items). External assistance does not always provide this flexibility, as recovery programmes can be constraining, with criteria within which people do not always fit. Besides, aid items are sometimes duplicated and/or not adapted to people's needs.</p> <p>In addition, remittances cannot be reduced to money and goods. In this research, disaster-affected households indicated the importance of being morally supported by their relatives. Phone and internet communications as well as visits by migrants coming back to Samoa provided great emotional support, contributing to effective recovery. For Samoan migrants, remitting was about complying with sociocultural obligations towards home, notions of identity, proudness, and showing love to distant relatives. Migrants remitted to their families, which reinforced geographically stretched social ties.</p>
HIGHLIGHTS	<ul style="list-style-type: none"> • In Samoa, remittances prove to be a timely, targeted and consistent form of financial recovery after disaster; • Remittances function as a form of safety net when governmental and non-governmental support is low; • Although usually not accessible to the very poor, remittances have positive indirect economic and socio-cultural effects by stimulating overall economic activity and contributing to re-establishing public infrastructure; • The moral support received via remittances plays an equally important role in recovery as their economic support.
Reference materials	<i>Le De, Gaillard and Friesen, 2015.</i>
Source	http://publications.iom.int/system/files/pdf/policy_brief_series_issue2.pdf

MARSHALL ISLANDS FUND³⁷

REGION: PACIFIC		LEVEL: NATIONAL
DESCRIPTION	<p>The Marshall Islands are a participant of the Pacific Disaster Risk Financing and Insurance (DRFI) Program, which aims to increase the financial resilience of Pacific Island Countries (PICs) to natural disasters and to improve their post-disaster financial response capacity. The programme is supported by the Government of Japan, the Asian Development Bank and the Global Facility for Disaster Reduction and Recovery (GFDRR) and carried out in partnership with the Secretariat of the Pacific Community (SPC) through its Applied Geoscience & Technology Division (SOPAC).</p> <p>Within that context the Marshall Islands have established a nominal contingency budget for the payment of unforeseen expenditures equivalent to US\$200,000 each year (the Disaster Assistance Emergency Fund – DAEF). The total amount in the fund as of June 2013 was just over \$1.5 million. The process for deciding to draw on these funds is not legislated but reflects self-imposed restraint and prudence by the staff at the Ministry of Finance. The limited amount of cash means it can be easily exhausted either by a disaster or another unforeseen event. The Marshall Islands' participation in the Pacific Catastrophe Risk Insurance Pilot provides access to an injection of liquidity within the first month of an eligible disaster.</p> <p>The pilot was launched on January 17, 2013, and the Marshall Islands opted for coverage against tropical cyclones with the associated hazards of storm surge, precipitation from tropical cyclone, and flooding caused by tropical cyclone. In the event that the Marshall Islands experiences a tropical cyclone with an estimated emergency loss that exceeds the selected attachment point, the country will be eligible for a payout worth over five times its contingency budget. Events that generate an emergency loss beneath the attachment point must be managed by optimising the use of other financial tools.</p>	
HIGHLIGHTS	<ul style="list-style-type: none"> Each year, upon receipt of US\$200,000 from the Marshall Islands government, the DAEF receives an equal amount in the form of a grant from the United States. The funds held within the DAEF can accrue interest until they are released post-disaster In the event that the Marshall Islands experiences a tropical cyclone with an estimated emergency loss that exceeds the selected attachment point, the country will be eligible for a payout worth over five times its contingency budget. 	
Reference materials	Weydahl and Ortiz, 2014; The World Bank, 2015; World Bank, 2015b.	
Source	http://documents.worldbank.org/curated/en/209571468088772601/The-Marshall-Islands-country-note	

³⁷ Index number: #288

VILLAGE SAVINGS & LOAN ASSOCIATIONS (CARE International)³⁸

REGION: GLOBAL		LEVEL: SUB-NATIONAL
DESCRIPTION	<p>Two billion poor people around the world – particularly women – are financially excluded and therefore have hardly any opportunity to safely store their money or access loans to help meet future needs, including health care, education, or investing into their own businesses.</p> <p>The Village Savings and Loan Association (VSLA), supported by CARE, aims at fostering the financial inclusion of women in developing countries: Only 37% of women in poor countries have access to basic financial services. CARE works to ensure that poor women have access to a full range of suitable and affordable financial services critical to withstand shocks and fulfil their economic and social potential.</p> <p>Women in poor communities can set up their own savings and loan groups, enabling them to save money, and lend to each other in case of hardship (e.g. illness, droughts or income shortages) – or to invest in starting or improving a small business.</p> <ul style="list-style-type: none">• Timeframe: 1991-ongoing• Beneficiaries: Women in developing countries (currently 4 Mio members) <p>How it works:</p> <ul style="list-style-type: none">• The approach uses the concept of “group savings” where community members pool their resources to create a kind of village bank.• CARE provides capacity building (incl. improving basic business and marketing skills) to women who want to participate in the VSLA.• CARE also trains other international aid organizations with a view to replicating the approach in other countries.	
HIGHLIGHTS	<ul style="list-style-type: none">• Strong gender aspect: empowering women to contribute more meaningfully to earning family income.• Easy to replicate and scale up: through widespread capacity building and training efforts to both stakeholder groups (i.e. community members + international aid organizations) the approach can be applied in almost any village / community set-up.	
Reference materials	CARE International, 2016a; CARE International, 2016b; CARE International, (2016c).	
Source	careinternational.org.uk	

³⁸ Index number: #329

OPERATION OF THE PORTUGUESE CONTINGENCY HEATWAVES PLAN³⁹

REGION: EUROPE		LEVEL: NATIONAL
DESCRIPTION	<p>The Portuguese Contingency Heatwaves Plan was established in 2004 following the major heatwave that hit Europe in 2003. Ever since it has been in operation every year from May to September. Its aim is to prevent the adverse health effects of heat stress on the population during periods of elevated temperatures which are predicted to increase in frequency and scale due to climate change. Particularly, if future populations become more urbanized and the number of elderly continues to increase, the issue of heat-related mortality will likely become more severe.</p> <p>The plan provides timely relevant information to local authorities to enable them to conduct risk assessments and suitable corrective measures. It also alerts the general public on a daily basis regarding the state of hazard related to extreme temperature and heat waves. The plan distinguishes three possible alert levels. For each level, specific protective measures are established to reduce possible health impacts, ranging from the spread of information to equipping emergency response services. Special attention is placed on the elderly population.</p> <p>The plan establishes roles and functions for governmental institutions at national, regional and local level. Although it is coordinated centrally by the Directorate-General of Health, it has a de-centralized operational structure.</p>	
HIGHLIGHTS	<ul style="list-style-type: none">• The plan involves a comprehensive communication strategy regarding the alert levels and corresponding risk reduction measures involving the media, websites and printed material distributed in clinics and homes of elderly – this has ensured that the plan is well known nation-wide.• The plan has been flexible in responding to observed challenges and implementing necessary adjustments, e.g. one of the biggest changes included shifting the implementation tasks from central government to regional and local governments, thus allowing for more realistic risk assessments and faster responses within the health system.	
Reference materials	European Climate Adaptation Platform	
Source	http://www.dgs.pt/?CR=16173 http://climate-adapt.eea.europa.eu/metadata/case-studies/operation-of-the-portuguese-contingency-heatwaves-plan	

³⁹ Index number: #347

E. TRANSFORMATIONAL APPROACHES

In situations where the impacts of climate change are particularly extreme or rapid, and where populations are especially exposed or vulnerable to these impacts, a more radical response referring to fundamental changes to a social-ecological system may be needed.

Transformation refers to the altering of fundamental attributes of a system (including value systems; regulatory, legislative, or bureaucratic regimes; financial institutions; and technological or biological systems) (SREX, 2012).

Actions that range from incremental steps to transformational changes are essential for reducing risk from weather and climate extremes. Incremental steps aim to improve efficiency within existing technological, governance, and value systems, whereas transformation may involve changes in some of the **fundamental attributes of those systems**. The balance between incremental and transformational approaches depends on evolving risk profiles and underlying social and ecological conditions. Disaster risk, climate change impacts, and capacity to cope and adapt are unevenly distributed geographically and demographically. Vulnerability is often concentrated in poorer countries or groups, although the wealthy can also be vulnerable to extreme events. Where vulnerability is high and adaptive capacity relatively low, changes in extreme climate and weather events can make it difficult for systems to adapt sustainably without transformational changes. Such transformations, where they are required, are facilitated through increased emphasis on adaptive management, learning, innovation, and leadership (SREX, 2012).

Responses such as adaptation measures can become transformational when they are used at a **greater scale** or in integrated combinations of such responses which have much larger effects than before. Some responses may be truly novel or they may never have been used at the site of a particular human-environment system (Kates, 2012).

Some responses collectively transform place-based human environment systems or shift such systems to **other locations**, for examples resettlement associated with climate variability and climate change (Kates, 2012).

KEY FINDINGS

Key findings regarding transformational approaches include (SREX, 2012; IPCC, 2014a):

- **Transformations** in economic, social, technological and political decisions and actions can enhance **adaptation and promote sustainable development**;
- Restricting adaptation responses to **incremental changes** to existing systems and structures, without considering transformational change, **may increase costs and losses**, and miss opportunities;
- Planning and implementation of transformational adaptation could reflect strengthened, altered or aligned **paradigms**, and may place new and increased demands on governance structures to reconcile different goals and visions for the future and to address possible equity and ethical implications;
- Progress towards resilient and sustainable development in the context of changing climate extremes can benefit from **questioning assumptions and paradigms**, and stimulating innovation to encourage new patterns of response.

Further findings from the case studies include:

- **Early consultation and involvement of stakeholders**, including all relevant levels of government, groups and organizations as well as the general public, are key for successful transformative approaches;
- In case of **relocations**, a participatory approach and early explanation of the need for relocation as well as the establishment of good relationships with the host communities prior to the relocation are important success factors;
- As transformative approaches can be **costly and potentially irreversible**, all arguments and counter-arguments must be carefully considered.

CASE STUDIES

RE-GREENING THE SAHEL⁴⁰

REGION: AFRICA		LEVEL: REGIONAL
DESCRIPTION	<p>The vulnerable Sahel area is highly exposed to climate change impacts due to the strong dependence of its population on rain-fed agriculture and livestock. Rainfall variability, land degradation and desertification are some of the key factors that are heavily impacting on local livelihoods.</p> <p>To save the land as well as local livelihoods, one inexpensive method of farming that helps to restore the Sahel's degraded land is the so called Farmer-Managed Natural Regeneration (FMNR). This technique was developed in the mid-1980s in Niger. This inspired the Sahel re-greening initiative which emerged in 2007. By pruning shoots that periodically and naturally sprout from below-ground root webs, farmers can promote forest growth and take advantage of a naturally occurring source of fuel, food, or animal fodder.</p> <p>The trees produce fruit rich nutrients and help to restore the soil by releasing nitrogen and protecting wind and rain induced erosion. The cultivated naturally occurring forest also creates a local source of firewood and mulch, reducing the time spent in gathering fuel for cooking meals and cleaning households. The practice also cuts down on deforestation as the trees that are used for fuel are replaced with seedlings and tended by farmers.</p> <p>Some other examples of natural regeneration include the use of simple water harvesting techniques like zaï, contour stone bunds and half-moons in Burkina Faso where farmers have rehabilitated an estimated 300,000 hectares of barren degraded land since the early 1980s. Benefits of re-greening are economic, improved household food security, higher crop yields, income diversification, support to women and global environmental benefits.</p>	
HIGHLIGHTS	<ul style="list-style-type: none"> • With a rapid transformation rate, the re-greening process, added on average 250,000 hectares/year in Niger, making it the largest environmental transformation in the Sahel. • One of the main reasons for its success is attributed to the sense of ownership by the farmers to protect their on-farm trees. • The essence of this technique is the focus on natural regeneration which means that nurturing trees that grow naturally have a better chance of survival. • A key feature identified for ensuring the success of the initiative is to scale up the process so that more farmers know about FMNR and its benefits. For this the Web Alliance for the Re-Greening in Africa is helping to create web based information exchanges between the farmers. 	
Reference materials	IFAD; Agricultures Network; Nourishing the planet	
Source	http://www.agriculturesnetwork.org/magazines/global/scaling-up-and-sustaining-the-gains/regreening-the-sahel-the-success-of-natural-tree https://www.ifad.org/documents/10180/5e333813-f355-4144-8a78-6fef533c775f	

⁴⁰ Index number: #331

THAMES ESTUARY 2100 PLAN⁴¹

REGION: EUROPE		LEVEL: REGIONAL	
DESCRIPTION	<p>The Thames Estuary 2100 (TE2100) Plan was developed by the UK Environment Agency in 2002 with the aim of developing a strategic flood risk management plan for London and the Thames estuary through to the end of the 21st century. The Plan primarily looks at tidal flooding, though other sources of flooding including high river flows as a result of heavy rainfall and surface water flooding are also part of it. A key driver for the project was considering how tidal flood risk is likely to change in response to future changes in climate and affect people and property in the floodplain. In addition, there is need for many existing flood walls, embankments and barriers to be raised or replaced to manage rising water levels.</p> <p>In developing the Plan the Environment Agency has investigated flood risk in the estuary today, how it might change in the future and the way it can be managed and adapted to. This Plan sets out the recommendations and short, medium and long-term actions required by all implementation partners to manage flood risk. It describes the future shape of flood risk management and the range of options which can manage a change in water levels. Each of the recommended estuary-wide options has been appraised and their environmental impacts identified, along with how they comply with environmental legislation.</p> <p>The Environment Agency has examined the impact of the existing flood defences on the internationally designated habitats along the margins of the Estuary. According to its estimates, during the life of the TE2100 Plan, 1,200 hectares of this important habitat will be lost through “coastal squeeze”. Therefore, the Plan includes recommendations for potential sites for replacement of these habitats.</p>		
HIGHLIGHTS	<ul style="list-style-type: none">• A primary purpose of the TE2100 project has been to plan proactively for the future rather than waiting for the next flood catastrophe to provoke society into action.• Public consultation has played an important part in the development of the TE2100 Plan. At every stage in the development of the Plan the Environment Agency has invited people to express their views and has taken these into account in developing the Plan.• The Environment Agency has built relationships with groups and organizations which play a key role in the implementation of the TE2100 Plan.• The Plan provides key information and actions for regional and local government to inform their spatial plans and help them make decisions on new and sometimes transformational developments across the floodplain.		
Reference materials	UK Environmental Agency, 2012; UK Environmental Agency, 2014.		
Source	https://www.gov.uk/government/organisations/environment-agency		

⁴¹ Index number: #298

PLANNED RELOCATION IN CARTERET ISLANDS IN PAPUA NEW GUINEA ⁴²

REGION: PACIFIC		LEVEL: REGIONAL
DESCRIPTION	<p>The planned relocation process currently underway from the Carteret Islands in Papua New Guinea (PNG) to the much larger neighbouring island of Bougainville (also in PNG) is one of the first organised resettlement movements of climate change displaced persons. In 2007, the national government of PNG and the Autonomous Bougainville Government (ABG) agreed to resettle the inhabitants of the Carterets and three other atolls to Bougainville. More than 3,000 Carteret Islanders and another 2,500 island dwellers from three other nearby atolls (the Mortlock, Tasman and Nuguria Islands) will need to relocate because of increasing land loss, salt water intrusion and growing food insecurity.</p> <p>Tulele Peisa is a local non-government organization which supports the initiative. Tulele Peisa thus far has been able to amass some 120 hectares (ha) of land on Bougainville, most of which has been donated by the Catholic Church for the purposes of relocating a small portion of the Carteret Islanders. According to the resettlement criteria developed by the Carteret community, some 3,000 ha of land would be required for the full relocation of the other three affected atolls. Tulele Peisa has developed a laudable land goal for each family that proposes that each resettled family receive land use rights over 5 ha of land; 1 ha would be allocated for housing and personal gardens, 3 ha for livelihood purposes, including the growing of cocoa and copra, and the remaining 1 ha set aside for purposes of reforestation.</p> <p>The logistics of the relocation process developed by Tulele Peisa involves a number of steps on the atoll itself. Initially, the Council of Elders was mobilised and the relocation plans discussed and approved. Once the plan was endorsed by the ABG, the group set out to raise awareness of the issues throughout the islands of the atoll. It developed a Task Force Committee that became the lead body responsible for elements of the relocation process. In terms of activities on Bougainville, the Carterets Integrated Relocation Plan involves a detailed and complex 20-step process, which when completed, leads to the successful relocation by those moving to Bougainville. The steps include: scoping out available land; identifying traditional land owners; negotiating with land title holders; engaging with landowners; exchange programmes; entering into land negotiations; carrying out social and resource mapping; planting gardens; identifying families using objective selection criteria; preparing families for relocation; preparing host families for relocatee arrivals; building homes; and moving families to the new settlements.</p>	
HIGHLIGHTS	<ul style="list-style-type: none">• Tulele Peisa's relocation programme is the only home-grown relocation programme operating successfully in PNG which has the potential to be replicated in other coastal and atoll groups of the region.• The programme recognises the importance of raising awareness about climate change and its impacts on the lives of the islanders and highlighted the idea of "relocating with dignity", including equipping relocated families with new skills in gardening and cash crop agriculture.• Tulele Peisa is conscious that the host communities must be integrated in the resettlement plan. It tries to establish good relations with the existing communities by exchange programmes of chiefs, women and children from Carteret and the host communities. Ceremonial acts like the exchange of traditional shell money were carried out. Marriages between Carteret Islanders and Bougainvilians are promoted.• Tulele Peisa aims also to maintain the cultural bonds to the islands of origin. Relocated islanders remain clan members. Regular sea transport services for passengers and freight should guarantee the connection to remaining islands.	
Reference materials	<i>Huntebrinker, 2014; Leckie, 2013; Tulele Peisa, 2016.</i>	
Source	tulele-peisa.org	

⁴² Index number: #264

F. ENABLING ENVIRONMENT

The existence of an **enabling environment** means having certain conditions in place that allow for the effective implementation of comprehensive risk management. Many components of disaster preparedness or risk reduction contribute to an enabling environment which in turn allows for further risk management activities. These include, for example, conducive legislative and regulatory frameworks, explicit adaptation and/or risk reduction strategies, awareness and capacity building. Further factors that contribute to an enabling environment and which have been mentioned by many of the case studies include:

- General efforts to **reduce poverty and inequalities** and to advance sustainable development;
- **Culture of risk awareness and prevention** amongst policy makers, communities and individuals through the provision of information and education as well as effective risk communication aiming at the integration of risk management considerations into sustainable policy, planning and programming at all levels;
- **Flexible and adaptive national systems**, which bring together different scientific, social, and economic information, experiences, and traditional knowledge into decision making through “learning by doing” instead of static and rigid national systems;
- **Whole- of- government approaches** that integrate key players (national and sub-national governments, private sector, research bodies, and civil society, including community-based organizations) into the risk management process by applying participatory and decentralised decision-making methods within a supporting hierarchy of higher levels (IPCC, 2012);
- **Institutions** and stakeholders with financial and technical capacity to coordinate and implement risk management strategies (UNISDR, 2005);
- **Empowerment of women** to play a leading role in risk management by e.g. managing resilience and other funds (NADRR, 2009);
- Availability and accessibility of globally consistent **data collection** and **forecasting** on climate-related natural hazards, vulnerabilities and risks and disaster impacts at all scales, including the development of standards, the maintenance of databases, the development of indicators and indices, support to early warning systems, the full and open exchange of data and the use of in situ and remotely sensed observations (UNISDR, 2005);
- Integration of **scientific and technical knowledge with local knowledge**;
- Establishment of systems to continually **monitor and assess** vulnerability and risk (UNISDR, 2005);
- Building of **multi-stakeholder partnerships** for the effective implementation of comprehensive risk management, including implementing schemes that spread out risks, reduce insurance premiums, and expand insurance coverage, including through public-private partnerships (UNISDR, 2005).

The establishment of an enabling environment can be promoted and supported internationally, nationally or sub-nationally through technical and financial assistance as well as international cooperation. The individual composition of an enabling environment influences the balance between reducing risks and other risk management strategies (IPCC, 2012).

KEY FINDINGS

Despite the various factors that contribute to an enabling environment, four broad aspects have been identified to be key enablers for comprehensive risk management (UNISDR, 2015a). These are:

- **Strong leadership and investment by national and local governments**, particularly by the latter, through policies, programmes and institutions they improve, create and dedicate to building disaster resilience;⁴³
- **Community involvement** wedded to knowledge and education which is linked to government spawn initiatives or support. Case studies have shown that knowledge empowers communities to become active participants in government-initiated programmes, and to take ownership of such programmes;
- Similar to knowledge, another **empowering factor for successful risk management are resources**. When appropriate resources are available, such as funding, human resources and capacity as well expertise and technical capability, communities are better empowered to deal with risk;
- Finally, the **sharing of good practices** across countries and regions is an important success factor. While each country and even district or province has its own unique situation, there are standard good practices in areas such as risk assessment, risk reduction and education that can be adapted to local realities.

Further findings from the case studies include:

- The **involvement and empowerment of all relevant stakeholders**, such as women or the private sector, at a certain location as well as teaching young people early about sustainability and resilience are important components of an enabling environment for comprehensive risk management;
- Governments and other stakeholders at all levels need to be **enabled to undertake sound risk assessment and financial planning** as a precondition for all other risk management measures.

⁴³ Japan, the Philippines, Australia, Indonesia, Mexico, Turkey, Colombia, Cuba, and Lebanon are just some examples out of many that demonstrate such leadership.

GLOBAL INDEX INSURANCE FACILITY (GIIF)⁴⁴

REGION: GLOBAL	LEVEL: REGIONAL/ NATIONAL/ SUB-NATIONAL
DESCRIPTION	<p>The Global Index Insurance Facility (GIIF) is a multi-donor trust fund supporting the development and growth of local markets for indexed or catastrophic insurance in developing countries. GIIF's objective is to expand the use of index insurance as a risk management tool in agriculture, food security and disaster risk reduction. The facility is part of the World Bank Group's Finance & Markets Global Practice.</p> <p>GIIF helps establish index insurance markets through:</p> <ul style="list-style-type: none"> • Financial education: Public education on index insurance for farmers, small businesses, MFIs, banks and other clients, distributors, etc. • Capacity building and subsidies: grants to research institutions, brokers and NGOs to support training for local insurers and financial institutions on the design of index insurance policies and claims process. • Technical advice on products and pricing: Advisory services from GIIF technical specialists and partners to design and develop appropriate index insurance products that meet and stimulate demand for insurance. • Public policy dialogue and regulatory environment facilitation: support the strengthening of legal, regulatory, and supervisory systems related to index insurance and the establishment of the pre-conditions necessary to launch and regulate agricultural index-based insurance products, with proper fiscal incentives and regulatory tools.
HIGHLIGHTS	<p>The GIIF team works with both the private and public sectors:</p> <p>Private sector activities:</p> <ul style="list-style-type: none"> • It funds private implementing partners comprised of an intermediary 'broker or agent' who develops index insurance products with local and regional insurance companies who then sell the products; • The products are often bundled with loans or credits and distributed mostly through portfolio-level aggregators such as agribusinesses, banks and microfinance institutions, and cooperatives; • Limited climate and yield data as well as infrastructure motivates GIIF to work with satellite data providers to bring the needed information to markets. <p>Public sector activities:</p> <ul style="list-style-type: none"> • It works with governments at the regional or national levels on policy issues to create enabling legal and regulatory environments, e.g. <ul style="list-style-type: none"> • Revision of the legal and regulatory framework in the CIMA zone, comprising 14 francophone countries in West Africa who have adopted and harmonised their insurance laws and regulations, thus enabling the sale of index insurance; • A new micro-insurance code has been approved in West Africa by the Inter-African Conference on Insurance Markets (14 member countries) allowing for the successful launch of index insurance products in Senegal and Benin; the World Bank team is actively working with insurance regulators in Kenya and Uganda. • The GIIF team also carries out feasibility studies and index insurance pilots to test the feasibility of index insurance markets.
Source	ifc.org/GIIF

⁴⁴ Index number: #133

CONTINGENT CREDIT FACILITY (CCF) OF THE INTER-AMERICAN DEVELOPMENT BANK (IDB) ⁴⁵

REGION: LATIN AMERICA & THE CARIBBEAN		LEVEL: NATIONAL
DESCRIPTION	<p>In 2007, the IDB approved the Disaster Risk Management Policy and later the Integrated Disaster Risk Management and Finance Approach, which called for the creation of ex-ante risk financing instruments. One of the financial instruments developed was the \$600 million Contingent Credit Facility (CCF) for Natural Disaster Emergencies, created to provide funds to bridge fiscal gaps after a major natural hazard and to cover extraordinary expenditures that arise after its occurrence, until other sources of funding can be accessed. The CCF finances loans of up to \$100 million, or 1% of the borrowing member country's GDP, whichever is less. Disbursements are determined by predefined parametric triggers based on the type, location (areas with a given level of population concentration), and magnitude of the event (e.g. standardised measures of wind speed and precipitation) as well as the existence of a Country Integrated Disaster Risk Management Programme satisfactory to the Bank. The CCF was configured as an investment loan, albeit with exceptions related to procurement and disbursement rules. Loan proceeds apply to financial needs that exceed the costs associated with frequent and recurring events that should be funded by planned budgetary allocations.</p>	
HIGHLIGHTS	<ul style="list-style-type: none"> • Eligibility for drawdowns subject to the existence of a Country Integrated Disaster Risk Management (IDRM) Programme satisfactory to the Bank, which should include measures on risk analysis, prevention, mitigation, emergency preparedness and disaster response, as well as provisions for adequate and sustainable financing of the remaining retained or transferred risks, to be executed in a period of no more than five years. Moreover, the IDRM Programme must have measurable output and outcome indicators to allow regular monitoring by the Bank; • An essential requirement of the facility is that certain Bank procurement policies will be waived in order to allow fast disbursements immediately after the event occurs; • The facility is part of the Bank's Integrated Disaster Risk Management and Finance Approach which aims at improving borrowing member countries' management and financial planning for natural disasters; • The facility is only one component of a menu of financial options that the Bank offers within its integrated disaster risk management and finance approach which is predicted on the reality that no single instrument is able to cover all levels of risk – countries are encouraged to undertake sound risk assessment and financial planning within their integrated disaster risk management programs before being able to access the facility. 	
Reference materials	IDB, 2009; IDB, 2010.	
Source	iadb.org	

⁴⁵ Index number: #339

COMMUNITY DISASTER RESILIENCE FUND (CDRF)⁴⁶

REGION: ASIA LEVEL: SUB-NATIONAL	
DESCRIPTION	<p>The Community Disaster Resilience Fund (CDRF) is viewed as a mechanism to direct resources for disaster risk reduction (DRR) to at-risk and vulnerable communities in the context of local implementation of the Hyogo Framework for Action (HFA). It is coordinated by a network of over 150 NGOs. CDRF is broadly used to refer to the project and processes which enhances community resilience. In particular, it refers to the community owned and managed funding mechanism piloted and evolving to resource innovative solutions by grassroots women's groups and community based organizations (CBOs) to reduce vulnerability and disaster risk in poor communities.</p> <p>Objectives of the CDRF initiative are:</p> <ul style="list-style-type: none"> • To demonstrate how a funding mechanism can promote a decentralised, pro-poor community driven approach to DRR; • To develop the capacity of local communities to identify vulnerabilities and reduce risks by creating sustainable livelihoods through linkages with development programs; • To enhance the general understanding of community resources and resilience initiatives by engaging in research, monitoring, impact studies and cooperation with the grassroots; • To promote lessons and leverage resources and partnerships for community led disaster resilience priorities. <p>Key actors and stakeholders in the project are multi-hazard prone communities, women's self-help groups, government at the local, state and national level, non-governmental and community organizations.</p>
HIGHLIGHTS	<ul style="list-style-type: none"> • Strong focus on developing community ownership of the activities and on promoting the concepts of disaster risk reduction and resilience; • Change in the mindset of communities from response and relief to building resilience by: <ul style="list-style-type: none"> • Putting them in charge of managing and implementing DRR initiatives, monitoring and evaluation, fund management, etc.; • Breaking kinship and gender related norms during an emergency; • Formation of local CDRF committees responsible for disbursement, guidance and monitoring of projects; • Empowerment of women as a key feature, by e.g. changing the mind set of governments to accept women's roles and responsibilities in risk and sustainability management; • Training of community groups (men and women groups) on resilience concepts, vulnerability and capacity assessments; • Creation of local platforms for engagement and mutual learning on DRR between communities and government and other institutional actors; • Creation of a local network of community based organizations, NGOs, government bodies and other actors that together craft the national disaster risk reduction agenda.
Reference materials	NADRR, 2009.
Source	www.preventionweb.net/files/11787_CDRFReportOct2009.pdf

⁴⁶ Index number: #340

DESALINATION – A CALIFORNIA PERSPECTIVE⁴⁷

REGION: NORTH AMERICA LEVEL: SUB-NATIONAL	
DESCRIPTION	<p>California has demonstrated high interest in desalination in the past years due to elevated risk of water shortage stemming from rapidly growing populations, inadequate regulation of the water supply/landuse nexus, and ecosystem degradation from existing water supply sources. This has forced a rethinking of water policies and management. Between 2001 and 2006, public and private entities have put forward more than 20 proposals for large desalination facilities along the California coast (see figure below).</p> <p>Project proponents point to state-wide water-supply constraints, the reliability advantages of “drought-proof” supply, the water quality improvements offered by desalinated water, and the benefits of local control. Along with the proposals, however, has come a growing public debate about high economic and energy costs, environmental and social impacts, and consequences for coastal development policies.</p> <p>If all proposals were realized, California’s water supply system would be radically transformed from a surface runoff- based to an ocean water-based system. However, the Pacific Institute, in a thorough analysis, has found that most of the proposals appear to be premature. Only when alternative water-management options have been substantially developed, explicit ecosystem benefits are guaranteed, environmental and siting problems have been identified and mitigated, the construction and development impacts are minimized, and customers are willing to pay the high costs to cover a properly designed and managed plant, should desalination plants be considered to be part of the solution to growing water problems.</p> <p>As of May 2016, only two of the proposed plants have been built. There remain nine active proposals along the California coast, as well as two additional proposed plants in Baja California, Mexico that would provide water to southern California communities. However, the discussion on pros and cons of desalination is ongoing, particularly against the background of persisting drought in California. Since 2006 the Pacific Institute has published a series of studies on the key issues around desalination and is actively following and supporting the debate.</p>
HIGHLIGHTS	<ul style="list-style-type: none"> Desalination plants can help reduce the dependence of local water agencies on climate-sensitive sources of supply, but can themselves contribute to increased climate change because of their high energy needs and may be vulnerable to the impacts of climate change, including rising sea levels, storm surges, and extreme weather events; There is a need to carefully consider all arguments and counter-arguments before taking a transformative approach to climate risk management and the challenging management situation of those providing critical public goods that are at risk from the adverse effects of climate change.
Reference materials	<p>Cooley H., Gleick P. & G. Wolff, 2006, <i>Desalination, with a grain of salt: a California perspective</i>. Pacific Institute.</p> <p>Kates, R.W., Travis, W.R. & R.J. Wilbanks, 2012, <i>Transformational adaptation when incremental adaptations to climate change are insufficient</i>.</p>
Source	<p>http://pacinst.org/publication/desalination-with-a-grain-of-salt-a-california-perspective-2/</p> <p>http://www.pnas.org/content/109/19/7156.full</p>

⁴⁷ Index number: #348

Countries that responded to the questionnaire reported that the following **institutional coordination mechanisms are in place** to bring together relevant stakeholders to assess and address climate risks:

- **Multi-sectoral bodies** (e.g. comprising members of government, NGOs, private sector, etc.);
- **Climate change commissions/committees/councils** (e.g. steering/ technical; led by a prime minister or environmental ministers, or members from all relevant ministries, etc.);
- **Interagency coordination mechanisms** (e.g. task force, working group, etc. to facilitate coordination of actions on climate change between ministries and agencies);
- **Regular meetings** coordinated by a relevant ministry (e.g. to bring together stakeholders from hydrometeorology and monitoring services, and science institutions, etc.);
- **National platforms** coordinated by a high state authority (e.g. by president, to bring together stakeholders from NGOs, science institutions, etc.);
- **Agreement between key ministries** (e.g. ministries for climate and disaster prevention).

Organizations did not report on particular support provided with respect to the establishment of coordination mechanisms.

⁴⁸ The key findings contained in this section are based on the inputs provided by 28 non-Annex I Parties and eight organizations in response to two sets of questionnaires regarding the systems and/or processes currently in place in countries for conducting and coordinating analyses of climate risk and loss and damage associated with the adverse effects of climate change, taking into account extreme and slow onset events, in the context of Action Area 5 of the initial two-year workplan of the Executive Committee.

REFERENCES

1. Abousleiman, I. and Selenko, I. (2011). MultiCat Program. PRODUCT NOTE. World Bank - Treasury. Available at: http://treasury.worldbank.org/bdm/pdf/MultiCat_ProductNote.pdf [Accessed 10 Sep. 2016].
2. Anthony, I. (2013). CCRIF UPDATE - Main Achievements and Lessons Learned Strategic Donor Meeting in Support of the Caribbean Catastrophe Risk Insurance Facility. CCRIF. Available at: http://www.ccrif.org/.../CCRIFUpdate-MainAchievements_LessonsLearned-March52013.pdf [Accessed 10 Sep. 2016].
3. Anthony, I. (2014). Remarks from CCRIF Chief Executive Officer. Caribbean Central America Action (CCAA). Available at: From: <https://ccaadcblog.files.wordpress.com/2014/05/isaac-anthony-remarks-caribbean-central-america-action-final-may-20-2014.pdf> [Accessed 10 Sep. 2016].
4. ARC, (2016a). Submission to UNFCCC: The cost of drought in Africa. UNFCCC. Available at: http://unfccc.int/files/cooperation_and_support/financial_mechanism/standing_committee/application/pdf/arc_cost_of_drought_en.pdf [Accessed 10 Sep. 2016].
5. ARC, (2016b). Submission to UNFCCC: African Risk Capacity. UNFCCC. Available at: http://unfccc.int/files/cooperation_and_support/financial_mechanism/standing_committee/application/pdf/arc_and_arc_ltd.pdf [Accessed 10 Sep. 2016].
6. Balbo, S., Boccardo, P., Dalmasso, S. and Pasquali, P. (2016). A public platform for geospatial data sharing for disaster risk management. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, XL-5/W3. Available at: <http://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XL-5-W3/189/2013/isprsarchives-XL-5-W3-189-2013.pdf> [Accessed 10 Sep. 2016].
7. Blampied, C. (2016). Weathering a Risky climate: The role of insurance in reducing Vulnerability to extreme weather. RESULTS UK. Available at: <http://www.results.org.uk/sites/default/files/files/Weathering%20a%20Risky%20Climate.pdf> [Accessed 10 Sep. 2016].
8. CAPRA, (2016). CAPRA | Probabilistic Risk Assessment. Ecpra.org. Available at: <http://ecpra.org> [Accessed 10 Sep. 2016].
9. Cardenas, V., Hochrainer, S., Mechler, R., Pflug, G. and Linnerooth-Bayer, J. (2007). Sovereign financial disaster risk management: The case of Mexico. Sciencedirect.com. Available at: <http://www.sciencedirect.com/science/article/pii/S1747789107000087> [Accessed 10 Sep. 2016].
10. CARE International, (2016a). Financial inclusion. CARE. Available at: <http://www.careinternational.org.uk/fighting-poverty/working-out-poverty/financial-inclusion> [Accessed 10 Sep. 2016].
11. CARE International, (2016b). Making markets more inclusive. CARE. Available at: <http://www.careinternational.org.uk/making-markets-more-inclusive> [Accessed 10 Sep. 2016].
12. CARE International, (2016c). Submission on information on 'best practices, challenges and lessons learned from existing financial instruments at all levels that address the risk of loss and damage associated with the adverse effects of climate change'. unfccc.int. Available at: [http://unfccc.int/files/adaptation/groups_committees/loss_and_damage_executive_committee/application/pdf/care_submission_loss_and_damage_finance_\(final_11_03_16\).pdf](http://unfccc.int/files/adaptation/groups_committees/loss_and_damage_executive_committee/application/pdf/care_submission_loss_and_damage_finance_(final_11_03_16).pdf) [Accessed 10 Sep. 2016].
13. Caribbean Risk Managers Ltd, (2013). Developing a strategic concept for the implementation of climate risk insurance in an integrated climate risk management approach. MCII and GIZ workshop. Available at: http://www.climate-insurance.org/fileadmin/mcii/documents/20130411_MCII-GIZ_Workshop_Elyahen.pdf [Accessed 10 Sep. 2016].
14. CCRIF, (2016). About Us | CCRIF SPC. ccrif.org. Available at: <http://www.ccrif.org/content/about-us> [Accessed 10 Sep. 2016].
15. CGAP. (2003). The Role of Financial risk transfer and Insurance in Disaster Risk Reduction and Climate Change Adaptation.
16. Climate Bonds Initiative. (2016). Climate Bonds Initiative. Available at: <http://climatebonds.net> [Accessed 10 Sep. 2016].
17. Congressional Policy and Budget Research Department, (2012). Review of the Philippine Crop Insurance: Key Challenges and Prospects | Novel Bangsal - Academia.edu. Available at: http://www.academia.edu/3891035/Review_of_the_Philippine_Crop_Insurance_Key_Challenges_and_Prospects [Accessed 10 Sep. 2016].
18. CRÉDOC. (2016). Social innovation & Mutual learning on Micro-Savings in Europe. Available at: http://www.credoc.fr/pdf/Sou/Evaluation_SIMS_Synthese_Rapport_Eng.pdf [Accessed 10 Sep. 2016].
19. Cummins, J.D. and Mahul, O. (2009). Catastrophe Risk Financing in Developing Countries: Principles for Public Intervention. International Bank for Reconstruction and Development. World Bank. Washington D.C., USA. Available at: <http://siteresources.worldbank.org/FINANCIALSECTOR/Resources/CATRISKbook.pdf> [Accessed 10 Sep. 2016].
20. Ecglobal, (n.d.). Livelihood Protection Policy LPP. Available at: <http://www.ecglobalinsurance.com/products-and-services/livelihood-protection-policy-lpp> [Accessed 10 Sep. 2016].
21. European Commission, (2016). Submission by the Netherlands and the European Commission on Behalf of the European Union and its Member States. UNFCCC. Available at: http://unfccc.int/files/adaptation/groups_committees/loss_and_damage_executive_committee/application/pdf/nl-03-16-excom_eu_submission.pdf [Accessed 10 Sep. 2016].
22. GFDRR, (2013). Mexico MultiCat Bond: Transferring Catastrophe Risk to the Capital Markets. Disaster Risk Finance and Insurance Case Study. Global Facility for Disaster Risk Reduction. Available at: https://www.gfdr.org/sites/gfdr.org/files/documents/Mexico-MultiCat_22Feb2013.pdf [Accessed 10 Sep. 2016].
23. GFDRR, (2015). Advancing Disaster Risk Financing & Insurance in the Pacific: Regional Summary Note and Options for Consideration. World Bank Group. Washington D.C., USA. Available at: https://www.gfdr.org/sites/default/files/publication/2015.06.25_PCRAFI_Combined-%5bCompressed%5d-rev-0.9.pdf [Accessed 10 Sep. 2016].
24. GFDRR, (2016). Identifying Risks and Guiding Recovery Efforts in Malawi. Global Facility for Disaster Reduction and Recovery. Available at: http://www-wds.worldbank.org/external/default/WDSCContentServer/WDSP/IB/2016/02/12/090224b084174232/1_0/Rend ered/PDF/IdentifyingOriOryOeffortsOinOMalawi.pdf [Accessed 10 Sep. 2016].

25. GFDRR, (2016). Submission Executive Committee of the Warsaw International Mechanism for Loss and Damage. UNFCCC. Available at: http://unfccc.int/files/adaptation/groups_committees/loss_and_damage_executive_committee/application/pdf/lessons_financial_protection_gfdr-wbg.pdf [Accessed 10 Sep. 2016].
26. GFDRR, (n.d.). In Malawi, Citizens Get Involved as Innovative Technologies Help Them Better Understand and Manage Disaster Risks | GFDRR. GFDRR. Available at: <https://www.gfdr.org/malawi-citizens-get-involved-innovative-technologies-help-them-better-understand-and-manage-disast-0> [Accessed 10 Sep. 2016].
27. GFDRR, Florida International University, (2011). Disaster risk management in East Asia and the Pacific disaster risk financing: case studies. EAP DRM Knowledge Notes. [online] Washington, DC: The World Bank Global Facility for Disaster Reduction and Recovery (GFDRR). Available at: <http://dpanther.fiu.edu/dpService/dpPurlService/purl/FI13042124/00001> [Accessed 10 Sep. 2016].
28. Ghesquiere, F. and Mahul, O. (2012). Caribbean Catastrophe Risk Insurance Facility (CCRIF). World Bank. Available at: http://siteresources.worldbank.org/EXTDISASTER/Resources/CCRIF_Final.pdf [Accessed 10 Sep. 2016].
29. Goodland, A. (n.d.). Risk management: the case of the livestock sector in Mongolia. FAO. Available at: http://www.fao.org/fileadmin/templates/rome2007/initiative/FAO.../ANDREW_1.PDF [Accessed 10 Sep. 2016].
30. Goodland, A. and Mahul, O. (2011). Index-based Livestock Insurance in Mongolia. GFDRR. Available at: http://gfdr.org/sites/gfdr.org/files/DRFI_Mongolia%20IBLIP_Final.pdf [Accessed 10 Sep. 2016].
31. Grantham Research Institute, (2016). Philippine Disaster Reduction and Management Act (RA 10121). Grantham Research Institute on climate change and the environment. Available at: <http://www.lse.ac.uk/GranthamInstitute/law/philippine-disaster-reduction-and-management-act-ra-10121/> [Accessed 10 Sep. 2016].
32. Gurenko, E. (2004). Catastrophe risk and reinsurance. London: Risk Books.
33. Hofliger, R., Mahul, O., Ghesquiere, F. and Perez, S. (2012). FONDEN: Mexico's natural disaster fund - a review. World Bank. Available at: <http://documents.worldbank.org/curated/en/408711468286527149/FONDEN-Mexicos-natural-disaster-fund-a-review> [Accessed 10 Sep. 2016].
34. Huntebrinker, H. (2014). Carteret Islands – The challenge of relocating entire islands. Available at: <https://sinkingislands.com/2014/10/12/carteret-islands-the-challenge-of-relocating-entire-islands/> [Accessed 10 Sep. 2016].
35. Ibarra, H. (n.d.). Self-Insurance Funds in Mexico. World Bank Institute Distance Learning: Natural Disaster Risk Management Program. Available at: http://worldbank.mrooms.net/file.php/350/community-pdf/SelfInsurance_mexico_English_Edited.pdf [Accessed 10 Sep. 2016].
36. IBLIP, (2007). Introduction to Index-based livestock insurance Project in Mongolia; The Stockholm Forum for Disaster Reduction and Recovery, Sweden. World Bank. Available at: <http://siteresources.worldbank.org/EXTDISMGMT/Resources/LailanOCT25.pdf> [Accessed 10 Sep. 2016].
37. IDB. (2009). Contingent Credit Facility for Natural Disaster Emergencies. Proposal.
38. IDB. (2010). Natural Disasters Financial Risk Management. Technical and Policy Underpinnings for the Use of Disaster-Linked Financial Instruments in Latin America and the Caribbean.
39. International Strategy for Disaster Reduction (ISDR) and World Bank, (2009). Agricultural Insurance Feasibility Study for Nepal. Report No. 46521-NP. Available at: http://www.agroinsurance.com/files/documents/Agri_Insurance_Feasibility_Study_for_Nepal_.pdf [Accessed 10 Sep. 2016].
40. IPCC, (2012) Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, UK, and New York, NY, USA, 582 pp. Available at: <http://ipcc-wg2.gov/SREX/> [Accessed 10 Sep. 2016].
41. IPCC, (2014) Annex II: Glossary [Mach, K.J., S. Planton and C. von Stechow (eds.)]. In: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, pp. 117-130. Available at: <https://www.ipcc.ch/report/ar5/>
42. IPCC, (2014a): Climate Change 2014 Synthesis Report Summary for Policymakers.
43. Ishizawa, O., Mahul, O. and Yi, H. (2013). FONDEN: Mexico's National Disaster Fund: An evolving inter-institutional fund for post-disaster expenditures. GFDRR. Available at: https://www.gfdr.org/sites/gfdr.org/files/.../Mexico_FONDEN_final_GFDRR.pdf [Accessed 10 Sep. 2016].
44. Iturrioz, R. (2009). Agricultural Insurance. Primer Series on Insurance, Issue 12, November 2009. Available at: http://siteresources.worldbank.org/FINANCIALSECTOR/Resources/Primer12_Agricultural_Insurance.pdf [Accessed 10 Sep. 2016].
45. Kates, R.W., Travis, W. R., Wilbanks T.J. (2012). Transformational adaptation when incremental adaptations to climate change are insufficient. PNAS. Available at: <http://www.pnas.org/content/109/19/7156.full.pdf> [Accessed 10 Sep. 2016].
46. Kenney, D. S. (n.d.). Water Allocation and Management in the Western United States: An Overview. Draft. Available at: http://www.colorado.edu/geography/geomorph/envs_5810/kenney_04.pdf [Accessed 10 Sep. 2016].
47. Le De, L., Gaillard, J. and Friesen, W. (2015). Remittances and disaster: Policy implications for disaster risk management. Migration, Environment and Climate Change: Policy Brief Series. Available at: http://publications.iom.int/system/files/pdf/policy_brief_series_issue2.pdf [Accessed 10 Sep. 2016].
48. Leckie, S. (2013). Finding land solutions to climate displacement: a challenge like few others. Available at: <http://displacementsolutions.org/wp-content/uploads/2014/12/DS-Report-Finding-Land-Solutions-to-Climate-Displacement.pdf> [Accessed 10 Sep. 2016].
49. Levin, T., Reinhard, D., Mahul, O. and Pérez, H. (2007). Munich Re Foundation from Knowledge to Action. Research Gate. Available at: https://www.researchgate.net/publication/265453390_Munich_Re_Foundation_From_Knowledge_to_Action [Accessed 10 Sep. 2016].
50. Mahul, O. and Skees, J. (2005). Mongolia - Index-based Livestock Insurance Project (Project Information Document - Appraisal Stage) | Washington: World Bank, through Microfinance Gateway. Available at: <http://www.microfinancegateway.org/library/mongolia-index-based-livestock-insurance-project-project-information-document-appraisal> [Accessed 10 Sep. 2016].
51. Morinière, L. and Zimmerman, L. (2015). ACP Compendium of Risk Knowledge: Mapping Risk in the African, Caribbean & Pacific Group of States (ACP). European Commission. Available at: https://ec.europa.eu/europeaid/sites/devco/files/acp-compendium-risk-2015_en.pdf [Accessed 10 Sep. 2016].

52. Munich Climate Insurance Initiative (MCII), (2013). UN/ISDR Global Platform on Disaster Risk Reduction 2013: Statement. Preventionweb.net. Available at: http://www.preventionweb.net/files/33310_mciistatement1.docx [Accessed 10 Sep. 2016].
53. Munich Climate Insurance Initiative (MCII), (n.d.). For Individuals: The Livelihood Protection Policy. Available at: http://www.climate-insurance.org/fileadmin/mcii/documents/201304_MCII_Carib_LPP_factsheet.pdf [Accessed 10 Sep. 2016].
54. NADRR, (2009). One Year Later...Community Disaster Resilience Fund (CDRF). Learnings from the Pilot Initiative in India. Available at: http://www.preventionweb.net/files/11787_CDRFReportOct2009.pdf [Accessed 10 September 2016].
55. Navarro-Martin, M. (2014). Mitigating the Impact of Drought on Energy Production and Fiscal Risk in Uruguay. World Bank. Available at: http://treasury.worldbank.org/bdm/pdf/Case_Study/Uruguay_Weather_Derivative.pdf [Accessed 10 Sep. 2016].
56. OECD, (2012). Disaster Risk Assessment and Risk Financing. A G20/OECD Methodological Framework. Available at: <https://www.oecd.org/gov/risk/G20disasterriskmanagement.pdf> [Accessed 10 September 2016].
57. Pelesikoti, N. (2013). Pacific Adaptation Strategy Assistance Program. Final Report. Available at: http://www.pacificclimatechange.net/sites/default/files/documents/JNAP%20Project_finalreport%281%29.pdf [Accessed 10 Sep. 2016].
58. Philippine Crop Insurance Corporation, (2016). About Us. Pciic.gov.ph | Department of Agriculture. Available at: <http://pciic.gov.ph/about-us/> [Accessed 10 Sep. 2016].
59. Philippine Institute for Development Studies, (2016). Targeting the Agricultural Poor: The Case of PCIC's Special Programs. Discussion Paper Series No. 2015-08. Available at: <http://dirp3.pids.gov.ph/webportal/CDN/PUBLICATIONS/pidsdps1508.pdf> [Accessed 10 Sep. 2016].
60. Rahman, S. (2014a). Strengthening Financial Resilience in the Pacific. Global Facility for Disaster Reduction and Recovery. Available at: https://www.gfdrr.org/sites/gfdrr/files/publication/PCR_AFI.pdf [Accessed 10 Sep. 2016].
61. Rahman, S. (2014b). Stakeholders Engage to Build Belize's Climate Resilience. Global Facility for Disaster Reduction and Recovery. Available at: <https://www.gfdrr.org/sites/gfdrr/files/publication/Belize.pdf> [Accessed 10 Sep. 2016].
62. Rahman, S. (2014c). Managing Drought, Sustaining Growth in Djibouti. World Bank. Available at: <http://www.worldbank.org/en/results/2014/08/18/managing-drought-sustaining-growth-djibouti> [Accessed 10 Sep. 2016].
63. Rahman, S. (2014d). Protecting School Infrastructure against Earthquake Risks in Peru. Global Facility for Disaster Reduction and Recovery. Available at: <http://www.wcdrr.org/wcdrr-data/uploads/881/GFDRR%20Stories%20of%20Impact%20-%20Protecting%20school%20infrastructure%20against%20earthquake%20risks%20in%20Peru.pdf> [Accessed 10 Sep. 2016].
64. Rahman, S. (2015a). Building Resilient Communities across Indonesia. Global Facility for Disaster Reduction and Recovery. Available at: <https://www.gfdrr.org/sites/default/files/publication/Indonesia.pdf> [Accessed 10 Sep. 2016].
65. Rahman, S. (2015b). Identifying Risks and Guiding Recovery Efforts in Malawi. Stories of impact. Washington, D.C. World Bank Group. Global Facility for Disaster Reduction and Recovery. Available at: <http://www-wds.worldbank.org/external/default/WDSContentServe>
66. re: focus partners, Ilc, RMS, and Swiss Re, (2015). Leveraging catastrophe bonds as a mechanism for resilient infrastructure project finance. The RE.bound Program. Available at: <http://www.refocuspartners.com/reports/RE.bound-Program-Report-December-2015.pdf> [Accessed 10 Sep. 2016].
67. Rey, A. (2015). RA 10121: The PH's disaster management law is up for review. Available at: <http://www.rappler.com/move-ph/issues/disasters/knowledge-base/93941-drrm-act-2010-review> [Accessed 10 Sep. 2016].
68. Reyes, C., Domingo, S., Mina, C. and Gonzales, K. (2009). Policy Options for Rice and Corn Farmers in the Face of Seasonal Climate Variability. Philippine Journal of Development Number 66, First Semester 2009 Volume XXXVI, No. 1. Available at: <http://dirp3.pids.gov.ph/ris/pjd/pidspid09-1ricecornfarmers.pdf> [Accessed 10 Sep. 2016].
69. Simpson, A. (2015). Understanding Disaster Risks through Science, Technology, Open Data and Innovation. GFDRR. Available at: https://www.gfdrr.org/sites/default/files/1.%20GFDRR%2016th%20CG%20Ppt%20Innovation%20Lab_v4.pdf [Accessed 10 Sep. 2016].
70. Swiss Re, (2016). Swiss Re and partners to develop resilience bonds: a tool for country and city risk management. Swissre.com. Available at: http://www.swissre.com/global_partnerships/Swiss_Re_and_partners_to_develop_resilience_bonds.html [Accessed 10 Sep. 2016].
71. Syroka, J. (2014). Opinion: Lessons from the African Risk Capacity for the new international disasters framework - Climate and Development Knowledge Network. Climate and Development Knowledge Network. Available at: http://cdkn.org/2014/07/opinion-lessons-from-the-african-risk-capacity-for-the-new-international-disasters-framework/?loclang=en_gb [Accessed 10 Sep. 2016].
72. Tulele Peisa, (2016). Submission to UNFCCC: Information on Internal Displacement & Relocation owing to factors relating to Climate Change Impacts. UNFCCC. Available at: http://unfccc.int/files/adaptation/groups_committees/loss_and_damage_executive_committee/application/pdf/loss_damage_submission_final_v2.pdf [Accessed 10 Sep. 2016].
73. U.S. Army Corps of Engineers, (2012). Water in the U.S. American West. Policy Report for the 6th World Water Forum. Available at: <http://naturalresourcespolicy.org/docs/water-in-the-west.pdf> 1470314406 [Accessed 10 Sep. 2016].
74. UK Environment Agency, (2012). TE2100 Plan. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/322061/LIT7540_43858f.pdf [Accessed 10 Sep. 2016].
75. UK Environment Agency, (2014). TE2100 Plan. Policy Paper. Available at: <https://www.gov.uk/government/publications/thames-estuary-2100-te2100/thames-estuary-2100-te2100> [Accessed 10 Sep. 2016].
76. UN-DESA, UNDP, and SIDS Inter-Agency Consultative Group (IACG), (2010). SIDS-SIDS Success Stories: An Innovative partnership in South-South Cooperation. Available at: https://sustainabledevelopment.un.org/content/documents/961sids-sids_success_stories.pdf [Accessed 10 Sep. 2016].
77. UNFCCC, (2016). Information Paper: Best practices, challenges and lessons learned from existing financial instruments at all levels that address the risk of loss and damage associated with the adverse effects of climate

- change. Available at:
https://unfccc.int/files/adaptation/groups_committees/loss_and_damage_executive_committee/application/pdf/information_paper_aa7d_april_2016.pdf [Accessed 10 Sep. 2016].
78. UNISDR (2005). Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters. Extract from the final report of the World Conference on Disaster Reduction.
 79. UNISDR (2009). Terminology on Disaster Risk Reduction. Geneva, Switzerland: United Nations Office for Disaster Risk Reduction (UNISDR). Available at:
<https://www.unisdr.org/we/inform/terminology> [Accessed 10 Sep. 2016].
 80. UNISDR (2015). Making Development Sustainable: The Future of Disaster Risk Management. Global Assessment Report on Disaster Risk Reduction. Geneva, Switzerland: United Nations Office for Disaster Risk Reduction (UNISDR). Available at:
<https://www.unisdr.org/we/inform/gar> [Accessed 10 Sep. 2016].
 81. UNISDR, (2010). Early Warning Practices can Save Many Lives: Good Practices and Lessons Learned, United Nations Secretariat of the International Strategy for Disaster Reduction (UNISDR). Available at:
http://www.preventionweb.net/files/15254_EWSBLLfinalweb.pdf [Accessed 10 Sep. 2016].
 82. UNISDR. (2015). From a Reactive to Proactive then People Centred Approach to DRR. Taking Inspiration from the Hyogo Framework for Action to Implement the Sendai Framework for Disaster Risk Reduction. Available at
http://www.unisdr.org/files/49574_hfacelebrationreport7082015verdana.pdf [Accessed at 5 September 2016].
 83. United States of America, (2016). Submission by the United States to the Warsaw International Mechanism Executive Committee on financial instruments that address the risk of loss and damage. UNFCCC. Available at:
http://unfccc.int/files/adaptation/groups_committees/loss_and_damage_executive_committee/application/pdf/us_submission_on_ld_financial_tools.pdf [Accessed 10 Sep. 2016].
 84. University of the West Indies, (n.d.). Report on early warning systems in the Caribbean sub region. Available at:
http://www.mona.uwi.edu/cardin/virtual_library/docs/1042/doc14559.pdf [Accessed 10 Sep. 2016].
 85. Warner, K. (2013). Humanitarian programming, risk management including insurance, & livelihood resilience. UNOCHA. Available at:
<https://docs.unocha.org/sites/dms/Documents/Session%202020-%20Humanitarian%20programming,%20risk,%20management%20including%20insurance.pdf> [Accessed 10 Sep. 2016].
 86. Warner, K. and Schäfer, L. (n.d.). Climate risk insurance for the poor. MCII. Available at: http://www.climate-insurance.org/fileadmin/mcii/pdf/COP-21/G7_InsuResilience_MCII_Factsheet_SuccessFactors___EnablingConditions.pdf [Accessed 10 Sep. 2016].
 87. Weydahl, M. and Ortiz, C. (2014). Samoa starts cross-sectoral response to climate change adaptation. UNDP. Available at:
<http://www.undp.org/content/undp/en/home/presscenter/pressreleases/2014/11/07/samoa-starts-cross-sectoral-response-to-climate-change-adaptation-/> [Accessed 10 Sep. 2016].
 88. WFP and Oxfam America, (2015). R4 Rural Resilience Initiative. Available at:
http://documents.wfp.org/stellent/groups/public/documents/newsroom/wfp284169.pdf?_ga=1.161938492.1032867783.1470314406 [Accessed 10 Sep. 2016].
 89. WFP and Oxfam America, (2016). R4 Rural Resilience Initiative. Annual report. January – December 2015. Available at:
http://documents.wfp.org/stellent/groups/public/documents/communications/wfp284831.pdf?_ga=1.99439518.1032867783.1470314406 [Accessed 10 Sep. 2016].
 90. WFP, (2012). Ethiopia: Productive Safety Net Programme (PSNP). Available at:
<https://www.wfp.org/sites/default/files/PSNP%20Factsheet.pdf> [Accessed 10 Sep. 2016].
 91. World Bank, (2009). Mongolia: Index Based Livestock Insurance Project. World Bank Feature Story. Available at:
<http://www.worldbank.org/en/news/feature/2009/09/23/index-based-livestock-insurance-project> [Accessed 10 Sep. 2016].
 92. World Bank, (2012a). Implementation completion and results report (P108058) The Caribbean Catastrophe Risk Insurance Facility for a Caribbean Catastrophe Risk Insurance Project. Sustainable Development Department Caribbean Country Management Unit Latin America and the Caribbean Region: World Bank.
 93. World Bank, (2012b). Improving the assessment of disaster risks to strengthen financial resilience. World Bank. Available at:
<http://documents.worldbank.org/curated/en/606131468149390170/improving-the-assessment-of-disaster-risks-to-strengthen-financial-resilience> [Accessed 10 Sep. 2016].
 94. World Bank, (2013). Pacific Catastrophe Risk Insurance Pilot: Regional Financial Protection against Natural Disasters for Pacific Island States. World Bank. Available at:
http://siteresources.worldbank.org/EXTDISASTER/Resources/8308420-1361321776050/Pacific-Catastrophe-Risk-Insurance-Pilot_4pager_12Feb13.pdf [Accessed 10 Sep. 2016].
 95. World Bank, (2013b). Fondos: Mexico's Unique Agricultural Mutual Insurance Funds. Mexico: Agriculture Insurance Market Review. Available at:
<http://documents.worldbank.org/curated/en/197661468281079879/pdf/880990BRIOP1300urance04Pager0Fondos.pdf> [Accessed 10 Sep. 2016].
 96. World Bank, (2014a). Strengthening Economic Linkages: Climate change financing and disaster risk reduction pilot country experiences with the Pacific Catastrophe Risk Insurance Pilot. The Pacific Islands Forum Secretariat. Available at:
http://www.forumsec.org/resources/uploads/attachments/documents/2014FEMM.08_Pacific_Catastrophe_Risk_Insurance_Pilot.pdf [Accessed 10 Sep. 2016].
 97. World Bank, (2014b). Planning an Open Cities Mapping Project. Global Facility for Disaster Reduction and Recovery. Available at:
https://www.gfdr.org/sites/gfdr/files/publication/Planning-an-Open-Cities-Mapping-Project_0.pdf [Accessed 10 Sep. 2016].
 98. World Bank, (2014c). Understanding Risk: The Evolution of Disaster Risk Assessment. Global Facility for Disaster Reduction and Recovery. Available at:
https://www.gfdr.org/sites/gfdr/files/publication/_Understanding_Risk-Web_Version-rev_1.7.3.pdf#p84 [Accessed 10 Sep. 2016].
 99. World Bank, (2014d). Protecting School Infrastructure against Earthquake Risks in Peru. Available at:
<http://www.worldbank.org/en/projects-operations/results/2014/09/22/protecting-school-infrastructure-against-earthquake-risks-peru> [Accessed 10 Sep. 2016].
 100. World Bank, (2015). Administration Agreement between the European Commission and the International Bank for Reconstruction and Development and the International Development Association concerning the Global Partnership on Disaster Risk Financing Analytics Single-Donor Trust Fund (TF072535). World Bank. Available at:
<http://documents.worldbank.org/curated/en/221111468320092030/pdf/RAD537641241.pdf> [Accessed 10 Sep. 2016].

101. World Bank, (2015). PCRAFI Country Note Marshall Islands, Disaster Risk Financing and Insurance. Global Facility for Disaster Risk Reduction. Available at: <https://www.gfdr.org/sites/gfdr/files/publication/Country-Note-Marshall-Islands.pdf> [Accessed 10 Sep. 2016].
102. World Bank, (2015a). Financing & Insurance in the Pacific: Regional Summary Note & Options for Consideration. Global Facility for Disaster Reduction and Recovery. Available at: [https://www.gfdr.org/sites/default/files/publication/2015.06.25_PCRAFI_Combined-\[Compressed\]-rev-0.9.pdf](https://www.gfdr.org/sites/default/files/publication/2015.06.25_PCRAFI_Combined-[Compressed]-rev-0.9.pdf) [Accessed 10 Sep. 2016].
103. World Bank, (2015b). Pacific Catastrophe Risk Insurance Pilot - From Design to Implementation - Some Lessons Learned. ReliefWeb. Available at: <http://reliefweb.int/report/world/pacific-catastrophe-risk-insurance-pilot-design-implementation-some-lessons-learned> [Accessed 10 Sep. 2016].
104. World Bank, (2016). Africa - Productive Safety Net Project (PSNP). Available at: <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/0,,contentMDK:21072837~menuPK:1804110~pagePK:146736~piPK:146830~theSitePK:258644,0.html> [Accessed 10 Sep. 2016].

PHOTO CREDIT: WORLD BANK⁴⁹

⁴⁹ https://www.flickr.com/photos/un_photo/5492638210/in/album-72157626003412837/

ANNEX I

I. Africa

Approach	Practice	Country/ies	Level	Index #
RISK ASSESSMENT				
Hazard mapping	Drought Monitoring Centre	Kenya, South Africa	National	103
	Malawi Spatial Data Platform (MASDAP) GeoNode	Malawi	National	186
	Rainfall predictions based on the observation of environmental and astronomical factors	United Republic of Tanzania	National	249
Impact assessment	Catastrophe risk model: The IIASA CATSIM	n.a.	Regional	42
	Durban Ecosystem-Based Adaptation	South Africa	National	104
Vulnerability assessment	Value of biodiversity (mountain gorilla) for the development of ecotourism	Democratic Republic of the Congo, Uganda	National	328
RISK REDUCTION				
Awareness raising, education, training	ACP-EU Africa Disaster Risk Financing (ADRF) Program	Niger	Regional	1
	Agricultural Information Management System	n.a.	Regional	8
	Community-based Disaster Risk Management and Urban Development Project	Niger	National	63
	Nile Basin Initiative	Nile Basin	Regional	218
	Protection of shea trees in order to create opportunities for income and to prevent desertification	Burkina Faso	Subnational	241
	Provision of agrometeorological information (AGRHMET/WMO)	Mali	National	243
	Women Entrepreneurship Resilient Cities (WE'Resilient Cities) competition	Egypt, Lebanon, Djibouti	Regional	337
Early warning systems	Arid Lands Resource Management Project (ALRMP)	Kenya	National	25
	Community-based flood early warning and response system	Mozambique	Subnational	65
	Contingency plans for different scenarios, coupled with early warning system	Somalia	National	77
	Djibouti Disaster Risk Management Program	Djibouti	National	101
	Early warning systems - vector-borne and food-borne infections	Botswana, Bhutan		106
	Institutional management of drought contingencies	Ethiopia, Kenya and Uganda	National	163
	Locust early warning system	Mauritania	National	183
	Radio stations for the transmission of drought warnings	Kenya	National	248
Hard infrastructure	ACP-EU Africa Disaster Risk Financing (ADRF) Program	n.a.	Regional	1
	Construction of wells and land dikes for safe water and agriculture	Mauritania	National	76
	Djibouti Disaster Risk Management Program	Djibouti	National	101
	Improved restoration of dams and habitats	Mali	National	149

	Rainwater harvesting and development of springs	Uganda	National	250
	Revival of traditional rainwater harvesting techniques	Ghana	National	266
	Silo construction for the reduction of post-harvest losses	Kenya	National	279
	Silo construction for the reduction of post-harvest losses	Malawi	National	280
	Solar-powered water supply and irrigation systems	United Republic of Tanzania	National	287
	Traditional water system (<i>khattara</i>) and water-user associations	Morocco	National	308
	Wells and community development in the Zukpuri Traditional Area	Ghana	Subnational	336
Legislative measures	Building Stronger Classrooms to Withstand Hazards in Mozambique	Mozambique	National	32
	Disaster Risk Management Act and National Disaster Risk Management Policy	South Africa	National	97
	Traditional rules/ laws and community-based management of the protection of forests	United Republic of Tanzania	Subnational	307
Planning	Arid Lands Resource Management Project (ALRMP)	Kenya	National	25
	Contingency plans for different scenarios, coupled with early warning system	Somalia	National	77
	Disaster Risk Management Act and National Disaster Risk Management Policy	South Africa	National	97
	Durban Ecosystem-Based Adaptation	South Africa	National	104
	Institutional management of drought contingencies	Ethiopia, Kenya and Uganda	National	163
	Mainstreaming climate change adaptation mechanisms in policies	Mozambique	National	185
	Monitoring of food availability and accessibility	Niger	National	196
	National contingency plan for food security and nutrition	Niger	National	209
	Okavango River Basin Water Commission	Okavango Basin	Regional	219
	Pilot Programme for Climate Resilience (PPCR)	various	Global	230
	Policy changes for the transition from rain-fed crops to non-rain fed crops	Mali	National	233
	Regional collaboration on adaptation strategies (ASARECA)	Burundi	National	258
	Regional collaboration on adaptation strategies (ASARECA)	Rwanda	National	259
	Regional collaboration on adaptation strategies (ASARECA)	Uganda	National	260
	Storm Water Management and Climate Change Adaptation Project (PROGEP)	Senegal	National	292
	UN Syria Drought Response Plan	Syria	National	312
	Zanzibar Strategy for Growth and Reduction of Poverty	United Republic of Tanzania	National	338
Sectoral interventions	Agricultural Information Management System	n.a.	Regional	8
	Community-based REDD - reforestation project for livelihood improvement	South Africa	Subnational	67
	Congo Basin Forest Partnership	n.a.	Regional	74
	Development of fair trade and organic small-scale enterprises (Rooibos tea)	South Africa	National	91
	Ecologically sustainable agriculture, leading to social security	Zambia	National	107
	Gambia - Integrated Water Resources Management (IWRM) road map	Gambia	National	130
	Guinea-Bissau - Integrated Water Resources Management (IWRM) road map	Guinea-Bissau	National	136
	Indigenous land unit framework	Namibia	National	159

	Integrated rainwater management in pastoral communities	Kenya	Subnational	165
	Joint management of rehabilitation of degraded forests	Ghana	Subnational	171
	Lake Victoria Management Project (stabilization of ecosystem)	Kenya, Uganda and the United Republic of Tanzania	Regional	174
	Living with Floods	Mozambique	National	178
	Local agricultural adaptation strategies to reduce yield variability	Burkina Faso	Subnational	180
	Local measures to adapt to moisture change	South Africa	Subnational	181
	Local responses to natural disasters	Uganda	Subnational	182
	Mainstreaming climate change adaptation mechanisms in policies	Mozambique	National	185
	Mangrove restoration and rehabilitation	Vietnam, Djibouti, and Brazil	Subnational	188
	Nairobi Rivers Basin Rehabilitation and Restoration Program	Kenya	National	202
	Okavango River Basin Water Commission	Okavango Basin	Regional	219
	Protection of palmyra palms in order to create opportunities for income and to prevent desertification	Niger	National	240
	Protection of shea trees in order to create opportunities for income and to prevent desertification	Burkina Faso	Subnational	241
	Recycling of wastewater for paddy irrigation farming	United Republic of Tanzania	National	252
	Sierra Leone - Integrated Water Resources Management road map	Sierra Leone	National	278
	Strategy for Flood Management for Kafue River Management	Zambia	National	293
	Sustainable management of coastal ecosystems	United Republic of Tanzania	National	297
	Use of local knowledge on weather and climate; local adaptation strategies	Sahel	Subnational	320
	Use of traditional water harvesting techniques, complemented by the use of modern technologies	Tunisia	National	326
FINANCIAL RISK TRANSFER				
Bonds/derivative	Sovereign weather derivative	Malawi	National	290
Insurance: Traditional	Climate Insurance Fund (CIF)	n.a.	Regional	52
	InsuResilience	Developing countries	International	164
Insurance: Regional	African Risk Capacity (ARC)	n.a.	Regional	4
	FoodSECuRE: forecast-based risk transfer mechanism	Guatemala, Niger, Sudan, Philippines, Zimbabwe	International	126
Insurance: National	Financial coverage for drought risk	Malawi	National	120
	Pilot insurance project combined with weather stations	Ethiopia	National	229
	Sovereign weather derivative	Malawi	National	290
	Weather-based crop insurance	Malawi	National	333
Insurance: Micro	Collective index-based insurance with informal networks	United Republic of Tanzania	National	56
	Index-based livestock insurance	Kenya and Ethiopia	Regional	154

	Index-based livestock insurance (IBLI)	Kenya	National	155
	Index-based livestock insurance (IBLI)	Nigeria	National	156
	Index-based weather insurance for smallholders	Malawi	National	158
	R4 Rural Resilience initiative	Ethiopia, Senegal, Malawi, Zambia	Regional	247
RISK RETENTION				
Contingency loans	Second phase of Productive Safety Net Program, with drought risk financing component	Ethiopia	National	275
Non-financial risk retention	Migrants' social networks; investments in renewable energy and electrification	Mali, Mauritania and Senegal	National	194
Reserve bonds/ contingency funds	African Risk Capacity (ARC)	n.a.	Regional	4
	Arid Lands Resource Management Project (ALRMP)	Kenya	National	25
Savings	Village savings and loan associations	n.a.		329
Social protection	Care of the People	Nigeria	National	34
	Community-led system of targeting social protection programmes; traditional practice of ubudehe	Rwanda	Subnational	68
	Ecologically sustainable agriculture, leading to social security	Zambia	National	107
	Maloti Drakensberg mountains - Improvement of water security through opportunities for work in river catchments	South Africa	National	187
	Productive Safety Net Programme (PSNP); disaster risk management (DRM)	Ethiopia	National	235
	R4 Rural Resilience initiative	Ethiopia, Senegal, Malawi and Zambia	Regional	247
	Safety nets and local adaptation through trading opportunities in NTFP: Non-timber forest products	Democratic Republic of the Congo	Subnational	272
TRANSFORMATIONAL APPROACHES				
Doing things at different location	Increased cross-border trade for food security	Nigeria, Niger	Regional	152
Doing things at different scale	Integration of indigenous knowledge into scientific climate forecasting	Malawi	National	168
Legislative measures	Transhumance certificates for transboundary mobility across livestock corridors	n.a.	Regional	309
ENABLING ENVIRONMENT				
	Global Index Insurance Facility (GIIF)	various	International	133

II. Asia

Approach	Practice	Country/ies	Level	Index #
RISK ASSESSMENT				
Hazard mapping	GIS technology for dealing with climate change hazards	Philippines	National	132
	Mekong River Flood Forecasting System	Mekong Basin	Regional	189
Impact assessment	Building Coastal Resilience in India	India	National	29
	Catastrophe risk model: The IIASA CATSIM	n.a.	Regional	42
	Economic valuation of impacts and vulnerabilities		National	108
	Lower Mekong Initiative	Lower Mekong	Regional	184
	Total Disaster Management System	Japan	National	304
	Urban Wetlands – A New Model for Urban Resilience in Colombo	Sri Lanka	National	317
Vulnerability assessment	Economic valuation of impacts and vulnerabilities		National	108
	GIS technology for dealing with climate change hazards	Philippines	National	132
	Total Disaster Management System	Japan	National	304
RISK REDUCTION				
Awareness raising, education, training	Approach to a more comprehensive disaster risk reduction strategy oriented around risk-informed planning and resilient infrastructure	Vietnam	National	23
	Climate Field Schools	Indonesia	National	51
	Integrating climate change into education	Bangladesh	Subnational	167
	National Programme for Community Empowerment in Urban Areas	Indonesia	Subnational	215
	Remote sensing-based Information and Insurance for Crops in Emerging economies (RIICE)	Cambodia, India, Philippines, Thailand and Vietnam	Regional	263
Early warning systems	Automatic early warning system for glacial lake outburst floods	Bhutan	National	26
	Building Coastal Resilience in India	India	National	29
	Bushfire early warning system (Ferny Creek Bushfire Alert System)	Australia	National	33
	Cyclone early warning system	Bangladesh	National	87
	Cyclone early warning system	Hong Kong	National	88
	Early flood warning systems	Bangladesh	Subnational	105
	Early warning systems - vector-borne and food-borne infections	Botswana, Bhutan	National	106
	Establishment of a Storm Warning Centre	Bangladesh	National	114
	Flood early warning system	Nepal	Subnational	122
	Improvement of the flood early warning system in Jakarta	Indonesia	National	150
	Mekong River Flood Forecasting System	Mekong Basin	Regional	189
	Weather-based forecasting model for dengue	Singapore	National	335
Hard infrastructure	Building Coastal Resilience in India	India	National	29
	Devices for controlling run-off	Japan	National	92

	Disaster-preparedness measures: Emergency shelters and services	Australia	Subnational	99
	Disaster-Proofing the Transport Sector	Vietnam	National	100
	Homestead protection	Bangladesh	Subnational	140
	Homestead reinforcement	Bangladesh, Philippines	Subnational	141
	House retrofitting initiative	Japan	National	142
	Multi-storey cyclone shelters	Bangladesh	National	200
	Raised earthen platforms for the protection of livestock during cyclones	Bangladesh	Subnational	251
	Ring dike reservoir	Cambodia	National	268
	Underground bunker construction	Bangladesh	Subnational	313
	Urban Resilience Project (URP)	Bangladesh	National	316
	Use of technology for the mitigation of drought	Sri Lanka	National	322
Legislative measures	Comprehensive DRM legislation	Philippines	National	72
	Flood Alleviation Scheme	India	National	121
	The Emergency Response Law	China	National	301
Planning	Approach to a more comprehensive disaster risk reduction strategy oriented around risk-informed planning and resilient infrastructure	Vietnam	National	23
	Central Disaster Management Council	Japan	National	45
	Community-based disaster risk reduction programme	Bangladesh	Subnational	64
	Desertification Prevention Program	Kazakhstan	National	90
	Dhaka Metropolitan Development Plan	Bangladesh	National	93
	Drought Crisis Management Plan	India	National	102
	IASC Contingency Plan	Indonesia	National	145
	IASC Contingency Plan	Nepal	National	146
	Incheon REMAP, a five-year regional road map	n.a.	Regional	151
	National Climate Risk Management Strategy and Action Plan	Mongolia	National	208
	National Plan for Disaster Management	Bangladesh	National	213
	National Platform for Disaster Risk Reduction	China	National	214
	National Programme for Community Empowerment in Urban Areas	Indonesia	Subnational	215
	Pacific Mangroves Initiative	n.a.	Regional	226
	Pilot Programme for Climate Resilience (PPCR)	various	International	230
	State System on Disaster Prevention and Mitigation	Kazakhstan	National	291
	Strengthening the Disaster Mitigation and Management Systems in Mongolia	Mongolia	National	294
	Urban Resilience Project (URP)	Bangladesh	National	316
	Use of the indigenous knowledge of herders	Russian Federation	Subnational	324
Sectoral interventions	Climate Change Adaptation “top up” performance based grant	Laos (expanding to Cambodia & Tuvalu)	International	49
	Community-based disaster risk reduction programme	Bangladesh	Subnational	64

	Comprehensive Approach to Climate Risk Management	Sri Lanka	National	71
	Crab fattening	Bangladesh	Subnational	84
	Cross-sectoral integrated approach - Integrated Water Resources Management (IWRM)	India, USA	National	86
	Drought Crisis Management Plan	India	National	102
	Embankment cropping	Bangladesh	Subnational	112
	Homestead ecosystem protection	Bangladesh	Subnational	139
	Hydroponics	Bangladesh	Subnational	144
	Increasing Climate Resilience through Drinking Water Rehabilitation project	Tajikistan	National	153
	Infrastructure for flood mitigation	Indonesia	National	160
	Integrating climate change adaptation into Disaster Risk Reduction (DRR) frameworks	Japan	National	166
	Keora nursery	Bangladesh	Subnational	172
	Large-scale mangrove restoration and rehabilitation	Vietnam	National	175
	Mangrove restoration and rehabilitation	Vietnam, Djibouti, and Brazil	Subnational	188
	Pacific Mangroves Initiative	n.a.	Regional	226
	Planting of bamboo in order to mitigate floods and soil erosion	India	National	232
	Saline-tolerant crop cultivation	Bangladesh	Subnational	273
	Short- and long-term prevention measures - Glacial Outburst flood events	Nepal	National	276
	Structural improvements for communities living along riverbeds	Bangladesh	National	295
	Traditional flood mitigation measures	China	National	305
	Use of the Karez technology (traditional irrigation system) for drought mitigation	China	Subnational	325
FINANCIAL RISK TRANSFER				
Bonds/ derivative	Comprehensive Approach to Climate Risk Management	Sri Lanka	National	71
Insurance: Traditional	Agricultural Insurance Pilot	Vietnam	National	10
	National Agricultural Insurance Scheme	India	National	205
	Risk insurance mechanisms - Sea Level Rise	India	Subnational	270
Insurance: Regional	FoodSECuRE: forecast-based risk transfer mechanism	(5) Guatemala, Niger, Sudan, Philippines and Zimbabwe	International	126
Insurance: Micro	Agricultural index insurance	China	National	5
	Agricultural index insurance	India	National	6
	Agricultural index insurance	Thailand	National	7
	CLIMBS micro-insurance product	Philippines	National	54
	Index-based livestock insurance (IBLI)	Mongolia	National	157
	Microfinance	Bangladesh and Nepal	National	191
	Microinsurance service	India	National	193
	Typhoon Weather Index	Philippines	National	311

	Weather index based flood risk insurance	Georgia	National	332
	Weather-Based Crop Insurance Scheme	India	National	334
RISK RETENTION				
Contingency loans	Micro Capital Grants	Turkmenistan	National	190
	Philippines Disaster Risk Management Development Policy Loan	Philippines	National	228
Non-financial risk retention	Community sharing of funeral costs	Philippines	Subnational	62
	Community-managed grain bank	India	Subnational	69
	Institutional Community participation in local government decision-making	Bangladesh	Subnational	162
	School midday meal scheme	India	National	274
Reserve bonds/ contingency funds	Community based revolving fund: Glacial Lake Outburst Floods	Pakistan	Subnational	58
	Community Livelihood Action Facility Network (CLAFNET) fund	Sri Lanka	Subnational	61
	Disaster risk financing strategy	Philippines	National	96
	IASC Contingency Plan	Indonesia	National	145
	IASC Contingency Plan	Nepal	National	146
Savings	Microfinance	Bangladesh and Nepal	National	191
Social protection	Agriculture Extension Special Task Force (AESTF)	China	National	20
	Conditional Cash Transfer scheme	Bangladesh	National	73
	Enhancing Resilience programme	Bangladesh	National	113
	Micro Capital Grants	Turkmenistan	National	190
	Microfinance	Bangladesh and Nepal	National	191
	National Rural Employment Guarantee Scheme	India	National	216
	Pantawid Pamilyang Pilipino Programme - Poverty Reduction and Social Development Strategy	Philippines	National	227
	Programme Keluarga Harapan	Indonesia	National	238
	Universal non-contributory pension	Nepal	National	314
ENABLING ENVIRONMENT				
	Community based revolving fund (Project under design)	Pakistan	Subnational	57
	Community Disaster Resilience Fund (CDRF)	India	Subnational	59
	The Disaster Risk Financing Analytics (DRFA) single donor trust fund	Pakistan, Bangladesh, India, Cambodia, Myanmar, Philippines, Indonesia, Lao, PDR, Fiji, Salvador, Nicaragua and Jamaica	International	300

III. Europe

Approach	Practice	Country/ ies	Level	Index #
----------	----------	--------------	-------	---------

RISK ASSESSMENT				
	CALCHAS – An integrated analysis system for the effective fire conservancy of forests	Greece	Subnational	343
RISK REDUCTION				
Sectoral interventions	Agriculture adaptation measure - Low- and no-till practices	U.S., Mediterranean	National	13
	Implementation of the integrated Master Plan for Coastal Safety in Flanders	Belgium		344
	Multi-Hazard Approach to Early Warning System in Sogn og Fjordane	Norway		345
FINANCIAL RISK TRANSFER				
Insurance:	Flood insurance: U.S. National Flood Insurance Programme and UK's flood insurance	USA, UK	National	123
Traditional	Public-private partnerships for insurance	UK	National	246
	Climate bond financing adaptation actions in Paris	France	National	346
RISK RETENTION				
	Operation of the Portuguese Contingency Heatwaves Plan	Portugal	National	347
TRANSFORMATIONAL APPROACHES				
	Thames Estuary 2100 Plan	UK	National	298

IV. Latin America and the Caribbean

Approach	Practice	Country/ ies	Level	Index #
RISK ASSESSMENT				
Hazard mapping	Comprehensive Approach for Probabilistic Risk Assessment (CAPRA)	n.a.	Regional	70
	Disaster risk financing and insurance strategy policy note	Colombia	National	95
Impact assessment	Catastrophe risk model: The IIASA CATSIM	n.a.	Regional	42
	National Flood Task Force and Damage Needs and Loss Assessment (DaLA)	Seychelles	National	211
Vulnerability assessment	Africa Caribbean Pacific- European Union Natural Disaster Risk Reduction (ACP-EU NDRR)	Belize	National	3
	Comprehensive Approach for Probabilistic Risk Assessment (CAPRA)	n.a.	Regional	70
	Disaster risk financing and insurance strategy policy note	Colombia	National	95
RISK REDUCTION				
Awareness raising, education, training	GFDRR's Code for Resilience	Haiti	National	131
	National Disaster Management Databases	Cuba, Jamaica, Guyana and Trinidad and Tobago	National	210
	National School Infrastructure Plan and Structural Retrofitting Program	Peru	National	217
Early warning systems	GFDRR's Code for Resilience	Haiti	National	131
	Hurricane early warning systems in the Caribbean	n.a.	Regional	143

	SIDS-Caribbean project “Preparedness to Climate Variability and Global Change in small island developing States of the Caribbean Region”	n.a.	Regional	277
Hard infrastructure	Bringing Disaster Risk Management to Scale in the Eastern Caribbean	Dominica, Grenada, Saint Lucia and Saint Vincent and the Grenadines	Regional	28
	Building of zinc roofs	Jamaica	National	31
	Century-old irrigation system (<i>camellones</i>)	Bolivia (Plurinational State of)	National	46
	National School Infrastructure Plan and Structural Retrofitting Program	Peru	National	217
	Redesign of low-cost buildings	Antigua and Barbuda	National	255
	Rímac River Basin (artificially connected lake)	Chile	National	267
Legislative measures	Building Financial Resilience against Natural Hazards	Panama	National	30
	National School Infrastructure Plan and Structural Retrofitting Program	Peru	National	217
	Soil Conservation Act	Barbados	National	286
Planning	Building Financial Resilience against Natural Hazards	Panama	National	30
	Consejo Nacional para el Cambio Climático, a high-level multi-ministry coordinating body	Dominican Republic	National	75
	Federal State Programmes for Climate Change Action (Programas Estatales de Acción ante el Cambio Climático (PEACC))	Mexico	National	119
	National Hurricane Committee	Cayman Islands	National	212
	Plan Maestro Optimizado (investment master plan)	Chile	National	231
	Provinces tackling hazards through low-cost technology and local participation	Honduras	Subnational	242
	Public Investment and Climate Change Adaptation	Peru	National	244
Sectoral interventions	Agriculture adaptation measure – Crop diversification	Mexico, U.S.	National	11
	Agriculture adaptation measure - Crop-specific weather index insurance	Mexico	National	12
	Agriculture adaptation measure - multi-organizational investments in adaptation	Mexico	National	14
	Agriculture adaptation measure – pasture management	Mexico, U.S.	National	16
	Agriculture adaptation measure - planting varieties better suited to future climate conditions	Mexico and El Salvador, U.S., Canada	National	17
	Agriculture adaptation measures - various strategies	Mexico	National	19
	Bringing Disaster Risk Management to Scale in the Eastern Caribbean	Dominica, Grenada, Saint Lucia and Saint Vincent and the Grenadines.	Regional	28
	Consejo Nacional para el Cambio Climático, a high-level multi-ministry coordinating body	Dominican Republic	National	75
	Crop protection	Jamaica	National	85
	Irrigation systems	Chile	National	169
	Mangrove restoration and rehabilitation	Vietnam, Djibouti, and Brazil	Subnational	188
	Provinces tackling hazards through low-cost technology and local participation	Honduras	Subnational	242
	Public Investment and Climate Change Adaptation	Peru	National	244
	Redesign of low-cost buildings	Antigua and Barbuda	National	255

	Reducing leaks from water systems	Mexico	National	257
	Use of <i>Quezunga</i> , a traditional farming method	Honduras	Subnational	321
	Use of <i>waru waru</i> , an ancient irrigation and drainage system	Peru	Subnational	327
FINANCIAL RISK TRANSFER				
Bonds/ derivative	Catastrophe bond	Mexico	National	39
	Catastrophe bonds for natural disasters	n.a.	Regional	40
	Catastrophe Deferred Drawdown Option	Costa Rica	National	41
	Costa Rica Catastrophe Deferred Draw Down Option (CAT DDO)	Costa Rica	National	83
	Issuance of catastrophe bonds by the Caribbean Catastrophe Risk Insurance Facility (CCRIF)	n.a.	Regional	170
	Multi-catastrophe bond "MultiCat Mexico"	Mexico	National	197
Insurance: Traditional	Agricultural insurance			9
	Agroasemex, weather index insurance	Mexico	National	21
	Alliance of Small Island States proposal of a multi-window insurance mechanism	n.a.	Regional	22
	Central American Natural Disaster Insurance Facility	Central America and Dominican Republic	National	44
	Disaster risk financing and insurance strategy policy note	Colombia	National	95
	InsuResilience	Developing countries	International	164
Insurance: Regional	Caribbean Catastrophe Risk Insurance Facility (CCRIF)	n.a.	Regional	35
	FoodSECuRE: forecast-based risk transfer mechanism	(5) Guatemala, Niger, Sudan, Philippines and Zimbabwe	International	126
Insurance: National	Uruguay hydro energy insurance	Uruguay	National	318
Insurance: Micro	Area-yield index-based insurance	Peru	National	24
	Climate Risk Adaptation and Insurance in the Caribbean programme		Regional	53
	El Niño index risk insurance	Peru	National	110
	El Niño-Southern Oscillation (ENSO) insurance scheme	Peru	National	111
	Fundación PROFIN, area-yield index-based insurance	Bolivia (Plurinational State of)	National	129
	Livelihood Protection Policy (LPP)	Jamaica, Saint Lucia, Grenada	Regional	177
	Microinsurance Catastrophe Risk Organisation	Haiti	National	192
	Rio Grande do Sul, area-yield index-based insurance	Brazil	National	269
RISK RETENTION				
Contingency loans	Cat DDO - Deferred Drawdown Option for Catastrophe Risks	Costa Rica, Guatemala, Colombia	Regional	38
	Contingent Loans for Natural Disaster Emergencies	Honduras, Nicaragua, Dominican Republic (inter alia)	Regional	80
	Contingent Loans for Natural Disaster Emergencies	n.a.	Regional	81

	Loan Portfolio Cover (LPC) in the Caribbean	n.a.	Regional	179
Non-financial risk retention	Bolsa Família (family allowance) programme	Brazil	National	27
Reserve bonds/ contingency funds	Catastrophe Deferred Drawdown Option	Costa Rica	National	41
	FONDEN, natural disaster fund	Mexico	National	124
	Fondo para Atender a la Población Afectada por Contingencia Climatológicas (FAPACC), natural disaster fund	Nicaragua	National	125
	Issuance of catastrophe bonds by the Caribbean Catastrophe Risk Insurance Facility (CCRIF)	n.a.	Regional	170
Social protection	Cash and in kind transfers targeted to poor households	Antigua and Barbuda, Belize, Dominica, the Dominican Republic, Fiji, Grenada, Guyana, Jamaica, Kiribati, Mauritius, St Lucia, Trinidad and Tobago, and others.	National	36
	Cash transfers	Belize, Dominica, Grenada, St. Kitts and Nevis, St Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago	National	37
	Chile Solidario and <i>Programa Puente</i>	Chile	National	47
	Familias en Accion, conditional cash-transfer programme	Colombia	National	118
	In-Kind transfers	Jamaica	National	161
	One-off or temporary public works programs	Grenada, St Lucia, and Trinidad and Tobago; One off/ temporary - Samoa and the Solomon Islands	National	220
	Oportunidades, conditional cash-transfer programme	Mexico	National	222
	Programme for Advancement Through Health and Education (PATH)	Jamaica	National	236
	Programme for Advancement Through Health and Education (PATH) Conditional Cash Transfer (CCT)	Jamaica	National	237
	Programa de Asignacion Familiar, conditional cash-transfer programme	Honduras	National	239
	Red de Proteccion Social, conditional cash-transfer programme	Nicaragua	National	253
	Red Solidaria, conditional cash-transfer programme	El Salvador	National	254
	Social Assistance	Jamaica	National	281

ENABLING ENVIRONMENT				
	Contingent Credit Facility for Natural Disaster Emergencies funds (from the Caribbean Catastrophe Risk Insurance Facility (CCRIF))	Dominican Republic, Haiti and Saint Lucia	National	78
	Contingent Credit Facility for Natural Disaster Emergencies of IDB	Dominican Republic	National	79
	Disaster Risk Reduction (DRR) & Climate Change Adaptation (CCA) Technical Support Fund	West Indies	Regional	98
	Global Index Insurance Facility (GIIF)	Argentina, Bangladesh, Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Comoros, Côte d'Ivoire, Dominican Republic, Gabon, Guinea, Haiti, Indonesia, Jamaica, Kenya, Mali, Mozambique, Niger, Nigeria, Papua New Guinea, Philippines, Rwanda, Senegal, Sri Lanka, Tanzania, Togo, Uganda, Uruguay, Zambia.	International	133
	The Disaster Risk Financing Analytics (DRFA) single donor trust fund	Pakistan, Bangladesh, India, Cambodia, Myanmar, Philippines, Indonesia, Lao, PDR, Fiji, Salvador, Nicaragua and Jamaica	International	300

V. North America

Approach	Practice	Country/ ies	Level	Index #
RISK ASSESSMENT				
Impact assessment	Visualization of sea level rise and climate change damage	Canada	Subnational	330
Risk tolerance assessment	Dam safety inspections	Canada	National	89
Vulnerability assessment	Forward pumping - coastal flood control system	USA	National	128
	Regulation and Assessment of future water supply risks	USA	National	261
Impact assessment	Climate change risk assessments under the SECURE Water Act	USA	Subnational	342
RISK REDUCTION				
Hard infrastructure	Green infrastructure	USA	National	135
	Height adjustable dam	USA	National	138
Planning	Municipal planning instruments - incorporating climate change adaptation planning	U.S.	Subnational	201

	Robust decision making (RDM) - Representing uncertainty long-term coastal adaptation	USA	National	271
Sectoral interventions	Adaptation strategies based on detailed knowledge of the vulnerabilities and sensitivities of species and ecosystems		National	2
	Agriculture adaptation measure – Crop diversification	Mexico, U.S.	National	11
	Agriculture adaptation measure - Low- and no-till practices	U.S., Mediterranean	National	13
	Agriculture adaptation measure - New crop varieties, including GMOs	USA	National	15
	Agriculture adaptation measure – pasture management	Mexico, U.S.	National	16
	Agriculture adaptation measure - planting varieties better suited to future climate conditions	Mexico and El Salvador, U.S., Canada	National	17
	Agriculture adaptation measure - Technological improvements	U.S., Canada	National	18
	Cross-sectoral integrated approach - Integrated Water Resources Management (IWRM)	India, USA	National	86
	Ecosystem adaptation measures	USA, Canada	National	109
	Reducing Crop yield losses - Spatial shifts in varietal selection		Regional	256
	Robust decision making (RDM) - Representing uncertainty long-term coastal adaptation	USA	National	271
FINANCIAL RISK TRANSFER				
Insurance: Traditional	Flood insurance: U.S. National Flood Insurance Programme and UK's flood insurance	USA, UK	National	123
TRANSFORMATIONAL APPROACHES				
Legislative measures	Water rights system in the American West	USA	National	331
	Canada's Adaptation Platform	Canada	National	348
ENABLING ENVIRONMENT				
	Desalination – a California perspective	USA	Subnational	348

VI. Pacific

Approach	Practice	Country/ ies	Level	Index #
RISK ASSESSMENT				
Vulnerability assessment	National Climate Change Policy Framework	Marshall Islands	National	207
	Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI)	(15) Cook Islands, Fiji Islands, Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands, Tokelau, Tonga, Tuvalu, Samoa, Timor-Leste, Vanuatu	Regional	224
	Community-Based Climate Vulnerability Assessment	Cook Islands, Fiji, Samoa, Vanuatu	Regional	234

RISK REDUCTION				
Early warning systems	Climate Change Unit	Vanuatu	National	50
	Community-based flood early warning systems	Fiji	Subnational	66
	Multi-hazard warnings	Mauritius	National	198
	Use of the <i>Garamut</i> (traditional drum) to announce warnings	Papua New Guinea	National	323
Hard infrastructure	Mobile flood barriers and mangrove planting	Samoa	National	195
Planning	Coastal and Marine Resources Management in the Coral Triangle of the Pacific project	Fiji, Micronesia (Federated States of), Palau, Papua New Guinea, Solomon Islands, Timor-Leste and Vanuatu	Regional	55
	Incheon REMAP, a five-year regional road map	n.a.	Regional	151
	National Climate Change Policy	Solomon Islands	National	206
	Pacific Islands Climate Change Cooperative	Samoa and Marianas Islands	National	225
	Pacific Mangroves Initiative	n.a.	Regional	226
	Pilot Programme for Climate Resilience (PPCR)	Bangladesh, Bhutan, Bolivia, Cambodia, Caribbean Region, Dominica, Ethiopia, Gambia, Grenada , Haiti, Honduras, Jamaica, Kyrgyz Republic, Madagascar, Malawi, Madagascar, Mozambique, Nepal, Niger, Pacific Region, Papua New Guinea, Philippines, Rwanda, Samoa, St. Vincent & Grenadines, St. Lucia, Tajikistan, Tonga, Uganda, Yemen, Zambia		230
	The Pacific Islands Framework for Action on Climate Change	n.a.	Regional	302
	The Tonga Joint National Action Plan for Climate Change and Disaster Risk Management 2010–2015	Tonga	Regional	303
	Upgrading of policies, tools, institutional capacity and governance	n.a.	Regional	315
Sectoral interventions	Climate Change Adaptation “top up” performance based grant	Laos (to be expanded to Cambodia and Tuvalu)	International	49
	Coral Triangle Initiative	Papua New Guinea and Solomon Islands	National	82
	Mobile flood barriers and mangrove planting	Samoa	National	195
	Pacific Adaptation to Climate Change Project	n.a.	Regional	223
	Pacific Islands Climate Change Cooperative	Samoa and Marianas Islands	National	225
	Pacific Mangroves Initiative	n.a.	Regional	226

FINANCIAL RISK TRANSFER				
Insurance: Traditional	Alliance of Small Island States proposal of a multi-window insurance mechanism	n.a.	Regional	22
	InsuResilience	Developing countries	International	164
Insurance: Regional	Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI)	(15) Cook Islands, Fiji Islands, Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands, Tokelau, Tonga, Tuvalu, Samoa, Timor-Leste, Vanuatu	Regional	224
Insurance: National	Tuvalu survival fund	Tuvalu	National	310
RISK RETENTION				
Non-financial risk retention	Remittances in Samoa			262
	Sovereign fund in Samoa/ Marshall Islands			288
Reserve bonds/ contingency funds	Community lifelines and community risk funds	Niue	Subnational	60
Social protection	Cash and in kind transfers targeted to poor households	Antigua and Barbuda, Belize, Dominica, the Dominican Republic, Fiji, Grenada, Guyana, Jamaica, Kiribati, Mauritius, St Lucia, Trinidad and Tobago, and others.	National	36
	Public works programs	Solomon Islands	National	245
	Social Insurance	Vanuatu	National	282
	Social pensions	Antigua and Barbuda, Barbados, Belize, Fiji, Kiribati, Mauritius, Samoa, St Kitts and Nevis, St Vincent and the Grenadines, and Trinidad and Tobago.	National	283
	Social Protection Policy	Comoros	National	284
TRANSFORMATIONAL APPROACHES				
	Resettlement in Carteret Islands in Papua New Guinea	Papua New Guinea	National	264
ENABLING ENVIRONMENT				
	Global Index Insurance Facility (GIIF)	Argentina, Bangladesh, Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Comoros, Côte d'Ivoire, Dominican Republic, Gabon,	International	133

		Guinea, Haiti, Indonesia, Jamaica, Kenya, Mali, Mozambique, Niger, Nigeria, Papua New Guinea, Philippines, Rwanda, Senegal, Sri Lanka, Tanzania, Togo, Uganda, Uruguay, Zambia.		
	The Disaster Risk Financing Analytics (DRFA) single donor trust fund	Pakistan, Bangladesh, India, Cambodia, Myanmar, Philippines, Indonesia, Lao, PDR, Fiji, Salvador, Nicaragua and Jamaica	International	300

VII. Global

Approach	Practice	Country/ ies	Level	Index #
RISK ASSESSMENT				
Hazard mapping	Global Risk Identification Programme (GRIP)	various	International	134
	Open Climate Data	various	International	221
Vulnerability assessment	Forensic investigations of disasters (FORIN): a conceptual framework and guide to research	various	International	127
	Global Risk Identification Programme (GRIP)	various	International	134
RISK REDUCTION				
Early warning systems	Disaster preparedness on a local community level	various	International	94
	Heat-health early warning systems	various	International	137
Planning	National Adaptation Plans (NAPs)	various	National	203
	National Adaptation Programmes of Action (NAPAs)	various	National	204
Sectoral interventions	Disaster preparedness on a local community level	various	International	94
FINANCIAL RISK TRANSFER				
Bonds/ derivative	Climate Bonds	various	International	48

ANNEX II

Parties and organizations who provided input to the two sets of questionnaires in the context of Action Area 5 of the initial two-year workplan of the Executive Committee:

Parties

1. Antigua and Barbuda
2. Armenia
3. Azerbaijan
4. Bosnia and Herzegovina
5. Bolivia
6. Brazil
7. Burundi
8. Cook Islands
9. Costa Rica
10. Egypt
11. El Salvador
12. Ethiopia
13. Georgia
14. Guyana
15. Indonesia
16. Kuwait
17. Republic of Macedonia
18. Malawi
19. Mali
20. Mauritius
21. Mexico
22. Montenegro
23. Myanmar
24. Republic of Serbia
25. Singapore
26. State of Palestine
27. Suriname
28. Vietnam

Organizations

1. African Risk Capacity
2. CARE International
3. Food and Agriculture Organization of the United Nations
4. International Institute for Applied Systems Analysis
5. International Organization for Migration
6. United Nations Economic and Social Commission for Asia and the Pacific
7. United Nations Office for Disaster Risk Reduction
8. World Health Organization