Disaster Risk Financing Analytics:
New tools to support decision-making for emergency response financing

Disaster Risk Financing & Insurance Program

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Introduction

Disaster Risk Financing

Financial protection and DRM

• **Pillar 1: Risk** • **Identification**	Improved Identification and understanding of disaster risks through building capacity for assessments and analysis
• **Pillar 2: Risk** • **Reduction**	Avoided creation of new risks and reduced risks in society through greater disaster risk consideration in policy and investment
• **Pillar 3:** • **Preparedness**	Improved capacity to manage crisis through developing forecasting and disaster management capacities
• **Pillar 4:** • **Financial** **Protection**	Increased Financial resilience of governments, private sector and households through financial protection strategies
• **Pillar 5: Resilient** • **Recovery**	Quicker, more resilient recovery through support for reconstruction planning

◎ Disaster Risk Finance is one component of a comprehensive approach to risk management

◎ Financial protection complements, but does not replace, risk reduction and resilience measures

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Disaster Risk Finance

- DRF development objective: "Financial planning to protect people against climate shocks, disasters, and other crises is a core priority for all countries."

- DRF provides the countries with Analytical & Advisory Services, Financial Services and Convening Services on financial risk management of disasters, climate shocks and other crises.

Sovereign Risk Finance	Agricultural insurance	Property catastrophe insurance	Crisis risk finance

Analytics for Financial Risk Management

Knowledge Management and Policy Dialogue

Disaster Risk Finance Principles

Timeliness of Funding

No One Financial Instrument Can Address All Risks

How **money reaches beneficiaries is as important** as where it comes from

To make sound financial decisions **you need to have the right information**

WHAT IS DISASTER RISK FINANCE?
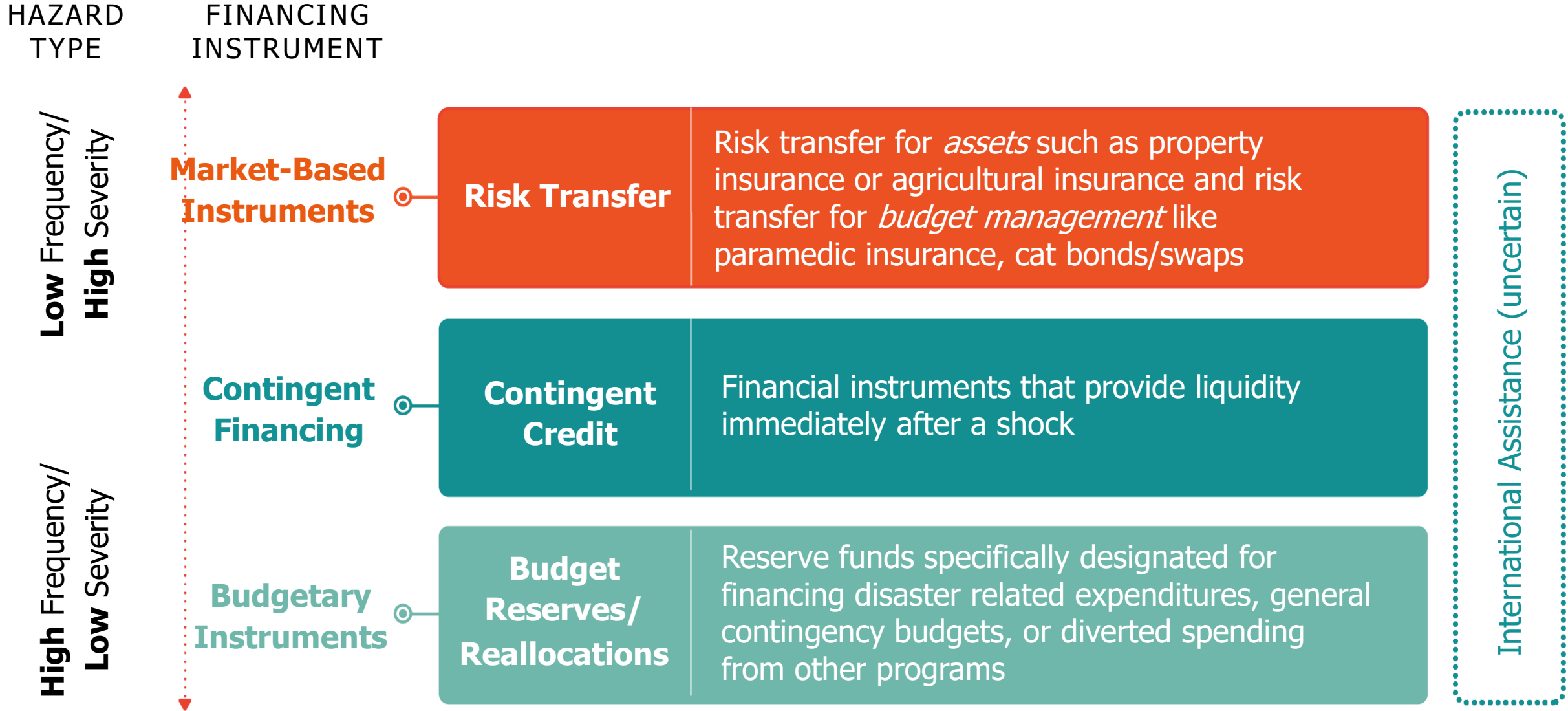
Protecting livelihoods and development

Increasing the Financial Resilience of the national and subnational governments, businesses, households, farmers, and the most vulnerable against natural disasters by implementing sustainable and cost-effective financial protection policies and operations.

Risk layering instruments

HAZARD TYPE

FINANCING INSTRUMENT

Low Frequency/**High** Severity

Market-Based Instruments

Risk Transfer — Risk transfer for *assets* such as property insurance or agricultural insurance and risk transfer for *budget management* like paramedic insurance, cat bonds/swaps

Contingent Financing

Contingent Credit — Financial instruments that provide liquidity immediately after a shock

High Frequency/**Low** Severity

Budgetary Instruments

Budget Reserves/Reallocations — Reserve funds specifically designated for financing disaster related expenditures, general contingency budgets, or diverted spending from other programs

International Assistance (uncertain)

THREE-TIERED RISK LAYERING STRATEGY FOR GOVERNMENT

Why DRF Analytics?

Interpret data & understand fiscal/financial exposure

Appraise, evaluate & monitor DRF decisions (evidence-base and value-for-money)

Transparent & open decision-making process

Communication tool to gain common understanding amongst different stakeholders

DRF ANALYTICS EMPOWERS STAKEHOLDERS TO TAKE RISK-INFORMED FINANCIAL PROTECTION DECISIONS, BASED ON SOUND FINANCIAL AND ECONOMIC ANALYSES

Project overview

EU-WB/GFDRR Global Partnership on

Disaster Risk Financing Analytics

Project background

- EU funded (DG DEVCO)

- Grant amount: € 6 million

- Established: December 2015

- Duration: 4 + 1 years

- Grant end date: 31 December 2020

EU-WB/GFDRR GLOBAL PARTNERSHIP ON DISASTER RISK FINANCING ANALYTICS

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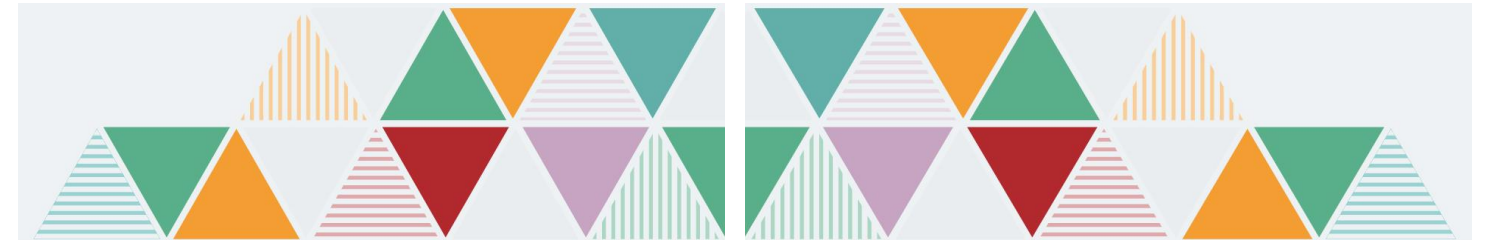
Objectives

Core objective: to increase financial resilience of countries against natural disasters

The DRF analytics project helps governments

Understand their financial risk related to natural hazard	Employ efficient financial/actuarial analysis in the development of DRF strategies	Improve their financial capacity to meet financial needs following natural disasters	Monitor and evaluate DRF strategies
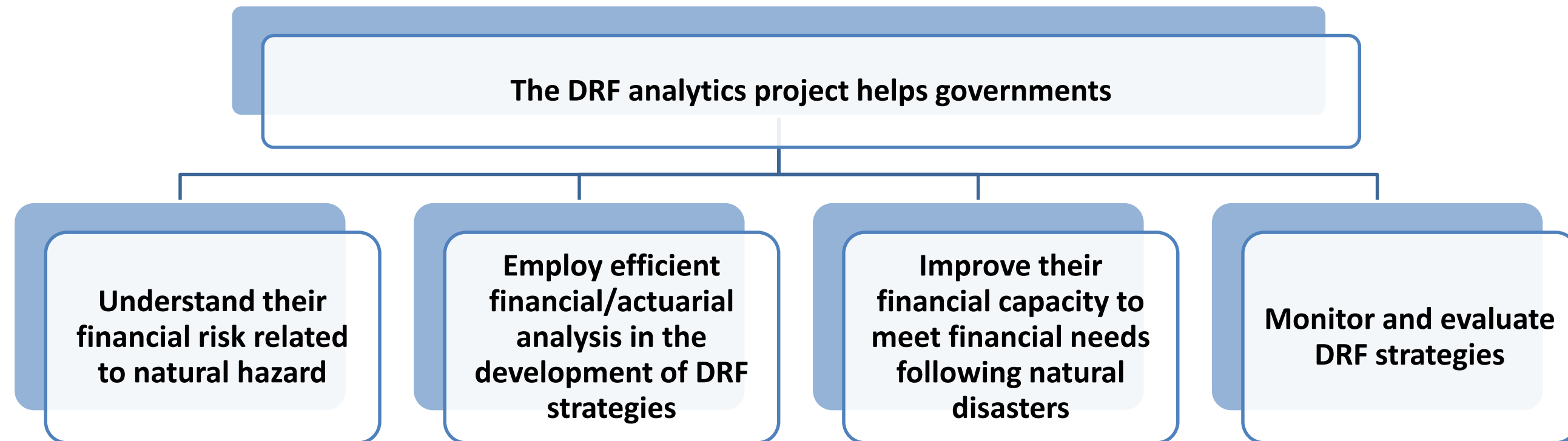
Components

Country-specific Analytics
- Pilot countries selected in partnership with EC
- Financial disaster risk assessment
- Review of the current financial protection strategy against disasters

Core/parent Analytics Tools
- Suite of generic, publicly available "parent" DRF Analytics tools for decision making based on lessons learned from pilot countries

Knowledge Management
- Target policy-makers, donors and practitioners
- Partner with universities/ professional associations
- Online training platform, outreach materials, 4 regional workshops

M&E Framework for DRF strategies
- Monitoring and Evaluation (M&E) Framework to assess the impact of DRF programs
- Operational guidance note to implement M&E Framework

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Key achievements so far

Emergency funding assessment tool
(Tool #1)

Face-to-face DRF Analytics Training

Philippines

Risk financing evaluation & optimization tool
(Tool #2)

DRF Analytics e-learning modules

Tailored analytics tools for pilot countries

Financing crisis response tool
(Tool #3)

Executive Education Programme
(focus day on DRF Analytics)

Pakistan

Suite of generic analytics tools
(on critical, demand-driven applications)

Strong engagements in non-pilot countries
(Senegal, Morocco, Vietnam, Tunisia)

DRF Analytics Flyer & Brochure

Operational Guide for M&E of DRF Strategies

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Outline of Generic Analytics Tools

Taking informed decisions based on sound financial analysis

Context

Crisis & Disaster losses are rising

- Direct economic losses from natural disasters are in excess of **US$300 billion** a year. **Since 2000, 3.5 billion people** have been impacted. Disaster losses are **rising** as a result of economic and demographic growths and rapid and uncontrolled urbanization

- 2018: more than **113 million** people across 53 countries experienced **acute hunger** requiring urgent food, nutrition and livelihoods assistance

Disasters disproportionally impact the poorest

- Developing countries are disproportionality impacted by disasters. Average annual damage over 1980 - 2015 was 1.5% of GDP in developing countries, compared to 0.3% of GDP in developed countries. The poor are the most impacted, considering limited capacity to absorb shocks

Acting before disasters strike is our responsibility

- **Evidence on the effectiveness of early action** has led to a growing recognition of the importance of incorporating anticipation into existing emergency models (e.g. IFRC, FAO, WFP, START Network, World Bank Famine Action Mechanism, OCHA/CERF). **Effective use of early warning information and the establishment of sound triggers** allow acting well in advance compared to standard humanitarian response. Timely agriculture and food security interventions have the potential to reduce the number of people in need of food assistance after crises strike/reach their peak

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Why Generic Tools

- The three core tools have been created to help developing country governments to:
    - Understand their financial exposure to natural disasters
    - Employ efficient financial/actuarial analysis in the development of disaster risk financing strategies
    - Benchmark various risk financing instruments, and challenge role and efficiency of insurance
    - Improve capacity to meet financial needs immediately following natural disasters
    - Develop the ability to monitor and evaluate DRF strategies

Leveraging technology to better inform decision-making in developing countries on financial risk management

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Tools Overview

Project Timeline

Emergency funding assessment tool
(Tool #1)

Risk financing evaluation & optimization tool
(Tool #2)

Financing crisis response tool
(Tool #3)

Financial risk modelling:
What could be happening ?

How to anticipate and best respond financially?

How to model and design social protection schemes?

- **Y1: Scoping & Awareness Raising**
  (priority countries identification, clients consultations, activities prioritization)

- **Y2: Design & Development**
  (demand consolidation, problem specification, DRF tools and solutions methodology design)

- **Y3: Development, QA & Risk Mitigation**
  (balance between global/in-country & generic/customized solutions, anticipating risks, managing expectations)

- **Y4: Implementation & Synergies**
  (focus on meeting broad demand, leveraging broader DRF/DRM agenda, strategic partnerships)

- **Y5: Impact & Outreach**
  (mostly remotely - generic tools deployment, applications, communication, M&E)

In partnership with: Government Actuary's Department

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Tools Overview

1. Emergency Funding Assessment Tool	2. Risk Financing Evaluation Tool	3. Financing Crisis Response Tool
1. Use historical event data, relating to disaster losses, to **estimate the potential financial response** required following a natural disaster. 2. **Quantify the resulting funding gap** based on the assumed available funding in the country of interest. 3. **Understand the uncertainty and variability** of the historical event data itself.	1. **Compare the funding available and funding gap** under various DRF strategies. 2. **Compare the cost-effectiveness** of various DRF strategies using an economic opportunity cost approach. 3. **Evaluate the impact of economic and financial assumptions** on the cost-effectiveness of various DRF strategies.	1. Use historical event data to **estimate the number of people who will be affected** by natural disasters. 2. **Estimate the financial cost** associated with supporting affected people through a scalable safety net program. 3. Evaluate and **compare the cost of alternative policy decisions** for the safety net programs.

Necessary Capacity Development
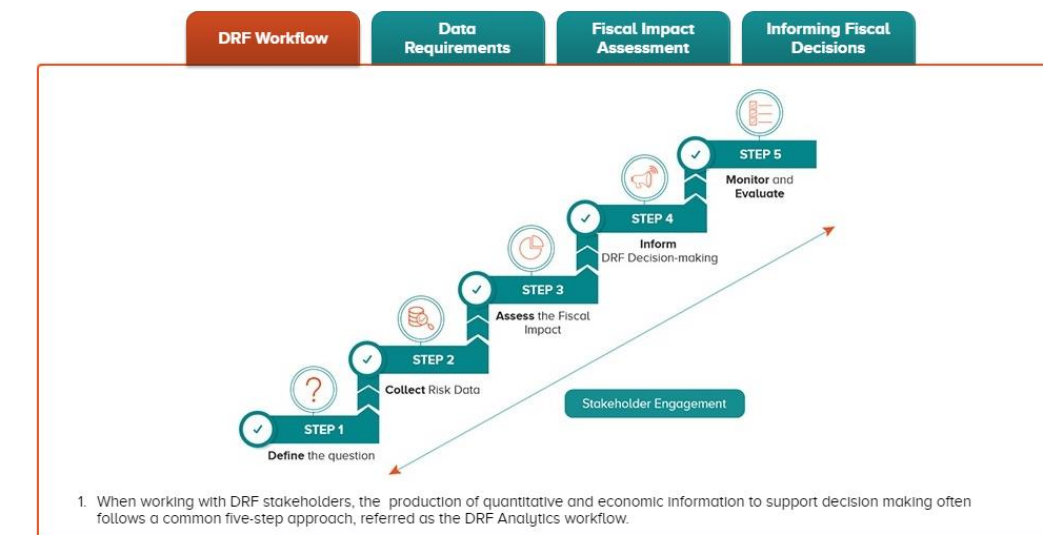
*Achieving significant completion rates since implementation on **World Bank internal Open Learning Center** since March 2020 (approximately 10/week since then)*

Three Core Analytics Tools

Taking informed decisions based on sound financial analysis

Tool 1: Emergency Funding Assessment Tool

- Through the tool the user can investigate:

  o The expected size of loss for different sized perils;

  o The funding gap for different sized perils; and

  o The probability of the available budget being insufficient.

Tool 1: Emergency Funding Assessment Tool
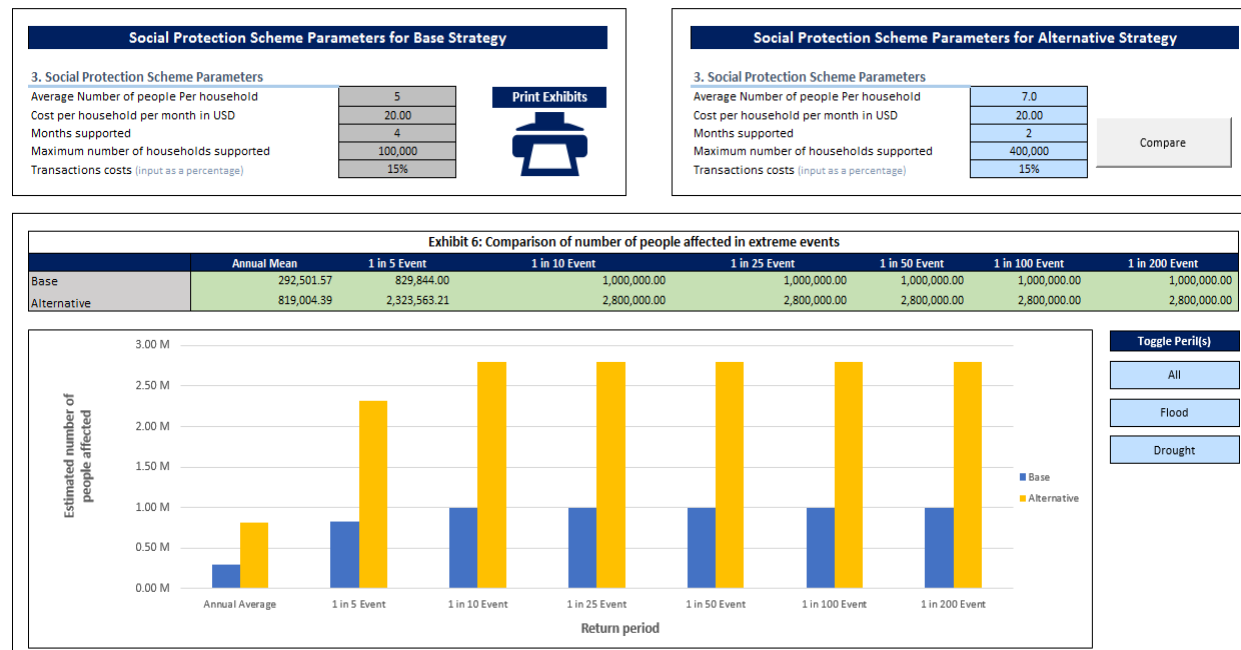
Original Excel version (2019)

Rshiny version (2020)

Tool 2: Risk Financing Strategy Evaluation / Optimization Tool

- The purpose of this tool is to help countries to:

  o Estimate the cost of risk financing instruments;

  o Compare the cost-effectiveness of various DRF strategies; and

  o Optimize the appropriate mix of risk transfer and risk retention instruments for a given contingent liability (a potential liability that may occur depending on the outcome of an uncertain future event).

Tool 3: Financing Crisis Response (& Social Protection) Tool

- Through the tool the user can investigate:

    o The number of people affected for different sized perils

    o The estimated cost of introducing a Social Protection Scheme (SPS)

    o How long would it take for the SPS budget to run out?

    o How many people are supported by an SPS?

    o How likely is the number of affected to exceed the SPS's safety net?

    o How does the chosen SPS compare to an alternative SPS?

Tool 3: Financing Crisis Response (& Social Protection) Tool

Estimated cost of different Social Protection Schemes in "Very high risk middle income country, exposed to storms, floods, and earthquakes"
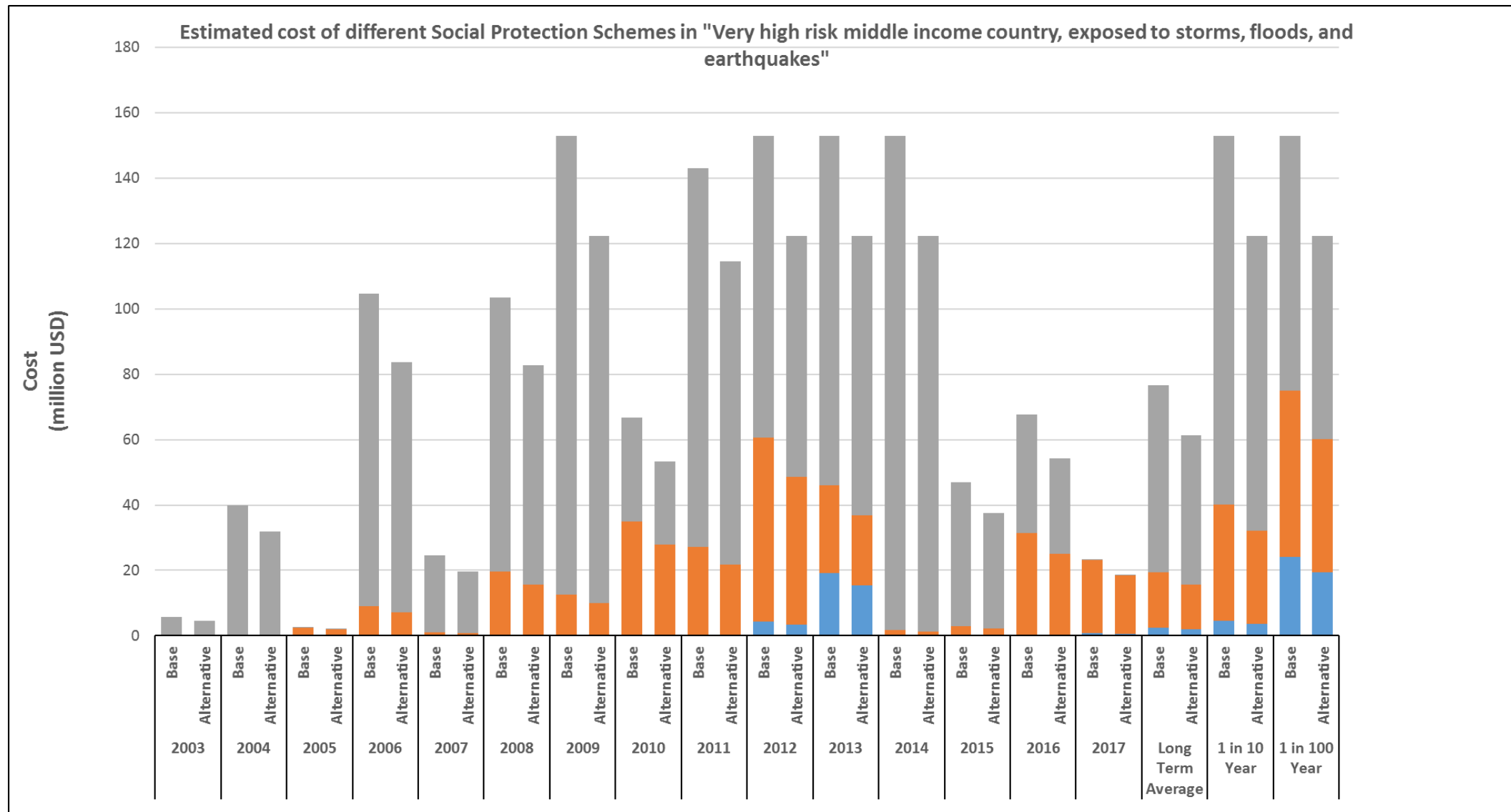
Tool 3: Financing Crisis Response (& Social Protection) Tool

Average number of people per household
5

Cost per household per month in USD
50.00

Months supported
3

Transaction costs (input as a %)
2.0%

Maximum number of households supported
1,000,000

Cost of Safety Net
153,000,000

Estimated cost for Earthquakes, Floods & Storms in "Very high risk middle income country, exposed to storms, floods, and earthquakes"

Estimated Cost (million USD)

600
500
400
300
200
100
0

Long Term Average | 1 in 5 Year | 1 in 10 Year | 1 in 25 Year | 1 in 50 Year | 1 in 100 Year | Highest Historical Annual Loss (2013) | Most Recent Annual Loss (2017)

Return Period

Legend:
- People outside of safety net
- People within safety net
- Safety Net

Toggle Peril(s)
- All
- Earthquake
- Flood
- Storm

Show Confidence Intervals

The above graph shows the estimated annual cost across all filtered perils. A return period of 1 in 5 years is the estimated annual cost expected to happen once every 5 years, i.e. a 20% probability. Similarly, a 1 in 10 year is the estimated annual cost expected to happen once every 10 years, i.e. a 10% probability. If enabled, the error bars show the 95% confidence interval for each return period.

This exhibit shows the estimated annual cost across all filtered perils individually and also the sum of the perils (overall figure). As such the sum of the estimated costs of the individual perils at different return periods may differ to the associated overall figure.

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Summary

We developed these tools to help countries:
- Develop a **coordinated plan** for post-disaster action agreed in advance,
- Enable a fast, evidence-based **decision-making process**, and
- Arrange **pre-planned financing** to ensure plan can be implemented

Key lessons learned to date are:
- Necessity of **in-depth country engagement** to develop relevant, **demand-driven** analytics for informed decision-making and to manage expectations or **high reputational risk;**
- Difficulty to design generic core tools, given **diverse group of users** and pilot countries. Cross-country applications feedback highly valuable;
- Importance of **tailor-made capacity development** programmes to inform design and accompany development and delivery phases; and
- Importance of **M&E framework**, as part of continuous analytics tools / financial instruments enhancement

Additional Generic Tools

Bridging the gap between latest technology and informed decision-making

Next Generation Drought Index: paving the way for more reliable drought insurance

- **Objective:** *More reliable drought response mechanisms through use of latest technology and based on developed markets experience (e.g. USDA/VanderSat)*

- **Led by Columbia University's International Research Institute (IRI)** *and supported by wide range of experts and partners (e.g. ESA, WFP, OCHA, ARC, START, GIIF)*

- **Supporting World Bank operations in Senegal and Mozambique** (pilot applications planned on being expanded to 5 countries in CY21)

- Supported by technical partnership with the **European Space Agency**'s Center for Earth Observation ESA/ESRIN
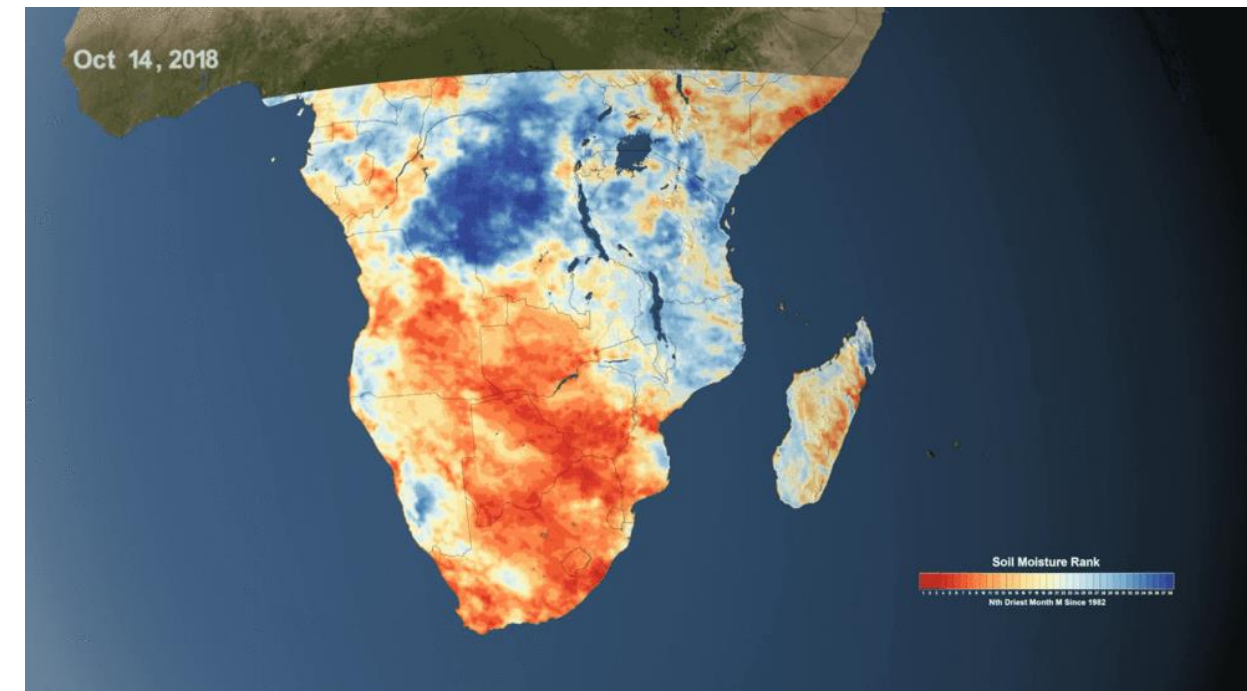
Exploring simple moisture-based drought indicators that leverage latest satellite technology, to complement (e.g. India) or supplement (e.g. Mozambique) DRF/DRM technical framework

Application: Supporting the development of scalable safety nets in Senegal

- **Objective:** *Better understanding drought severity and probability by leveraging latest satellite technology*

- **Results:** *full set of analytics tools: from risk evaluation to operational drought indicator (with improved historical performance), and drought risk financing strategy supporting the design of scalable safety nets for the most vulnerable smallholder farmers in Senegal*

1 Review and selection of safety net configuration(s)

2 How much would it have disbursed? Historical data review

Actuarial modelling from historical losses

Alternative to historical loss data: Virtual loss generation from satellite data
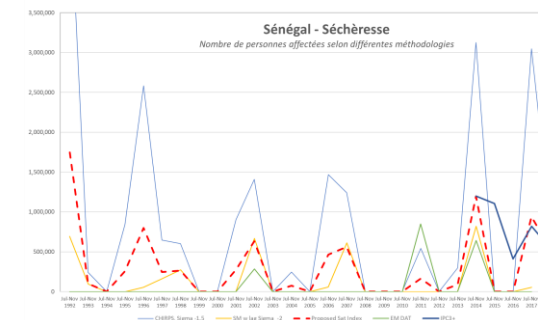
3 How much will/could it disburse? Contingent Liability
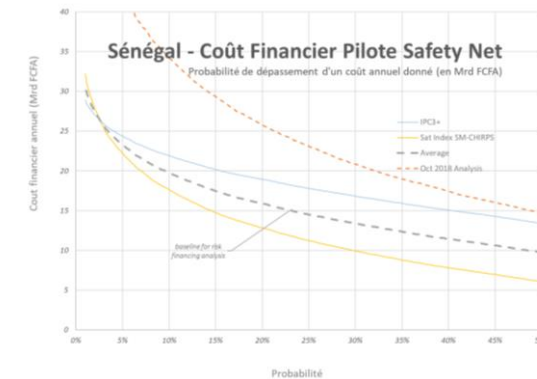
4 How much will/could it cost? Review of Various risk financing strategies
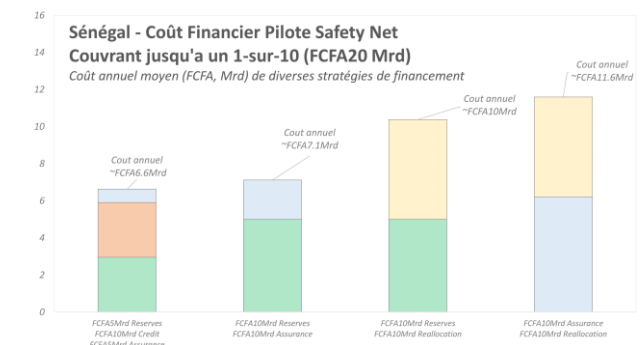
*Leveraging the full suite of Disaster Risk Finance Analytics tools*

Covid Crisis & Natural Disasters: Compound Risks

Objective: quantifying increased vulnerability to natural disasters from current covid crisis

The COVID-19 pandemic and mitigation measures put in place are driving major fiscal and macroeconomic impacts globally, particularly in lowest-income countries and those in debt distress.

An added complexity is how this triple health, economic and financial shock will interact with ongoing crises and natural disasters to come. Seasonal weather-related risks will continue – the predictable annual march of typhoon and hurricane seasons, drought and flooding, will make mitigation of the health shocks more difficult and exacerbate the impacts.

The DRF Analytics team is currently working with the OECD and the Venice School of Economics to develop and apply financial risk modelling frameworks for a number of priority countries (directly informing World Bank DRF engagements): Philippines, Kenya, Jamaica, Indonesia, Morocco, Tunisia, Sierra Leone. Preliminary results (e.g. impact on GDP, on key sectors, on most vulnerable) are expected in July 2020.
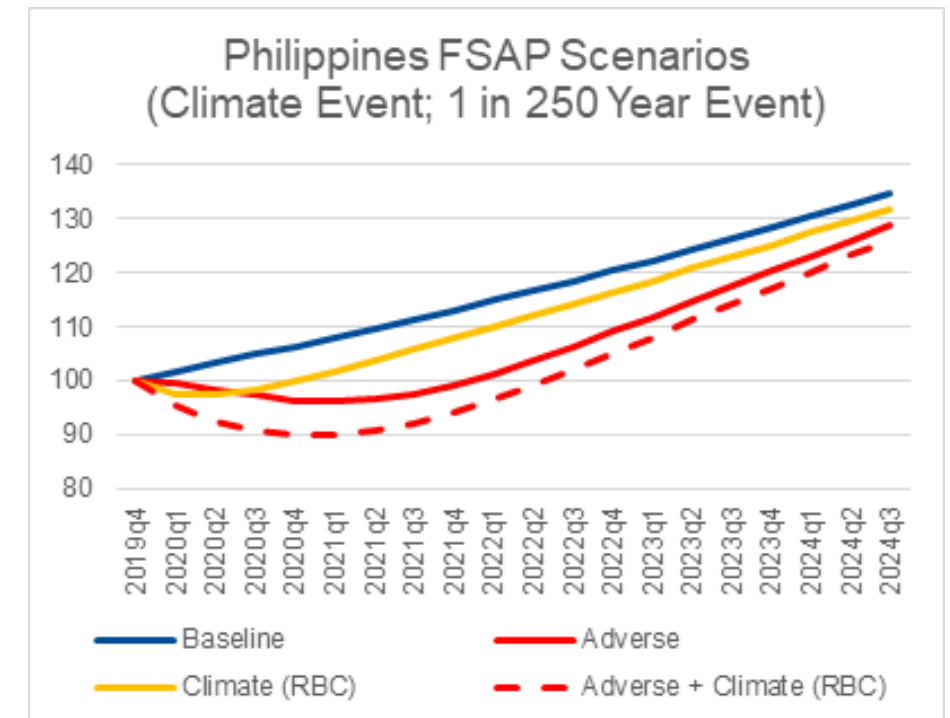
Example of preliminary analysis looking at compound effects of covid and climate risk on the financial sector in the Philippines

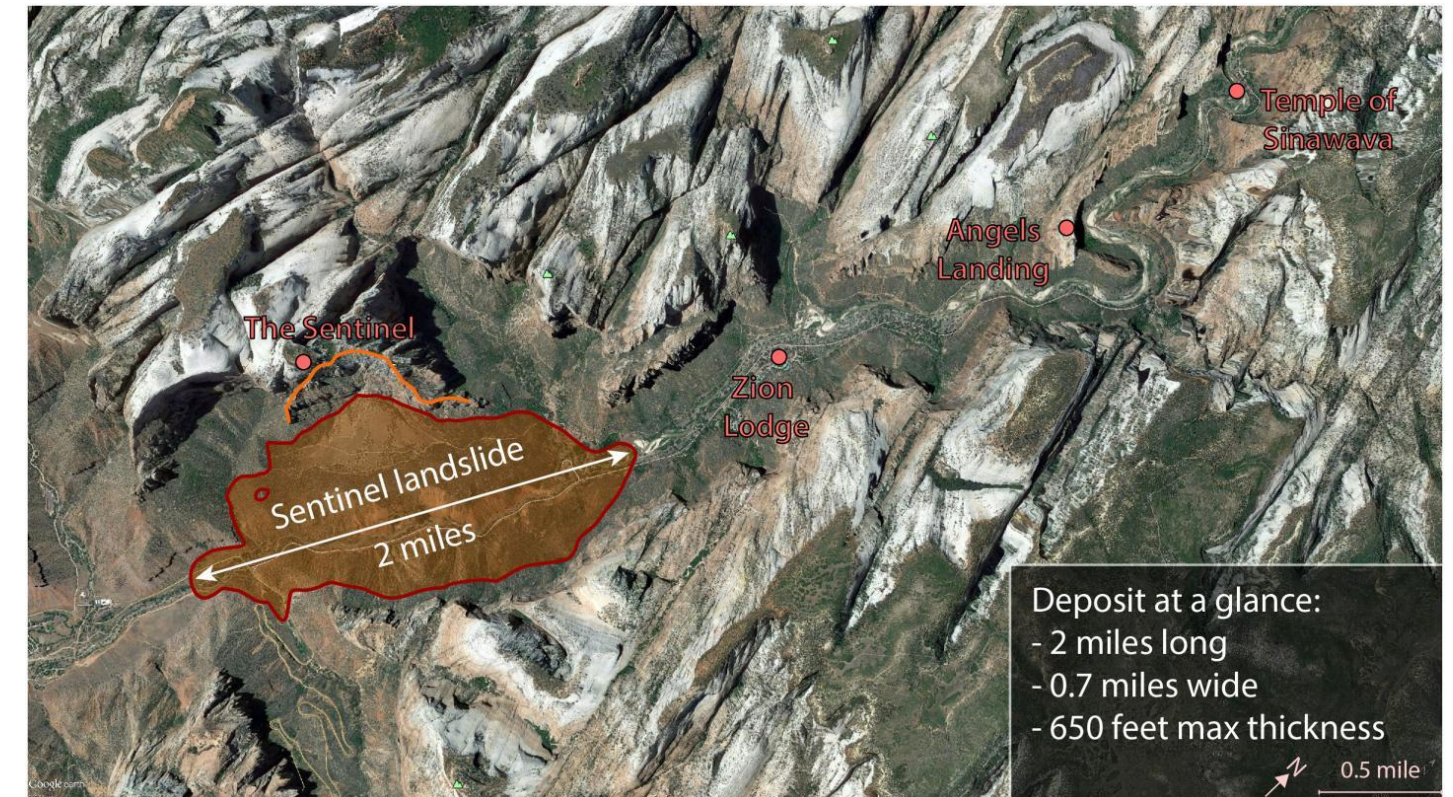# Quantifying devastating effects of Locust Swarms in 2020
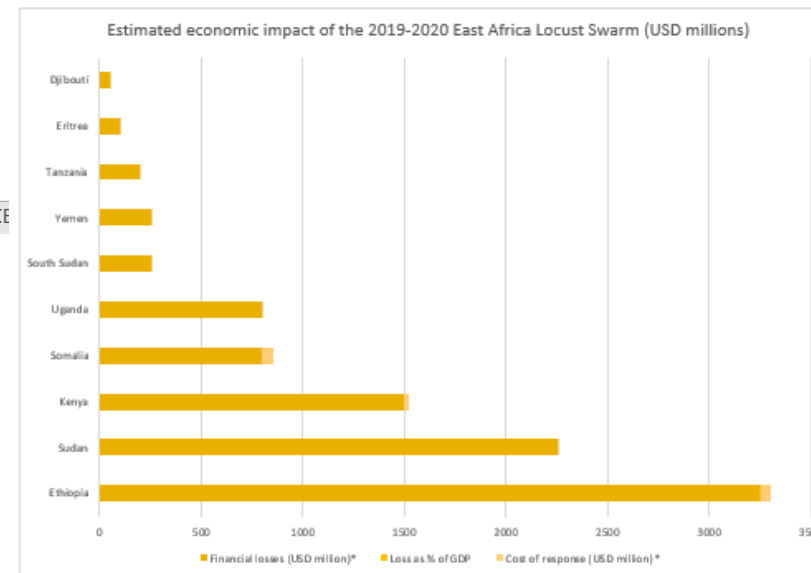
In partnership with FAO/Locust Monitoring team

Addressing flash floods and landslides

Objective: developing risk quantification and monitoring capability for a largely under-estimated peril type

Today, landslides account for more than 15% of total economic losses from natural disasters, whilst flash floods typically result in large loss of life because of the sudden onset of the event type.

The DRF Analytics team identified strong demand from pilot countries (including Sierra Leone) and initiated the development of risk monitoring capability for these specific peril types, through consultations with key technical partners on the topic (within the World Bank - GFDRR and Urban Resilience teams - and outside, with Strasbourg Earth Observatory, NASA, ESA, CNRS)

Temple of Sinawava

Angels Landing

The Sentinel

Zion Lodge

Sentinel landslide
2 miles

Deposit at a glance:
- 2 miles long
- 0.7 miles wide
- 650 feet max thickness

0.5 mile

Example of landslides monitoring using high-resolution satellite data

esa
European Space Agency

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Key Lessons Learnt to date

1. Necessity of **in-depth country engagement** to develop relevant, **demand-driven** analytics that can be used to inform decision-making *(see capacity building below)*, and to manage expectations or **high reputational risk**

2. Promising potential of **disruptive technologies** (*e.g. earth observation, online media, AI)* when specifically connected to concrete, short-term benefits, and within clients' capacity limits. Trade-off between **enabling and accessible** analytics

3. Difficulty to design generic core tools, given **diverse group of users** and pilot countries *(iterative development process required, and as well as customized versions).* Cross-country/applications feedback highly valuable

4. Importance of **tailor-made capacity development** programmes to inform design and accompany development and delivery

5. Importance of **M&E framework**, as part of continuous analytics tools / financial instruments enhancement and value-for-money monitoring

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Technical Partnerships

WB/GFDRR-EU DISASTER RISK FINANCING ANALYTICS PROJECT

J. Carlos Edo, Policy Officer, Disaster Risk Reduction DEVCO C.6, Jose-Carlos.EDO-MONFORT@ec.europa.eu

Antoine Bavandi, Senior DRF Specialist, Crisis & Disaster Risk Finance, abavandi@worldbank.org

Stephan Zimmermann, DRM Specialist, GFDRR, szimmermann3@worldbank.org