RISK MANAGEMENT AND FINANCING

Use this resource if you don't know much about risk management and financing in the context of resilience work or if you want a quick refresh in these areas.

Hover your mouse over this box then press CTRL + Click to find out how to use the material presented. Alternatively go the contents page, pick a topic and start your journey from there.

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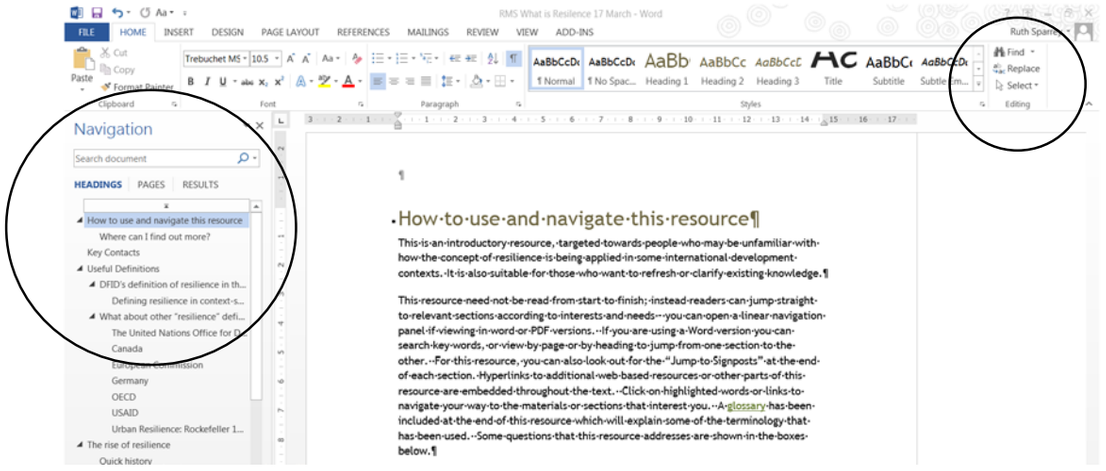
HOW TO USE AND NAVIGATE THIS RESOURCE

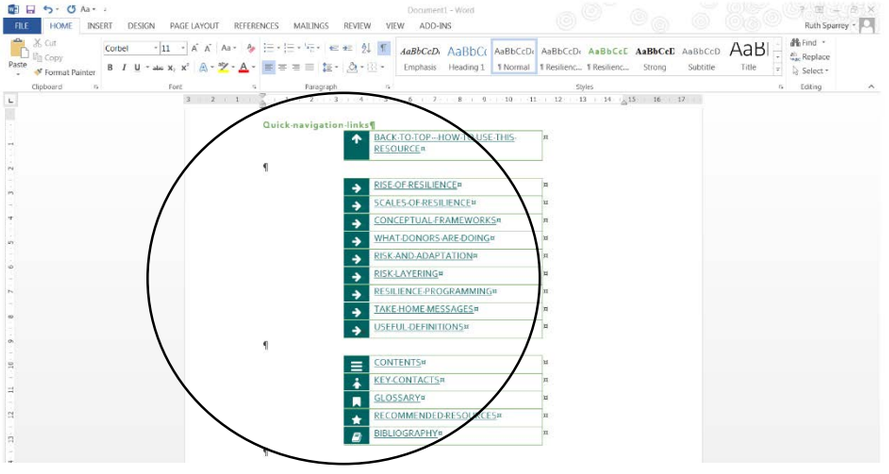
This resource is about assessing and managing risk, including disaster risk finance solutions. It presupposes a basic understanding of the concept of resilience in international development contexts.

This resource need not be read from start to finish; instead readers can jump straight to relevant sections according to interests and needs. Here are some ways that you can do this:

1. You can open a linear navigation panel if viewing in Word. From here you can search key words, view by page, or use the headings to jump from one section to the other. Pull up your navigation panel by clicking "Find" from the Home Tab on your document.



2. You can also look out for the "Quick Jump to" links at the end of each section. Click the hyperlink to where you want to go.



3. Hyperlinks to web based resources or other parts of this resource are embedded throughout the text. Click on highlighted words or links to navigate your way to the materials or sections that interest you.
4. A glossary has been included at the end of this resource which will explain some of the terminology that has been used.
5. Some questions that this resource addresses are shown in the boxes below

To return to where you were before clicking a hyperlink press the ALT Key and the Left Arrow on your keyboard together. This acts like the back arrow on a web page.

What are the components for assessing risk?

What are multi-hazard risk assessments?

How useful are MHRAs and vulnerability assessments?

How effective are Early Warning Systems?

What is risk financing (and risk layering)?

How can we anticipate and adapt to change?

What are the lessons learnt from insurance programmes?

What are the challenges to risk financing?

What is DFID's future direction on risk financing?

Practitioners may be most interested in the following sections:

- DFID's multi-hazard disaster risk assessment
- How useful are multi-hazard risk assessments?
- Tools and data sources to feed into multi-hazard risk assessments
- Adaptive programming
- Flexible programme financing
- Overcoming constraints to risk financing

The resource is split into two main parts: risk assessment and risk financing.

Part A, risk assessment, covers: the rationale for assessing risk; multi-hazard disaster risk assessments (MHDRAs); vulnerability and capacity assessment (VCAs); examples of MHDRAs and VCAs; tools to facilitate risk assessment; early warning systems, including examples; and adaptive programming.

Part B, risk financing, covers: ex-ante financial instruments for disaster response and recovery; examples of parametric insurance on DFID and other programmes; lessons learnt from insurance programmes (particularly index-based insurance); challenges and constraints to risk financing; and UK commitments on risk financing and DFID's future direction.

Acknowledgements
Special thanks to Daniel Clarke and Peter D'Souza for their comments on earlier drafts of this resource.

Where can I find out more?

There are two ways to find further information.

1. Firstly, if you are DFID staff you can contact the DFID Virtual Community of Practice on Resilience, or get in touch with a key contact for specific expertise. We have started a list of key contacts which will be updated periodically. This resource is available to DFID personnel.
2. Secondly, you can follow the links embedded in the text or take a look at some recommended resources and ideas for further reading (see Recommended Resources).

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PART A: RISK ASSESSMENT

Part A covers: the rationale for assessing risk; multi-hazard disaster risk assessments (MHDRAs); vulnerability and capacity assessment (VCAs); examples of MHDRAs and VCAs; tools to facilitate risk assessment; early warning systems; and adaptive programming.

1. INTRODUCTION TO RISK ASSESSMENT

This section looks at definitions of risk management, the rationale for assessing risk and components for assessing risk.

> "Pre-emptive risk reduction avoids unnecessary suffering, protects coping mechanisms and is more cost effective than a post facto humanitarian response, especially in protracted or predictable crises." (EU Resilience Compendium, EC 2015, p.5)

Risk management can be defined succinctly as "the systematic approach and practice of managing uncertainty to minimise potential harm and loss." (UNISDR, 2009)

For DFID, general risk management" incorporates all the activities required to identify and control the exposure to risk", with risk being defined as uncertainty, whether positive or negative, that will affect the outcome of an activity (DFID, 2013 – also see latest 2016 corporate risk management guidance.) Identification and analysis of risk, i.e. risk assessment, is an essential part of risk management.

A distinction can be made between formal risk management and risk-based approaches (e.g. World Economic Forum Global Risks Reports, UN Global Assessment Report on Disaster Risk Reduction), which may take a longer term outlook, or consider more uncertain risks. Resilience can be seen as an adapted approach to risk management, which addresses uncertainty, complexity and unpredictability as well as capacities to respond to risks (*see Section 6 of 'What is Resilience?' resource).*

Why is it important to assess risk in the context of resilience?

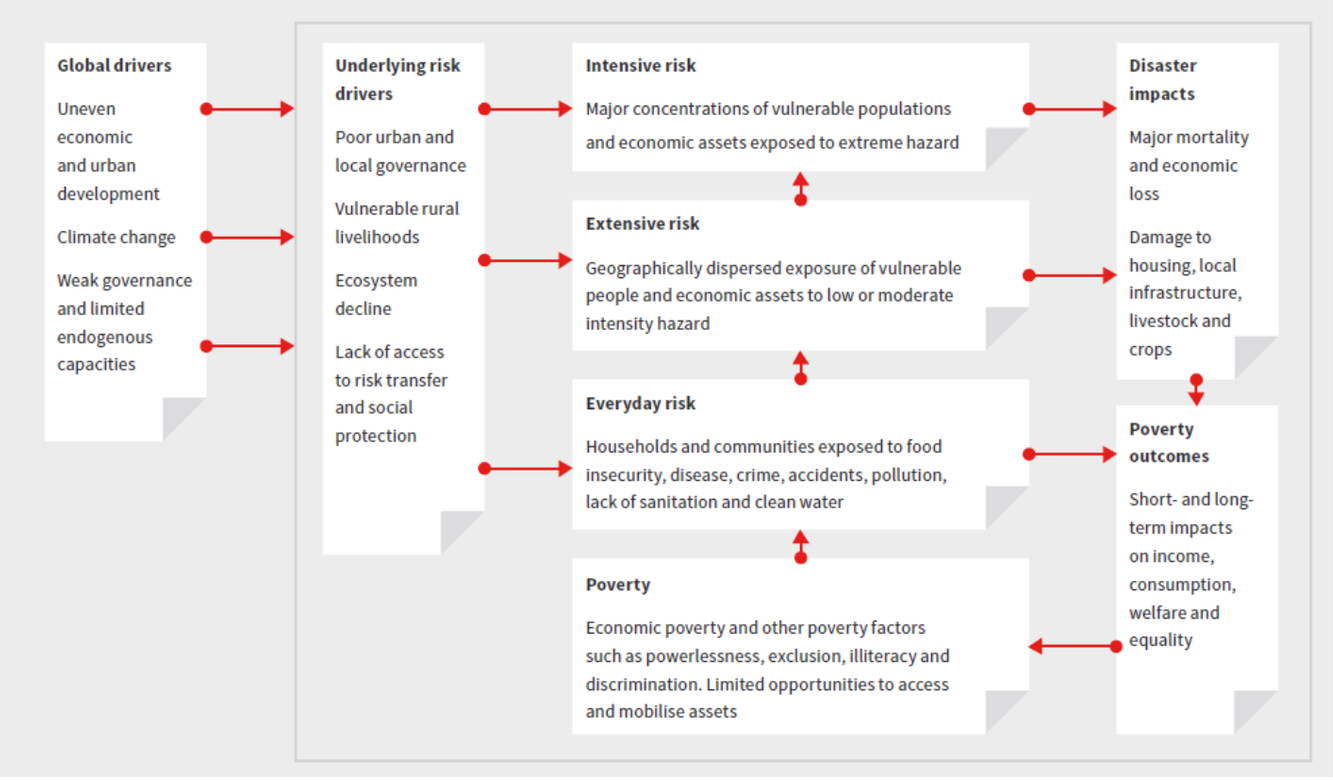
Climate change will amplify existing risks and create new risks for natural and human systems. Demographic change, such as population growth and urbanisation, are likely to increase vulnerability to natural disasters. Risks will be unevenly distributed and greater for disadvantaged people. (IPCC, 2014)

Poor people are more exposed to a wide variety of risks than the non-poor, and are less able to deal with risks due to limited assets. Poor people often refrain from investing in high-risk but high-return activities. Risks and shocks can drive and maintain poverty. (ODI, 2007)

*(For more specific information on identifying and assessing the risk of both disasters and slow onset climate change to **infrastructure**, see 'Risk Assessment for Infrastructure' resource. This provides good examples of risk informed infrastructure delivery as well as the impacts of failing to consider climate/disaster risks in infrastructure planning. It also covers multi-sectoral approaches, appreciating the interdependencies between infrastructure assets and systems, and livelihoods.)*

The diagram below shows how risk drivers lead to exposure to disaster impacts and poverty.

FIGURE 1: THE DISASTER-RISK-POVERTY NEXUS



(Source: UNISDR, 2009)

Holistic risk management is acknowledged by the international community as being integral to poverty reduction and resilience (EC, 2015); 2014 World Development Report. Detailed and actionable risk assessment can facilitate targeted interventions and guide allocation of resources. The World Bank sees disaster risk assessment as integral to identifying, reducing, and preparing for risks. It also enables financial protection and resilient reconstruction (GFDRR/World Bank, 2014a).

What are the components for assessing risk?

According to the GFDRR/World Bank (2014a), the following components need to be considered when assessing risk:

Hazard: The likelihood, probability, or chance of a potentially destructive phenomenon.

Exposure: The location, attributes and values of assets that are important to communities.

Vulnerability: The likelihood that assets will be damaged or destroyed when exposed to a hazard event.

Impact: An evaluation of what might happen to people and assets from a single event.

FIGURE 2: THE COMPONENTS FOR ASSESSING RISK

(Source: GFDRR, 2014a)

Similarly to the World Bank/GFDRR, DFID's understanding of disaster risk encompasses hazard exposure, vulnerability and coping capacity:

$$Risk = \frac{Hazard\ exposure \times vulnerability}{Coping\ capacity}$$

(See explanation of DFID approach to multi-hazard disaster risk assessment for further details.)

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2. MULTI-HAZARD RISK ASSESSMENTS; VULNERABILITY AND CAPACITY ASSESSMENTS

This section provides an explanation of multi-hazard risk assessments (MHRAs) and vulnerability and capacity assessments (VCAs) and compares three examples. We then discuss the usefulness of MHRAs and VCAs. This is followed by links to reviews of risk and vulnerability assessments and useful resources on disaster risk reduction.

WHAT ARE MULTI-HAZARD RISK ASSESSMENTS?

One criticism of traditional risk analysis is that it can focus on quantifiable elements, e.g. physical or financial assets or quantitative data on hazards rather than broader human vulnerabilities and capacities, which may be captured through more participatory risk analysis (Twigg, 2015). *(Also see 'Risk Assessment for Infrastructure' section for a discussion of how the resilience concept has affected the process of risk assessment in planning infrastructure.)*

Multi-hazard risk assessments offer potential to consider multi-spatial and multi-temporal risks and dynamic hazards, vulnerabilities and capacities. They represent a shift away from quantitative risk assessment of a hazard to addressing complex interactions between hazards, vulnerability and capacity. (UN University, 2011)

"Multi-hazard risk management approaches provide opportunities to reduce complex and compound hazards. Considering multiple types of hazards reduces the likelihood that risk reduction efforts targeting one type of hazard will increase exposure and vulnerability to other hazards, in the present and future." (IPCC, 2012, p.17)

What are vulnerability and capacity assessments?

Vulnerability and Capacity Analysis or Assessment (VCA) originated in the 1980s and is often used by NGOs. VCA identifies vulnerable groups and their needs and capacities. VCA views vulnerability in the broadest sense, including environmental, economic, social, cultural, institutional and political pressures. VCAs can be used for problem identification or can feed into risk assessment but they sometimes overlook the 'capacity' dimension. Many 'vulnerability' assessments include wider risk analysis, while many 'risk' assessments also look at vulnerability. Thus, in practice, there is much overlap between multi-hazard risk assessments and VCAs.

Examples of VCAs: ActionAid Participatory Vulnerability Analysis, Christian Aid Participatory Vulnerability and Capacity Assessment, Oxfam Vulnerability and Risk Assessment, UNDP Community Based Resilience Analysis.

(Adapted from Twigg, 2015)

Examples of multi-hazard risk assessments

This section will look at the following examples of multi-hazard risk assessments:

- Example 1: DFID's Multi-Hazard Disaster Risk Assessment
- Example 2: OECD Resilience Systems Analysis
- Example 3: Oxfam Vulnerability and Risk Assessment

Example 1: DFID's Multi-Hazard Disaster Risk Assessment (MHDRA)

DFID has advocated the use of MHDRA to enable country offices to embed resilience within their programmes (see DFID guidance). MHDRA has been undertaken in Ethiopia, Kenya, Malawi, Bangladesh, Mozambique, Somalia, Nigeria and Uganda.

DFID's multi-hazard disaster risk assessment involves considering hazard exposure; vulnerability analysis; and coping capacity in turn:

$$Risk = \frac{Hazard\ exposure\ x\ vulnerability}{Coping\ capacity}$$

1. *Hazard exposure* - magnitude and likelihood of hazards (geophysical, climatological, hydrological or biological) – what/when/where natural hazards can be expected and scale
2. *Vulnerability analysis* – which people and assets are most exposed, why are they vulnerable, susceptibility to hazards
3. *Coping capacity* - national, provincial and local capacity to prevent, mitigate, prepare or respond to risk, through policy, planning and investment, broken down by stakeholder group, may involve political economy analysis of decision making

Additionally, the MHDRA estimates *overall impact assessment* through analysis of previous events and existing modelling (UN, World Bank, insurance industry), leading to a risk matrix and priorities for action.

Information to complete the MHDRA can be drawn from a country office's Operational Plan, Strategic Programme Reviews, existing humanitarian and development programme data, open data and risk modelling tools (see below), partner governments, UN agencies, World Bank and Global Facility for Disaster Reduction and Recovery, the private sector, NGOs and other donors.

N.B. DFID also has an overarching, formal framework for all risk management activity at programme, portfolio and corporate levels (DFID, 2016 – internal) – this is not the same as country-specific multi-hazard disaster risk assessment.

TABLE 1: SUMMARY OF MULTI-HAZARD DISASTER RISK ASSESSMENT (DFID)

Topic	Detail	Methodology	Data Sources
Hazard	• What shocks or stresses? • Where might it happen? • Scale and trends? • Impacts and potential fatalities	• Secondary data analysis • Interviews with key stakeholders • Historical data, e.g. evaluations. • Early Warning Systems	• IPCC, FEWSNET • Maplecroft and others
Vulnerability	• Who are most vulnerable? • Where are the most vulnerable? • Why are they vulnerable? • What makes them vulnerable? • What assets are vulnerable?	• Poverty assessments • Humanitarian evaluations • PDNAs • Household surveys • Historical data	• Government, UNOCHA, UNISDR, UNDP. NGOs Red Cross/Red Crescent
Capacity of government and other stakeholders?	• Who are the stakeholders? • What are the government structures, policies and capacities? • Where is the leadership? • What are others stakeholders' roles and actions? • Political economy of decision making	• External analysis • CAS's, PRSPs and country strategies • Household surveys • Research reports	• Government departments + partner agencies • UN • NGOs
Overall assessment of impact	• Economic, social, environmental, political impacts and potential fatalities • Review of potential scenarios • Priorities for action	• Risk matrix	
What is DFID doing and what should it do on resilience	• Knowledge and experience • Skills and capacity • Whether mainstreamed or programmatic • Level of ambition what DFID should do with national government and partners	• Operational plans, BAR bids, Business Cases. • Capacity and skills analysis	• C-O advisers and programme managers • Partners • Vertical programmes

(Source: DFID, 2012)

Full DFID MHDRAs are owned and stored by country offices – there are good examples from Kenya, Uganda, Somalia and the Occupied Palestinian Territories.

Below is an example from DFID Uganda, which summarises aspects considered in the process of completing their MHDRA.

TABLE 2: EXAMPLE FROM DFID UGANDA MHDRA

TOPIC	ASPECTS CONSIDERED	DATA SOURCES
Hazard	» Drought » Floods » Landslides » Storms » Epidemics » Earthquakes » Wildfires » Conflict and security	» Maplecroft » Oxfam analysis on hazards » Government of Uganda data » International Disaster Database (EM-DAT) » UN OCHA » IFRC » Academic literature » Advisory Consortium on Conflict Sensitivity » Africa Climate Change Resilience Alliance » World Bank
Vulnerability	» Natural Hazards » Poverty » Agricultural dependence » Food insecurity » Population growth & water stress » Vulnerable groups » Deforestation » Conflict » Disputes over land tenure, low govt capacity » Refugees » International terrorism » Political violence	
Capacity of government and other stakeholders	» Government structures and policy for disaster preparedness and management, climate change adaptation » NGOs involved in DRR and CCA and coordination » Regional initiatives	
Overall assessment of impact	» Impacts of disasters from 1980-2010 » Current high risks - severe storms, wildfire, conflict, and extreme climate change vulnerability » Future risks of water stress and drought arising from climate change and projections	

Example 2: OECD's Resilience Systems Analysis

The OECD's resilience systems analysis (RSA) can also be seen as a multi-hazard approach. It considers different types of risks, shocks (covariate, idiosyncratic, seasonal, recurring) and stresses i.e. the risk landscape, within the context of a system. The key concepts underpinning resilience systems analysis are shown in the diagram.

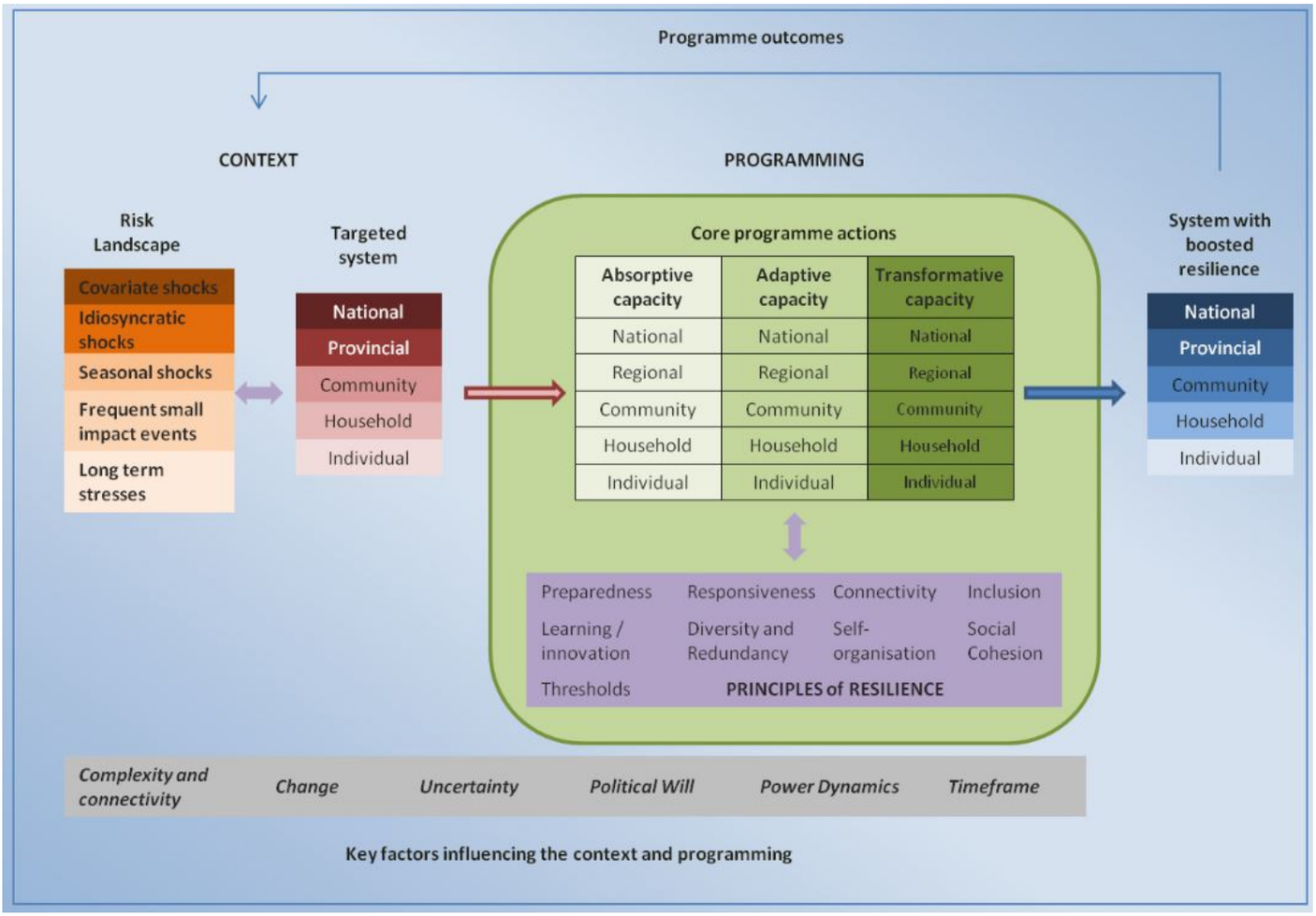


FIGURE 3: FRAMEWORK FOR RESILIENCE SYSTEMS ANALYSIS

(Source: OECD, 2014)

RSA is a participatory and multi-stakeholder four-step process, spanning several months. This includes two months at the start to identify the scope (resilience of what system, of who, to what risk and over what timeframe?) of the analysis and to ensure that the right stakeholders are involved. The next step is production of a briefing pack that synthesises information, e.g. risk profiles, risk heat maps and livelihoods assets, for workshop participants. This is followed by a 2-day structured workshop involving around 40 key decision-makers and experts in risk or systems. The resulting roadmap identifies priority actions for policy and programming.

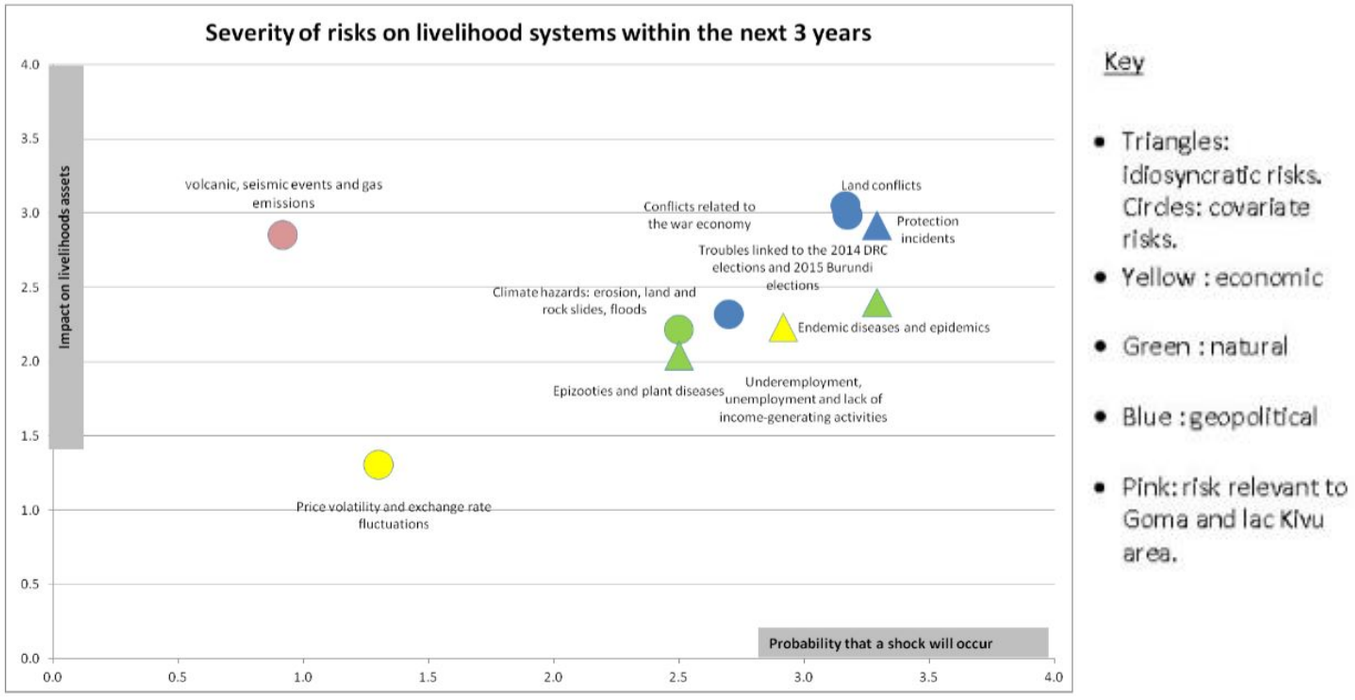
FIGURE 4: THE FOUR STEPS OF RESILIENCE SYSTEMS ANALYSIS

(Adapted from OECD, 2014)

Application of Resilience Systems Analysis

The RSA methodology is fairly new but has been applied to the Democratic Republic of Congo, a complex emergency environment. In April 2014, UNICEF hosted a workshop with the support of OECD. Using a sustainable livelihoods approach, the participants reflected on current and near-term risks affecting eastern DRC, causes and effects of risks, vulnerability of different groups and links to stresses. They also considered current and future interventions to produce a roadmap (OECD/UNICEF, 2014, pp. 26-28) to boost resilience of households and communities over the next three years. Contrary to the organiser's early assumptions, priority actions included ways to transform aspects of the system, alongside interventions to improve absorptive and adaptive capacity. The diagram below shows the risk heatmap produced under the process.

FIGURE 5: EXAMPLE OF A RISK HEATMAP

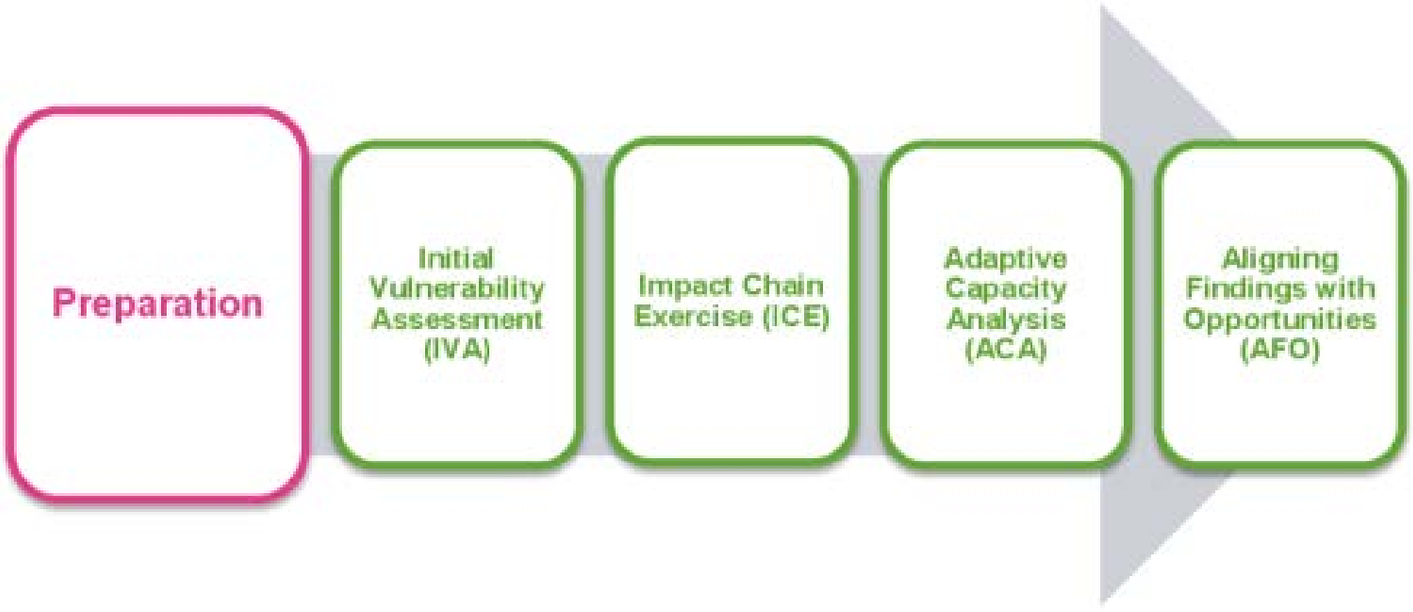


(Source: OECD/ UNICEF, 2014)

Example 3: Oxfam's Vulnerability and Risk Assessment (VRA) methodology

The VRA methodology aims to foster multi-stakeholder understanding (through convening a 'knowledge group') about the hazards affecting people in a social- ecological landscape, and subsequently to jointly design risk reduction measures. It builds on tools such as community-based participatory rural appraisals (but takes a bigger picture approach) and systematically includes women. The VRA has been implemented by 12 Oxfam country teams – see case study in Botswana for an example of its application. The steps are set out in the diagram below.

FIGURE 6: OXFAM'S VULNERABILITY AND RISK ASSESSMENT METHODOLOGY



(Source: Oxfam, 2016) [1]

[1] The figure, a diagram of Oxfam's Vulnerability and Risk Assessment Methodology, is reproduced with the permission of Oxfam GB, Oxfam House, John Smith Drive, Cowley, Oxford, OX4 2IY, UK, www.oxfam.org.uk. Oxfam GB does not necessarily endorse any text or activities that accompany the materials.

Oxfam case study – Botswana

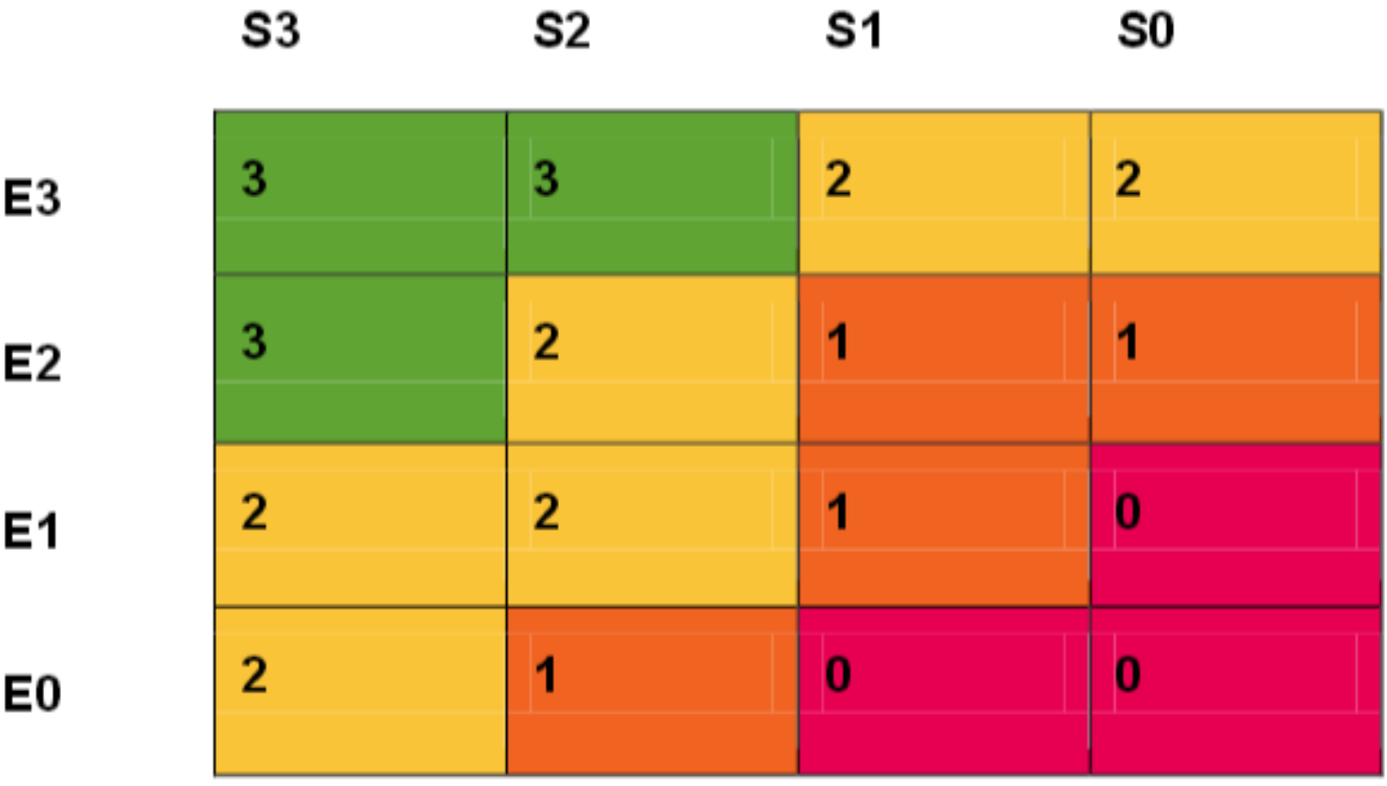
Case Study 2: Assessing exposure and sensitivity in Botswana

A VRA conducted in Bobirwa Sub-District, Botswana in November 2015 focused on analysing the exposure and sensitivity of hazards and issues related to **high temperatures**. Through their discussions, the Knowledge Group decided that for **'arable farmers'** (thus described to refer to food-growing smallholder farmers, as opposed to smallholder farmers focusing on small stock and livestock rearing), the highest significance exposure was expected (E0). This value for exposure was agreed based on the fact that crops have frequently been dying in the heat, the health of farmers themselves is also affected (e.g. high blood pressure in the extreme heat), and crops are more likely to succumb to outbreaks of disease when the farmers cannot tend to them because of the impact of extreme temperatures. Sensitivity was assessed as high (S1). This is because although temperatures have been high for the past 15 years, the Knowledge Group members now consider the temperatures to be extreme, especially as they combine with the effects of low and inconsistent rainfall.

For the category of **'livestock farmers with respect to high temperatures'**, high-level exposure (E1) was agreed, albeit not as high as for 'arable farmers'. This is because high temperatures are directly and indirectly contributing to boreholes drying up (more evapotranspiration, more water demand) and thus temperatures are a contributing factor preventing livestock farmers from taking appropriate care of their cattle. A high sensitivity scale was selected (S1) for this combination of hazard and social group, as the Knowledge Group agreed that access to water had become more difficult over the past 15 years, because the mouths of rivers where locals would dig for water nearby were drying up and the cost of pumping water from boreholes had increased.

Lastly, for **'commercial farmers with respect to the combined issues of drought, lower rainfall and ponds drying up'** both exposure and sensitivity values were considered to be low (E2, S2) because, commercial farmers commonly have technology and infrastructure to absorb these impacts (e.g. irrigation systems, larger water reservoirs), and in the last 15 years the negative impact has been quite moderate.

(Source: Oxfam, 2016)



(E – exposure, S – sensitivity, 0-highest level of vulnerability, 3- lowest level of vulnerability)

Initial Vulnerability Assessment matrix in the Bobirwa Sub-district, Botswana (November 2015). The higher level of vulnerability is assigned the colour red (0), followed by orange (1) and yellow (2), down to the lowest level of vulnerability, green (3).

Social group/LH activity	Drought, lower rainfall, ponds drying up	Foot and mouth disease (FMD) outbreaks	Limited knowledge about climate change	High temperatures	Poorly resourced agricultural extension services	Limited access & uptake of meteorological data	Limited access & uptake of new agricultural practices and farming technologies	Difficult access to markets	Lack of alternatives to agricultural based livelihoods
Small scale subsistence farmers (arable)	0	2	1	0	2	3	2	3	0
Small scale livestock keeper	0	0	0	1	1	3	1	1	0
Woman traders	2	2	1	1	2	1	1	0	3
Phane harvesters	0	1	1	0	N/A	1	1	0	3
Women handicrafts	2	0	2	0	N/A	1	1	0	3
Social welfare dependents	1	N/A	2	2	2	1	3	2	1
Out of school youth (18–35 years old)	0	3	2	2	2	1	2	2	0
Commercial farmers (livestock and horticulture)	2	0	2	1	2	3	2	2	2

(Source: Oxfam, 2016)

The table below compares the three methodologies.

TABLE 3: COMPARISON OF RISK ASSESSMENT METHODOLOGIES

	DFID MULTI-HAZARD RISK ASSESSMENT	OECD RESILIENCE SYSTEMS ANALYSIS	OXFAM VRA METHODOLOGY
Overview	Considers hazard exposure, vulnerability, coping capacity and overall impact assessment, using different sources of information, leading to development of risk matrix and priority actions.	Looks at the risk landscape within the context of a system (e.g. national, community, household). Risk analysis is conducted prior to, and during a workshop with decision makers & experts, once scope is agreed. Workshop leads to a roadmap.	Aims to combine biophysical and socio-cultural knowledge on hazards, trends and impact analysis with a focus on specific social groups or livelihoods (rather than location) to design risk reduction measures.
Strengths	Not prescriptive about which information should feed into the MHRA. Avoids lengthy negotiations.	Participatory, gives detailed guidance on how to build briefing pack and run workshop. Focus on system not risk - enables analysis of risk against people's capacities/capital (integrates SLA).	Participatory, locally-driven, adaptable, integrates different types of knowledge (not just science), gender sensitive. Understanding of how different vulnerabilities interact.
Weaknesses	May rely too heavily on secondary data sources at expense of primary/participatory data collection.	Lengthy and set process could be restrictive. Quality/outcomes depend on composition of workshop participants. Requires expertise in risk analysis and workshop facilitation.	Requires experienced facilitation, outcomes depend on who is in the 'knowledge group'. Lack of quantification.
Application so far	Used by country offices to produce disaster resilience plans	Limited – applied to DRC in 2014	Implemented by 12 Oxfam country teams, IRC and 2 universities since 2013

How useful are multi-hazard risk assessments and VCAs?

Multi-hazard risk assessments (MHRAs) and vulnerability and capacity assessments (VCAs) attempt to build on traditional risk management by addressing complexity and inter-linkages of different risks, and considering capacities and vulnerabilities of people. They attempt to account for unpredictability and change at different levels e.g. long term trends and stressors, large scale (covariate) and small scale (idiosyncratic) shocks. They incorporate different sources of information and can consider both historical vulnerability and future risk.

However, this is far from simple in practice. Assessing the risks of hazards necessarily involves a degree of uncertainty (Twigg, 2015). Multi-hazard risk assessment in the context of resilience can be seen as a 'wicked problem' – ill-defined, complex, no easy solutions, non-linear, requires systems thinking, unpredictable, and involves different scales and dimensions. (See this ODI article on navigating wicked problems in development for more details.)

The drawback of VCAs is that many are more descriptive than analytical, especially where the evidence is mainly qualitative: this makes it difficult to set priorities for intervention (Twigg, 2015).

Additionally, a truly comprehensive multi-hazard risk assessment is likely to involve significant financial and time resources, especially if it involves participatory, qualitative and quantitative inputs (OECD Resilience Systems Analysis takes several months to complete). Vulnerability analysis tends to focus on individual and household level; but it is not clear if or how this links to resilience of communities, geographical areas and/or countries (see 'Measuring Resilience' resource).

Reviews of Risk, vulnerability and capacity assessments

Review of four risk/capacity assessment techniques: http://www.elrha.org/wp-content/uploads/2015/03/Annex-3-Recommendations-Disaster-Risk-Assessment-Approaches.pdf

IUCN review of vulnerability assessments:

https://portals.iucn.org/library/efiles/documents/2011-068.pdf

Vulnerability assessment methodologies literature review:
http://www.fhi360.org/sites/default/files/media/documents/Vulnerability%20Assessment%20Literature%20Review.pdf

Review of WB risk and vulnerability analysis 2000-2007:
http://siteresources.worldbank.org/SOCIALPROTECTION/Resources/SP-Discussion-papers/Social-Risk-Management-DP/0812.pdf

Useful resources on disaster risk reduction

Humanitarian Practice Network/ODI – Disaster Risk Reduction: 2015 Good Practice Review. See Key Resources section.

For managing risk and promoting resilience in urban settings, see Chapter 13 Managing Urban Risk. (Also see Urban Africa Risk Knowledge).

International DRR networks, documentation centres and information-sharing platforms

Asian Disaster Preparedness Center

DRR and Building Resilience Community

Emergency Capacity Building Project

Gender and Disaster Network

Humanitarian Practice Network

Natural Hazards Center

PreventionWeb

ReliefWeb

Risk Reduction Africa

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3. TOOLS AND DATA SOURCES TO FEED INTO MULTI-HAZARD RISK ASSESSMENT

This section provides useful tools and data sources to assist practitioners when conducting MHRA and improve decisions about how to reduce risk:

- Which tools are most useful
- Risk information and modelling platforms, including open data
- Assessment reports
- Climate and disaster risk screening tools

(N.B. This is not an exhaustive list – context-specific resources will also be needed.)

Risk modelling tools and meteorological data can assist practitioners with addressing complexity, uncertainty and unpredictability when undertaking multi-hazard risk assessments. There is a current gap between scientific information on climate change/risk modelling and decision-making.

Which tools are most useful?

GFDRR and World Bank have reviewed open source hazard and risk modelling software to provide initial guidance on the appropriateness of the various tools to quantify risk (Daniell et al., 2014), including CAPRA and INASAFE. This is a technical review, aimed at technical audiences.

Also see Climate risk screening tools and their application: A guide to the guidance, a more accessible UNEP online presentation on climate risk screening and assessment.

Data sets and tools based on them can only be as good as the data entered – problems remain around standardisation of methodologies and quality of data collection.

Deterministic and probabilistic risk models

Risk models are either 'deterministic' or 'probabilistic'.

"**Deterministic risk models** are used to assess the impact of specific events on exposure. Typical scenarios for a deterministic analysis include renditions of past historical events, worst-case scenarios, or possible events at different return periods." (GFDRR/World Bank, 2014b, p. 46)

"**A probabilistic risk model** contains a compilation of all possible "impact scenarios" for a specific hazard and geographical area. This requires a variety of hazard-dependent data." GFDRR/World Bank, 2014, p.48). The UN's Global Assessment Report now uses a probabilistic approach to risk.)

Many tools are poorly suited to government officials trying to manage disaster risk. Tools that have been developed jointly e.g. by governments and World Bank tend to be more user friendly – e.g. INASAFE (GFDRR/World Bank, 2014). The World Bank recommends training in the use of risk modelling software.

The World Bank's screening tools were only rolled out in 2015 – it is therefore too early to judge how effective/useful they are. As a minimum, users need to understand the project components and location, have subject matter expertise (although climate and disaster information is provided through the World Bank's Climate Change Knowledge Portal). Time requirements will vary depending on the user's knowledge. On average, the tool is estimated to take two hours, but consultations may also be required.

Risk information and modelling platforms

A key challenge is to convert raw data into meaningful and actionable information (GFDRR, 2014b). These platforms can assist in decisions to manage risk as well as **quantifying potential impacts** of decisions. Some examples of platforms are provided below (all are free/open source except Maplecroft):

Index for Risk Management (INFORM) is a way to understand and measure the risk of a ***humanitarian crisis***. INFORM is a composite indicator, combining 53 indicators into three dimensions of risk: hazards (events that could occur) and exposure to them, vulnerability (the susceptibility of communities to those hazards) and the lack of coping capacity (lack of resources that can alleviate the impact). The index results are published once every year. INFORM is a joint initiative of the European Commission and the Inter-Agency Standing Committee Task Team(IASC)for Preparedness and Resilience (plus partnership with DFID, World Bank, UN OCHA and other UN agencies).

Maplecroft - enables the assessment of risk and trends at multiple levels and has interactive GIS mapping. Uses 200+ risk indices to evaluate key ***political, economic, societal and environmental risks*** for countries and subnational levels. It draws on global risk analytics, situational data feeds, country risk reports and interactive risk calculators.

Global Risk Data Platform – a multi-agency initiative managed by UNEP/UNISDR to share spatial data information on global risk from ***natural hazards***. Users can visualise, download or extract data on past hazardous events, human hazard exposure and risk from natural hazards.

Central America Probabilistic Risk Assessment (CAPRA) – combines information on hazards with exposure and physical vulnerability data and applies probabilistic techniques to hazard and loss assessment allowing the user to determine ***risk from multiple hazards***. Several Latin American countries are preparing major public investment plans based on risk assessments conducted through the CAPRA.

INASAFE - produces ***natural hazard impact scenarios*** for better planning, preparedness and response. The software allows users to combine data from many sources and explore the impacts a single hazard would have on specific sectors e.g. how many schools might be damaged by a flood. Developed by World Bank/GFDRR and Government of Indonesia.

RiskInfo – Sri Lanka's Disaster Risk Information Platform which aims to make disaster risk information available to all stakeholders in order to facilitate risk reduction and recovery. Enables collaborative use of geospatial data and maps.

Desinventar – disaster information management system, sponsored by UNISDR.

FIGURE 7: EXAMPLES OF RISK INFORMATION PLATFORMS

(Source: World Bank, 2013a)

Early warning systems (see section below) systematically collect and analyse data to ensure their risk knowledge is up to date – they therefore incorporate risk assessment.

Open data

The World Bank's Understanding Risk Community of Practice encourages open data and information sharing between donors, scientists and development practitioners. Complementary initiatives include the Open Data for Resilience Initiative (OpenDRI) established by the Global Facility for Disaster Reduction and Recovery (GFDRR) in 2011. OpenDRI uses an open source data sharing platform (GeoNode) – this has been used by communities in Haiti, Indonesia, Nepal and Sri Lanka, enabling them to quantify risk from natural hazards. Other online platforms include the Climate Change Knowledge Portal (CCKP) that collates open sources of information about climate change.

The International Disaster Database, EM-DAT, is managed by the Centre for Research on the Epidemiology of Disasters (CRED). EM-DAT contains data on the occurrence and effects of over 18,000 global disasters from 1900 to present. The database is compiled from various sources, including UN agencies, NGOs, insurance companies, research institutes and press agencies.

[Big Data, if used intelligently, may also be able to contribute to risk assessment in future e.g. using crowd-sourced mapping or satellite imagery to assess exposure or vulnerability to hazards - see this DFID-funded 2015 report for challenges and opportunities for leveraging Big Data. (DFID/NERC/ODI/ERSC/Data Pop Alliance, 2015).]

Assessment reports

The UN Global Assessment Report (GAR) on Disaster Risk Reduction 2015 is developed every 2 years on the basis of original research contributed to UNISDR by scientific institutions, think tanks, UN agencies, governments, NGOs and businesses. The website also has country profiles and a risk data platform.

World Economic Forum Global Risks Report – the WEF's *annual reports contain expert opinion on the perceived impact and likelihood of prevalent global risks over a 10-year timeframe. The risks are divided into five categories: economic, environmental, geopolitical, societal and technological.* 2016 report.

Inter-governmental Panel on Climate Change -the *IPCC's* fifth assessment report *(AR5) provides the latest view on the current state of scientific knowledge relevant to climate change.*

Global Facility for Disaster Reduction and Recovery (GFDRR) - managed by the World Bank and funded by 21 donors. It assists high-risk, low-income developing counties in understanding and reducing vulnerabilities to natural hazards, and adapting to climate change.

Key read: GFDRR. 2014. *Understanding Risk in an Evolving World: Emerging Best Practices in Natural Disaster Risk Assessment*, Washington, DC: World Bank. Full report with case studies, policy note.

This report provides a general introduction to risk assessment, concepts and evolution of practice – charts progress, achievements and remaining challenges. With a focus on natural disasters, it contains more than 20 case studies from 40 countries, highlighting emerging best practice (around risk data, modelling developments, risk assessment, collaboration and future of risk). Note that this paper is primarily about a technical/quantitative approach to risk.

UN University and Bündnis Entwicklung Hilft - World Risk Report and Index - every year, the World Risk Report focuses on an area of special interest e.g. food security, cities, health, environmental degradation, governance. The World Risk Index looks at the risk of natural disaster for 171 countries.

International Finance Corporation - as part of engaging the private sector, the IFC has published a series of reports that assess private sector risk from climate change (IFC 2013; www.ifc.org/climaterisks).

Adelphi report and knowledge platform on climate change, fragility and conflict - commissioned by the G7, looks at climate-fragility risks, and how to increase resilience to them.

Climate and Disaster Risk Screening Tools

The World Bank has developed climate and disaster risk screening tools to help government and development practitioners to identify risks to national or sectoral investments. These tools are still in the early stages of use and therefore their effectiveness

is unknown. The sector-level tools cover agriculture, coastal flood protection, energy, health, roads and water. There is also a general tool. Demos and sample outputs.

The National Climate Impact Screening tool identifies climate vulnerabilities, using data from the Climate Change Knowledge Portal (CCKP).

The Hands-on Energy Adaptation Toolkit (HEAT) is an example of a sector-level tool to assess climate risks to the energy sector and to suggest measures to reduce risk and vulnerability.

There are also infrastructure screening tools, e.g. the methodology developed by the Climate Resilient Infrastructure Development Facility. *(For more information on infrastructure screening tools, see 'Risk Assessment for Infrastructure'.)*

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4. EARLY WARNING SYSTEMS

This section defines early warning systems (EWS), provides examples of different types of EWS (food security and meteorological) at different scales, and considers the effectiveness of EWS.

What are Early Warning Systems?

UNISDR definition: "The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organisations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss."(UNISDR, 2007)

Formal famine early warning systems were first developed in response to droughts and famines in Africa in the 1970s and 1980s.

Early warning systems are not the same as risk assessment or management, but they incorporate risk analysis and provide a way of managing and monitoring risk.

Early warning systems can operate typically entail four elements: i) risk knowledge; ii) monitoring, analysis, forecasting and warning service; iii) response capability and iv) dissemination / communication of warnings. (IFRC, 2012; UNISDR, 2006).

What do Early Warning Systems look like?

Early warning systems (EWS) exist at international, regional, national, and community levels and primarily address risk relating to food security and natural hazards. EWS also exist for conflict e.g. Africa Union's Continental Early Warning System (CEWS).

While single-hazard EWS are common, IFRC (2014) advocates a multi-hazard approach. An example of a city-level multi-hazard EWS is Shanghai (see Annex to this report on EWS). An example of a global multi-hazard early warning system is the Global Disaster Alert and Coordination System (GDACS).

For diverse examples of EWS, see this Evidence on Demand study: Science for Humanitarian Emergencies and Resilience (SHEAR) scoping study: Annex 3 - Early warning system and risk assessment case studies. It provides case studies of EWS for three main hazard types: drought, flood and cyclones and at both national and community level. The case studies are taken from ten countries across three continents (focusing on Africa, South Asia and the Caribbean). The case studies highlight a number of challenges facing EWS: financing; integration; responsibilities; community interpretation; politics; dissemination; accuracy; capacity and focus.

The table presents some examples of EWS, which are explained in further detail below:

TABLE 4: EXAMPLES OF EARLY WARNING SYSTEMS

Scale	Food security	Meteorological/natural hazards
International	FEWS NET	Global Tropical Cyclone System
Regional		Regional Integrated Multi-Hazard Early Warning System (RIMES)
National	FSNAU	Bangladesh Flood and Forecasting Warning Centre/Kenya Drought EWS
Community		Nepal floods EWS

Food security

International

*Famine Early Warning Systems Network (*FEWS NET) provides evidence-based analysis on acute food insecurity and alerts on emerging crises to help with planning and responding to humanitarian crises. It has a knowledge base covering 35 of the world's most food insecure countries and draws on livelihoods data (Household Economy Analysis) in its monthly analysis. Every three months, FEWS NET analysts conduct scenario-building exercises to estimate food security outcomes for the coming six months. FEWS NET has used scenario building to:

- Assess the impact of drought on farming households in Somalia

- Estimate the effect of currency devaluation in Malawi on food security
- Project impact of extensive flooding in Nigeria on the regional market

(FEWS NET, 2016)

National

The Food Security and Nutrition Analysis Unit (FSNAU) provides information and analysis on food and livelihood insecurity, and malnutrition in Somalia.

How is food security assessed for Early Warning Systems?

FEWS NET relies on 'scenario development'- the creation of specific, informed assumptions about future events, their effects, and the likely responses of various actors. Combined with an understanding of current conditions, and a consistent process, these assumptions allow estimates of future food security. See this USAID paper for more information.

FAO/WFP Crop and Food Security Assessment Missions

WFP facilitates around 20 Food Security Monitoring Systems in high vulnerability areas, in support of governments' early warning and disaster risk management strategies. In December 2015, WFP started remote phone-based data collection and food security monitoring in Malawi through mVAM (mobile Vulnerability Analysis and Mapping). Survey respondents are contacted through SMS and asked to respond to a short series of questions on coping strategies and their food security situation.

Meteorological/natural hazards

International

The World Meteorological Organisation's global tropical cyclone warning system enables international, regional and national collaboration in technical monitoring, data exchange, regional forecasting and warning.

Regional

The Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES) integrates risk information at different time scales to meet different early warning information needs. RIMES addresses both high-impact, low-frequency hazards, such as tsunamis, as well as low-impact, but high-frequency hazards. It provides a monitoring service and earthquake alerts as well as risk analysis. It also develops decision-support tools and tends towards capacity support.

National

Bangladesh's Flood Forecasting and Warning Centre (FFWC) is the established governmental system for issuing flood forecasts. A major challenge is dissemination of nationally produced warnings and forecasts, and interpretation of the implications at sub-national or community level.

Community

Nepal community-based EWS for flooding

The Nepalese Department for Hydrology and Meteorology (DHM) has teamed up with the NGO Practical Action to test Community Based Early Warning Systems within five river basins in Nepal. Community level disaster management committees have been formed in each targeted village. These committees are linked to a network of District Disaster Relief Committees, the local media, the Red Cross, police, and the flood monitoring and forecasting station of the DHM.

The EWS uses a combination of remote and manual river monitoring and rainfall monitoring. Automated hydrological stations continuously monitor river levels and provide real time information via SMS and Internet. But an outstanding concern is the lack of community capacity to operate, maintain or repair local EWS equipment.

(Brown, 2013, pp 33-34)

Kenya's Drought Early Warning System works at both community and national level – see box.

An Early Warning System to Manage Drought – Kenya

The Kenya Drought Early Warning System (DEWS) was established in 1987. It is part of a wider drought management system aiming to trigger a timely response to drought by providing accurate and credible information to stakeholders. Kenya's National Drought Management Authority (NDMA) spearheads Kenya's preparation, risk-reduction and drought response.

Kenya's EWS relies on the collection and monitoring of data by a sample of communities. Each month data is analysed and published in a drought monitoring bulletin by NDMA offices in 23 arid and semi-arid counties. These monthly bulletins confirm the specific stage of drought in each county (i.e. normal, alert, alarm, emergency or recovery) and whether the situation is worsening or improving. Any stage other than normal may trigger a rapid assessment by county authorities.

Drought monitoring is carried out against a common set of indicators: 1) Environmental indicators; 2) Rural economy indicators (food availability, livestock and crop diseases/production); and 3) Human welfare indicators (food consumption, livestock and crop prices, and the nutritional status of children under five years old).

Sustainability and Effectiveness

The sustainability of the drought management system has been helped by the institutionalisation of the EWS through the NDMA, formal coordination structures, sustained financial and technical support and political commitment to managing drought.

As Kenya continues to make the transition towards a devolved system of governance, there is uncertainty about how the NDMA will coordinate emerging structures.

At community level, the Kenya DEWS has shown that capturing existing local knowledge of changing trends leads to successful outcomes, but the more challenging stage is ensuring outputs (such as risk maps and simplified data) are communicated back to the community. (Abridged from *Brown, 2013*, pp14-18)

How effective are early warning systems?

UNEP's detailed literature review (Zommers, 2012) on early warning systems identified lack of multi-hazard EWS as a key problem.

EWS are most effective when accompanied by critical infrastructure, preventative investment and engagement of expected beneficiaries – raising awareness of risks and responses. Multi-agency cooperation to develop multi-hazard warning systems is particularly effective e.g. Shanghai's Multi-Hazard EWS. (Rogers and Tsirkunov, 2011.)

EWS have substantially reduced mortality rates from severe weather events, especially in countries with recurrent disasters e.g. cyclones in Bangladesh. The relative benefits of EWS are shown in the box below.

BOX 1: COSTS AND BENEFITS OF EARLY WARNING SYSTEMS

- An estimate in China in 1994 – 96 found a benefit cost ratio between 35 and 40 (Guocai and Wang 2003)
- Meteorological services in Mozambique were estimated to have a benefit-cost ratio of 70 (World Bank 2008)
- The ratio of the economic benefits of improved hydrometeorological information (calculated as avoided losses) to the costs of national hydrometeorological services modernization programs vary between 2.1 and 14.4 for some European and Asia countries (World Bank 2008)
- Benefits of improved weather forecasts estimated for U.S. households exceed the costs of U.S. National Weather Service modernization program more than threefold (Lazo, Teisberg, and Weiher 2007)
- A more recent nationwide survey indicates that the U.S. public obtains several hundred billion forecasts each year, generating $31.5 billion in benefits compared to costs of $5.1 billion (Laos et al, 2009)

(Source: *Rogers and Tsirkunov, 2011*)

Engaging the private sector in early warning systems could improve capacity to respond to risks and allow transfer of risk through insurance or other mechanisms.

Nevertheless, there are several limitations associated with EWS:

1. Gap between warning and action. FEWSNET and FSNAU flagged the impending food crisis in Somalia many months before the UN declared famine in 2011 but the early warning did not translate into early action (Bailey, 2012). Accurate early warning of a wider food crisis in the Horn of Africa also failed to mobilise sufficient early action in Ethiopia and Kenya. EWS need to incorporate pre-agreed trigger points to lead to early action and decisions (Bailey, 2012).
2. EWS can become too techno-centric - IFRC recommends "people-centred" approaches (IFRC, 2012) such as building local networks to ensure adequate response capability and communication.
3. EWS and triggers for action need to be contextualised - seasonality, livelihoods patterns, coping strategies, and other dynamic variables have to be considered.
4. EWS may be of limited use in predicting:
    i. specific impact that the projected conditions will have at household level, where context is dynamic.
    ii. complexities of human interaction e.g. the potential for conflict over limited resources, or how markets will react to price variation.

(Adapted from IFRC, 2014)

Characteristics of successful EWS

The UNEP review of EWS (Zommers, 2012) found that successful EWS shared the following characteristics:

1. Political recognition of the benefits of EWS.
2. Each effective system was built upon four components: i) hazard detection, monitoring and forecasting; ii) risk analysis and incorporation of risk information in emergency planning and warnings; iii) dissemination of timely and authoritative warnings; and iv) community planning and preparedness.
3. Clarity over roles.
4. Allocation of resources across national and local levels.

5. Integrated of risk assessment into EWS (covering hazard, exposure and vulnerability information).
6. Appropriate warnings issued from a single authoritative source (N.B. IFRC, 2012, however, counters that people at risk seek information from a variety of sources and multiple sources will help people to triangulate and confirm warnings).
7. Timely dissemination.
8. Integration of EWS into response planning.
9. Relevant formal and informal training or education.
10. Feedback mechanisms at all levels to encourage improvement.

(Zommers, 2012)

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5. HAZARD FORECASTING AND ADAPTIVE PROGRAMMING

Managing dynamic risk successfully will not only require technical improvements in forecasting hazards but also flexible and adaptive programming. After considering hazard forecasting ability, this section will look at flexible programming, including shock responsive social protection systems. (Also see 'Social Protection and Climate Resilience' resource.)

Hazard Forecasting

A hazard is a potentially destructive phenomenon. Scientific ability to anticipate natural hazards and epidemics is expected to improve in the next few decades (Foresight, 2012). Hazard forecasting is most highly developed in terms of probabilistic forecasting of weather events and this ability is set to improve further. Forecasting of geophysical and biological hazards will continue to be more problematic. The diagram represents forecasting in three dimensions – where hazards will strike *(spatial)*, when they will occur *(temporal)* and the degree of severity *(magnitude)*. The estimates are based on expert analysis by Foresight, from a report commissioned by the UK Government Office for Science.

FIGURE 8: ABILITY TO PRODUCE RELIABLE HAZARD FORECASTS IN FUTURE

	Ability to produce reliable forecasts					
	Now			2040		
	Spatial	Magnitude	Temporal	Spatial	Magnitude	Temporal
Geophysical hazards						
Earthquakes	2	1	1	3	2	1
Volcanoes	3	2	2	5	3	3
Landslides	2	2	1	3	3	2
Tsunamis	2	2	1	3	3	2
Hydrometeorological hazards	6 days ahead					
Storms	3	3	4	5	5	5
Floods	3	3	4	5	5	5
Droughts	5	5	5	5	5	5
Hydrometeorological hazards	6 months ahead					
Storms	2	2	2	3	3	3
Floods	2	2	2	4	4	4
Droughts	2	2	2	4	4	4
Infectious disease epidemics						
Known Pathogens	2	5	2	4	5	4
Recently emerged pathogens	1	4	1	2	4	2
Pathogens detected in animal reservoirs	1	1	1	2	3	2

Low ability 1 2 Medium ability 3 4 High ability 5

(Source: Foresight/Government Office for Science, 2012)

Adaptive programming

Since development contexts are dynamic, risk assessment for resilience is not a one-off process. Managing risk will involve integrating predictions at design stage, anticipating change and re-visiting a programme's theory of change and assumptions. Programmes will need to be flexible and to adapt to changing conditions. The VfM adaptation framework advocates iterative action as risks near-future and long-term risks evolve or new risks emerge.

In the context of climate change, 'low-regret' options (those that address adaptation deficits under current conditions) will be a 'safe bet' even if further climate change does not occur. The terminology of 'no-regrets' programming is also applied to livelihood support measures in the absence of crises. The Livestock Emergency Guidelines and Standards (LEGS) is an example of technical guidance on a range of early actions that can be taken to support livelihoods in pastoralist areas faced by a potential crisis (Levine and Sharp, 2015).

Future uncertainty can be addressed by:

- Building in flexibility e.g. infrastructure that can be upgraded
- Making decisions reversible e.g. roads with a deliberately short life span
- Using adaptive management principles in planning
- Early research into adaptation that may be required later e.g. flood-resistant crops
- Investment in climate data and weather monitoring
- Designing social protection programmes that can be scaled up

(Olsson, 2015)

(Inter-sectoral collaboration in planning infrastructure is covered in the 'Resilience in Infrastructure' resources: 'Overall Strategy Development and Joint (Multi-Sector) Planning' section, including examples of good practice. This acknowledges the interdependencies between different infrastructure elements and systems; and between infrastructure and livelihoods.)

Topic Guide - Anticipating and responding to shocks: livelihoods and humanitarian responses (see Section 6)

Early warning, early response and no-regrets programming require collaborative analysis from specialists outside the humanitarian sphere, e.g. livelihoods specialists. Early warning of a hazard does not always trigger effective early action, nor is it always accompanied by adequate livelihoods analysis. "Livelihood interventions have a window of opportunity that is determined by a livelihoods calendar and not by a humanitarian crisis." (Levine and Sharp, 2015, p. 45)

Shock responsive social protection systems

Where extreme needs are chronic (predictable, seasonal or recurrent) they can be met more effectively by using permanent state structures. Where states do not have functioning social protection systems, some donors (including DFID) are advocating use of aid for multi-year social protection or safety net systems that can eventually be transferred to the state. For example, the World Bank's Rapid Social Response Program has moved from being a crisis response mechanism to strengthening social protection and labour systems.

Social protection systems can respond to shocks and crisis in many different ways:

1. Vertical expansion: increasing the value or duration of an existing programme
2. Horizontal expansion: adding new beneficiaries
3. Piggybacking: using the same administrative framework, but running the shock-response programme separately
4. Shadow alignment: developing a parallel humanitarian system to the social protection programme
5. Refocusing: adjusting the social protection system to target assistance on the most vulnerable groups to the shock.

Several types of development assistance (emergency response, multi-year humanitarian financing, social safety nets etc.) can coexist. Ideally, all should be harmonised under one agreed strategy, with **contingency for modifying support** (including appropriate financing – see Part B: Disaster Risk Financing and Insurance) according to the situation (known as a 'tracking strategy').

Abridged from Levine and Sharp, 2015**.**

(For further information on scalable and flexible shock mechanisms, including lessons from Kenya's Hunger Safety Net Programme, see 'Social Protection and Climate Resilience' resource.)

Further reading: DFID Shock-Responsive Social Protection Systems Research: Literature Review (OPM, 2016)

Dialogues for disaster anticipation and resilience – this website supports dialogue between the scientific community and those who use science to make decisions. The case studies are designed to support learning and adoption of different dialogue approaches.

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PART B: DISASTER RISK FINANCING AND INSURANCE

Part B covers: ex-ante financial instruments for disaster response and recovery; examples of parametric insurance on programmes; lessons learnt from insurance programmes (particularly index-based insurance); challenges to risk financing; and UK commitments on risk financing.

1. WHAT IS RISK FINANCING?

This section provides an introduction to the concept of risk financing and provides examples of the available finance instruments. It then explains risk financing strategies, risk layering and crisis modifiers (flexible programme financing). This is followed by an illustration of sovereign disaster risk finance instruments around the world and a summary table of different types of risk financing at different scales.

"Risk financing is the financial protection of populations against disaster events. Disaster risk finance strategies increase the ability of national and local governments, homeowners, businesses, agricultural producers, and low-income populations to respond more quickly and resiliently to disasters." (*Clarke and Dercon, 2016*)

The objective of financial protection is to ensure that governments, businesses and households (including agricultural, homeowners, and the most vulnerable) can identify and meet financing obligations arising from natural disasters at the lowest possible cost. Financial protection complements other investments in risk reduction and prevention.

Post-disaster reconstruction and investment in infrastructure

Maintaining or building new infrastructure may not always be compatible with improving people's resilience to natural disasters or improving their livelihoods, especially if infrastructure investments are planned in isolation. Best practice, tools and approaches for post-disaster reconstruction are considered in a DFID topic guide currently being produced (see Lloyd-Jones, Davis and Steele (2016). This looks at the issue of institutional gaps between humanitarian organisations concerned with short-term disaster relief and those concerned with longer-term 'building back better' reconstruction and climate smart development.

See Glossary for explanation of key terms.

Useful introductory materials

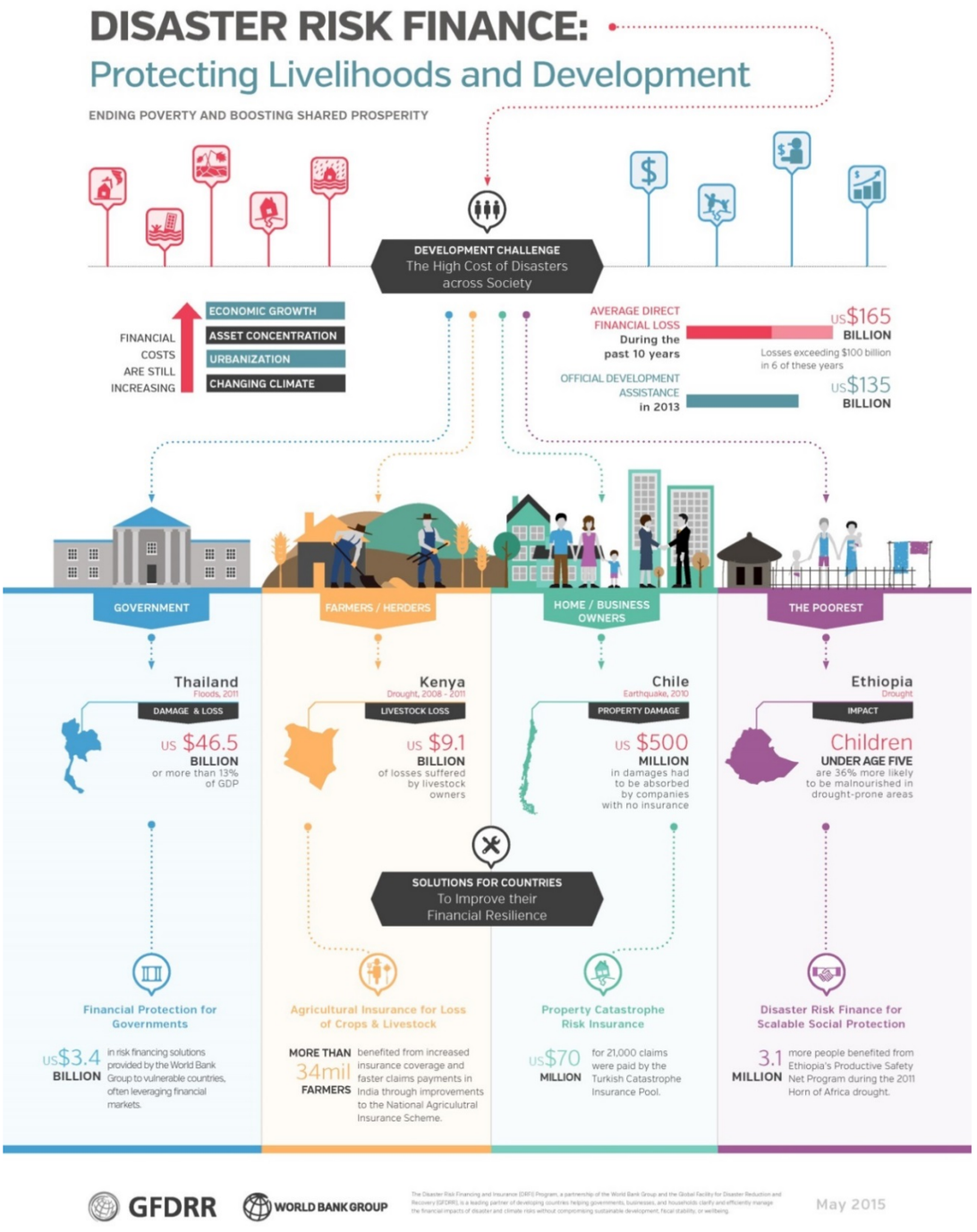
See this OECD report (Poole, 2014) for a straightforward introduction to risk financing for donors.

For a brief overview of the historical evolution of disaster risk financing and insurance in developing countries since 2000, see the World Bank report Financial Protection Against Natural Disasters – especially the timeline on pages 40-41.

World Bank overview video - Disaster risk finance across the globe.

For general macro-economic resilience in terms of fiscal and monetary space (debt, tax revenue mobilisation, savings) this article by DAI**:** Macroeconomic Resilience of Nations may be of interest.

FIGURE 9: WORLD BANK DISASTER RISK FINANCE INFOGRAPHIC



(Source: GFDRR/World Bank, 2015)

What finance instruments are available?

The infographic shows some of the World Bank financing solutions that have addressed financial resilience of different groups.

An optimal risk financing strategy should include a mix of *ex-ante* and *ex-post* instruments. *Ex-ante* instruments require advance planning. At sovereign level, governments can also use *ex-post* instruments after a disaster, such as requesting international aid, budget reallocation, new borrowing and tax increases (may be cheaper than some ex-ante instruments but may take longer to mobilise). For relative costs and benefits of ex-post and ex-ante instruments, see Ghesquiere and Mahul, 2010, p.9.

> "The main advantage of ex-ante instruments is that they are secured before the occurrence of a disaster or crisis and allow for quick disbursement post event, supporting more cost-effective early response." (Dercon, 2015, p.14)

Examples of ex-ante instruments

1. **Index-based micro-insurance** – mainly used in the agriculture sector for protecting farmers from losses caused by drought or excessive rainfall. Index-based insurance (also called **parametric insurance**) means that compensation is collected if the index reaches a certain measure or trigger in a specified location, regardless of actual losses. (Climate change-related index insurance solutions are also mitigating losses in power in the renewable energy sector.) Useful IFC explanation of terms.
2. **Traditional indemnity insurance** – Unlike index-based insurance, indemnity insurance pays out against actual losses. Typically used to cover property, healthcare, death. At household level, often bundled with micro-credit or savings schemes. (There is some evidence that households using microcredit in combination with microinsurance derive significant gains in welfare.)
3. **Disaster reserve funds** - budgetary tool for allocating government funds such as contingency savings for disaster response expenditure.
4. **Contingent credit -** pre-negotiated credit arrangements that can provide rapid access to funding at preferential rates to governments in the event of crises, including natural disasters and economic shocks.
5. **Government catastrophe bonds** - a high-yielding, insurance-linked security providing for payment of interest and/or principal to be suspended in the event of a specified catastrophe, within a predefined location (GFDRR/World Bank, 2012). The main example is Mexico, although the Philippines were also discussing potential for cat bonds with the World Bank in late 2015. Catastrophe risk can also be 'swapped' between two reinsurers with exposure to different types of catastrophe risk.

The World Bank and other multi-lateral finance institutions provide catastrophe bonds and contingent loans that are specially designed to manage developing country disaster risk. See Catastrophe Risk Financing in Developing Countries and Development Solutions for Disaster Risk Finance.

1. **Sovereign risk pools** – catastrophe parametric risk insurance for states where risk is pooled across multiple countries rather than individual countries. See this YouTube video for an explanation of the concept.
2. **Pooled contingency donor funds** – donor multi-year humanitarian reserve funds financed by voluntary contributions. DFID contributes to the START fund for NGOs and UN OCHA's Central Emergency Response Fund.

(N.B. This is not an exhaustive list, other available mechanisms include remittances, savings, micro-credit and social protection schemes.)

What is a risk financing strategy?

Disaster risk financing is part of sound risk management. Effective planning for disasters requires governments to build strategies to meet the costs of humanitarian relief, recovery support and reconstruction following a disaster. Building a strategy involves defining and quantifying costs to be financed under particular circumstances ('**contingent liability'**).

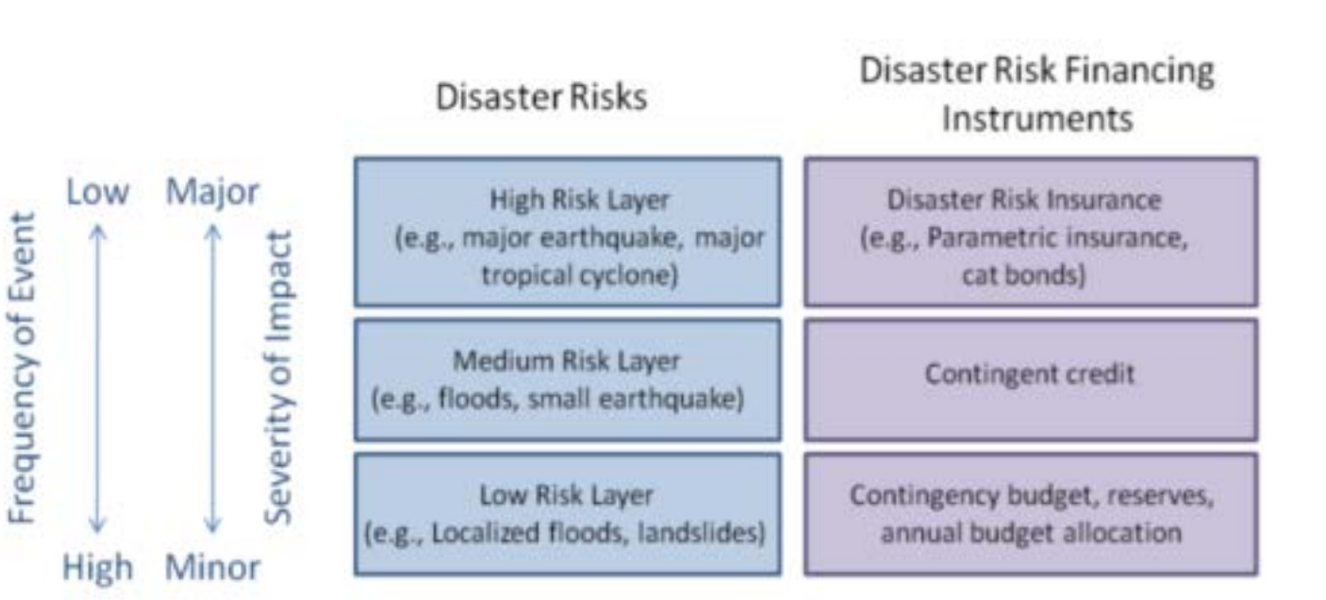
Financing instruments that can be used as part of a diversified finance strategy include insurance, government reserves and contingency measures built into donor programmes or country strategies e.g. 'crisis modifiers'. (Crisis modifiers enable a proportion of the budget to be switched from development work to contingency plans if necessary, with minimal bureaucracy.)

For high frequency, low severity risks - budget contingencies, reserves and borrowing are more cost-effective financing instruments.

For low frequency, high severity risks - disaster risk insurance may be more cost-effective in the long-term, but as it is expensive, cheaper sources of financing should be exhausted first (risk layering).

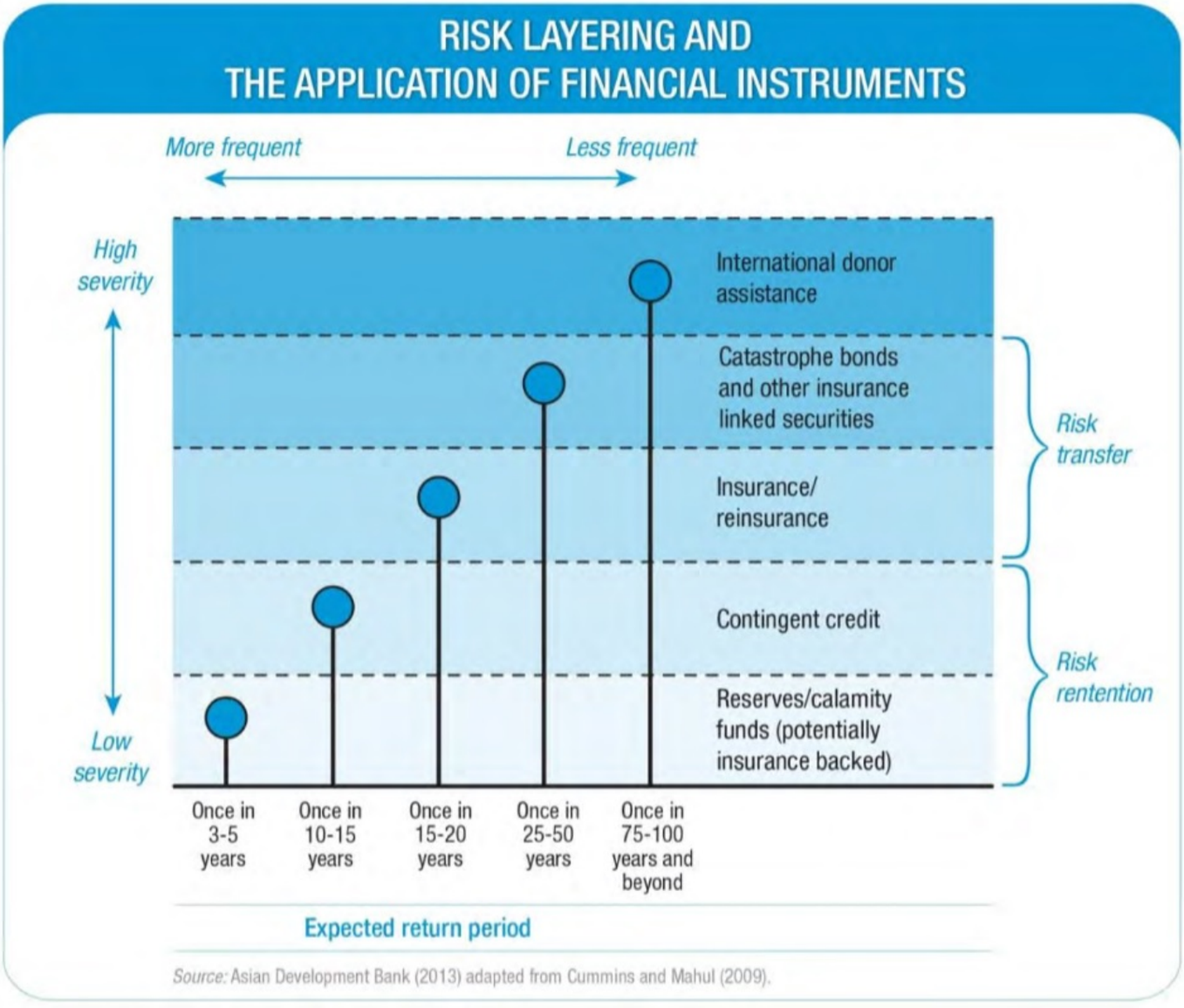
In other words, the different mechanisms available to governments can be deployed strategically to address different levels of risk, using cheaper instruments in the first instance (**i.e. 'risk layering' – also see 'Dull Disasters'**.)

FIGURE 10: RISK LAYERING



(Source: World Bank, 2013b, p.14)

FIGURE 11: RISK LAYERING AND APPLICATION OF FINANCIAL INSTRUMENTS



(Source: Poole, 2014, p.5)

Crisis modifiers and flexible programme financing

USAID pioneered the use of 'crisis modifiers' in Ethiopia on the Pastoralist Livelihoods Initiative. They are a provision that is designed to allow budgetary flexibility without the need to modify the mechanism e.g. ability to provide small grants to partners implementing an existing development programme in the event of a shock or localised disaster. This built-in contingency fund enables an earlier or even pre-emptive response. For evidence on the benefits of multi-year flexible funding of programmes, see Mercy Corps' Case study of the RAIN programme in Ethiopia.

DFID is building in flexibility to scale up social protection systems and safety net programmes – for example, in Zimbabwe, Ethiopia and Kenya *(see below and case studies in the 'What is Resilience?' and 'Social Protection and Climate Resilience' resources)*.

On the Zimbabwe Resilience Building Fund (ZRBF) programme, a 'crisis-modifier' window is being established for humanitarian shocks. This can be used by other donors, as well as DFID.

Productive Safety Nets Programme (PSNP), Ethiopia

On PSNP, there is a contingency budget (20% of annual PSNP budget) to allow rapid mobilisation of resources following an emergency. There is a separate Risk Financing Mechanism for mobilisation of up to $80 million additional funds for a particular crisis each year. These mechanisms are based on an established early warning system to trigger the release of funds. While both of these mechanisms are state-managed, they rely on donor funding.

Hunger Safety Nets Programmes (HSNP) – Phase II, Kenya

HSNP in Kenya incorporates a shock-response component which scales up based on trigger indicators, using remote sensing data on vegetation cover. However, this mechanism would require predictable funding to be sustainable. The ambition is for a dedicated risk finance pool to be established, with contributions from donors and government.

Information on PSNP and HSNP above abridged from Shock-Responsive Social Protection Systems Literature Review (OPM, 2016, p. 28.)

The figure on the next page shows examples of sovereign disaster risk financing around the world. It is followed by a summary table providing examples of different scales and types of risk financing.

FIGURE 12: SOVEREIGN DISASTER RISK FINANCING AROUND THE WORLD

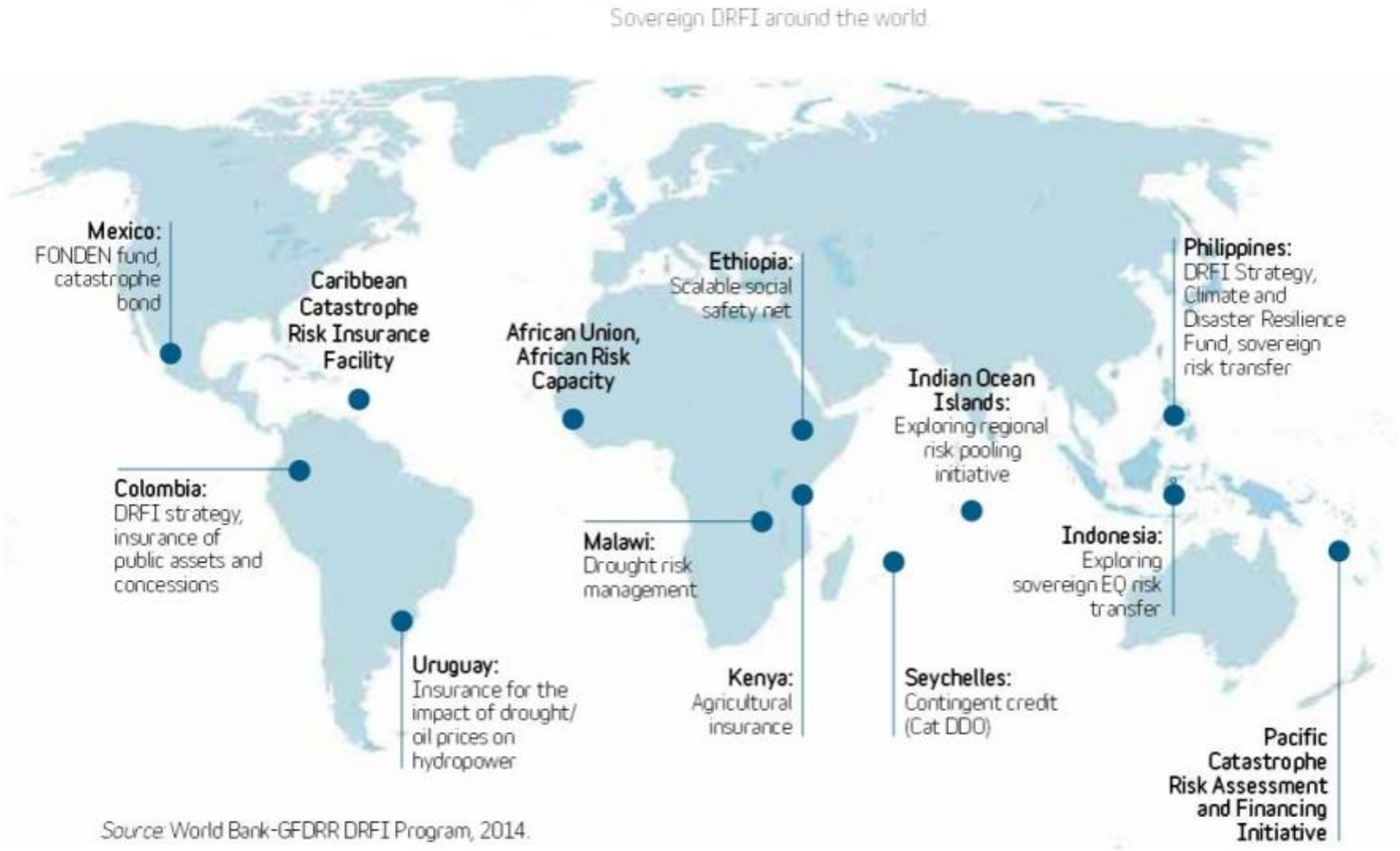


TABLE 5: EXAMPLES OF DIFFERENT SCALES AND TYPES OF RISK FINANCING

SCALE	MECHANISM	EXAMPLE	STRENGTHS	WEAKNESSES
Individuals	Index-based insurance (in agriculture sector)	Index-Based Livestock Insurance (IBLI) in Kenya (supported by DFID)and Ethiopia CADENA catastrophe insurance for small farmers in Mexico	May improve creditworthiness Transfers risk away from govts - even if subsidised, acts as social safety net Low transaction costs in comparison to agricultural indemnity insurance Farmers may be incentivised to make riskier productivity investments Reduced 'moral hazard' and 'adverse selection' (see Glossary) For weather index products – even data-poor environments have or can get rainfall data	Not always affordable to farmers Inadequate information for insurers to price premiums accurately – can result in high premiums Basis risk – the trigger for pay-outs needs to be sufficiently correlated to losses, accurate data collection May involve high start-up costs in awareness-raising/marketing Not commercially viable at scale yet – weak demand, many projects are subsidised
	Traditional indemnity insurance	Often attached to micro-credit schemes e.g. compulsory group-based life and property insurance on Proshika scheme in Bangladesh (for more examples, see this useful review of micro-insurance)	Compensation for actual losses Better at covering idiosyncratic loss than index-based insurance - helps individuals cope with everyday risk Provides access to liquidity post-disaster, without government or donor intervention	High transaction costs associated with settling claims on a case by case basis Problem of 'moral hazard' – no incentive to reduce risks 'Adverse selection' – higher risk clients more likely to take up insurance, resulting in higher premiums Expensive for covering regional or national disaster risk – insurers need sufficient capital reserves to make large-scale pay-outs
Governments	Disaster reserve funds	India's Calamity Relief Fund PSNP contingency budget (donor-funded)	Cheapest source of ex-ante disaster financing Allows for rapid disbursement	Potential funds available are limited May involve political bargaining between government ministries
	Contingent loans/credits	World Bank Catastrophe Deferred Drawdown Option (CAT DDO) WB Crisis Response Window	Less pressure for humanitarian system to supply funds Larger funds available more quickly	Loans may be less attractive to poorest countries – tend to be aimed at middle income countries Increased debt
	Insurance linked securities - catastrophe bonds (CAT Bonds), Cat Swaps	Mexico's FONDEN (the newer component)	Provide capacity for reinsurance markets Can offer multi-year protection Bonds are attractive to investors – not correlated to traditional financial assets	Premiums will be high for high frequency events, or rare but high loss events Difficult for govts to define potential losses Gaps in cat risk modelling for govts Not suitable for low levels of risk cover
	Sovereign risk pools - pooled insurance funds	African Risk Capacity Fund (ARC) – focused on severe but infrequent droughts.	Quick pay-outs, based on pre-defined, objective triggers Pools like ARC are reinsured to avoid depletion	Not all losses will be covered – payments linked to triggers – reliance on accurate modelling for triggers

SCALE	MECHANISM	EXAMPLE	STRENGTHS	WEAKNESSES
		Caribbean Catastrophic Risk Insurance Facility (CCRIF)	Risk aggregator - premiums lower with shared risk in a diversified portfolio	Resources might not reach those in need – not linked to scalable social protection schemes (but they could be…)
		Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI)	International reinsurance market willing to supply at competitive price	National reserves more appropriate for more frequent but less severe events
	Pooled contingency donor funds	Central Emergency Response Fund (CERF) at UN OCHA	Designed to allow rapid response and access to funds Allows donor coordination	No clearly defined triggers for release of funds Often require additional mechanisms

(Information derived from DFID, 2015; Dercon, 2015; GFDRR, 2014; GFDRR/World Bank, 2012; Twigg, 2015; OPM, 2016; J-PAL, 2016)

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2. EXPERIENCE OF INSURANCE ON PROGRAMMES

This section looks at programmatic experience of using insurance to build resilience. The following topics are covered:

- *Micro-insurance, including case studies from a CGIAR report and three DFID-supported programmes*
- *Relevant resources on micro-insurance*
- *Lessons learnt*

Micro-insurance

Index-based commercial micro- insurance has gained prominence as a tool for building the resilience of smallholder farmers in recent years.

Scaling up index insurance for smallholder farmers: Recent evidence and insights

This 2015 CGIAR report presents five case studies addressing the challenge of insuring poor smallholder farmers and pastoralists. It claims that index insurance has potential to provide benefits at scale:

- In India, national index insurance programmes have reached over 30 million farmers through links with agricultural credit and strong government support.
- In East Africa (Kenya, Rwanda and Tanzania), Agriculture and Climate Risk Enterprise (ACRE) has reached nearly 200,000 farmers, bundling index insurance with agricultural credit and farm inputs. ACRE has built on strong partnerships with regional initiatives such as M-PESA mobile banking.
- In Ethiopia and Senegal, the R4 Rural Resilience Initiative has scaled unsubsidised index insurance to over 20,000 poor smallholder farmers who were previously considered uninsurable, using insurance as an integral part of a comprehensive risk management portfolio.
- The Mongolia Index-Based Livestock Insurance Project (IBLIP) insures nomadic herders and links commercial insurance with a government disaster safety net.
- The Index-Based Livestock Insurance (IBLI) project in Kenya and Ethiopia is insuring poor nomadic pastoralists in challenging circumstances

(Source: Geatrex et al., 2015, p. 5)

TABLE 6: EXAMPLES OF INDEX-BASED INSURANCE

Case study	Country	Commodities	Start date	Number of insured	Key features
NAIS *National Agricultural Insurance Scheme* **mNAIS** *modified National Agricultural Insurance Scheme* **WBCIS** *Weather-Based Crop Insurance Scheme*	India	Cereals, millets, pulses, oilseeds, annual commercial horticulture	1999	16.79 million under NAIS, 3 million under mNAIS 13.62 million under WBCIS (2013)	State-subsidized insurance programmes, bringing insurance to millions of farmers through a link with agricultural credit.
ACRE *Agriculture and Climate Risk Enterprise (formerly Kilimo Salama)*	Kenya, Rwanda, Tanzania	Maize, beans, wheat, sorghum, coffee, potatoes	2009	Over 187,466 60% in Kenya, 40% in Rwanda (2013)	Strong links to aggregators and mobile technology. Wide range of products, mostly linked to credit or inputs.
R4 *Rural Resilience Initiative (formerly HARITA)*	Ethiopia, Senegal	Teff, beans, maize, wheat, barley, sorghum, millet	2009	24,133 in 82 villages in Ethiopia 1989 in Senegal (2014)	A farmer-led, integrated risk management project, with labour for insurance and satellite rainfall indexes.
IBLIP *Index-Based Livestock Insurance Project*	Mongolia	Livestock (camels, cattle, sheep, goats and horses)	2006	Approximately 15,000 herders (2014)	A public-private partnership with innovative risk layering, within a diversified risk management portfolio.
IBLI *Index-Based Livestock Insurance*	Kenya	Livestock (camels, cattle, sheep, goats)	2010	Approximately 3000 contracts sold during the project lifetime	Creative education methodologies and an innovative mortality index-based on NDVI.

(Source: Geatrex et al., 2015, p.8)

DFID-supported programmes

1. *Index-Based Livestock Insurance (IBLI), Kenya*
2. *Strengthening Adaptation and Resilience to Climate Change in Kenya (STARCK+, 2014-2017)*
3. *Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED, 2015-2017) Ethiopia*

DFID support to Index-Based Livestock Insurance in Kenya under the Arid Lands Support Programme (ASP, 2012-2016): Building resilient and adaptive livelihoods in Kenya's arid lands

ASP aims to provide improved economic opportunities and assets. It is a complementary programme to the Hunger Safety Net Programme (HSNP), which provides unconditional electronic cash transfers to the poorest households. (*See 'Social Protection and Climate Resilience' resource*). ASP includes an Internal Risk Facility (IRF) to support pastoralists in case of drought, to avoid

them falling into deeper poverty, and also funds scale-up of Index-Based Livestock Insurance (IBLI), which is implemented by the International Livestock Research Institute. The contracts are based on an index, not on individual stock mortality or depletion. Therefore, they insure pastoralists from a community-level risk.

IBLI is sold in three counties (Wajir, Marsabit and Isiolo) by two private insurance agencies. Sales figures were not as high as expected in 2014 (1,116 policies sold in 2014), attributed to low levels of understanding of the product, but have improved in 2015 and 2016 (over 6000 policies sold in Jan/Feb 2016).

IBLI influenced the World Bank's design of the Government of Kenya's (GoK's) Kenya Livestock Insurance Programme (KLIP), a macro-coverage public-private insurance scheme. IBLI has also informed the HSNP scalability model. DFID will be monitoring the effects of KLIP on commercial uptake of IBLI.

KLIP is active in Wajir and Turkana, having offered support to more than 5000 pastoralists from October 2015 to February 2016. It intends to expand to other counties in 2016 and to cover 80,000–100,000 households by 2019 with the goal of building a critical mass.

The IBLI insurance model is potentially transformative; there is growing interest in commercial insurance to fill the gap left by the breakdown of traditional shared coping mechanisms. The box below shows some of the lessons learnt from the Index-Based Livestock Insurance (IBLI) programme in Kenya.

(Source: DFID'S 2015 annual review of ASP.)

Index-Based Livestock Insurance (IBLI) in Kenya

High-level lessons learnt

Lessons learnt include the need for constant stakeholder engagement; complementary scientific research and implementation; and the need for smart subsidies until critical mass is achieved.

Sales were initially limited by insufficient incentives to agents, and low levels of financial literacy. Strong growth in early 2016 - over 6000 policies sold in Jan/Feb 2016 – attributed to geographical expansion, improved client engagement and a move from asset replacement to asset protection.

Move to asset protection contract

IBLI in Kenya was initially based on a predicted livestock mortality index and forage availability ('normalised difference vegetation index' - NDVI) data. In 2015, the index moved to one exclusively based on NDVI.

Under the previous contract, clients had complained of pay-outs after animals had already died. Asset protection means pastoralists will get paid before livestock die and it is easier to scale up (also cheaper and easier to explain).

There has been less uptake from large herd owners who manage risk by absorbing losses. The products are better suited to those on the edge of herd viability (holding 7-12 Tropical Livestock Units) where drought could push them out of pastoralism.

Trialling new technology

In 2015 IBLI trialled crowdsourcing data on rangeland conditions to address gaps in the remote sensing data used to develop the insurance index.

A mobile learning application was tested for sales agents in late 2015 and an IBLI Percentile Calculator App was launched to build trust in the product among pastoralists. Initial results are positive.

Remaining challenges

- **Weak pastoral understanding of the product.**
- **Infrastructure challenges relating to roads and telecommunications provision in the ASALs.**
- **Coordination challenges with the national index-based insurance programme (KLIP) – KLIP offers fully subsidised contracts which affects take-up of purely market-based component**
- **High staff turnover and low capacity of private sector insurance partners**

(Sources: DFID Annual Review of ASP, 2015 and internal report in preparation for 2016 review)

Strengthening Adaptation and Resilience to Climate Change in Kenya (STARCK+, 2014-2017)

The Finance Innovation for Climate Change Fund (FICCF) falls under STARCK's Climate Smart Agriculture (CSA) component. FICCF has contracted four microfinance institutions (MFIs) to work in partnership with ACRE. These are service providers that work with insurers to offer products for farmers. FICCF has also engaged climate information services to improve the insurance products offered and to provide agro-weather advisory services (weather stations set-up, allowing satellite forecasts to be compared with downscaled weather information). **The initiative is in its early stages but it may be worth monitoring future developments.**

Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED, 2015-2017) Ethiopia

Market Approaches to Resilience (MAR) is a three year programme (2015-2017) under BRACED that is testing market-based approaches to improving the resilience of vulnerable pastoralist to climate change in the Afar, SNNP and Somali regions. MAR works on the **resilience of economic, ecological and social systems**, rather than focusing on individual households.

It aims to extend insurance mechanisms to vulnerable communities in partnership with a private insurance company and to improve understanding and uptake of risk information to improve the anticipation of shocks and stresses. **In its infancy, but may yield evidence for future use.**

Relevant resources on micro-insurance

The Microinsurance Centre's Landscape of Microinsurance Africa 2015 – upcoming report may be of interest, see briefing note.

The favourable impacts of Index-Based Livestock Insurance: Evaluation results from Ethiopia and Kenya.

ILO's Impact Insurance Facility and Global Action Network on agriculture insurance

Index Insurance Innovation Initiative

The MicroInsurance Network

The MicroFinance Gateway

Access to Insurance Initiative (A2ii)

Lessons learnt from insurance programmes

Lessons learnt on micro-insurance

Micro-insurance is evolving dynamically and is no longer a simple product. Hybrid products, bundling and community schemes are being tested to suit different agricultural contexts and pragmatic considerations. There are over 10 established micro-insurance schemes worldwide (the most mature schemes are in India). In the early phase, they often face problems of regulation and trust and few are self-sustaining. Further cost-benefit analysis is required to determine if they offer VfM and lead to better development outcomes. (Source: Ajay Sharma, DFID)

Nevertheless, there is evidence that when farmers are insured, they invest and produce more crops, and grow higher-risk, higher-return crops (J-PAL, 2016; Cole, 2015)

Despite considerable 'basis risk' (risk that events will occur that produce significant losses but trigger no pay-out from index-based insurance) evaluations of IBLI suggest strong positive impacts on economic and health indicators and greater cost-effectiveness than unconditional cash transfers (Jensen et al., 2015) IBLI has been linked to a 36% drop in distress sales of livestock following drought and a 33% reduction in dependence on aid (Mude, 2014).

The Agriculture and Climate Risk Enterprise (ACRE), previously known as Kilimo Salama, has increased investment and earnings as well as access to loans. The key to its success has been offering a holistic solution to mitigate weather risks, not just insurance.

A World Bank presentation for the 2011 FARMD conference: Effectiveness of Index-Based Weather Insurance in a Highly Volatile Climate warns that index insurance is not a panacea. It is not necessarily cheaper than traditional insurance, due to high costs of design, education and marketing. Adequate supply chain linkages and demand are critical for it to be effective.

Similarly, a GIZ presentation of project experiences, also presented at the 2011 FARMD conference cautions that "a product solution does not create a market". It suggests that public-private partnerships may be required to manage basis risk and reduce transaction costs.

A systematic review *(Cole et al. 2012) on the effectiveness of index-based micro-insurance to help smallholders manage weather-related risks found some evidence (across 13 studies) that access to index-based insurance increases the use of agricultural inputs. Financial literacy, trust and liquidity appear to affect demand for micro-insurance products. A more recent* review *in 2015 by the same author, looked at barriers to adoption of micro-insurance and advocated public-private partnerships.*

DFID is commissioning research into VfM of microinsurance in 2016.

Sovereign disaster risk financing

The evidence base on cost-effectiveness of sovereign disaster risk financing and insurance (DRFI) relative to their impact on resilience remains limited. DFID, the World Bank, and the GFDRR have partnered on the DRFI Impact Appraisal Project (2013-2016) to assess the likely effectiveness, efficiency, and impact of current and potential programmes, and to generate new evidence (new research expected to be available from April 2016).

(For information on ARC, see section on overcoming constraints to risk financing. An evaluation of ARC is planned for mid-2017.)

"The Pacific and Caribbean regional catastrophe insurance pools have demonstrated that the international reinsurance market is willing and able to supply catastrophe risk insurance at very competitive prices: risk pooling among countries has resulted in cost savings of up to 50% of the premium for participating countries compared to a single country approach". (OPM, 2016, p.29)

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3. WHAT ARE THE CHALLENGES ASSOCIATED WITH RISK FINANCING?

This section considers the contextual, programmatic and institutional challenges associated with risk financing and how to overcome constraints.

Contextual – particularly in fragile and conflict-affected states

- Lack of knowledge - access to affordable and comprehensive data and information on risk required
- Limited infrastructure for targeting and distribution and also the need to address weak points – e.g. financing to protect critical infrastructure that is vulnerable to conflict
- Lack of demand – 'missing markets'
- Almost exclusive focus on natural disasters (- what about economic volatility?)
- Segmentation of risk, especially parametric insurance that considers only 1 or 2 hazards – what about intersecting risks? Undermines comprehensive risk management approaches
- Slower onset risk may not be covered
- Political instability and conflict too costly to insure
- Commercial providers may not find it cost-effective to extend services to fragile states where rule of law and security are threatened (donors may need to underwrite political risk)
- Requires political commitment from governments

Programmatic

- Lack of integration and complementarity across development and humanitarian programming
- Difficult to achieve affordability and scale in micro-insurance
- Incomplete evidence base on micro-insurance and sovereign disaster risk financing – there may be unintended consequences
- Risk-informed decision-making is limited by lack of shared risk analysis

Institutional

- High risk of failure and uncertain return on investment
- Risk financing is often disbursed across multiple thematic or technical teams
- Solutions require networks of actors – donors need to act as catalysts
- Investing in public goods (such as generating/improving risk data and developing a risk-transfer market) may not be appealing to donors
- Multiple partners may weaken chains of accountability and attribution of results
- Establishing viable risk finance mechanisms may take longer than typical programmatic cycles

(Abridged from Poole, 2014)

How can we overcome constraints to risk financing?

Constraints include basis risk, low demand, low quality/availability of risk profiling data and constraints to regional pools such as ARC. We will look at each of these in turn and consider how to overcome the constraints.

Basis risk

Parametric insurance involves basis risk - events can occur which produce significant losses but no payout.

"One source of basis risk is poorly designed products, and the other is geographical. Product basis risk is minimised through robust product design and back testing of contract parameters. Geographically, the greater the distance between the index measurement instrument (e.g. rainfall station) and the production field, the greater the basis risk. Some households that experience loss may not receive compensation while others that experience no loss may receive payments. Basis risk is reduced when the area covered by the index is homogeneous both in terms of weather and farming techniques." (IFC, 2015)

High quality weather and yield data is required for index-based agricultural insurance. This could include crowdsourcing data on rangeland conditions and combining this with satellite imagery (IBLI has been trialling this). Historical weather data is needed to allow robust analysis and product pricing. The box below provides more detail on the potentials and challenges of index-based insurance.

OECD guidance to donors on effective disaster risk financing (Poole, 2014)

- Identify level of engagement
- Adapt internal ways of working
- Provide catalytic investment – support innovation, invest in public goods, promote demand and political support
- Collective approach across public-private sector - shared analysis of risk, facilitate partnerships
- Accept uncertainty and complexity
- Maintain a balanced and comprehensive approach to risk, ensure investments are inclusive and be alert to downside risks

BOX 2: THE POTENTIALS AND CHALLENGES OF INDEX-BASED INSURANCE

Index-based insurance: The potential and the challenges

Index-based insurance can be a viable instrument to manage agricultural risk. Index-based, or parametric, insurance provides payments based on physical triggers (such as variation in rainfall) rather than loss claims. This type of insurance is less subject to moral hazard and has significantly lower transaction costs. Although some farmers bear significant "basis risk" because their risk is imperfectly correlated with the risk insured by the index contract, several studies show that index-based insurance increases investment and improves yields. In Tamil Nadu in India, for example, offering farmers index-based insurance made them more likely to plant higher-yield (but riskier) rice varieties and less likely to plant lower-yield but drought-tolerant ones. And when basis risk is large, having an informal network can help by providing insurance against basis risk. Thus the presence of informal risk sharing actually increases demand for index-based insurance in the presence of basis risk.

Still, the coverage of index-based insurance remains low. In particular, providers need to find better ways to market it by taking into account the context in which farmers operate, the variety of risks that they face, and their lack of experience with formal financial products. For instance, the studies for India show that selling insurance to landless laborers, not just land owners, provided significant protection to their income and their ability to invest, because they bear a disproportionate share of agricultural risk. In Kenya and Rwanda, Kilimo Salama, an index-based insurance program for small farmers, has managed to increase its client base by insuring inputs instead of harvests, using "aggregators" such as cooperatives to insure groups rather than single farmers, creating premium-sharing arrangements between farmers and agribusinesses, selling through local businesses that are frequented by the farmers, and paying claims immediately using mobile phones.

Governments also have a role to play. The Mexican Catastrophe Climate Contingency Insurance Program provides state governments with funding for the purchase of insurance, most of which is index-based and targeted at subsistence producers below the threshold for commercial agricultural insurance. India's Weather Based Crop Insurance Scheme has significantly expanded the use of index-based insurance by subsidizing premiums. However, government premium subsidies create tensions in the market that are difficult to resolve. For example, selling subsidized index-based insurance to landless agricultural laborers (who technically do not possess an insurable interest) opens the market to others (such as urban residents) to gamble with the product because the subsidized premiums make the insurance product, in effect, look like an attractive lottery ticket. Government resources might be better targeted to covering the up-front cost of installing weather stations needed to monitor rainfall at high density (to reduce basis risk), and to scaling up these investments, rather than subsidizing the price of the premiums.

Source: WDR 2014 team based on Brown, Mobarak, and Zelenska 2013 for the WDR 2014; Alejandro de la Fuente for the WDR 2014; "Fact sheet: Kilimo Salama ("Safe Agriculture")," available at http://kilimosalama.files.wordpress.com/2010/02/kilimo-salama-fact-sheet-final11.pdf.

(Source: World Bank, 2014, p.126)

Low demand/take-up of index-based micro-insurance

Cole (2015) has reviewed academic literature on overcoming barriers to micro-insurance adoption in emerging markets (See Key Resources section for a summary.)

The Abdul Latif Jameel Poverty Action Lab (J-PAL) reported on results of randomised evaluations in 10 rainfall-based index insurance schemes in Ethiopia, Ghana, India and Malawi in February 2016, see *policy bulletin*. This included looking at the effects of different initiatives to encourage take-up.

Key findings from these studies are listed below:

Marketing and training: As index products can be complex, they have to be marketed in a way that people can understand. Financial literacy training may not be cost-effective.

Building trust and experiential learning: Observing payouts to friends and family increased trust in the products.

Group-risk sharing: informal group networks may be preferable to individual insurance.

Pricing: Take-up is low at market prices. Demand increases when premiums are subsidised.

"In Kenya and Rwanda, Kilimo Salama (now known as ACRE), an index-based insurance programme for small farmers, has managed to increase its client base by insuring inputs instead of harvests, using "aggregators" such as cooperatives to insure groups rather than single farmers, creating premium-sharing arrangements between farmers and agribusinesses, selling through local businesses that are frequented by the farmers, and paying claims immediately using mobile phones." (World Bank, 2014, p.126)

Linking insurance with other products: there is little evidence to support linking index-based insurance with other financial products such as loans, to increase take-up.

Also see: Lessons in extension and outreach of index-based livestock insurance in Wajir, Kenya.

Making insurance more affordable

Governments are working with the private sector to subsidise programmes and create cheaper premiums (e.g. Mexican Catastrophe Climate Contingency Insurance Program; India's Weather Based Crop Insurance Scheme). However, these subsidies can create tensions in the market.

An alternative is to insure the lenders: meso-level insurance can be offered to agricultural lenders e.g. India's National Agricultural Insurance Scheme.

Further information on using subsidies can be found in Using Subsidies for Inclusive Insurance: Lessons from agriculture and health

The World Food Programme collaborates with Oxfam America and Swiss Re on the 'R4 Rural Resilience Initiative' to provide weather-indexed insurance to rural communities. Farmers are able to pay for their premiums by working on Insurance for Assets schemes.

Risk profiling and data on risks

Developing country disaster risk is more expensive compared to developed countries due to the uncertainty about risk profiles, caused by lack of data, modelling tools and forecasting models.

At sovereign level, high quality and trustworthy catastrophe modelling needs to be in place for market-based insurance, so that investors will trust the risk analysis. There may be less commercial interest in developing and investing in new models if only one public monopoly catastrophe insurer is to be established in a territory (GFDRR, 2014, p.56). Catastrophe modelling is now based on 'probabilistic' risk (forward forecasting rather than using historical data to estimate expected loss).

The World Bank, GFDRR and DFID launched a Challenge Fund in 2015 to address challenges to accessing and using available risk information for decision making. This has funded 15 projects, which address issues such as data gaps/modelling, how to communicate complex and uncertain information, and how to support decision-making using open source tools.

Constraints to expansion of African Risk Capacity (a pooled insurance mechanism)

ARC launched its first products in 2014 and made pay-outs to Senegal, Niger and Mauritania in early 2015. These pay-outs preceded the World Food Programme's Sahel Appeal. There is potential for governments to use these payouts to finance rapid scale-up of social protection measures. (OPM, 2016)

ARC now covers seven countries. DFID's first annual review in 2015 was positive but suggested that participating countries needed more technical support, especially with regards to Africa Risk View (ARV)[2]. ARV is customised by each country and developed every year to improve quality of data and accuracy of modelling. ARC is broader than an insurance mechanism and is also concerned with improving capacity to quantify different risks and cost implications.

DFID is tackling three main challenges to building a pipeline for ARC expansion:

1. Capacity – the process to become a member of ARC is fairly time-consuming and labour-intensive since it requires countries to show an understanding of Africa Risk View and draft a contingency plan in order to qualify (to receive a 'Certificate of Good Standing'). DFID is planning to offer advisory services to assist governments through a disaster risk financing technical assistance facility (later in 2016). This could also respond to demands from beneficiary governments for building in social protection financing.
2. Affordability – even with supporting capital, premiums are not insubstantial and governments need to budget accordingly and see evidence of benefits (e.g. fast payouts within weeks, with estimated VfM ratio of 4:1 compared to late response).

[2] ARV is a model that uses rainfall estimates to monitor crop development during a planting season, with insurance payouts triggered at harvest time if rains are poor.

There could be options to offer insurance products for rarer, 1 in 10 year events, rather than 1 in 5 year events, to make it more affordable.

3. Single product – as only drought cover is offered, this limits demand, ARC is looking to expand to covering tropical cyclones, floods and also non-natural disasters e.g. epidemics.

(Source: Nicola Jenns, DFID)

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4. DFID'S FUTURE DIRECTION AND UK COMMITMENTS ON RISK FINANCING

This section looks at how DFID will be supporting UK commitments to risk financing.

UK commitments

- The UK has committed to the G7 Climate Risk Insurance Initiative (2015), which aims to assist up to **400 million** additional poor people with access to **climate risk insurance** by 2020
- **Commonwealth Heads of Government commitment: Aim to triple the amount of disaster risk insurance cover to $1 billion over the next five years**
  - establish Disaster Risk Financing and Advisory facility
  - financial support to expand the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI)

DFID's future direction

- To meet these commitments, DFID is planning to work in partnership with other UK government departments, the Prosperity Fund and external international players e.g. multi-lateral development banks
- DFID is currently providing support to the African Risk Capacity Fund (ARC) - a parametric (index-based) weather risk insurance pool that will provide participating African countries with predictable, quick-disbursing funds with which to implement pre-defined contingency response plans in the case of a drought
- DFID funding: £130m+ programmes committed (incl. ARC expansion); £500m+ programmes planned
- DFID is supporting the Insurance Development Forum, a global initiative launched in 2015
- DFID is funding research into insurance as a risk management tool as a part of the Humanitarian Innovation and Evidence Programme
- In the pipeline for DFID: funding earmarked for Disaster Risk Insurance, including a Disaster Risk Finance Facility and support to the development of a market for private sector disaster risk insurance in developing countries.

See: DFID January 2016 internal Private Sector Department presentation [or similar external link]

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5. TAKE HOME MESSAGES ON RISK FINANCING

1	Risk financing and financial preparedness are essential to form a coherent approach to managing risk (and promoting resilience), and to link humanitarian relief, social protection and development programming.
2	Different models of risk financing can be applied at different scales to achieve the most cost-effective response ('risk layering').
3	Preconditions for take-up of micro-insurance may include overcoming regulatory or trust issues, effective marketing, offering group risk-sharing, and providing subsidies in the absence of a self-sustaining market.
4	'Crisis modifiers' can be used to build in contingency financing and flexibility of programmes to respond to disasters.
5	Sovereign risk pools such as ARC show promise for infrequent but severe events, and could be used to scale up social protection schemes.

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Adverse selection – higher risk clients are more likely to purchase insurance, resulting in higher risk pool and higher premiums, pushing lower risk clients out of the market

Basis risk – risk of events that produce significant losses but no pay-out from index-based insurance

Catastrophe Bond - A high-yielding, insurance-linked security providing for payment of interest and/or principal to be suspended or cancelled in the event of a specified catastrophe, such as an earthquake of a certain magnitude within a predefined geographical area. (GFDRR/World Bank, 2012)

Early Warning System - The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organisations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss (UNISDR)

Exposure - assessment of the magnitude and frequency of shocks or the degree of stress as well as the location, attributes and values of assets that are important to communities.

Hazard - The likelihood, probability, or chance of a potentially destructive phenomenon.

Impact - An evaluation of what might happen to people and assets from a single event.

Index-based or parametric insurance - A form of insurance that makes indemnity payments based not on an assessment of the policyholder's individual loss, but rather on measures of a parametric index (e.g. weather or geological observation such as rainfall, Richter scale reading) that is assumed to proxy actual losses. (GFDRR/World Bank, 2012)

Moral hazard – Individuals become less incentivised to alter behaviour or invest in risk reduction measures due to feeling secure

Multi-Hazard Risk Assessment – holistic approach to risk management which involves considering multiple hazards faced by vulnerable people or systems and/or their capacities to cope with shocks

Reinsurance – insurance taken out by an insurance company.

Risk layering - The process of separating risk into tiers that allow for more efficient financing and management of risks. (GFDRR/World Bank, 2012)

Risk management - "The systematic approach and practice of managing uncertainty to minimize potential harm and loss." (UNISDR, 2009)

Risk retention – one party retains financial responsibility for loss in the event of a shock. Governments typically hold risk through government reserves, contingency funds, contingent credits and loans.

Risk transfer – the burden for financial loss or responsibility is transferred to another party e.g. international donors (aid) or market-based mechanisms including insurance and securities such as catastrophe bonds.

Triggers - Trigger points are key changes in the indicators that make up the early warning system. For the system to work swiftly, these triggers for action need to be agreed in advance (IFRC, 2014)

Vulnerability - The likelihood that assets will be damaged or destroyed when exposed to a hazard event.

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RECOMMENDED RESOURCES

Overview of resources

Where can I find a comprehensive guide to disaster risk reduction?	Where can I find a simple overview of disaster risk financing?	Where can I find detailed guidance on mainstreaming risk?
Where can I find evidence on barriers to microinsurance adoption?	How is the WB approaching disaster risk finance from a practical perspective?	

The five resources that follow have been chosen on the basis of accessibility in terms of presentation and content, their relevance to understanding resilience and recommendations from DFID staff. For each resource we also include links to further reading/resources. Click on the links below to go directly to the resource or read our overviews first.

- Disaster Risk Reduction – Good Practice Review **[**overview**]**
- Planning for Disasters - And the economics of disaster risk financing and insurance **[**overview**]**
- World Development Report 2014: Risk and Opportunity – Managing Risk for Development **[**overview**]**
- Overcoming Barriers to Microinsurance Adoption: Evidence From the Field **[**overview**]**
- Financial protection against natural disasters: An operational framework for disaster risk financing and insurance **[**overview**]**

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Disaster Risk Reduction – Good Practice Review

RECOMMENDED BY:

TIM WAITES

DFID SENIOR LIVELIHOODS AND DISASTER RESILIENCE ADVISER

How the material could be used

Deals with many aspects of DRR, including Institutionalising DRR (Chapter 2), Project Planning (Chapter 3), Livelihoods and DRR (Chapter 9), Financial Mechanisms and Services for Risk Reduction (Chapter 12) and Managing Urban Risk (Chapter 13).

Why this is a good resource

Comprehensive and accessible online and PDF resource synthesising other materials under clear headings.

Length and level of detail

Although this is a lengthy resource (18 chapters), readers can quickly navigate to relevant topic(s) of interest using the chapter navigation pane on the online resource. No prior knowledge required.

How to reference

Twigg, J. 2015. Disaster Risk Reduction, Good Practice Review 9, Humanitarian Policy Group, ODI. Available online at: http://goodpracticereview.org/wp-content/uploads/2015/10/GPR-9-web-string-1.pdf

Links to further material

- A guide to mainstreaming disaster risk reduction and climate change adaptation (IFRC)
- Toward Resilience: A Guide to Disaster Risk Reduction and Climate Change Adaptation

Was this resource useful?

Please contact us with comments on how you have used this resource or if you have further suggestions/questions. Please rate this material.

Keywords [tags]

DRR, disaster risk reduction, institutionalising DRR, project planning, mainstreaming DRR

Planning for Disasters - And the economics of disaster risk financing and insurance

How the material could be used

This presentation explains why financial protection is a key pillar of disaster risk management. It can be used as a simple overview for those that are unfamiliar with the subject.

Why this is a good resource

Clear and easy to understand – this is a complementary presentation by Daniel Clarke and Stefan Dercon to 'Dull Disasters' (book to be published in May 2016, an internal DFID paper of the same name is also available).

Length and level of detail

This is a 23-page presentation and is suitable as a quick introductory read.

How to reference

Clarke, D. and Dercon, S. 2015. Planning for Disasters, and the economics of disaster risk financing and insurance, 2015 Disaster Risk Financing and Insurance Workshop.

Links to further material

- Dull Disasters – book/DFID internal paper
- DFID Shock-Responsive Social Protection Systems Research: Literature Review [Chapter 5.4 Financial mechanisms for managing disaster risk]

Was this resource useful?

Please contact us with comments on how you have used this resource or if you have further suggestions/questions. Please rate this material. 👍

Keywords [tags]

financial protection, disaster risk financing, insurance, ex-ante financial planning

World Development Report 2014: Risk and Opportunity – Managing Risk for Development

RECOMMENDED BY:

TIM CONWAY

SENIOR SOCIAL DEVELOPMENT ADVISER, DFID ETHIOPIA, DFID CLIMATE & ENVIRONMENT DEPARTMENT, AND MANY OTHERS!

How the material could be used

Offers guidance on mainstreaming risk management into development agenda, and for helping countries and communities strengthen their own risk management systems. Explains the fundamentals of risk management.

Why this is a good resource

Useful introductory read, synthesising relevant information on risk in a single resource. Focuses on process of risk management, seeing risk as an opportunity as well as a burden. Considers roles of different actors/systems - households, communities, enterprises, financial systems, international community etc. in managing risk and creating resilience.

Length and level of detail

A lengthy and detailed resource (over 300 pages).

How to reference

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

Links to further material

- Understanding Risk: Producing Actionable Information, Proceedings from the 2014 Understanding Risk Forum
- Understanding Risk in an Evolving World: Emerging Best Practices in Natural Disaster Risk Assessment (and shorter policy brief)

Was this resource useful?

Please contact us with comments on how you have used this resource or if you have further suggestions/questions. Please rate this material.

Keywords [tags]

risk management, risk assessment, fundamental principles of risk management

Overcoming Barriers to Microinsurance Adoption: Evidence From the Field

RECOMMENDED BY:

PETER D'SOUZA

DFID ECONOMIST

How the material could be used
Possible source of evidence on microinsurance for writing Business Cases.

Why this is a good resource
Good overview of academic literature on microinsurance adoption in emerging markets. Main conclusions:

- Weak evidence base to support poverty reduction impacts of life or health microinsurance.
- Robust evidence that agricultural index insurance can encourage farmers to plant riskier, higher-yield crops.
- Mobile payment infrastructure could facilitate provision of insurance and lower transaction costs.
- Financial education often fails in practice.
- Private insurance providers tend to be more creative than governments in designing products.

Length and level of detail
Academic paper, 21 pages long, accessible to non-experts.

Strength of evidence: Secondary review, non-systematic (emphasis on randomised control trials)

How to reference
Cole, S. 2015. Overcoming Barriers to Microinsurance Adoption: Evidence from the Field. *The Geneva Papers on Risk and Insurance-Issues and Practice, 40*(4), pp.720-740.

Links to further material
- The determinants of microinsurance demand (Eling et al., 2013)
- J-PAL 2016 Evaluation of Weather Index Insurance
- Agricultural Decisions after Relaxing Credit and Risk Constraints
- The Geneva Papers: Special Issue on Microinsurance (Vol. 39, Issue 2)

Was this resource useful?
Please contact us with comments on how you have used this resource or if you have further suggestions/questions. Please rate this material.

Keywords [tags]
microinsurance, weather index insurance, public-private partnerships, insurance markets, transaction costs, health insurance, life insurance, financial literacy

Financial protection against natural disasters: An operational framework for disaster risk financing and insurance

RECOMMENDED BY:

DANIEL CLARKE

SENIOR DISASTER RISK FINANCING AND INSURANCE (DRFI) SPECIALIST, WORLD BANK

How the material could be used

May be useful for considering strategies and action plans to support decision makers looking at disaster risk financing and insurance – see Part 2, which is about operationalising existing knowledge and experience. See Annex V (p.78) for a list of DRFI initiatives undertaken around the world.

Why this is a good resource

This paper shows how the World Bank Group now approaches disaster risk finance from a practical perspective and reflects how their policy and technical dialogue has developed. Good overview of the tools available and evaluation of progress made on financial protection over the last decade.

Length and level of detail

This paper is 88 pages long and looks at the topic in depth but it is easy to navigate to topics of interest from the contents page.

How to reference

GFDRR/World Bank. 2014. *Financial protection against natural disasters: An operational framework for disaster risk financing and insurance*, Washington, D.C.: The World Bank Group

Links to further material

- GFDRR Disaster Risk Financing and Insurance Program
- Innovation in Disaster Risk Financing for Developing Countries: Public and Private Contributions
- Catastrophe Risk Financing in Developing Countries

Was this resource useful?

Please contact us with comments on how you have used this resource or if you have further suggestions/questions. Please rate this material.

Keywords [tags]

financial protection, disaster risk financing, insurance, ex-ante financial planning

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