Catastrophe Model for the Assessment of Exposure to Disaster Risks

Kazuya Fujimura, Ph.D., P.E.
Vice President and Managing Director, AIR Worldwide

OECD-ADBI Workshop on Disaster Risk Financing in Asia
24 June 2016, Tokyo, Japan

Catastrophe Models Provide an Objective and Stable View of Risk

- CAT Model is designed to answer;
  - Where future events likely to occur and how intense they likely to be
  - What the estimated range of damage and insured loss by future events

- Why we need CAT models;
  - Traditional methods relying on historic losses may not be a good predictor of possible losses
  - Constantly changing landscape of exposure limits the use of past loss
  - New properties continue to be built in areas of high hazard
  - Building materials and designs change
AIR Catastrophe Model Framework

- Event Generation
- Hazard Intensity Calculation
- Damage Estimation
- Loss Calculation

- Earthquake catalog
  - Epicentre
  - Magnitude
  - Fault Parameters
- Typhoon catalog
  - Track
  - Central Pressure
  - Forward Speed
- Exposure attributes
  - Construction type
  - Occupancy
  - Height
  - Built Year

Earthquake Catalogs are Generated Through a Simulation Approach Using Historical and Geophysical Data

- Historic seismicity data
- Active faults: subduction zone and crustal
- Geodetic data
Local Ground Motion Intensity is Computed Based on the Attenuation Function and Local Ground Condition

- Strong motion data for GMPEs
- Geotechnical data for site amplification

\[ \log(Y) = c_1 + F(M) + F(R) + G(M, R) + \text{site effect} + \text{faulting} \ldots \]

Y: Ground motion or spectral values
M: Magnitude
R: Source - site distance

Typhoon Catalog is Generated Through a Simulation Approach Using Historical Data

- Historical typhoon data from meteorological institute
  - Typhoon tracks
  - Central pressure
  - Forward speed
Local Wind Speed is Computed Based on the Central Pressure with the Consideration of Local Effect

- **Maximum Wind Speed**
  - Central Pressure
  - Radius of maximum wind
  - Distance from eye

- **Local Effect**
  - Surface friction
  - Topography
  - Terrain height, land use, etc.

Damage is Estimated Based on Vulnerability Function

- Vulnerability functions are developed based on structural analysis and claims data
- Vulnerability depends on construction type, height, and built year etc.

Intensity (e.g. wind speed and ground motion)
Exposure Data is the Key for CAT Models

- **Exposure Data for CAT models**
  - **Data** | **Description**
  - Location information | Latitude and Longitude, Zip codes, City, and etc.
  - Replacement values | Full cost to replace the building and contents
  - Risk characteristics | Construction, height, built year, occupancy, and etc.
  - Policy terms | Financial terms such as limit, deductible and etc.

- **AIR’s Industry Exposure Database (IED)**
  - Database of the building stock exposed to catastrophe risk, including replacement values and other risk characteristics
  - Developed using data gathered from local agencies and publicly accessible sources
  - Used for the development and validation of the models
  - Used to estimate industry losses

AIR Employs a Robust Approach for Building Industry Exposure Databases

**Data Collection**
- Risk Counts
  - Population & economic censuses
  - Housing surveys
- Risk Attributes
  - Occupancy
  - Construction & Height
  - Floor Area
- Construction Costs
  - Costing Manuals
  - Construction Indexes

**AIR High-Resolution Attribute Modeling**
- Disaggregation
  - High-resolution spatial mapping of risks
- Construction Distribution
  - Assignment of construction types to risks
- Spatial Cost Index
  - National costs adjusted for regional variation

**Rebuild Cost Approach**
- Replacement Values
- Benchmarking
  - National Economic Data
  - Insurance Publications

**Industry Exposure Database**
Different Types of Exposure Concentrated in Different Areas

- IED Includes the followings by LOB
  - Replacement values
  - Construction type
  - Building/Content splits
  - Building height

Catastrophe Models Provide a Wide Range of Outputs

- Exceedance Probability (EP) Curve
- Real Time Loss Estimate

Event loss table

<table>
<thead>
<tr>
<th>Event</th>
<th>Year</th>
<th>Company Loss</th>
<th>Event Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>520075080</td>
<td>934</td>
<td>2,811,789</td>
<td>MW 9.1 EQ Tokyo Metropolis Osaka Aichi Kanagawa Shizuoka</td>
</tr>
<tr>
<td>520175271</td>
<td>2179</td>
<td>2,672,028</td>
<td>MW 8.8 EQ Tokyo Metropolis Osaka Aichi Kanagawa Shizuoka</td>
</tr>
<tr>
<td>520078334</td>
<td>975</td>
<td>1,951,563</td>
<td>MW 8.8 EQ Osaka Aichi Tokyo Metropolis Shizuoka Kanagawa</td>
</tr>
<tr>
<td>520146021</td>
<td>5783</td>
<td>1,946,088</td>
<td>MW 8.8 EQ Osaka Aichi Shizuoka Tokyo Metropolis Kanagawa</td>
</tr>
<tr>
<td>520146044</td>
<td>1829</td>
<td>1,786,625</td>
<td>MW 8.8 EQ Osaka Aichi Shizuoka Kanagawa Tokyo Metropolis</td>
</tr>
<tr>
<td>520146735</td>
<td>8811</td>
<td>1,658,605</td>
<td>MW 8.9 EQ Osaka Aichi Shizuoka Hyogo Mie</td>
</tr>
<tr>
<td>520134374</td>
<td>1422</td>
<td>1,634,955</td>
<td>MW 8.7 EQ Aichi Osaka Shizuoka Tokyo Metropolis Kanagawa</td>
</tr>
<tr>
<td>520065253</td>
<td>764</td>
<td>1,625,767</td>
<td>MW 8.7 EQ Aichi Osaka Shizuoka Tokyo Metropolis Kanagawa</td>
</tr>
<tr>
<td>520158375</td>
<td>9417</td>
<td>1,613,123</td>
<td>MW 8.8 EQ Aichi Shizuoka Mie Hyogo</td>
</tr>
</tbody>
</table>

©2016 AIR WORLDWIDE
Based on the quantitative risk assessment, the funding gap analysis will consider the government’s own responsibilities after a disaster event to arrive at an overall assessment of the funding gap that may exist to respond to such disasters.

1) Risk Profiling

2) Funding Gap Analysis

Model Usage in Disaster Risk Reduction and Mitigation

Without Mitigation

With Mitigation

Image Source: Adapted from the World Bank, (2012)
Summary

- Catastrophe models are integral part of risk assessment and risk transfer value chain.
- Catastrophe models provide various outputs which can be used to assess, mitigate and transfer disaster risk.
- Quality of the data plays an important role for model development and accurate risk assessment.
- Challenges in collecting data/information:
  - Data might not be available or might be incomplete and inaccurate.
  - Same data from two sources are sometimes contradicting.
  - Data often not in a format for use with catastrophe models.
  - General difficulty in acquiring certain exposure datasets.
Session 1 – Designing a disaster risk financing strategy

PPP for data collection and sharing on natural disasters in France

Roland NUSSBAUM, MRN & ONRN, FR

OUTLINE

NatCat DRM in France:
- Risk profile (exposure, losses)
- Integrated PPP scheme involving insurance industry

• What drove the development of this PPP?
• What are the specific roles of the public and private sector in this initiative?

2 Practical examples
- Public hazard zoning data used by insurers in their risk assessment
- Insured loss data/indicators used as awareness raising and decision making tools in participative governance fora

Concluding remarks: is this model replicable to other countries?
NatCat DRM in France: Risk Profile (loss records)

L’approche par événement
Les événements importants (fr. « en » à 300 M€) sur la période 1993-2011

3-4 bn € economic losses / yr, out of which more than 50 % are insured

Source: http://www.onrn.fr/site/rubriques/indicateurs/cartographie.html

<table>
<thead>
<tr>
<th>Peril</th>
<th>Personal lines</th>
<th>Commercial lines</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flood</td>
<td>7 220 €</td>
<td>26 700 €</td>
<td>11 400 €</td>
</tr>
<tr>
<td>Windstorm</td>
<td>1 810 €</td>
<td>6 070 €</td>
<td>2 600 €</td>
</tr>
<tr>
<td>Subsidence</td>
<td>12 700 €</td>
<td>n/a (1)</td>
<td>12 700 €</td>
</tr>
<tr>
<td>All perils</td>
<td>3 200 €</td>
<td>9 070 €</td>
<td>4 310 €</td>
</tr>
</tbody>
</table>

Sources: AFA / FFSA-GEMA (2015) and ONRN (2014)

NatCat DRM in France: Integrated PPP scheme involving insurance industry

Integrated NatCat Risk Management & Participative governance in France

1. NatCat insurance scheme
2. Public risk reduction policy financing
3. Risk, loss & DRR policy data sharing platform
NatCat Insurance: an integrated scheme

NatCat 1982 law, revised: 1995, 2003, ...

Drivers:
- Constitutional principle of solidarity against national calamities (1958)
- Significant flood losses & national budget constraints (1981-82)
... reasons to introduce a compulsory extended NatCat coverage on all property damage insurance contracts (NatCat Law 1982)

NatCat Insurance scheme

PPP Components

Ethical Political
- Design and governance of DRM scheme
* solidarity / responsibility
* exclusion issues

Natural Catastrophe Risk Transfer
- Structuring ex ante financing capacities according to national risk profile, State solidarity, if necessary
- Organise insurance conditions as economic incentives compliance to prescriptions

Risk knowledge
- hazards mapping and zoning assets exposure
- vulnerabilities
- Land use planning
- Building codes

Financial

Technical

Source: R. NUSSBAUM, 2005
2. PPP for Policy risk reduction financing

**National drivers:** national budget constraints:
- 1995: Fund to support national DRM policy issues & fully subsidized by a levy (12%) on NatCat insurance premium (Barnier Law), collected by the insurers (180 M€/yr)
- 2000 onwards: Fund eligibility extended to finance public DRM policy instruments at local level

Direct insurers take part to:
- the management board of FPRNM*
- the governance body (CMI*) in charge of authorizing and State resources allocation to the DRM projects introduced and carried by local authorities (PAPI***)


direct insurers take part to:
- the management board of FPRNM*
- the governance body (CMI*) in charge of authorizing and State resources allocation to the DRM projects introduced and carried by local authorities (PAPI***)

(*) PPR = Risk Prevention Plan
(*) FPRNM = Fund for Major Natural Risks Prevention
(**) CMI = National Flood Risk Prevention Committee
(***) PAPI = Flood Risk Mitigation Plan

Geographical coverage of PAPIs (as of 2014)
source: MEDDE/DGPR - Mapping: MRN

3. PPP for data collection and sharing

Evolution in France

50 downloadable indicators at municipality grid

The National Observatory for Natural Hazards (ONRN)
1. What drove the development of this PPP?

**Drivers**

- **International/EU drivers:**
  - Post 2015 Framework for DRR (Target indicators)
  - OECD loss and damage survey
  - EU DRM Policies (DG ECHO) - Disaster Loss Data Project (DG JRC)

- **National drivers:**
  - 2010 major events (Xynthia and Var floods) – repeated loss records
  - Political momentum:
    - Insurance federation chairman
    - Parliamentary support
  - Integration of national DRR platform (see scheme beside)
  - Precise definition of targets: legally binding agreement under national budget constraints
2. What are the specific roles of the public and private sector in this initiative?

PPP for data collection and sharing on natural disasters in France

Specific roles of public and private sector: a win-win partnership

Public Sector
- State & Local River Basin authorities,
- Participative Governance Fora

Private Sector
- Insurance Reinsurance

Example 1
- Hazard zoning data
- Progress data of public risk reduction policies
- Support to the ONRN PPP platform management

Example 2
- Aggregated loss data at municipality / event level
- Support to the ONRN PPP platform management
- Data sharing platform development & management
- Indicators implementation & production
- Lessons learnt & events data base
- Damage functions & model calibration

Current issue: address level?
Example 1 (private sector benefitting from public data)
MRN-GIS Webservices for exposure analysis of commercial lines assets
Hazard zoning GIS data layers provided by public authorities

Example 2 (public sector benefitting from insurance loss data)
Data/indicators to be used as awareness raising and decision making tools in national and regional participative governance fora.
Concluding remarks:
Is this model replicable to other countries?

The following key success factors of the PPP data sharing model

- developed as a result of a long lasting PPP experience,
  - on a NatCat high penetration risk transfer scheme
  - on public risk reduction policy financing tools (possibly)
- strong political will of PPP partners, stimulated by the experience of events and budgetary constraints
- holistic (top down) project, preparing for further integration of all stakeholders categories with an aim to generate bottom up initiatives
  - Participatory governance
  - Dialogue with regional stakeholders / end users

... certainly facilitate replicability of the model to other countries.

Such a data sharing PPP scheme may also be replicable to any country in a process of integrating a risk transfer scheme into a national DRM policy.

Thank you for your attention!
Europa Reinsurance Facility Ltd.
A Consolidated Market Infrastructure Solution

Orsalia Kalantzopoulos,
Chief Executive Officer,
Europa Reinsurance Facility Ltd.

Session 1: Designing a disaster risk financing strategy
OECD-ADBI Seminar on Disaster Risk Financing in Asia, 24 June 2016, Tokyo, Japan

Overview

- Why Europa Re?
- How Europa Re was conceived?
- Europa Re Structure and Corporate Governance
- Europa Re achievements
- Europa Re – a scalable insurance market infrastructure solution
- Application
- Lessons learned
Why Europa Re?

- South East Europe (SEE) is highly prone to geo-physical and weather related hazards.
- Countries lack preventive capacity and fiscal resources.
- All SEE countries have faced severe droughts and floods in the last ten years. Drought is one of the largest agricultural risk.
- This phenomena will increase.
- Disaster risk financing and risk transfer instruments remain very weak at the regional and the country levels.

How Europa Re was conceived?

- The World Bank, the Swiss Economic Cooperation Organization (SECO) and Global Environmental Facility (GEF), financed and outlined a comprehensive disaster management strategy, essential policy recommendations and an innovative catastrophe insurance instrument, to address the consequences of natural disasters in South East Europe.

- The World Bank Southeast Europe Catastrophe Risk Insurance Facility (SEE CRIF) project implementation was delegated to Europa Re in 2011.

- Since then, the company has established and implemented a comprehensive web-based (re) insurance market infrastructure comprising integrated catastrophe risk applications that support custom tailored and risk model-driven catastrophe insurance coverage for SEE countries.
Europa Re Structure and Corporate Governance

- Conceived as an innovative public-private partnership
- Swiss-based property catastrophe reinsurance company
- Based in Zug Switzerland with Representative offices in Skopje, Macedonia; Belgrade, Serbia; Tirana, Albania.
- Owned by the Governments of the Republic of Macedonia, the Republic of Serbia and the Republic of Albania; the Europa Re Shareholder Member Countries.
- Supervised and licensed by FINMA, the Swiss Financial Market Supervisory Authority.
- Audited by a reputable Swiss Auditor.

Europa Re Solution – a Unique Project: Public Private Partnership

Private sector insurance partners

Serbia

Albania

Macedonia

Member countries
Europa Re achievements

A multifaceted and scalable market infrastructure solution in place in Serbia, Macedonia and Albania that integrates across several business lines:

- Technically sound insurance product development;
- Access to reinsurance capacity as a Swiss based Reinsurer;
- A fully customizable web-based (re) insurance market infrastructure that can support custom tailored and risk model-driven insurance coverage for any line of business implemented with private sector insurance partners;
- A public interactive online risk awareness building tool;
- Public access to a user friendly online sales portal that supports sales of insurance products directly to end consumers.

The infrastructure was built with a view to high scalability

- The systems can be implemented on any new market and ready for sales within 3-5 months at marginal costs.

Europa RE endorsed insurance products* sold by private insurance partners in Serbia, Macedonia and Albania

FAST and SIMPLE CLAIMS ASSESSMENT AND SETLEMENT procedure after a catastrophe event!

Earthquake
- Homeowners
- SMEs
- Farmers
- Banks
- Local governments

Flood
- Homeowners
- SMEs
- Farmers
- Banks
- Local governments

Multi climate peril in Agriculture
- Individual farmers
- Commercial farms
- Banks and others
- Municipalities
- Sovereign level.

*Europa Re holds the resources and product development know how for any other line of business
Application

- Country Y Identifies a risk to be mitigated and decides implementation of a country wide **standard** or **micro** insurance product to address the risk
- Country Y assigns implementation of the project to Europa Re
- Europa Re’s existing scalable infrastructure can be implemented on any new market within **3 to 5 months** at **marginal costs** and will include:
  - the new custom made insurance product to address the risk identified
  - the web based insurance platform
  - access to the public interactive online risk awareness building education tool
  - the online sales portal to ensure public access to the insurance product

Prerequisites to building financial resilience to climate change through the insurance sector (1)

- For the insurance premium not to be exorbitant or for the insurance sector not to walk away from the area altogether, there has to be a strong partnership between the legislator and the insurance sector to create the infrastructure and the legislative framework that are conducive to the insurance sector operating in that country. Without such framework, the insurance sector cannot commercially enter a market with reasonable rates, especially one that is prone to disaster.
- The most important thing governments can do to facilitate building financial resilience to climate change through the insurance sector in any market is to adopt policies aimed at behavioral changes of consumers. For instance:
  - **To adapt to more extreme weather in agriculture**, governments should provide subsidies only for those farmers that demonstrate willingness to adopt more drought resilient crops and show positive crop yields in most of the years.
  - **To encourage homeowners to adapt to more frequent and severe floods**, governments should reduce or phase out post-disaster subsidies for home reconstruction and require people to ensure.
  - **To ensure municipalities are better prepared to deal with weather related emergencies** they should put in place ex ante disaster emergency plans and secure funding for dealing with emergency outcomes. To enact this change governments of different level should share the costs of natural disasters, with the local governments to be incentivized to insure.
Prerequisites to building financial resilience to climate change through the insurance sector (2)

Moral hazard: The Government and/or international community should avoid post disaster financing to rebuild only the houses of homeowners that had not taken out insurance thus discriminating against existing insurance policy holders who are this way de facto penalized and will not take out insurance again.

e.g. Serbia May 2014 floods

Building codes: The Insurance sector cannot enter a market where the building codes i) are not proper OR ii) are proper, but not properly enforced.

e.g. After the Marmara Earthquake, EQ insurance premium became prohibitive due to poor enforcement of building codes as revealed post disaster.
Operational Framework for Disaster Risk Finance
From Products to Strategies

Olivier Mahul
Global Lead, Disaster Risk Finance
Program Manager, Disaster Risk Financing and Insurance Program (DRFIP)
World Bank

Disaster Risk Financing and Insurance Program
A joint program between WBG and GFDRR

DRFIP development objective is to increase financial resilience of the countries through minimizing the cost and optimizing the timing of meeting post-disaster funding.
To achieve this objective, DRFIP provides countries with Analytical & Advisory Services, Financial Services and Convening Services on Disaster Risk Finance.
Disaster Risk Financing and Insurance Program
Strong partnerships with GFDRR and donor partners

DRF for MIDDLE INCOME COUNTRIES
Support Middle-income Countries to become proactive risk managers to meet the cost of disasters and climate shocks.

DRF for AFRICA
Support African countries to manage the financial impact from disasters as part of building their overall resilience to climate and disaster shocks.

DRF for RESILIENT LIVELIHOODS
Support governments to integrate social protection schemes in their DRF strategy to offer rapid and timely assistance to vulnerable households affected by shocks.

DRF for SMALL ISLAND STATES
Support SIDS to strengthen their financial resilience as part of the broader disaster risk management and climate change adaptation agenda.

DRF for ASIA
Support Asian countries to manage the financial impact from disasters as part of building their overall resilience to climate and disaster shocks.

DRF for GLOBAL POLICY, KNOWLEDGE & TRAINING
Leverage the WBGs convening power to invest in policy advice and knowledge management to support policy reforms and financial instruments.

DRF for AGRICULTURE
Support countries to implement sustainable, cost-effective public-private partnerships in agricultural insurance as part of broader agricultural risk.

DRF for AFRICA
Support African countries to manage the financial impact from disasters as part of building their overall resilience to climate and disaster shocks.

DRF for SMALL ISLAND STATES
Support SIDS to strengthen their financial resilience as part of the broader disaster risk management and climate change adaptation agenda.

DRF for ASIA
Support Asian countries to manage the financial impact from disasters as part of building their overall resilience to climate and disaster shocks.

DRF for GLOBAL POLICY, KNOWLEDGE & TRAINING
Leverage the WBGs convening power to invest in policy advice and knowledge management to support policy reforms and financial instruments.

DRF for AGRICULTURE
Support countries to implement sustainable, cost-effective public-private partnerships in agricultural insurance as part of broader agricultural risk.

DRF for AFRICA
Support African countries to manage the financial impact from disasters as part of building their overall resilience to climate and disaster shocks.

DRF for SMALL ISLAND STATES
Support SIDS to strengthen their financial resilience as part of the broader disaster risk management and climate change adaptation agenda.

DRF for ASIA
Support Asian countries to manage the financial impact from disasters as part of building their overall resilience to climate and disaster shocks.

DRF for GLOBAL POLICY, KNOWLEDGE & TRAINING
Leverage the WBGs convening power to invest in policy advice and knowledge management to support policy reforms and financial instruments.

DRF for AGRICULTURE
Support countries to implement sustainable, cost-effective public-private partnerships in agricultural insurance as part of broader agricultural risk.

DRFIP – Operational Engagement Worldwide
DRFIP is active in more than 50 countries

DISASTER RISK FINANCING AND INSURANCE PROGRAM (DRFIP)

DRFIP – Operational Engagement Worldwide
DRFIP is active in more than 50 countries

GFDRR
WORLD BANK GROUP

DISASTER RISK FINANCING AND INSURANCE PROGRAM (DRFIP)
Operational DRF Framework

Improve fiscal and debt management and reduce contingent liability

Assess Risk

Assess and quantify disaster risks to understand potential financial and budget impacts

- Quantify disaster risks
  - Conduct comprehensive risk assessment to identify risks and understand potential damages and loss
  - Quantify risks to understand potential costs
- Define and assess contingent liabilities associated with disaster shocks
  - Quantify contingent liabilities arising from disasters
  - Analyze potential expenditures on emergency response
  - Set policies on post-disaster financial assistance to sub national entities, individuals and businesses;
  - Formalize the process of identifying and declaring disasters
### Arrange Financial Solutions

**Review current financial instruments**

<table>
<thead>
<tr>
<th>Ex-post financing</th>
<th>Relief Phase (1-3 months)</th>
<th>Recovery Phase (3-9 months)</th>
<th>Reconstruction Phase (over 9 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donor assistance (relief)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Budget reallocation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic credit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Externally credit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donor assistance (reconstruction)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tax increase</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Ex-ante financing**
- Budget contingencies
- Reserve fund
- Contingent debt facility
- Parametric insurance
- Catastrophe bonds
- Traditional insurance

**Note:** Graph only for illustrative purpose
Arrange Financial Solutions
Develop/combine financial instruments to bridge the funding gaps

International Assistance
- Sovereign Risk Transfer (e.g., Cat Bond/_cat swap, (re)insurance)
- Insurance of Public Assets
- Contingent Credit Lines
- Post Disaster Credit
- Government Reserves, Contingency Budget / Funds

Emergency Funding
Reconstruction

DISASTER RISK FINANCING AND INSURANCE PROGRAM (DRFIP)

GFDRR
WORLD BANK GROUP

Arrange Financial Solutions
Improving risk-informed financial decisions

DRFI ANALYTICS
- Quantitative Analytics
- Financial Decision Making Tools
- Financial Impact Analysis
- Cost Benefit Analysis

Understand quantitative financial impact of disasters
Make evidence-based informed decisions
Leverage private financial markets using quantitative outputs
Monitor and evaluate DRFI strategies
### Arrange Financial Solutions

#### World Bank financial products

<table>
<thead>
<tr>
<th>Insurance-linked Securities</th>
<th></th>
<th>World Bank financial products</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Bank Cat Bonds</td>
<td></td>
<td>World Bank direct issuance of Cat Bonds</td>
</tr>
<tr>
<td>MultiCat Program</td>
<td></td>
<td>Facilitate issuance of multi region, multi-peril cat bonds</td>
</tr>
<tr>
<td>CAT/Weather Derivative</td>
<td></td>
<td>Insures against weather + geological related losses, based on an index</td>
</tr>
<tr>
<td>CCRIF / PCRAFI</td>
<td></td>
<td>Establishment of regional facilities to pool risks and reduce cost to cover against natural disasters in different countries</td>
</tr>
<tr>
<td>Investment DDO</td>
<td></td>
<td>Provides immediate liquidity following a pre-defined weather trend/event</td>
</tr>
<tr>
<td>Cat DDO</td>
<td></td>
<td>Provides immediate liquidity following a natural disaster</td>
</tr>
</tbody>
</table>

#### Development of domestic cat risk insurance markets

- **Catastrophe risk insurance programs for private dwellings**
  - Turkish Catastrophe Risk Insurance Pool
  - Morocco catastrophe risk insurance program

- **Catastrophe risk insurance programs for public assets and concessions**
  - Improving coverage of public assets and infrastructure against natural disasters
  - Detailed cat risk assessment
  - Standard terms and conditions
Deliver Funds to Beneficiaries

Execute and monitor resources to ensure effective execution of public funds directed to disaster response, recovery and reconstruction

- Loss reporting
- Post-disaster fiduciary controls
- Post-disaster budget execution manuals
- Procurement arrangements
- Approval and transfer of funds
- Targeting of funds
- Scalable social protection systems
- Disaster risk management funds

Disaster Risk Finance Strategies

Identifying and prioritizing DRF policy objectives and actions
The Case of The Philippines

Development Outcomes

1. To sustain economic growth and protect gains from natural disaster shocks
2. To reduce impact on the marginalized sector and prevent them from falling into a cycle of poverty.

Four Policy Objectives for Actions by the Government

1. National Level: Enhancing the financing of post-disaster emergency response, recovery, and reconstruction needs
   a. Quantifying and clarifying the contingent liabilities faced by the government.
   b. Building up multi-year reserves through annual contributions to a response contingency fund.
   c. Using risk transfer to access international private reinsurance and capital markets.

2. Local Level: Providing local governments with funds for recovery and reconstruction after a disaster
   a. Catastrophe risk insurance facility for local governments
   b. Improve Insurance of public assets of LGUs

3. Individual Level: Empowering poor and vulnerable households and SMEs to quickly restore their livelihoods after a disaster
   a. Broadening private property catastrophe risk insurance and micro-insurance coverage.
   b. Broadening agricultural insurance and micro-insurance coverage.

4. Risk Analytics: Using risk information to support decision making on financial protection
   a. Build an improved asset exposure database and historical loss database.
   b. Refine the catastrophe risk model to the local government level.
   c. Develop financial and actuarial tools to inform future disaster risk financing and insurance decisions.

Conclusion

• DRF is an integral part of the disaster and climate risk management agenda as well as fiscal risk and budget management agenda.
• Effective DRF relies on effective resource mobilization and effective resource execution.
• Regional initiatives can enhance national DRF strategies.
• Financial protection requires strong leadership by the country’s ministry of finance.
• The private sector is an essential partner.
• DRF is a long-term agenda that requires political will, technical expertise, and time.