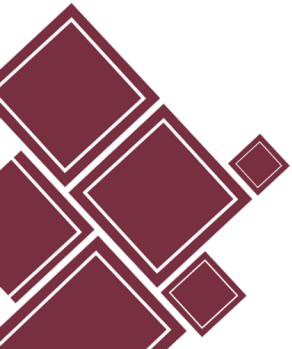
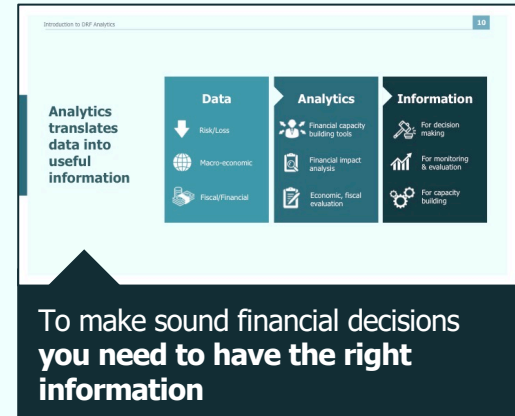
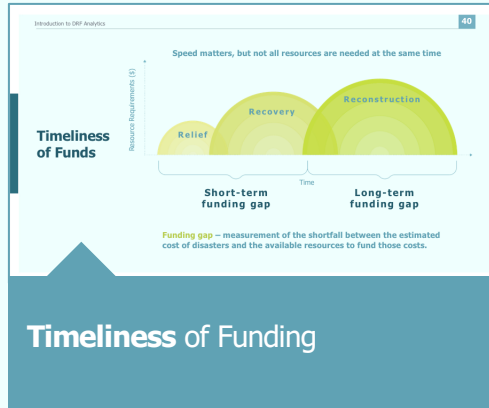


Disaster Risk Finance Analytics

Richard Poulter



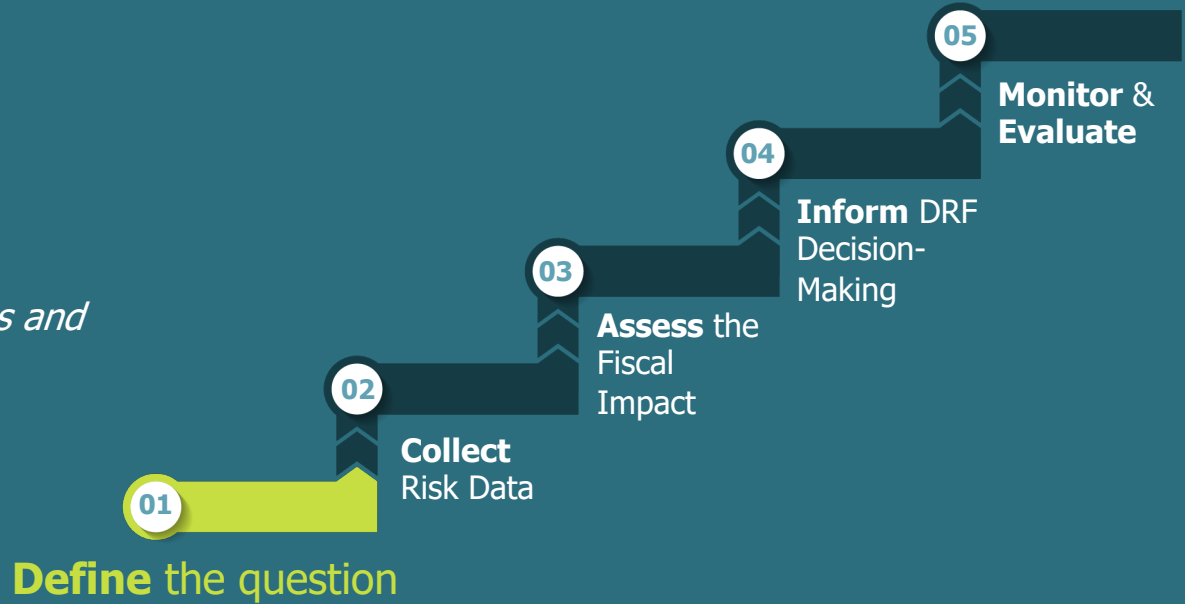
Remember Four Core Principles of DRF



MODULE 1

Fundamentals of DRF analytics

Basic concepts, DRF decisions and 5 step analytics workflow



DRF Decisions Require Quantitative Analytics

How do I estimate my fiscal exposure in the event of a disaster?

Should we set aside funds in a reserve fund, and how large should this reserve fund be?

Should we seek to establish a line of credit, which can immediately be drawn upon if a disaster were to occur?

How can we evaluate proposals for risk transfer products such as disaster insurance or catastrophe bonds?

What is the financial cost of scaling up an existing social protection program?

What is DRF Analytics?

Combines disaster risk information with financial methodologies and assumptions to support informed decision making

Bridges the gap between disaster risk data and risk-informed decision making

Standardized approach of proven statistical and economic methodologies to conduct financial analyses to support governments in fiscal decisions related to disaster risk

DRF Analytics empowers stakeholders to take risk-informed financial protection decisions, based on sound financial and economic analyses

Why is DRF Analytics important to financial decision makers?



Interpret data & understand fiscal exposure



Appraise, evaluate & monitor DRF decisions

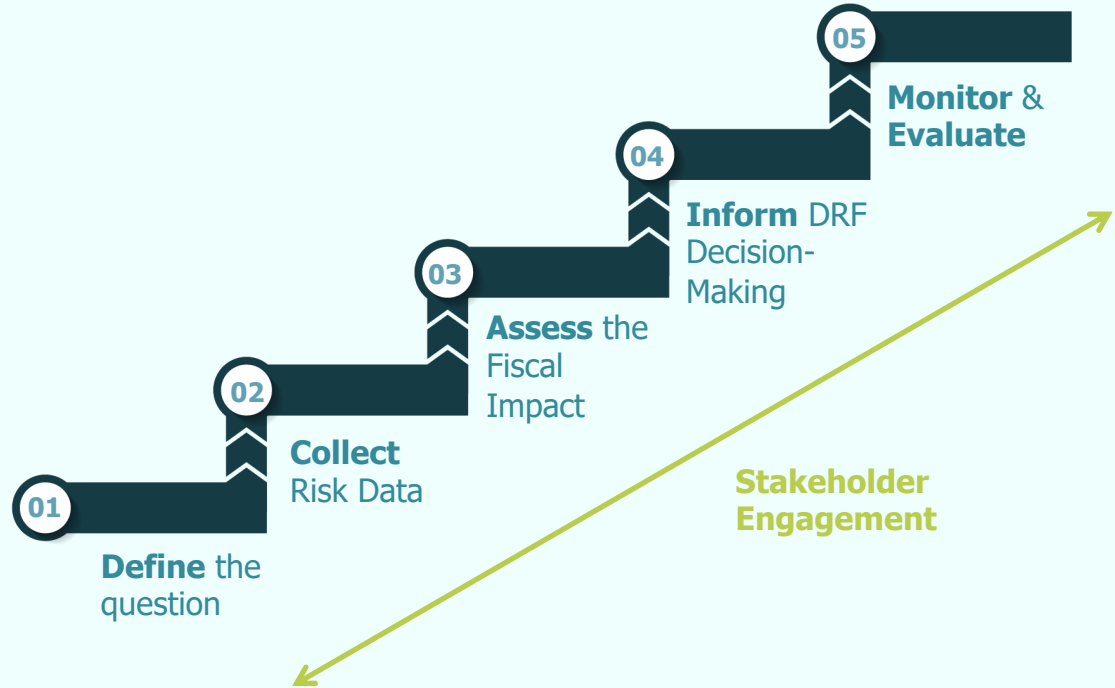


Transparent & open decision-making process



Communication tool to gain common understanding amongst different stakeholders

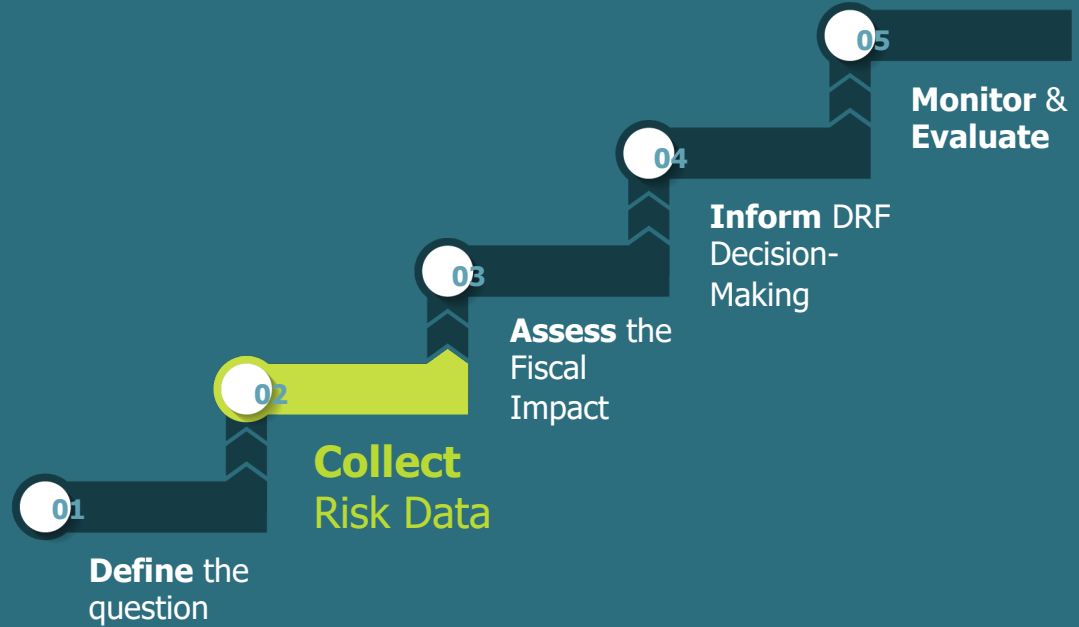
5-Step DRF Analytics Workflow



MODULE 2

Data Requirements

Reliable data required to produce quality quantitative information



I. What Type of Data Do You Need?



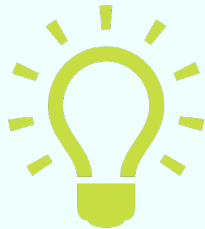
Risk / Loss
Data



Macro-economic
Data



Fiscal /
Financial Data



**BIG DATA SETS DOES NOT
ALWAYS EQUATE TO
USABLE INFORMATION**

II. Where Can You Find the Data?



Government Agencies



Public Sources



Humanitarian Organizations



Risk Model Firms



Insurance Companies

Analytics translates data into useful information

Data



Risk/Loss



Macro-economic



Fiscal/Financial

Analytics



Financial capacity building tools



Financial impact analysis



Economic, fiscal evaluation

Information



For decision making



For monitoring & evaluation



For capacity building

MODULE 3

Fiscal Impact Assessment

Estimating the fiscal impact using probabilistic risk assessments



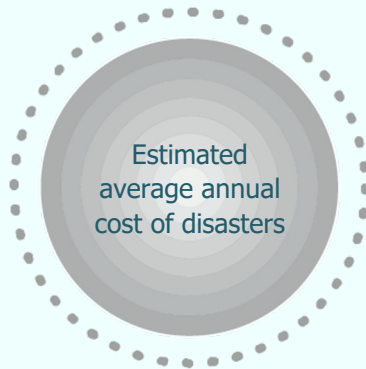
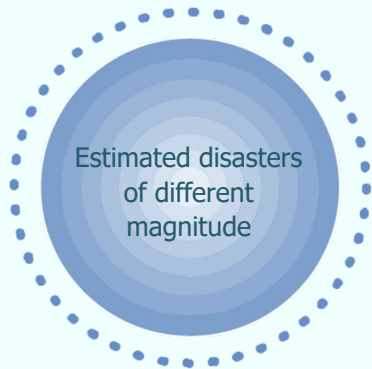
Exercise One:

Estimating Potential Costs

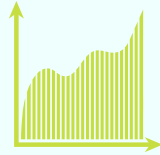
As the Minister of Finance, you are developing a DRF strategy to manage the cost of future disasters. You want to understand the potential disaster-related costs the government could face. The primary financial driver of disaster response is supporting people who are affected. Historical records on the number of people impacted by disasters from 2002 to 2016 are available. This historical information has been used by a technical colleague to complete an analysis ('probabilistic risk assessment') of the financial cost of the impact of disasters.

You have been presented with a simple quantitative tool to evaluate the potential costs based on the historical number of people affected by disasters.

Exercise One



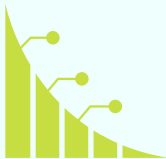
What do the actuaries do?



Technical statistical analysis using limited historical data



Estimating 10,000 potential future events (or less/more) from a limited number of historical events



Statistical measurements (such as average annual loss) quantified based on the estimated potential future events

**TAKE OUT YOUR LAPTOP
(one between three is fine)**



Tool link:

<https://www.financialprotectionforum.org/online-learning-exercises-using-data-and-analytics>

Password: passwd1

EXERCISE 1: FISCAL IMPACT ASSESSMENT

[View background information](#)

SELECT THE OTHER RISK PROFILE GRAPH USING THIS DROP DOWN.

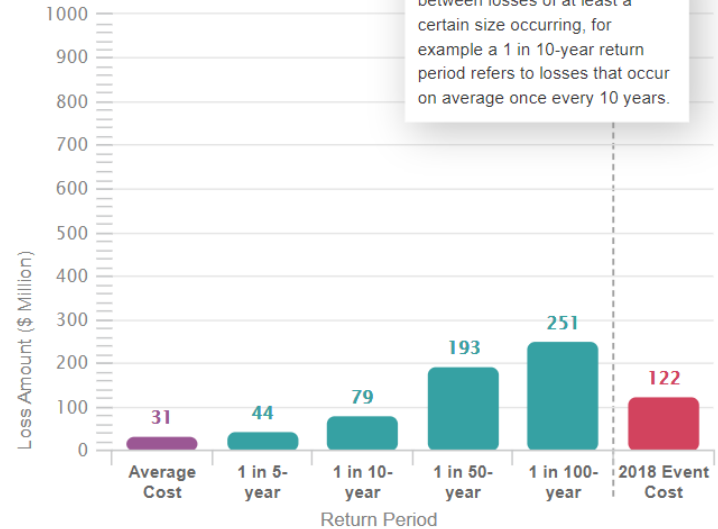
Indicative Fiscal Cost Risk Profile (by Return Period) ▼

SELECT RELIEF COST PER PERSON AFFECTED BY DISASTER

\$100

INDICATIVE FISCAL COST RISK PROFILE

(by Return Period)




The relief cost per person is a Government input that could be estimated using expenditure information from the most recent 2016 event and other available information.



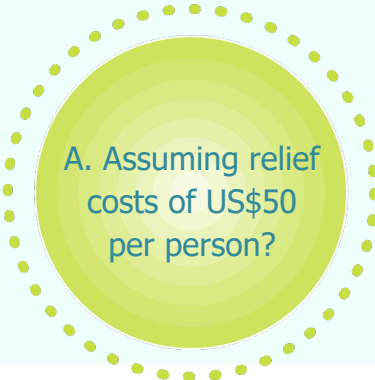
DRF Analytics Exercise

Vary the relief **cost per person** using the slider to determine the:

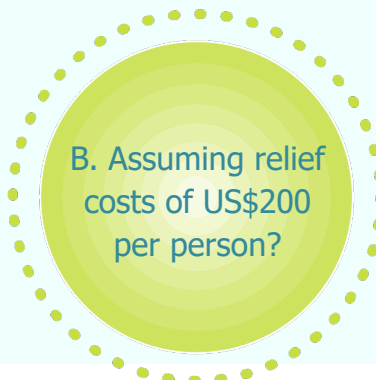
- Estimated **average annual cost** of disasters; and
- Estimated cost of a **1 in 10-year disaster event**.



Take 10 minutes to vary the inputs and evaluate the results



A. Assuming relief costs of US\$50 per person?

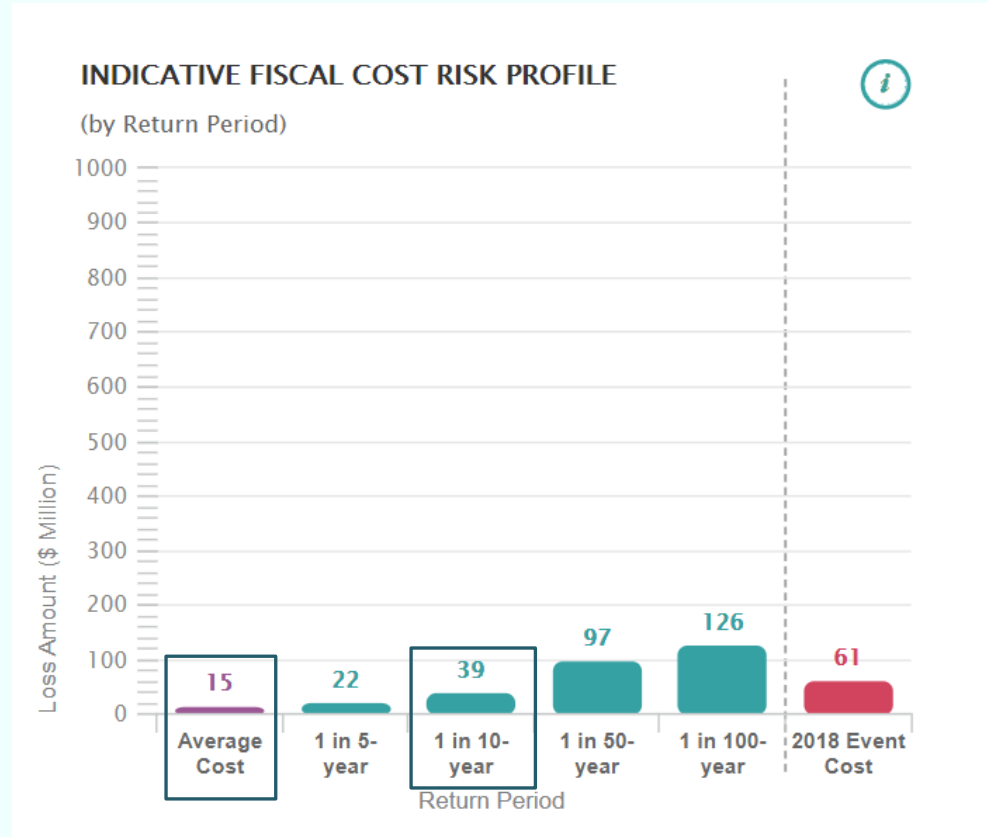


B. Assuming relief costs of US\$200 per person?

Exercise One: Solution A

Assuming relief costs of US\$50

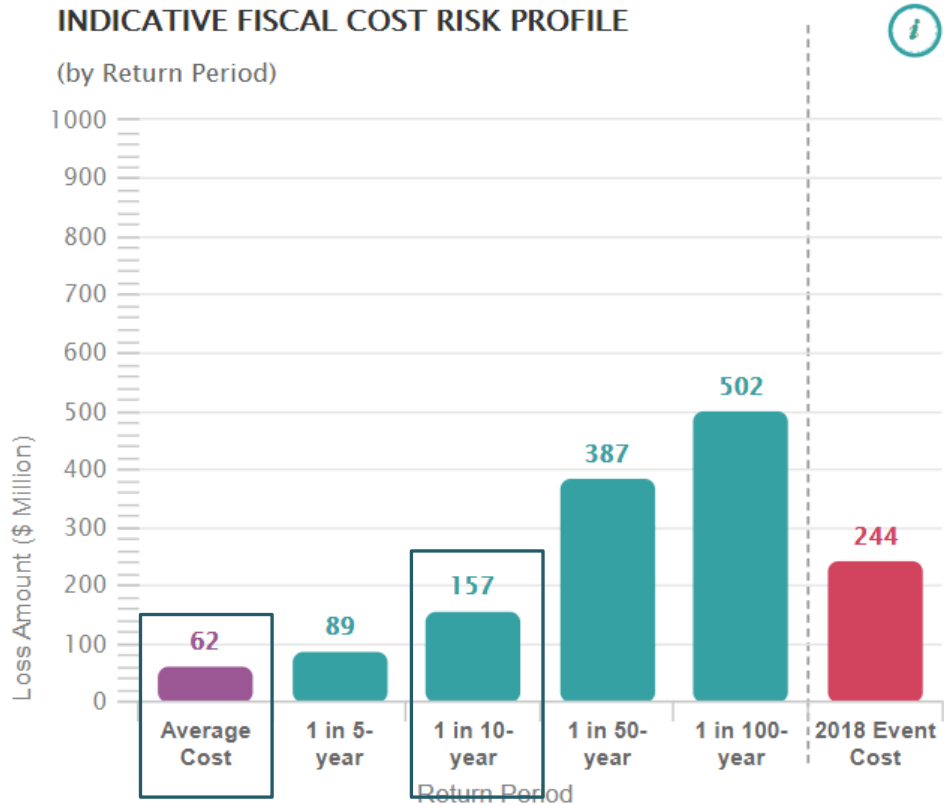
- Estimated average annual cost is **\$15million**
- A 1-in-10 year disaster event costs **US\$39 million** in any given year.



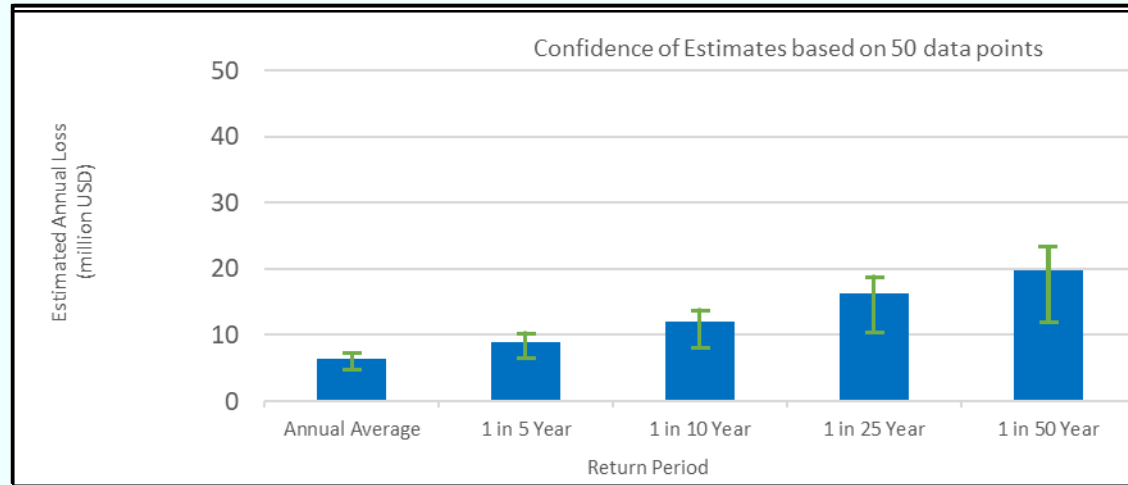
Exercise One: Solution B

Assuming relief costs of US\$200

- Estimated average annual cost is **\$62 million**
- A 1-in-10 year disaster event costs **US\$157 million** in any given year.

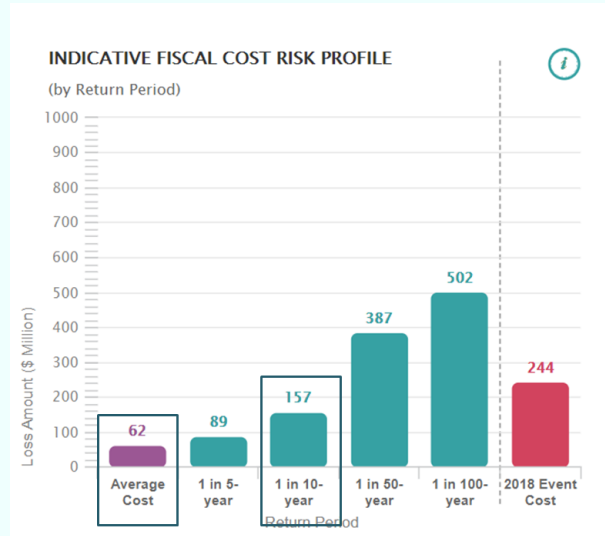


Accounting for Uncertainty (lack of data)



Quantity and quality of data is critical to reduce the levels of uncertainty in the fitted distributions. More data reduces confidence bands, and therefore increases confidence in estimates

Module 3 Recap



Evaluating a probabilistic risk assessment

Using risk assessment information to support decisions

MODULE 4

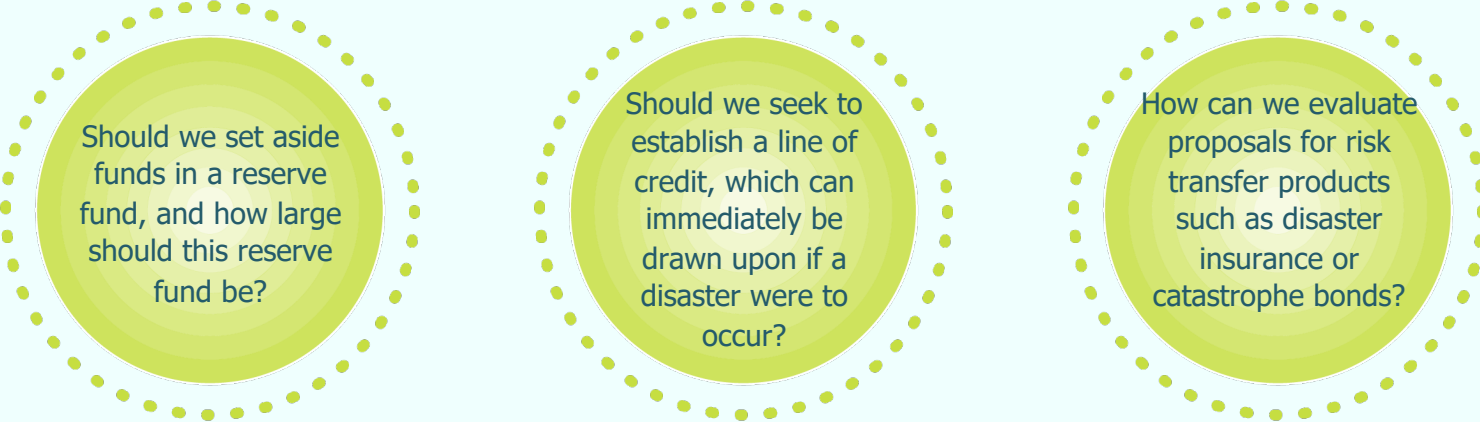
Informing Fiscal Decisions

DRF Instruments and managing the disaster related funding gap



- **How** much funding will be required post disaster [Module 3]
- **When** will funds be required, **Where** will the funds comes from and **What** is the funding gap [Module 4]

Overview



Should we set aside funds in a reserve fund, and how large should this reserve fund be?

Should we seek to establish a line of credit, which can immediately be drawn upon if a disaster were to occur?

How can we evaluate proposals for risk transfer products such as disaster insurance or catastrophe bonds?

Exercise Two: Assessing Funding Gap

You are now developing a DRF strategy to better manage your estimated disaster costs. A technical colleague has prepared a quantitative tool to support you in evaluating the funding gap and to assess the impact of different financial instruments available to you. The options available include the following:

Exercise Two

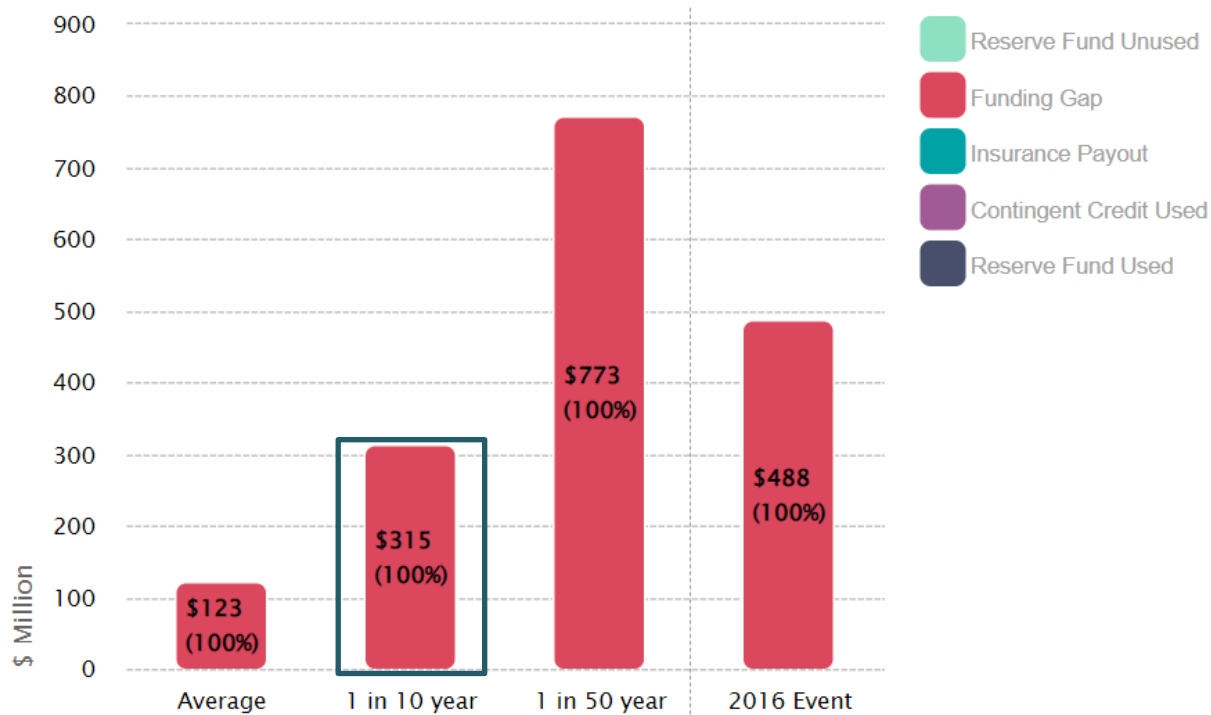


[You have access to two insurance options of equal cost: option a) provides cover for moderate and extreme events; and option b) provides higher cover for extreme events only.]

Exercise Two

FUNDING OF ESTIMATED RELIEF COSTS

(Funding gap highlighted in red. Quantified in absolute terms and percentage of total relief cost.)



Remember the estimated 1 in 10-year cost of US\$315 million from exercise one (with relief costs of US\$400 per person)

DRF Analytics Exercise Two

Evaluate the following options:

- A. Increase in reserve fund to US\$200 million;
- B. Reduce the reserve fund to US\$100 million **and** take out a contingent line of credit for US\$300 million;
- C. A reserve fund of US\$100 million **and** take out a contingent line of credit for US\$300 million **and** take out an insurance policy for extreme events.

Note: It is assumed that the contingent credit will only be drawn down once the reserve fund is fully used.



Take 15 minutes

What is the impact of this strategy on the funding gap during the: average year, 1 in 10 year, 1 in 50 year?

Would this strategy have provided enough funding for the event in 2016?

How do the outcomes compare across the three strategies?

Exercise Two: Solution A

1. SELECT LEVEL OF RESERVE FUND IN PLACE

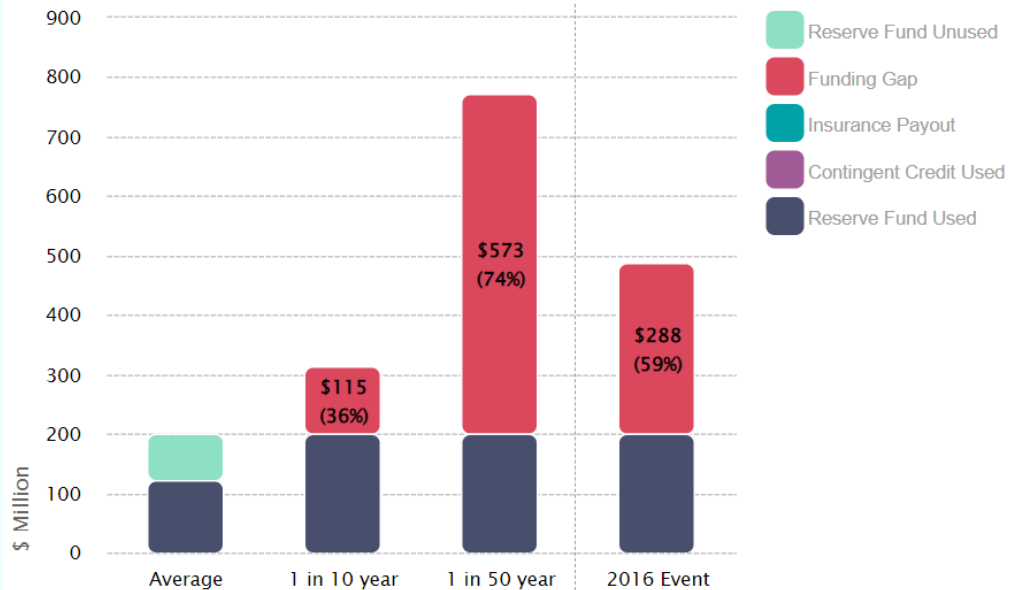
 \$200

2. SELECT LEVEL OF CONTINGENT CREDIT IN PLACE

 \$0

FUNDING OF ESTIMATED RELIEF COSTS

(Funding gap highlighted in red. Quantified in absolute terms and percentage of total relief cost.)



?

Funding gap reduces
Is this an efficient allocation of limited government resources?

Exercise Two: Solution B

1. SELECT LEVEL OF RESERVE FUND IN PLACE

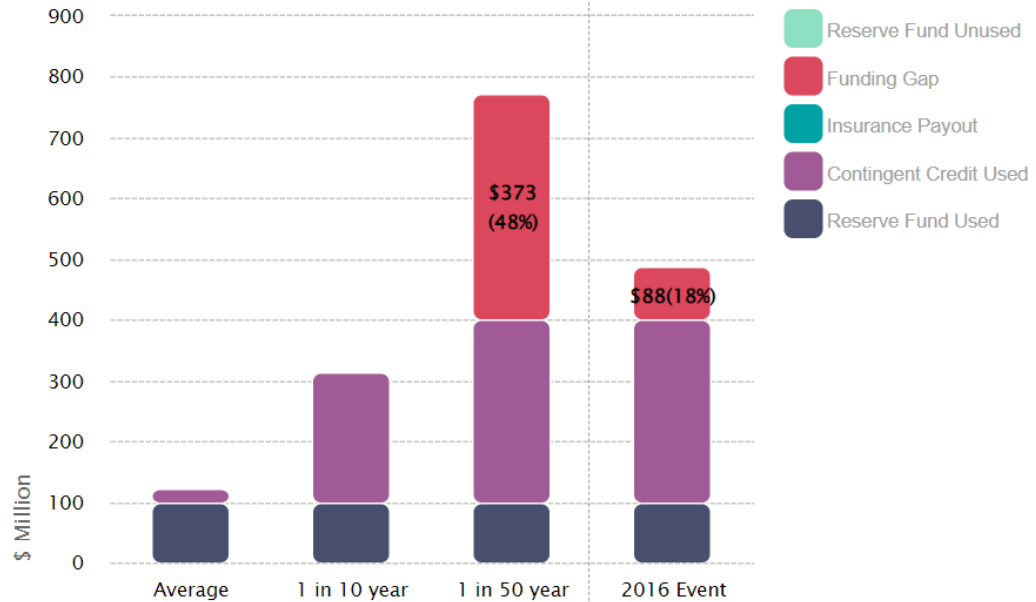
\$100

2. SELECT LEVEL OF CONTINGENT CREDIT IN PLACE

\$300

FUNDING OF ESTIMATED RELIEF COSTS

(Funding gap highlighted in red. Quantified in absolute terms and percentage of total relief cost.)



?

Funding gap reduces further
However, for extreme events there are still significant unfunded costs that will need to be covered using ex-post resources that can be both slow to arrange and costly

Exercise Two: Solution C

1. SELECT LEVEL OF RESERVE FUND IN PLACE

\$100

2. SELECT LEVEL OF CONTINGENT CREDIT IN PLACE

\$300

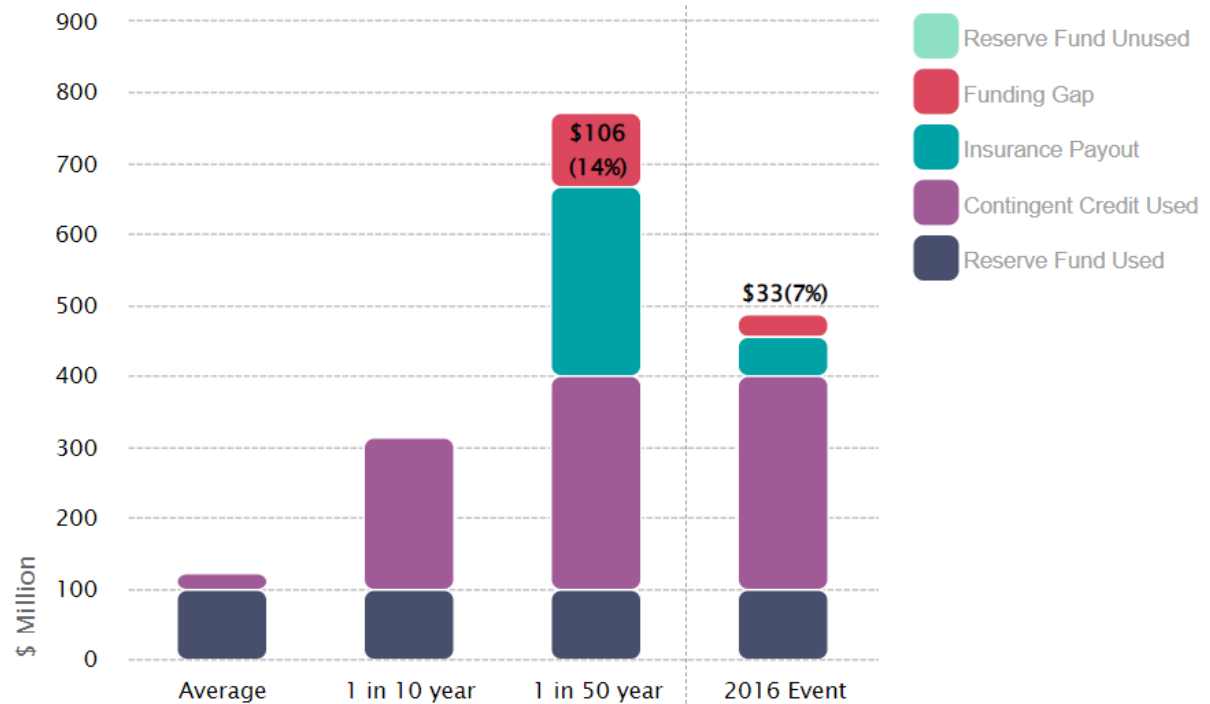
3. SELECT INSURANCE COVER IN PLACE

Option B: Extreme Cover Only ▼

Note: The cost of insurance Options A and B are equal.

FUNDING OF ESTIMATED RELIEF COSTS

(Funding gap highlighted in red. Quantified in absolute terms and percentage of total relief cost.)





Exercise Two: Group Discussion

This exercise included two alternative insurance options; both of which have an equal cost.

What is the difference between Insurance Option A and Insurance Option B for the Government? What do you notice with the funding gap?

Take 10mins to discuss

Framework to evaluate sovereign DRF strategies

Evaluating the Cost of Sovereign DRF Strategies



Exercise Three:

Evaluating Optimal Funding Mix

You are developing a DRF strategy to be better prepared financially to manage future relief costs in the event of a disaster. You are trying to understand the optimal DRF strategy to finance future disasters.

A technical colleague has prepared a quantitative tool to support you in evaluating the total cost of alternative DRF strategies based on required finance from the 2016 event of US\$488 million.

The financial instruments available include:

Exercise Three



PRE-ARRANGED TOTAL FINANCE \$488 million

1. SELECT THE COST OF INSURANCE

High (hard market) ▼

2. SELECT THE CONCESSIONAL RATE SPREAD

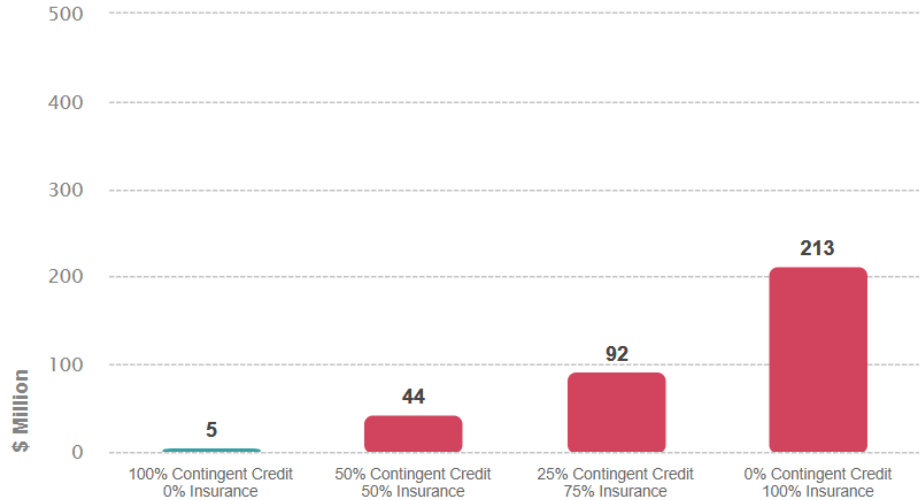
Low (1% spread) ▼

3. SELECT THE EVENT OCCURRENCE

No Disaster Occurs ▼

ACTUAL COST OF EVENT \$0 million

TOTAL COST OF DISASTER EVENT BASED ON PRE-ARRANGED FINANCE ⓘ





Use the quantitative tool to evaluate the following scenarios:

DRF Analytics Exercise Three

- A. The insurance cost is **high (hard market)** and the cost of borrowing is high (**concessional rate spread offered is low**)
 - No disaster occurs
 - 2016 disaster occurs


- B. The insurance cost is **low (soft market)** and the cost of borrowing is high (**concessional rate spread offered is low**)
 - No disaster occurs
 - 2016 disaster occurs

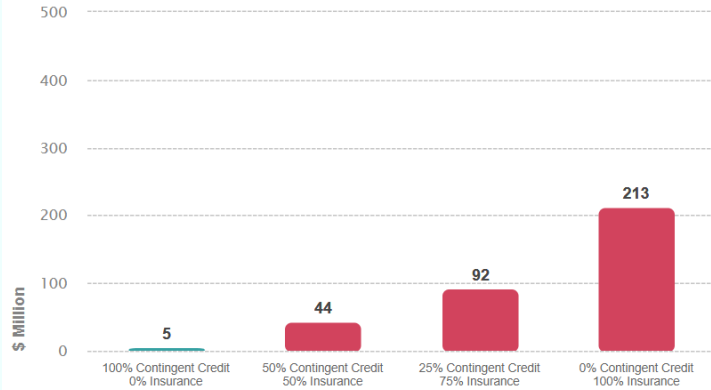
DRF Analytics Exercise Three




**Take 15 minutes to vary the inputs
and evaluate the results**

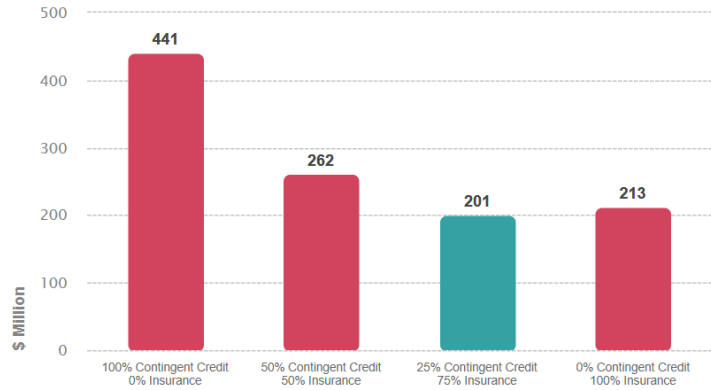
Exercise Three: Solution A

TOTAL COST OF DISASTER EVENT BASED ON PRE-ARRANGED FINANCE 



No disaster

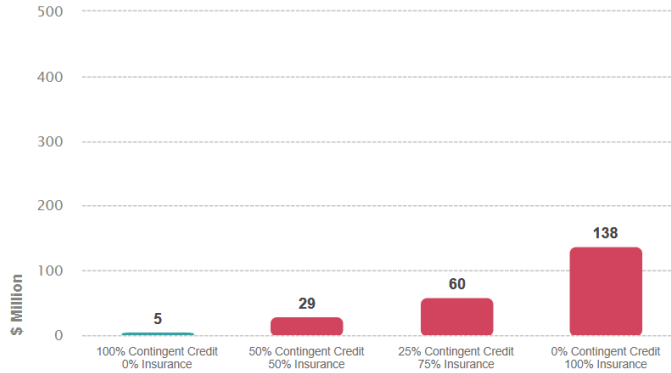
TOTAL COST OF DISASTER EVENT BASED ON PRE-ARRANGED FINANCE 



2016 disaster

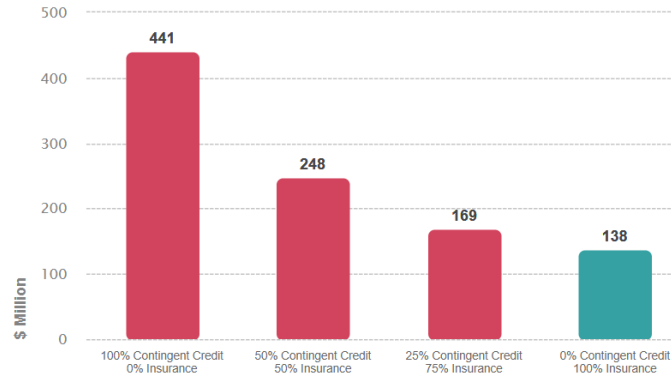
Exercise Three: Solution B

TOTAL COST OF DISASTER EVENT BASED ON PRE-ARRANGED FINANCE ⓘ



No disaster

TOTAL COST OF DISASTER EVENT BASED ON PRE-ARRANGED FINANCE ⓘ



2016 disaster

Challenging DRF Analytics Information

1. What is the **purpose and significance** of the analytics information; including the consequences and implications of its use in decision-making?

2. **How sensitive** is the analytics information to changes in assumptions?

3. **Who has prepared** the analytics information and have they any incentive to mislead?

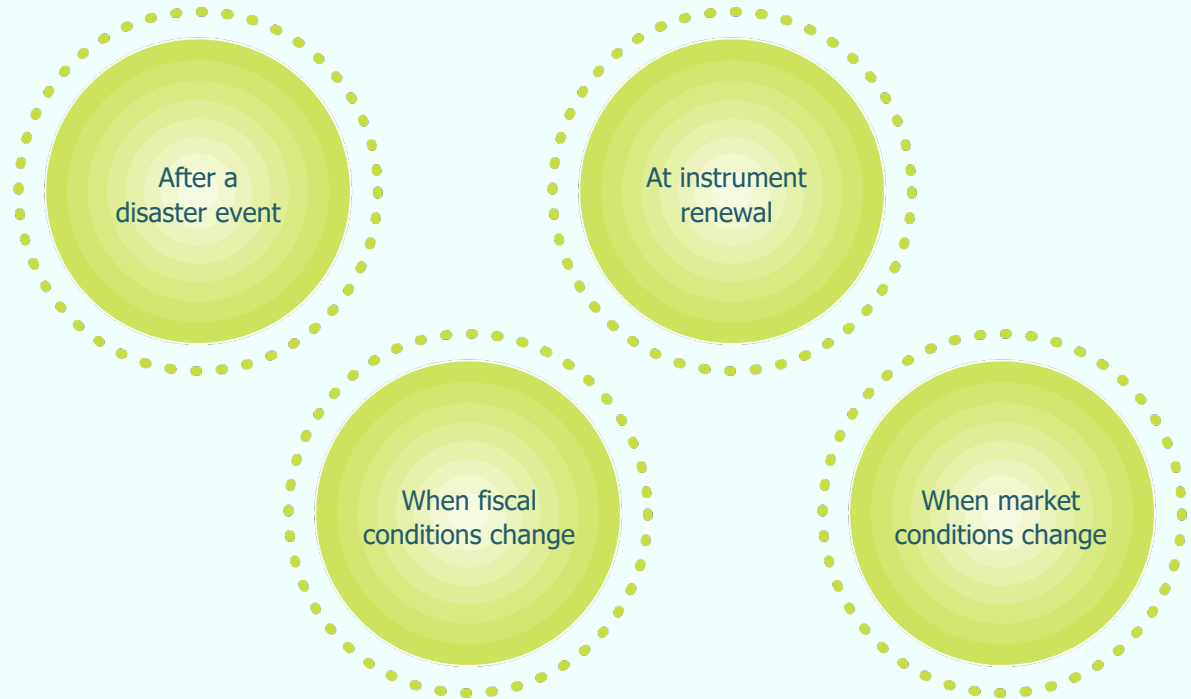
4. Has the analytics information been **peer reviewed** by a technical expert?

Commissioning DRF Analytics

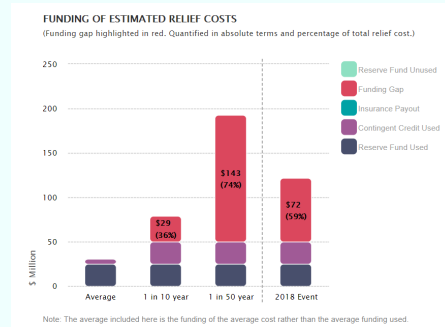
Provider	How can a Government Contract with Provider
Multilateral Development Banks	<ul style="list-style-type: none"> • Technical assistance provided through development loans or through trust funds • These could be bank executed or recipient executed
Donors	<ul style="list-style-type: none"> • Technical assistance provided through donor projects • Services often provided to Governments at no cost through donor funded projects
Insurance Companies	<ul style="list-style-type: none"> • Analytics information provided to support design and selection of an insurance contract • Fees are often paid for through insurance premiums
Financial Intermediary	<ul style="list-style-type: none"> • Analytics information provided to support design, selection and execution of a financial instrument • Fees are often paid for through commission
Brokers	<ul style="list-style-type: none"> • Analytics information provided to support selection and execution of a financial instrument • Fees are often paid for through commission.
Consultants	<ul style="list-style-type: none"> • Technical support provided under an individual or firm contract • Fees could be time based or fixed fee and negotiated between the individual/firm and the Government.

After a DRF instrument, strategy or program has been implemented stakeholders should monitor the decision. Monitoring can take place at different stages such as:

Monitoring of DRF Decisions

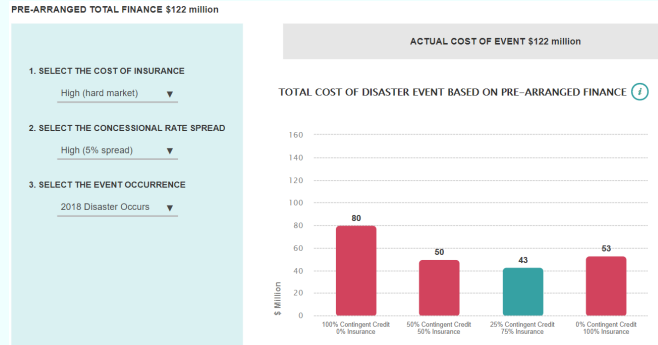


Module 4 Recap



Framework to evaluate sovereign DRF strategies

Tools to assess funding gaps and the costs of DRF strategies



Challenging and commission DRF analytics