Willis Towers Watson

Sustaining the Gains:
Feasibility of Risk Financing for Education

Task 2 Report

Annexes

Willis Towers Watson

Start Network & Save the Children

Overseas Development Institute

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Sustaining the Gains: Feasibility of Risk Financing for Education
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Annex 1 Historical Context of Catastrophe Modeling

Catastrophe modeling is a process for assisting insurers, reinsurers and governments to identify, quantify and manage risk from catastrophic events, both natural and man-made. This risk management tool combines inputs a broad multi-disciplinary range of skills including physical sciences (subject matter experts by peril), statistics / probability, engineering / technology, actuarial science and computing / programming.

Over the past 30 years, a risk modeling approach has been developed within the reinsurance industry to quantify the impacts from natural catastrophes. Low frequency / high severity events have the capacity to generate aggregated levels of claims costs that far exceed an insurance company’s premium income and even reinsurance provisions, which transfer a portion of exposed risk to reinsurance companies.

Large loss-making events have often prompted innovative changes in risk management techniques, Hurricane Andrew in 1992 being the pre-eminent example (US$26 billion damage), along with European winter storms of 1987 and 1990, the 1994 Northridge earthquake in California and the Kobe (Great Hanshin) earthquake of 1995. These events coincided with technological advances such as increased computing power, increasing availability of electronic data-sets and applied mathematical methodologies diffusing from academia.

Subsequent events which have driven both model coverage (e.g. terrorism, tsunami) and also validation of existing model results include: the 1999 European windstorms Lothar & Martin, the 2001 World Trade Center terror attack, Hurricane Ivan in 2004, Hurricane Katrina in 2005, the 2011 Tohoku earthquake and tsunami, and Hurricane Sandy in 2012. Figure A1.1 provides a timeline of catastrophe model development and influential disasters, which mainly affected developed economies.

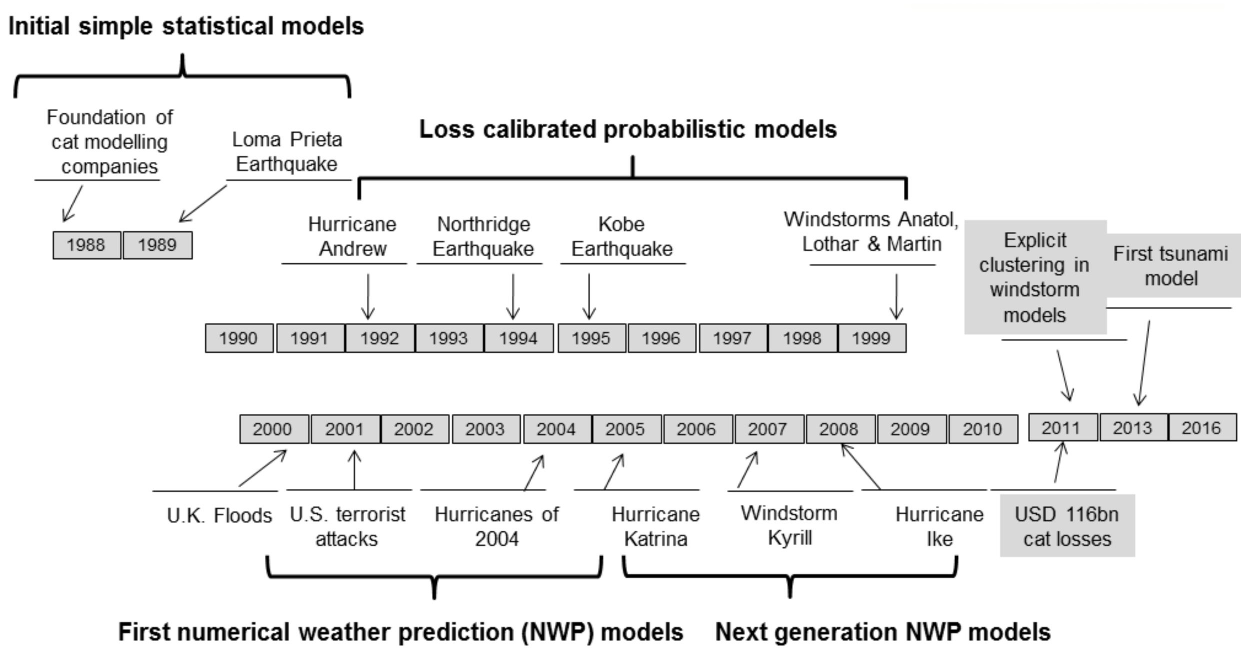

Figure A1.1 Timeline of catastrophe model development and influential disasters.

Proprietary (a.k.a. ‘vendor’) modeling companies (such as AIR, RMS and Eqecat / CoreLogic) emerged to construct ‘catastrophe models’, alongside pioneering efforts by reinsurance brokers and larger reinsurers such as Munich Re and Swiss Re. Such models focused on the property line of business (residential, commercial, industrial and agricultural) as these losses had predominated in previous ‘nat cat’ events. Modeled coverages included building and contents sums insured and business interruption, as defined in insurance policies, with the possible inclusion of financial conditions such as deductibles, limits and co-insurance.

The main perils covered were initially earthquake, windstorm and coastal flood, with inland (riverine) flood later enabled by higher geographical resolution digital elevation model (DEM) data, greater computing power and improved geocoding of the built environment. Subsequent modeling activities have extended geographical domain and peril type, including tornado, hail, surface water flooding, as well as formerly ‘non-modeled’ risk such as post loss amplification (e.g. demand surge), fire following earthquake, storm surge, soil liquefaction, landslides etc.

The development of catastrophe modeling now allows re/insurance companies to handle three major business issues:

- Capital Requirement:
  - A standardized process to calculate reinsurance needs, solvency and other regulatory requirements (e.g. Solvency II in Europe with 1-in-200 year loss benchmarks).
- Portfolio Management:
  - Identifying areas of concern such as an accumulation of correlating risks.

    - Identifying opportunities where diversifying risks could be added to an existing portfolio with marginal impact.
- Risk Pricing:
    - Supporting technical pricing during the underwriting process.

Catastrophe modeling as a maturing risk management approach and business technology is fundamentally interconnected with insurance approaches now being considered by other sectors for possible utility, extending to climate infrastructure resilience (Golnaraghi and Khalil, 2017), climate risk (Golnaraghi et al., 2016) and international development:

- Insurance as a tool to fight poverty - Edwards, Nov, 2016[1]
- Payouts for Perils: Why Disaster Aid is Broken, and How Catastrophe Insurance Can Help to Fix It - Talbot and Barder, July 2016[2]
- Humanitarian actors start to embrace insurance instruments - Menzinger, May 2016[3]

The phrase 'Protection Gap' (Schanz and Wang, 2014) has captured the issue of dramatic global variation in difference between insured and total economic losses from catastrophic events as a share of GDP. Alternatively, the phrase can be used as a description of underinsurance, defining the gap between the amount of insurance that is economically beneficial for a society and the amount of insurance actually purchased[4]. Presently, 70% of economic losses from natural hazards remain uninsured and in middle/low-income countries the uninsured proportion of economic losses often exceeds 90%.

[1] https://quarterly.blog.gov.uk/2016/11/01/insurance-as-a-tool-to-fight-poverty/
[2] https://www.cgdev.org/publication/payouts-perils-why-disaster-aid-broken-and-how-catastrophe-insurance-can-help-fix-it
[3] https://openminds.swissre.com/stories/1032
[4] http://www.lloyds.com/~/media/Files/News%20and%20Insight/360%20Risk%20Insight/Global_Underinsurance_Report_311012.pdf

Annex 2 Understanding Catastrophe Model Metrics: A Worked Example

As a guide to understanding the relationships between hazard and exposure, Figure A2.1 shows a hypothetical windstorm catalogue with three events potentially affecting three properties in a portfolio. Wind speeds experienced by these exposures are shown in Table A2.1 along with annual event probabilities, so describing both event intensity and frequency.

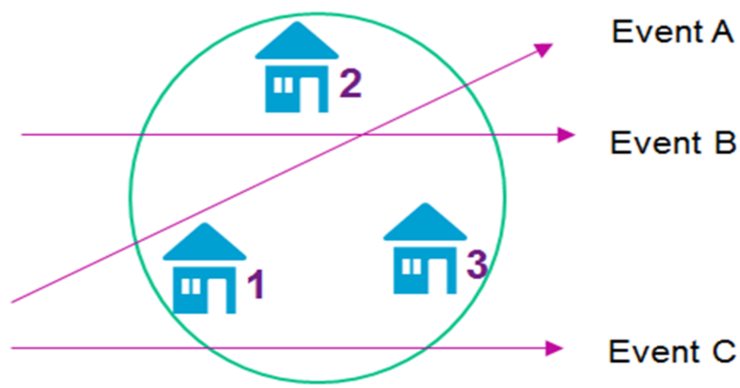

Figure A2.1 Hypothetical windstorm event set.

Event	Location 1	Location 2	Location 3	Event Probability	Return Period of Event (Years)
A	50 m/s	30 m/s	5 m/s	0.10	10.0
B	10 m/s	20 m/s	10 m/s	0.02	50.0
C	40 m/s	0 m/s	30 m/s	0.08	12.5

Table A2.1 Hypothetical wind speeds for an exemplar event set.

Table A2.2 continues the simplified demonstration of catastrophe modeling calculation of Figure A2.1 with hypothetical mean damage ratios by event and location derived from the wind speeds of Table A2.1. Exposure values at risk (for example building value) are multiplied by damage ratios to give site-specific losses which are summed to give overall event losses.

Damage Ratio	Location 1	Location 2	Location 3	
A	20.0%	12.0%	4.0%	
B	7.5%	10.0%	7.5%	
C	15%	0%	12%	
Exposure	**Location 1**	**Location 2**	**Location 3**	
Value at Risk	$10m	$5m	$5m	
Loss	**Location 1**	**Location 2**	**Location 3**	**Total Loss**
A	$2.0	$0.6	$0.2	**$2.8**
B	$0.75	$0.5	$0.375	**$1.625**
C	$1.5	$0	$0.6	**$2.1**

Table A2.2 Hypothetical vulnerabilities and resultant losses for an exemplar event set.

Table A2.3 extends the demonstration of hypothetical loss calculation by ranking total event losses in descending order and calculating a cumulative event probability, the inverse of which gives the return period of loss. Average annual loss is also derived from this table by summing the multiplications of individual event probabilities and loss.

Further useful background on the business interpretation of such statistics can be found in Lloyd's Market Association (2013).

Event	Event Probability	Cumulative Probability	Total Loss	Return Period of Loss	Average Annual Loss
A	0.10	0.10	$2.8	10.0	$0.28
C	0.08	0.18	$2.1	5.6	$0.168
B	0.02	0.20	$1.625	5.0	$0.032
Total					**$0.48**

Table A2.3 Hypothetical vulnerabilities and resultant losses for an exemplar event set.

Annex 3 Munich Re 'NATHAN' Natural Disaster Statistics by Continent: 1980 to 2012

Source:
https://www.munichre.com/en/reinsurance/magazine/topics-online/2013/02/risikomanagement/index.html

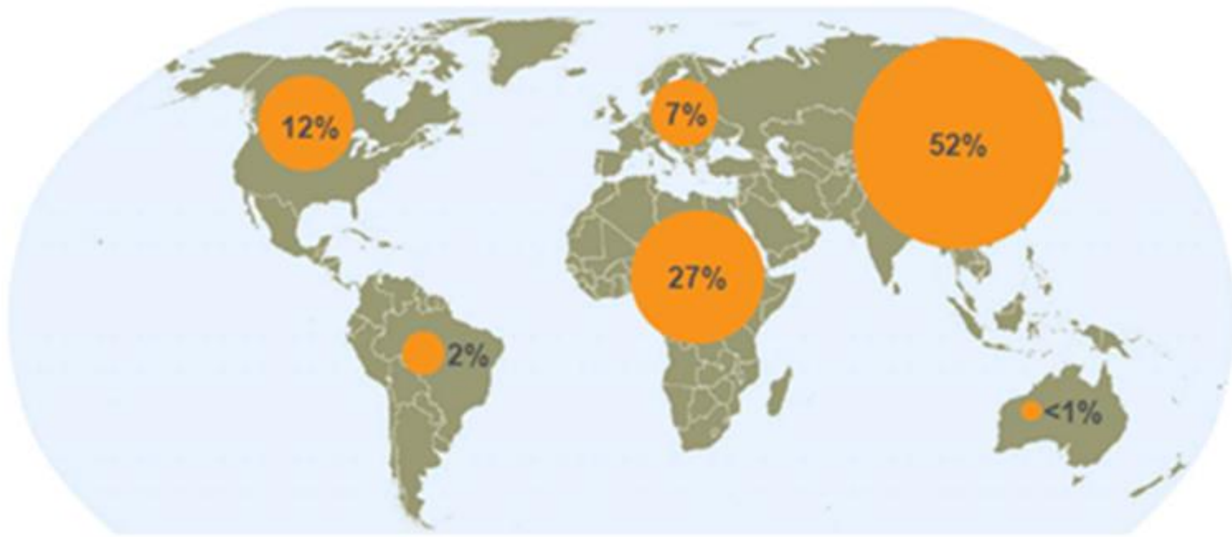

Figure A3.1 Natural catastrophe fatalities by continent: 1980–2012.

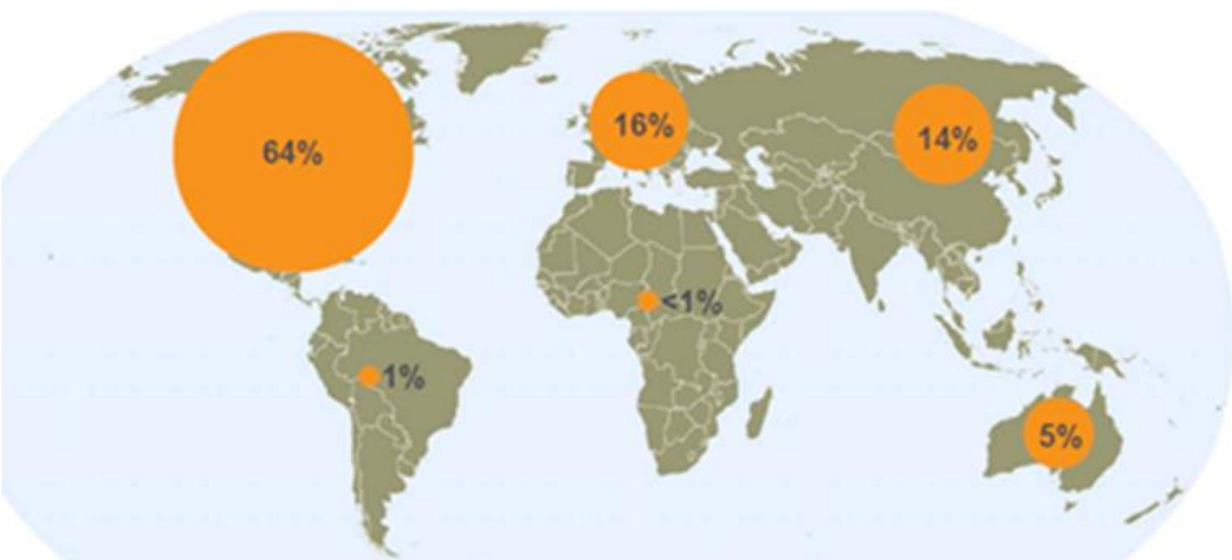

Figure A3.2 Natural catastrophe insured losses: 1980–2012.

Annex 4 Recent Initiatives in Extending Natural Catastrophe Modeling

A4.1 OASIS Loss Modelling Framework

OASIS Loss Modelling Framework[5] aims to build a broader community of catastrophe models and risk information by reaching beyond re/insurance to increase diversity of supply. Encouragement of open-source approaches beyond the traditional vendor modelers allows other organizations (such as KatRisk, JBA, etc.) to more easily launch their products on a common IT platform. Innovation is also stimulated from the academic sector that has a portal through which to promote the latest applied research and also a tool to use free of prohibitive annual software license fees. Openness and transparency of model building will also be strengthened, leading to improved model validation, sensitivity analysis and uncertainty communication. The OASIS project has recently been endorsed by The Global Innovation Lab for Climate Finance as one of four new financial instruments to catalyze investment in climate mitigation and adaptation in developing countries[6].

In 2017, the OASIS Hub[7] has also been launched, which aims to become an online ‘show window’ and marketplace for publishing and purchasing environmental data. An aim is to reach a broad range of non-technical audience, including city planners and resilience officers. Hopefully this will also stimulate work in developing economies and will include lesser-covered perils such as drought, agricultural crops and livestock risk, and epidemic.

A4.2 Insurance Development Forum (IDF)

The Insurance Development Forum[8] (IDF) is a public / private partnership led by the insurance industry and supported by international organizations such as the World Bank Group and the United Nations. The IDF was officially launched in 2016 after being first announced at the United Nations Conference of the Parties (CoP21) Paris Climate summit in 2015. The IDF aims to optimize and extend the use of insurance and its related risk management capabilities to build greater resilience and protection for people, communities, businesses and public institutions that are vulnerable to disasters and the associated economic shocks.

The Risk Modelling and Mapping Group (RMMG) of the IDF is currently cataloguing all nat cat risk models available globally and identifying gaps in coverage by country, peril and risk model type (e.g. indemnity-based catastrophe models, parametric hazard triggers or deterministic scenarios). The RMMG is also working with the Global Earthquake Model (GEM) initiative to extend the existing earthquake-related Global Exposure Database (GED)[9] to cover characteristics relevant to other perils such as windstorm and flood. RMMG assisted in the construction of Tables A12.1 and A12.2 detailing existing risk model availability for GPE partner countries.

[5] http://www.oasislmf.org/
[6] http://climatefinancelab.org/idea/climate-risk-assessment/
[7] https://oasishub.co/
[8] http://theidf.org/
[9] https://www.globalquakemodel.org/what/physical-integrated-risk/exposure-database/

Annex 5 ClimateWise Compendium of Disaster Risk Insurance Initiatives

Country	GPE Country	Agricultural insurance (indemnity-based)	Agricultural insurance (index-based)	Disaster Micro-insurance	Property and/or BI insurance	Property Catastrophe Risk Re/Insurance Pool	Sovereign Disaster Risk Financing
Algeria	No					1	
Argentina	No	2					
Bangladesh	Yes		2	1			
Bolivia	Yes	1	2				
Brazil	No	4	1				
Bulgaria	No	1				1	
Burkina Faso	Yes		1				
Chile	No	1					
China	No	1	1	1		1	
China	No	1	1				
China (Taiwan)	No					1	
Colombia	No	1	1		1		
Costa Rica	No	1					
Dominican Republic	No		1				1
Ecuador	No	1					
El Salvador	Yes	1					
Ethiopia	Yes	1	3				1
Guatemala	Yes	1					
Haiti	Yes			1			
Honduras	Yes	1					
India	Yes	1	7	6			
India (Andhra Pradesh)	Yes			1			
Indonesia	Yes		1	2		1	
Iran	No		1				
Jamaica	No	1	1				
Kazakhstan	No	1	1				
Kenya	Yes		2				
Malawi	Yes						1
Malawi	Yes		1				
Mali	Yes		1				
Mauritius	No	1					
Mexico	No	1					3
Mexico (Rio Mayo)	No		1				
Moldova	Yes	1					
Mongolia	Yes		1				
Morocco	Yes	2	2			1	
Mozambique	Yes		1				
Nepal	Yes	1	1	1			
Pakistan	Yes			1			
Panama	No	1					
Paraguay	No	1					
Peru	No	3	1		1		
Philippines	Yes	1	2		1		
Romania	No	1	1			1	

Russia	No	1					
Rwanda	Yes		1				
Senegal	Yes		2				
South Africa	No	1					
Sri Lanka	Yes		1				
St. Lucia	Yes			1			
Sudan	Yes	1					
Tanzania	Yes		1				
Thailand	No		1				
Turkey	No	1				1	
Ukraine	Yes	1	1				
Uruguay	No	1	1				
Venezuela	No	1					
Vietnam	Yes		2				
Zambia	Yes		1				
12 villages across Africa	Yes		1				
16 Caribbean governments	Yes						1
32 member countries	Yes						1
AOSIS and SIDS member states	Yes						1
Central American countries	Yes						2
SEEC countries	No				1		
Dominica, Grenada, St. Vincent, St. Lucia	Yes	1					
Guatemala, Honduras, Nicaragua	Yes		1				
Indonesia, Philippines, Viet Nam	Yes						
Kenya, Rwanda, Tanzania	Yes		1				
Senegal and Ethiopia (operational). Malawi and Zambia (pilot)	Yes		1				
South Pacific Islands	Yes						1

Table A5.1 ClimateWise compendium of disaster risk insurance initiatives.

Annex 6 Example Occupancy Type & Construction Classifications

Classification System	Name	Web-site
ATC	Applied Technology Council	https://www.atcouncil.org/
EN Eurocodes	European Union structural design standards	http://eurocodes.jrc.ec.europa.eu/
IBC	International Building Code	http://www.iccsafe.org/codes-tech-support/codes/2015-i-codes/ibc/
ISO	International Organization for Standardization	https://www.iso.org/home.html
NAICS	North American Industry Classification System	https://www.naics.com/
NCCI	National Council on Compensation Insurance	https://www.ncci.com/pages/default.aspx
Sanborn	Mapping classification	http://www.sanborn.com/
SIC	Standard Industrial Classification	http://siccode.com/en/siccode/list/directory
Unicede	AIR Worldwide (AIR) data format (since 1993)	http://unicede.com/

Table A6.1 Example occupancy type and construction classifications.

Classification System	Educational Services: Sub-categories
Applied Technology Council (ATC)	Elementary and secondary schools
	Day-care centers, nursery schools
	Other educational services
	Higher education structures
Standard Industrial Classification (SIC)	Educational Services
	Elementary & Secondary Schools
	Colleges & Universities, NEC
	Junior Colleges
	Business & Secretarial Schools
	Vocational Schools, NEC
	Schools & Educational Services, NEC
International Building Code (IBC)	Schools N.O.C.a, Business Colleges
	Trade Schools or Vocational Schools
	Day Care, Nursery, Kindergarten
	Private Schools—Primary, Secondary Levels
	Public Primary Schools
	Public Secondary Schools incl. Junior High
	Schools—N.O.C.a incl. Trade Schools, Business Colleges
	Universities, Community Colleges, and Polytechnics

Table A6.2 Educational Services sub-categories.

Annex 7 FONDEN Scheme Exposure Data: Federal and State Education Assets

FONDEN Federal Liability: Asset Type	% of Total
Roads + Bridges	54.6%
Housing	22.2%
Schools	12.3%
Hydraulic Infrastructure	8.2%
Health	2.8%
Total	**100%**

Table A7.1 FONDEN scheme exposure data: federal portfolio composition by asset type.

Field Type	Field Name	Example
Policy Information	Policy ID	Basic Schools 1
	Policy No	XXX
Location Information	Country Code	28
	State Code	1
	Municipality	1
	Localidad	1
	Postal Code	20190
	Longitude	-102.3
	Latitude	21.9
Value at Risk	Building Value	43,750
Primary and Secondary Modifiers	Occupation Type	346
	Construction Type	100
	No. Floors	1
	Building Date	1983
	Responsibility	FEDERAL

Table A7.2 FONDEN scheme exposure data: educational risks data structure.

Annex 8 Safer Communities Through Safer Schools (SCOSSO) Rapid Visual Survey Form

SAFER COMMUNITIES THROUGH SAFER SCHOOLS - RAPID VISUAL SURVEY [V.2]

SCOSSO

General Info.

Date:	Time:	Surveyor Name:
School Compound Name / Address:		
Building ID:		Total No. of Students in Building:
GPS Coordinate → Lat.:	Lon.:	
Position → [ ] Corner [ ] Mid-block [ ] End-block [ ] Isolated [ ] Other:		
Construction Year:	[ ] Unknown	Confidence: [ ] H [ ] M [ ] L
Any School Plan / Arial Map Attached? → [ ] NO [ ] YES Info:		
Any nearby Rivers → [ ] NO [ ] YES Distance:		
Any nearby Coasts → [ ] NO [ ] YES Distance:		
Any nearby Faults → [ ] NO [ ] YES Distance:		

Building Info.

No. Storey :	Storey Height (m):
No. Bay X :	Total Length X (m):
No. Bay Y :	Total Length Y (m):
No. Rooms → Classroom: Library: Office:	IT Hub: Hall: Services: Other:
Dimension of Average Classroom (m) → X:	Y:
Dimensions of Largest Room (m) → X:	Y: Info:
No. openings per storey:	Largest opening size (m):

Structural Info.

		Unk*	Confidence
Primary Structural System	[ ] Masonry [ ] RC frame [ ] Steel [ ] Timber [ ] Other:	[ ]	H M L
Floor Material	[ ] RC Slab [ ] Timber Joists + Wooden Floor [ ] Reinforced Brick Concrete [ ] Other:	[ ]	H M L
Roof Structural System	[ ] RC Slab [ ] Timber Frame [ ] Steel Truss [ ] Reinforced Brick Concrete [ ] Other:	[ ]	H M L
Roof Covering	[ ] Tiles [ ] Metal Sheeting [ ] Other:	[ ]	H M L
Roof Pitch	[ ] Flat [ ] Mono Pitch [ ] Multi Pitch → No.:	[ ]	H M L
Roof Condition	[ ] Deteriorated [ ] Fair [ ] Excellent (Brand New)	[ ]	H M L
Roof Connection	[ ] Deteriorated [ ] Fair [ ] Excellent (Brand New)	[ ]	H M L
Lateral Load Resisting System	[ ] Frame [ ] Load Bearing Walls [ ] RC Shear Wall [ ] Bracing [ ] Confined Masonry [ ] Combined [ ] Other:	[ ]	H M L
Structural Condition	[ ] Deteriorated [ ] Fair [ ] Excellent (Brand New)	[ ]	H M L
Connection Quality	[ ] Low [ ] Moderate [ ] High	[ ]	H M L
Retrofitting	[ ] No [ ] Yes → Info:	[ ]	H M L
Aseismic Devices	[ ] No [ ] Yes → Info:	[ ]	H M L
Modifications	[ ] No [ ] Yes → Info: [ ] Addition of Stories: [ ] Extension of Plan:	[ ]	H M L
Vulnerability Factors (Indicate Confidence)	[ ] Short column [ ] Pounding (if buildings closer than 0.2m) [ ] Soft storey [ ] Strong Beam-Weak Column [ ] Built on Slope [ ] Built on Stilts [ ] Balconies [ ] Plan irreg. [ ] Elevation irreg. [ ] Mass irreg. [ ] Opening irreg. [ ] Other:		

If MASONRY:

		Unk*	Confidence
Masonry Type	[ ] Masonry Brick [ ] Masonry Block [ ] Concrete Block [ ] Cut stone [ ] Adobe [ ] Rubble Stone [ ] Other:	[ ]	H M L
Mortar Type	[ ] None [ ] Cement [ ] Lime [ ] Mud	[ ]	H M L
Reinforcement	[ ] No [ ] Yes	[ ]	H M L
Confinement	[ ] No [ ] Yes	[ ]	H M L
Wall Thickness (m)		[ ]	H M L
Wall Layer	[ ] Solid [ ] Multi Leaf [ ] Cavity Walls	[ ]	H M L

If FRAME [RC, Timber, Steel]:

		Unk*	Confidence
Beam Dimensions (m)		[ ]	H M L
Column Dimensions (m)		[ ]	H M L
Infill Wall Material	[ ] Brick [ ] Concrete Block [ ] Adobe [ ] Timber Plates [ ] Other:	[ ]	H M L

*Unknown H = high, M = medium, L = low

Any extra comments can be added on the back of this sheet.

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Figure A8.1 SCOSSO rapid visual survey form.

Annex 9 GPE Partner Country Classification

Country	ISO Code	Year Joined GPE	GPE Classification	Region	Income group
Afghanistan	AFG	2011	1	South Asia	Low income
Armenia	ARM	2017	4	Europe and Central Asia	Lower middle income
Bangladesh	BGD	2015	3	South Asia	Low income
Benin	BEN	2007	1	Sub-Saharan Africa	Low income
Bhutan	BTN	2009	2	South Asia	Lower middle income
Bolivia	BOL	2017	4	LAC	Lower middle income
Burkina Faso	BFA	2002	1	Sub-Saharan Africa	Low income
Burundi	BDI	2012	1	Sub-Saharan Africa	Low income
Cabo Verde	CPV	2017	2	Sub-Saharan Africa	Lower middle income
Cambodia	KHM	2006	3	East Asia and the Pacific	Low income
Cameroon	CMR	2006	3	Sub-Saharan Africa	Lower middle income
Central African Republic	CAF	2008	1	Sub-Saharan Africa	Low income
Chad	TCD	2012	1	Sub-Saharan Africa	Low income
Comoros	COM	2013	1	Sub-Saharan Africa	Low income
Congo, Dem. Rep.	COD	2010	1	Sub-Saharan Africa	Low income
Congo, Rep.	COG	2015	4	Sub-Saharan Africa	Lower middle income
Cote d'Ivoire	CIV	2012	3	Sub-Saharan Africa	Lower middle income
Djibouti	DJI	2006	3	Middle East and North Africa	Lower middle income
Dominica	DMA	2016	2	LAC	Upper middle income
Egypt	EGY	2017	4	Middle East and North Africa	Lower middle income
El Salvador	SLV	2017	4	LAC	Lower middle income
Eritrea	ERI	2013	1	Sub-Saharan Africa	Low income
Ethiopia	ETH	2004	1	Sub-Saharan Africa	Low income
Gambia, The	GMB	2003	1	Sub-Saharan Africa	Low income
Ghana	GHA	2004	3	Sub-Saharan Africa	Lower middle income
Grenada	GRD	2016	2	LAC	Upper middle income
Guatemala	GTM	2017	4	LAC	Lower middle income
Guinea	GIN	2002	1	Sub-Saharan Africa	Low income
Guinea-Bissau	GNB	2010	1	Sub-Saharan Africa	Low income
Guyana	GUY	2002	2	LAC	Lower middle income
Haiti	HTI	2008	1	LAC	Low income
Honduras	HND	2002	4	LAC	Lower middle income
India	IND	2017	4	South Asia	Lower middle income
Indonesia	IDN	2017	4	East Asia and the Pacific	Lower middle income
Kenya	KEN	2005	3	Sub-Saharan Africa	Low income
Kiribati	KIR	2017	2	East Asia and the Pacific	Lower middle income
Kyrgyz Republic	KGZ	2006	4	Europe and Central Asia	Lower middle income
Lao PDR	LAO	2009	3	East Asia and the Pacific	Lower middle income
Lesotho	LSO	2005	3	Sub-Saharan Africa	Lower middle income
Liberia	LBR	2007	1	Sub-Saharan Africa	Low income
Madagascar	MDG	2005	1	Sub-Saharan Africa	Low income
Malawi	MWI	2009	1	Sub-Saharan Africa	Low income
Maldives	MDV	2017	2	South Asia	Upper middle income

Mali	MLI	2006	1	Sub-Saharan Africa	Low income
Marshall Islands	MHL	2017	2	East Asia and the Pacific	Upper middle income
Mauritania	MRT	2002	3	Sub-Saharan Africa	Lower middle income
Fed States of Micronesia	FSM	2017	2	East Asia and the Pacific	Lower middle income
Moldova	MDA	2006	4	Europe and Central Asia	Lower middle income
Mongolia	MNG	2003	4	East Asia and the Pacific	Lower middle income
Morocco	MAR	2017	4	Middle East and North Africa	Lower middle income
Mozambique	MOZ	2009	1	Sub-Saharan Africa	Low income
Myanmar	MMR	2017	3	East Asia and the Pacific	Low income
Nepal	NPL	2002	1	South Asia	Low income
Nicaragua	NIC	2002	3	LAC	Lower middle income
Niger	NER	2012	1	Sub-Saharan Africa	Low income
Nigeria	NGA	2012	3	Sub-Saharan Africa	Lower middle income
Pakistan	PAK	2010	3	South Asia	Lower middle income
Papua New Guinea	PNG	2005	3	East Asia and the Pacific	Lower middle income
Philippines	PHL	2017	4	East Asia and the Pacific	Lower middle income
Rwanda	RWA	2006	1	Sub-Saharan Africa	Low income
Samoa	WSM	2017	2	East Asia and the Pacific	Lower middle income
Sao Tome and Principe	STP	2007	2	Sub-Saharan Africa	Lower middle income
Senegal	SEN	2006	1	Sub-Saharan Africa	Lower middle income
Sierra Leone	SLE	2007	1	Sub-Saharan Africa	Low income
Solomon Islands	SLB	2017	2	East Asia and the Pacific	Lower middle income
Somalia	SOM	2012	1	Sub-Saharan Africa	Low income
South Sudan	SSD	2012	1	Sub-Saharan Africa	Lower middle income
Sri Lanka	LKA	2017	4	South Asia	Lower middle income
St. Lucia	LCA	2016	2	LAC	Upper middle income
St. Vincent & the Gren.	VCT	2016	2	LAC	Upper middle income
Sudan	SDN	2012	3	Sub-Saharan Africa	Lower middle income
Swaziland	SWZ	2017	4	Sub-Saharan Africa	Lower middle income
Syrian Arab Republic	SYR	2017	3	Middle East and North Africa	Lower middle income
Tajikistan	TJK	2005	4	Europe and Central Asia	Low income
Tanzania	TZA	2005	1	Sub-Saharan Africa	Low income
Timor-Leste	TLS	2010	2	East Asia and the Pacific	N.D
Togo	TGO	2011	1	Sub-Saharan Africa	Low income
Tonga	TON	2017	2	East Asia and the Pacific	Upper middle income
Tunisia	TUN	2017	4	Middle East and North Africa	Upper middle income
Tuvalu	TUV	2017	2	East Asia and the Pacific	Upper middle income
Uganda	UGA	2013	1	Sub-Saharan Africa	Low income
Ukraine	UKR	2017	4	Europe and Central Asia	Lower middle income
Uzbekistan	UZB	2013	4	Europe and Central Asia	Lower middle income
Vanuatu	VUT	2017	2	East Asia and the Pacific	Lower middle income
Vietnam	VNM	2003	4	East Asia and the Pacific	Lower middle income
West Bank and Gaza	PSE	2017	4	Middle East and North Africa	N.D
Yemen, Rep.	YEM	2003	3	Middle East and North Africa	Lower middle income
Zambia	ZMB	2008	3	Sub-Saharan Africa	Lower middle income
Zimbabwe	ZWE	2013	1	Sub-Saharan Africa	Low income

Table A9.1 GPE partner countries by country classification.

GPE Classification	Classification Code	No. of Countries
Low Income Countries	1	30
Small Island and Landlocked Developing States	2	18
Vulnerable LMICS* <US$2,000 GNI p/c and below 90% LSCR** OR FCACs*** <US$3,000 GNI p/c and below 90% LSCR	3	19
Other LMICs	4	22
Total		**89**

Table A9.2 GPE partner country classification code.

* LMIC Low and Middle-Income Countries
**LSCR Local State of Children Report
***FCAC Fragile and Conflict-Affected Countries

Annex 10 PDNA Reports with Education Sector Loss Metrics

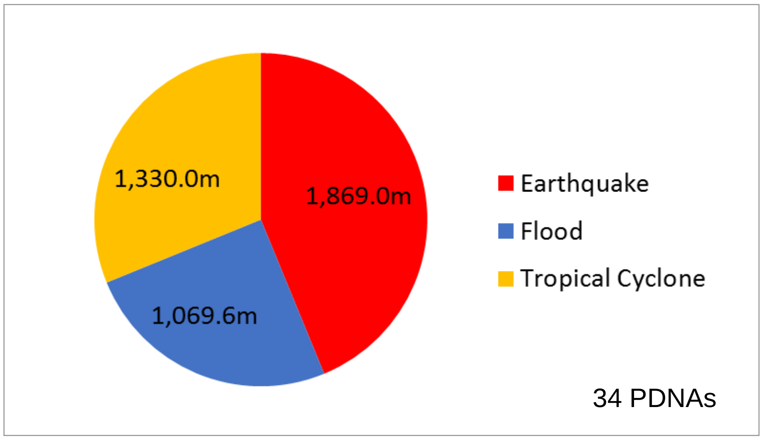

Figure A10.1 GPE PDNA education sector losses (USD 2016) by natural hazard.

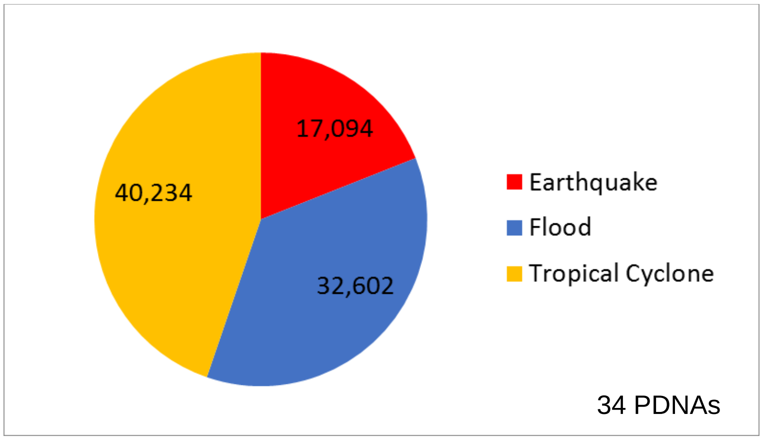

Figure A10.2 GPE PDNA number of schools affected by natural hazard.

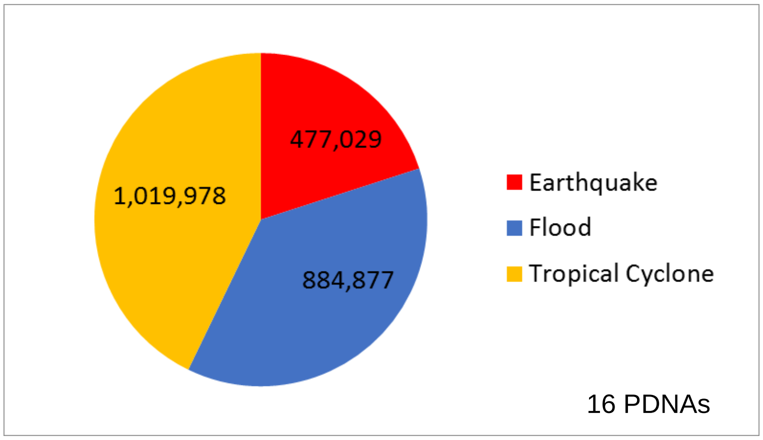

Figure A10.3 GPE PDNA number of children affected by natural hazard.

GPE Classification	GPE ID	GPE Countries	PDNA Countries	% Sampled
Low Income Countries	1	30	10	33%
Small Island and Landlocked Developing States	2	18	7	39%
Vulnerable LMICS – Less than US$2,000 GNI p/c and below 90% LSCR OR FCACs with Less than US$3,000 GNI p/c and below 90% LSCR	3	19	6	32%
Other LMICs	4	22	4	18%
Total		**89**	**27**	**30%**

Table A10.1 GPE PDNA country sampling by GPE classification.

Income Group	GPE Countries	PDNA Countries	% Sampled
Low income	33	11	33%
Lower middle income	45	14	31%
Upper middle income	9	2	22%
N.D	2		
Total	**89**	**27**	**30%**

Table A10.2 GPE PDNA country sampling by income group.

Region	GPE Countries	PDNA Countries	% Sampled
East Asia and the Pacific	17	6	35%
Europe and Central Asia	6	1	17%
LAC	11	7	64%
Middle East and North Africa	**7**	**-**	0%
South Asia	8	4	50%
Sub-Saharan Africa	40	9	23%
Total	**89**	**27**	**30%**

Table A10.3 GPE PDNA country sampling by geographical region.

Annex 11 UNISDR GAR2015 Modeled AAL Statistics by GPE Country

				Average Annual Loss (AAL) USD m					
Country	**ISO Code**	**Year joined GPE**	**Exposed Value (USD m)**	**Earthquake**	**Tropical Cyclones**	**Tsunami**	**Floods**	**Multi-Hazard**	**Volcanic Ash**
Afghanistan	AFG	2011	60,187.90	146.81	-	---	74.52	221.33	
Armenia	ARM	2017	22,895.20	45.24	-	---	17.68	62.92	
Bangladesh	BGD	2015	381,432.00	126.46	489.20	5.50	2,343.16	2,964.32	
Benin	BEN	2007	21,971.90	0.23	-	-	23.89	24.12	
Bhutan	BTN	2009	11,083.70	7.98	-	---	45.54	53.52	
Bolivia	BOL	2017	60,590.00	74.50	-	---	61.70	136.20	
Burkina Faso	BFA	2002	24,689.40	0.03	-	---	25.04	25.07	
Burundi	BDI	2012	3,616.17	3.87	-	---	2.80	6.67	
Cabo Verde	CPV	2017	7,137.79	0.04	0.15	-	---	0.19	
Cambodia	KHM	2006	27,390.50	-	0.01	---	242.43	242.44	
Cameroon	CMR	2006	81,683.70	9.88	-	-	102.84	112.72	
Central African Republic	CAF	2008	3,893.74	0.43	-	---	6.57	7.00	
Chad	TCD	2012	26,745.10	0.17	-	---	49.83	50.00	
Comoros	COM	2013	1,426.14	0.25	0.56	-	---	0.81	
Congo, Dem. Rep.	COD	2010	27,402.00	4.18	-	---	63.32	67.50	
Congo, Rep.	COG	2015	69,047.70	0.99	-	---	153.62	154.61	
Cote d'Ivoire	CIV	2012	45,467.60	0.33	-	-	54.93	55.26	
Djibouti	DJI	2006	4,744.66	2.95	-	-	0.22	3.17	
Dominica	DMA	2016	2,027.94	13.06	55.46	-	---	68.52	
Egypt	EGY	2017	617,149.00	176.90	-	8.52	93.59	279.01	
El Salvador	SLV	2017	71,580.50	250.38	0.08	0.07	10.70	261.23	
Eritrea	ERI	2013	9,081.79	0.71	-	---	7.21	7.92	
Ethiopia	ETH	2004	65,598.90	2.94	-	---	83.72	86.66	
Gambia, The	GMB	2003	2,097.61	0.05	-	-	1.75	1.80	
Ghana	GHA	2004	74,174.00	0.09	-	-	66.26	66.35	
Grenada	GRD	2016	4,536.19	8.60	21.07	0.01	---	29.68	
Guatemala	GTM	2017	172,912.00	701.65	0.80	0.04	57.41	759.90	
Guinea	GIN	2002	13,665.90	0.45	-	-	24.41	24.86	
Guinea-Bissau	GNB	2010	2,029.35	0.06	-	-	1.01	1.07	
Guyana	GUY	2002	8,076.05	0.06	-	-	33.75	33.81	
Haiti	HTI	2008	28,268.60	119.53	51.16	0.12	27.94	198.75	
Honduras	HND	2002	77,974.80	675.94	24.34	0.01	104.84	805.13	
India	IND	2017	5,769,370.00	446.55	1,887.36	19.14	6,230.81	8,583.86	
Indonesia	IDN	2017	2,827,830.00	1,116.01	38.35	48.15	2,086.88	3,289.39	5,929.30
Kenya	KEN	2005	98,382.70	12.57	-	-	107.67	120.24	
Kiribati	KIR	2017	595.12	---	-	0.01	---	0.01	
Kyrgyz Republic	KGZ	2006	18,466.60	62.60	-	---	30.08	92.68	
Lao PDR	LAO	2009	21,925.60	5.03	0.35	---	207.59	212.97	
Lesotho	LSO	2005	17,938.00	15.77	-	---	19.83	35.60	
Liberia	LBR	2007	1,911.24	0.11	-	-	2.73	2.84	
Madagascar	MDG	2005	23,496.40	0.58	206.26	0.01	57.42	264.27	
Malawi	MWI	2009	18,357.00	8.20	0.01	---	46.05	54.26	
Maldives	MDV	2017	7,443.12	0.01	-	0.05	---	0.06	

Mali	MLI	2006	27,719.20	0.15	-	---	56.00	56.15	
Marshall Islands	MHL	2017	766.31	---	0.25	-	---	0.25	
Mauritania	MRT	2002	11,985.50	0.22	-	-	17.39	17.61	
Micronesia, Fed. States of	FSM	2017	1,347.82	0.06	6.38	0.02	---	6.46	
Moldova	MDA	2006	33,762.70	2.83	-	---	84.76	87.59	
Mongolia	MNG	2003	36,587.60	3.83	-	---	31.04	34.87	-
Morocco	MAR	2017	374,846.00	157.28	-	0.23	176.51	334.02	
Mozambique	MOZ	2009	36,409.40	7.91	45.08	-	50.56	103.55	
Myanmar	MMR	2017	195,390.00	35.57	82.37	3.27	1,909.01	2,030.22	
Nepal	NPL	2002	53,996.60	29.50	-	---	132.07	161.57	
Nicaragua	NIC	2002	35,973.80	72.50	3.85	0.01	33.28	109.64	
Niger	NER	2012	12,723.50	-	-	---	21.43	21.43	
Nigeria	NGA	2012	592,030.00	20.64	-	-	693.24	713.88	
Pakistan	PAK	2010	502,344.00	272.05	25.60	0.17	955.59	1,253.41	
Papua New Guinea	PNG	2005	47,017.90	73.59	1.43	0.59	86.39	162.00	13.70
Philippines	PHL	2017	566,949.00	703.46	6,613.13	30.63	506.70	7,853.92	557.60
Rwanda	RWA	2006	13,197.40	12.68	-	---	22.48	35.16	
Samoa	WSM	2017	1,930.49	0.40	14.29	0.01	---	14.70	-
Sao Tome and Principe	STP	2007	2,122.70	0.06	-	-	---	0.06	
Senegal	SEN	2006	35,335.20	0.79	-	0.01	14.09	14.89	
Sierra Leone	SLE	2007	3,031.82	0.10	-	-	7.72	7.82	
Solomon Islands	SLB	2017	3,693.47	3.61	39.66	0.13	---	43.40	0.10
Somalia	SOM	2012	6,408.32	0.16	-	-	18.88	19.04	
South Sudan	SSD	2012	19,958.30	3.90	-	---	30.01	33.91	
Sri Lanka	LKA	2017	208,274.00	0.77	20.27	1.75	128.05	150.84	
St. Lucia	LCA	2016	3,361.85	5.06	41.67	0.01	---	46.74	
St. Vincent and the Grenadines	VCT	2016	2,645.41	2.79	21.69	0.01	---	24.49	
Sudan	SDN	2012	70,368.80	1.89	-	---	120.40	122.29	
Swaziland	SWZ	2017	13,701.20	6.99	-	---	8.41	15.40	
Syrian Arab Republic	SYR	2017	204,643.00	149.11	-	0.13	89.16	238.40	
Tajikistan	TJK	2005	20,536.90	64.44	-	---	42.34	106.78	
Tanzania	TZA	2005	50,142.80	26.08	-	-	38.01	64.09	
Timor-Leste	TLS	2010	12,524.20	14.59	-	0.25	0.69	15.53	
Togo	TGO	2011	12,513.70	0.07	-	-	15.84	15.91	
Tonga	TON	2017	1,303.32	3.35	29.14	0.18	---	32.67	-
Tunisia	TUN	2017	178,846.00	97.19	-	0.23	22.45	119.87	
Tuvalu	TUV	2017	123.27	-	-	-	---	-	
Uganda	UGA	2013	43,697.10	22.14	-	---	28.40	50.54	
Ukraine	UKR	2017	676,834.00	8.67	-	---	1,018.35	1,027.02	
Uzbekistan	UZB	2013	151,891.00	225.05	-	---	64.15	289.20	
Vanuatu	VUT	2017	2,809.61	7.65	58.87	0.06	---	66.58	3.20
Vietnam	VNM	2003	487,574.00	3.95	76.07	0.66	2,252.82	2,333.50	
West Bank and Gaza	PSE	2017	69,454.30	26.75	-	0.06	0.15	26.96	
Yemen, Rep.	YEM	2003	79,113.60	45.87	-	-	46.05	91.92	
Zambia	ZMB	2008	48,954.50	17.41	-	---	34.28	51.69	
Zimbabwe	ZWE	2013	22,038.10	4.18	0.06	---	8.00	12.24	

Table A11.1 UNISDR GAR2015 modelled average annual losses (AAL) by GPE partner country.

Rank	Earthquake	Tropical Cyclones	Tsunami	Floods	Multi-Hazard	Volcanic Ash
1	Honduras	Dominica	Tonga	Myanmar	Dominica	Indonesia
2	Dominica	Tonga	Philippines	Lao PDR	Tonga	Vanuatu
3	Haiti	Vanuatu	Solomon Islands	Cambodia	Vanuatu	Philippines
4	Guatemala	St. Lucia	Vanuatu	Bangladesh	St. Lucia	Papua New Guinea
5	El Salvador	Philippines	Timor-Leste	Vietnam	Philippines	Solomon Islands
6	Kyrgyz Republic	Solomon Islands	Indonesia	Guyana	Solomon Islands	
7	Tajikistan	Madagascar	Kiribati	Bhutan	Madagascar	
8	Vanuatu	St. Vincent and the Grenadines	Myanmar	Somalia	Myanmar	
9	Tonga	Samoa	Micronesia, Federated States of	Sierra Leone	Honduras	
10	Afghanistan	Micronesia, Federated States of	Bangladesh	Moldova	Lao PDR	
11	Nicaragua	Grenada	Egypt	Malawi	St. Vincent and the Grenadines	
12	Armenia	Haiti	Papua New Guinea	Nepal	Cambodia	
13	Grenada	Bangladesh	Sri Lanka	Madagascar	Bangladesh	
14	Papua New Guinea	Mozambique	Maldives	Congo, Dem. Rep.	Samoa	
15	St. Lucia	Myanmar	Samoa	Congo, Rep.	Haiti	
16	Uzbekistan	Comoros	Haiti	Tajikistan	Grenada	
17	Philippines	India	St. Vincent and the Grenadines	Mali	Tajikistan	
18	Bolivia	Marshall Islands	India	Pakistan	Kyrgyz Republic	
19	Timor-Leste	Honduras	St. Lucia	Chad	Bhutan	
20	Burundi	Vietnam	Grenada	Papua New Guinea	Micronesia, Federated States of	
21	St. Vincent and the Grenadines	Nicaragua	Vietnam	Guinea	Vietnam	
22	Solomon Islands	Sri Lanka	Tunisia	Sudan	Guatemala	
23	Rwanda	Pakistan	El Salvador	Rwanda	Guyana	
24	Lesotho	Papua New Guinea	West Bank and Gaza	Central African Republic	Afghanistan	

25	Syrian Arab Republic	Cabo Verde	Syrian Arab Republic	Niger	El Salvador	
26	Bhutan	Lao PDR	Morocco	Kyrgyz Republic	Papua New Guinea	
27	Djibouti	Indonesia	Madagascar	Ukraine	Nicaragua	
28	Yemen, Rep.	Guatemala	Pakistan	South Sudan	Nepal	
29	Nepal	Zimbabwe	Senegal	Mauritania	Somalia	
30	Tunisia	El Salvador	Nicaragua	Liberia	Malawi	
31	Pakistan	Malawi	Guatemala	Mozambique	Mozambique	
32	Tanzania	Cambodia	Honduras	Honduras	Armenia	
33	Swaziland			Ethiopia	Rwanda	
34	Uganda			Togo	Moldova	
35	Malawi			Cameroon	Sierra Leone	
36	Morocco			Afghanistan	Pakistan	
37	Indonesia			Cote d'Ivoire	Congo, Dem. Rep.	
38	West Bank and Gaza			Nigeria	Bolivia	
39	Zambia			Lesotho	Congo, Rep.	
40	Bangladesh			Kenya	Mali	
41	Egypt			Benin	Lesotho	
42	Lao PDR			India	Uzbekistan	
43	Mozambique			Bolivia	Chad	
44	Samoa			Burkina Faso	Burundi	
45	South Sudan			Haiti	Guinea	
46	Zimbabwe			Nicaragua	Central African Republic	
47	Myanmar			Philippines	Sudan	
48	Comoros			Ghana	South Sudan	
49	Congo, Dem. Rep.			Mongolia	Niger	
50	Kenya			Gambia, The	Ukraine	
51	Cameroon			Eritrea	India	
52	Central African Republic			Burundi	Liberia	
53	Mongolia			Armenia	Mauritania	
54	Moldova			Tanzania	Cameroon	
55	Eritrea			Indonesia	Ethiopia	
56	India			Zambia	Tanzania	
57	Liberia			Uganda	Togo	

58	Ethiopia			Sri Lanka	Timor-Leste	
59	Micronesia, Federated States of			Swaziland	Kenya	
60	Nigeria			Yemen, Rep.	Cote d'Ivoire	
61	Sierra Leone			Guinea-Bissau	Nigeria	
62	Guinea			Morocco	Syrian Arab Republic	
63	Guinea-Bissau			Syrian Arab Republic	Indonesia	
64	Sao Tome and Principe			Uzbekistan	Yemen, Rep.	
65	Sudan			Senegal	Uganda	
66	Somalia			Zimbabwe	Swaziland	
67	Madagascar			Guatemala	Benin	
68	Gambia, The			Egypt	Zambia	
69	Senegal			El Salvador	Burkina Faso	
70	Mauritania			Tunisia	Mongolia	
71	Congo, Rep.			Timor-Leste	Ghana	
72	Ukraine			Djibouti	Morocco	
73	Benin			West Bank and Gaza	Eritrea	
74	Vietnam				Gambia, The	
75	Guyana				Sri Lanka	
76	Cote d'Ivoire				Tunisia	
77	Chad				Djibouti	
78	Cabo Verde				Comoros	
79	Togo				Zimbabwe	
80	Mali				Guinea-Bissau	
81	Sri Lanka				Egypt	
82	Maldives				Senegal	
83	Burkina Faso				West Bank and Gaza	
84	Ghana				Marshall Islands	
85					Sao Tome and Principe	
86					Cabo Verde	
87					Kiribati	
88					Maldives	

Table A11.2 UNISDR GAR2015 AAL as loss damage ratio %, ranked by hazard.

Annex 12 GPE Countries and Risk Model Availability

Country	Parametric Scheme	Drought	Earthquake	Excess Rainfall	Flood	Tropical Cyclone	Tropical Storm	No. of Risk Models
Benin	ARC	1	1		1			**3**
Burkina Faso	ARC	1	1		1			**3**
Burundi	ARC	1			1			**2**
Cameroon	ARC	1	1		1			**3**
Central African Republic	ARC	1			1			**2**
Chad	ARC	1			1			**2**
Comoros	ARC	1			1	1		**3**
Congo, Dem. Rep.	ARC	1			1			**2**
Congo, Rep.	ARC	1			1			**2**
Cote d'Ivoire	ARC	1	1		1			**3**
Djibouti	ARC	1			1			**2**
Egypt	ARC				1			**1**
Eritrea	ARC	1			1			**2**
Ethiopia	ARC	1			1			**2**
Gambia, The	ARC	1	1		1			**3**
Ghana	ARC	1	1		1			**3**
Guinea	ARC	1	1		1			**3**
Guinea-Bissau	ARC	1	1		1			**3**
Kenya	ARC	1	2		1			**4**
Lesotho	ARC	1			1			**2**
Liberia	ARC	1	1		1			**3**
Madagascar	ARC	1			1	1		**3**
Malawi	ARC	1	1		1			**3**
Mali	ARC	1	1		1			**3**
Mauritania	ARC	1	1		1			**3**
Morocco	ARC	1	2		1			**4**
Mozambique	ARC	1			1	1		**3**
Niger	ARC	1	1		1			**3**
Nigeria	ARC	1	1		1			**3**
Rwanda	ARC	1			1			**2**
Sao Tome and Principe	ARC		1					**1**
Senegal	ARC	1	1		1			**3**
Sierra Leone	ARC	1	1		1			**3**
Somalia	ARC	1			1			**2**
South Sudan	ARC	1			1			**2**
Sudan	ARC	1			1			**2**

Swaziland	ARC	1			1			**2**
Tanzania	ARC	1	1		1	1		**4**
Togo	ARC	1	1		1			**3**
Tunisia	ARC				1			**1**
Uganda	ARC	1	1		1			**3**
Zambia	ARC	1			1			**2**
Zimbabwe	ARC	1			1			**2**
Dominica	CCRIF		2	1		3		**6**
El Salvador	CCRIF		3	1		3		**7**
Grenada	CCRIF		2	1		3		**6**
Guatemala	CCRIF		3	1		3		**7**
Guyana	CCRIF			1				**1**
Haiti	CCRIF		2	1		3		**6**
Honduras	CCRIF		3	1		3		**7**
Nicaragua	CCRIF		3	1		2		**6**
St. Lucia	CCRIF		2	1		3		**6**
St. Vincent and the Grenadines	CCRIF		2	1		3		**6**
Mongolia	Own							**0**
Kiribati	PCRAFI		1			1	1	**3**
Marshall Islands	PCRAFI		1			1	1	**3**
Micronesia, Federated States of	PCRAFI		1			1	1	**3**
Papua New Guinea	PCRAFI		1			1	1	**3**
Samoa	PCRAFI		1			1	1	**3**
Solomon Islands	PCRAFI		1			1	1	**3**
Timor-Leste	PCRAFI		1			1	1	**3**
Tonga	PCRAFI		1			1	1	**3**
Tuvalu	PCRAFI		1			1	1	**3**
Vanuatu	PCRAFI		1			1	1	**3**
Afghanistan								**0**
Armenia								**0**
Bangladesh			1					**1**
Bhutan								**0**
Bolivia								**0**
Cabo Verde			1					**1**
Cambodia						1		**1**
India			4		2	3		**9**
Indonesia			5		2			**7**
Kyrgyz Republic								**0**
Lao PDR						1		**1**
Maldives								**0**
Moldova								**0**

Myanmar			1					**1**
Nepal			1					**1**
Pakistan			3			1		**4**
Philippines			5		1	4		**10**
Sri Lanka								**0**
Syrian Arab Republic								**0**
Tajikistan								**0**
Ukraine								**0**
Uzbekistan								**0**
Vietnam			2		1	3		**6**
West Bank and Gaza								**0**
Yemen, Rep.			3			1		**4**

Table A12.1 GPE partner countries and risk model availability by parametric scheme and hazard.

ISO Code	Country	Modeling Company	Hazard	Notes
BGD	Bangladesh	KIT	Earthquake	
BEN	Benin	ARC	Flood	
BEN	Benin	ARC	Drought	
BEN	Benin	KIT	Earthquake	
BFA	Burkina Faso	ARC	Drought	
BFA	Burkina Faso	ARC	Flood	
BFA	Burkina Faso	KIT	Earthquake	
BDI	Burundi	ARC	Flood	
BDI	Burundi	ARC	Drought	
CPV	Cabo Verde	KIT	Earthquake	
KHM	Cambodia	KatRisk	Tropical Cyclone	http://www.katrisk.com/models
CMR	Cameroon	ARC	Drought	
CMR	Cameroon	ARC	Flood	
CMR	Cameroon	KIT	Earthquake	
CAF	Cent. African Rep.	ARC	Drought	
CAF	Cent. African Rep.	ARC	Flood	
TCD	Chad	ARC	Drought	
TCD	Chad	ARC	Flood	
COM	Comoros	ARC	Tropical Cyclone	
COM	Comoros	ARC	Drought	
COM	Comoros	ARC	Flood	
COD	Congo, Dem. Rep.	ARC	Drought	
COD	Congo, Dem. Rep.	ARC	Flood	
COG	Congo, Rep.	ARC	Drought	
COG	Congo, Rep.	ARC	Flood	
CIV	Cote d'Ivoire	ARC	Drought	
CIV	Cote d'Ivoire	ARC	Flood	
CIV	Cote d'Ivoire	KIT	Earthquake	
DJI	Djibouti	ARC	Flood	
DJI	Djibouti	ARC	Drought	
DMA	Dominica	AIR	Tropical Cyclone	AIR Tropical Cyclone Model for the Caribbean
DMA	Dominica	CCRIF-Carib	Earthquake	
DMA	Dominica	CCRIF-Carib	Excess Rainfall	
DMA	Dominica	CCRIF-Carib	Tropical Cyclone	
DMA	Dominica	Corelogic	Earthquake	
DMA	Dominica	Corelogic	Tropical Cyclone	

EGY	Egypt	ARC	Flood	
SLV	El Salvador	AIR	Earthquake	AIR Earthquake Model for Central America
SLV	El Salvador	AIR	Tropical Cyclone	AIR Tropical Cyclone Model for Central America
SLV	El Salvador	CCRIF-CA	Tropical Cyclone	
SLV	El Salvador	CCRIF-CA	Earthquake	
SLV	El Salvador	CCRIF-CA	Excess Rainfall	
SLV	El Salvador	Corelogic	Earthquake	
SLV	El Salvador	Corelogic	Tropical Cyclone	
ERI	Eritrea	ARC	Flood	
ERI	Eritrea	ARC	Drought	
ETH	Ethiopia	ARC	Drought	
ETH	Ethiopia	ARC	Flood	
GMB	Gambia, The	ARC	Drought	
GMB	Gambia, The	ARC	Flood	
GMB	Gambia, The	KIT	Earthquake	
GHA	Ghana	ARC	Drought	
GHA	Ghana	ARC	Flood	
GHA	Ghana	KIT	Earthquake	
GRD	Grenada	AIR	Tropical Cyclone	AIR Tropical Cyclone Model for the Caribbean
GRD	Grenada	CCRIF-Carib	Tropical Cyclone	
GRD	Grenada	CCRIF-Carib	Excess Rainfall	
GRD	Grenada	CCRIF-Carib	Earthquake	
GRD	Grenada	Corelogic	Earthquake	
GRD	Grenada	Corelogic	Tropical Cyclone	
GTM	Guatemala	AIR	Tropical Cyclone	AIR Tropical Cyclone Model for Central America
GTM	Guatemala	AIR	Earthquake	AIR Earthquake Model for Central America
GTM	Guatemala	CCRIF-CA	Excess Rainfall	
GTM	Guatemala	CCRIF-CA	Tropical Cyclone	
GTM	Guatemala	CCRIF-CA	Earthquake	
GTM	Guatemala	Corelogic	Earthquake	
GTM	Guatemala	Corelogic	Tropical Cyclone	
GIN	Guinea	ARC	Flood	
GIN	Guinea	ARC	Drought	
GIN	Guinea	KIT	Earthquake	
GNB	Guinea-Bissau	ARC	Flood	
GNB	Guinea-Bissau	ARC	Drought	
GNB	Guinea-Bissau	KIT	Earthquake	
GUY	Guyana	CCRIF-Carib	Excess Rainfall	
HTI	Haiti	AIR	Tropical Cyclone	AIR Tropical Cyclone Model for the Caribbean
HTI	Haiti	CCRIF-Carib	Excess Rainfall	
HTI	Haiti	CCRIF-Carib	Tropical Cyclone	
HTI	Haiti	CCRIF-Carib	Earthquake	
HTI	Haiti	Corelogic	Earthquake	
HTI	Haiti	Corelogic	Tropical Cyclone	
HND	Honduras	AIR	Tropical Cyclone	AIR Tropical Cyclone Model for Central America
HND	Honduras	AIR	Earthquake	AIR Earthquake Model for Central America
HND	Honduras	CCRIF-CA	Tropical Cyclone	
HND	Honduras	CCRIF-CA	Earthquake	
HND	Honduras	CCRIF-CA	Excess Rainfall	
HND	Honduras	Corelogic	Tropical Cyclone	
HND	Honduras	Corelogic	Earthquake	
IND	India	AIR	Tropical Cyclone	AIR Tropical Cyclone Model for India
IND	India	AIR	Earthquake	AIR Earthquake Model for India
IND	India	Corelogic	Tropical Cyclone	
IND	India	Corelogic	Earthquake	
IND	India	Impact Forecasting	Flood	

IND	India	Impact Forecasting	Tropical Cyclone	
IND	India	KIT	Earthquake	
IND	India	RMSI	Flood - River	https://www.rmsi.com/products/
IND	India	RMSI	Earthquake	https://www.rmsi.com/products/
IDN	Indonesia	AIR	Earthquake	AIR Earthquake Model for Southeast Asia
IDN	Indonesia	Catalytics	Earthquake	http://www.catalytics.asia/products/earthquake/
IDN	Indonesia	Corelogic	Earthquake	
IDN	Indonesia	Impact Forecasting	Flood	
IDN	Indonesia	Impact Forecasting	Earthquake	
IDN	Indonesia	Impact Forecasting	Flood	
IDN	Indonesia	KIT	Earthquake	
KEN	Kenya	ARC	Flood	
KEN	Kenya	ARC	Drought	
KEN	Kenya	Corelogic	Earthquake	
KEN	Kenya	Impact Forecasting	Earthquake	
KIR	Kiribati	PCRAFI	Tropical Cyclone	
KIR	Kiribati	PCRAFI	Tropical Storm	
KIR	Kiribati	PCRAFI	Earthquake	
LAO	Lao PDR	KatRisk	Tropical Cyclone	http://www.katrisk.com/models
LSO	Lesotho	ARC	Flood	
LSO	Lesotho	ARC	Drought	
LBR	Liberia	ARC	Drought	
LBR	Liberia	ARC	Flood	
LBR	Liberia	KIT	Earthquake	
MDG	Madagascar	ARC	Drought	
MDG	Madagascar	ARC	Flood	
MDG	Madagascar	ARC	Tropical Cyclone	
MWI	Malawi	ARC	Flood	
MWI	Malawi	ARC	Drought	
MWI	Malawi	Corelogic	Earthquake	
MLI	Mali	ARC	Flood	
MLI	Mali	ARC	Drought	
MLI	Mali	KIT	Earthquake	
MHL	Marshall Islands	PCRAFI	Earthquake	
MHL	Marshall Islands	PCRAFI	Tropical Cyclone	
MHL	Marshall Islands	PCRAFI	Tropical Storm	
MRT	Mauritania	ARC	Drought	
MRT	Mauritania	ARC	Flood	
MRT	Mauritania	KIT	Earthquake	
FSM	Micronesia, Fed. States of	PCRAFI	Earthquake	
FSM	Micronesia, Fed. States of	PCRAFI	Tropical Storm	
FSM	Micronesia, Fed. States of	PCRAFI	Tropical Cyclone	
MAR	Morocco	ARC	Drought	
MAR	Morocco	ARC	Flood	
MAR	Morocco	Impact Forecasting	Earthquake	
MAR	Morocco	Impact Forecasting	Earthquake	
MOZ	Mozambique	ARC	Drought	
MOZ	Mozambique	ARC	Flood	
MOZ	Mozambique	ARC	Tropical Cyclone	
MMR	Myanmar	KIT	Earthquake	

NPL	Nepal	KIT	Earthquake	
NIC	Nicaragua	AIR	Earthquake	AIR Earthquake Model for Central America
NIC	Nicaragua	AIR	Tropical Cyclone	AIR Tropical Cyclone Model for Central America
NIC	Nicaragua	CCRIF-CA	Excess Rainfall	
NIC	Nicaragua	CCRIF-CA	Tropical Cyclone	
NIC	Nicaragua	CCRIF-CA	Earthquake	
NIC	Nicaragua	Corelogic	Earthquake	
NER	Niger	ARC	Flood	
NER	Niger	ARC	Drought	
NER	Niger	KIT	Earthquake	
NGA	Nigeria	ARC	Drought	
NGA	Nigeria	ARC	Flood	
NGA	Nigeria	KIT	Earthquake	
PAK	Pakistan	Corelogic	Tropical Cyclone	
PAK	Pakistan	Corelogic	Earthquake	
PAK	Pakistan	Impact Forecasting	Earthquake	
PAK	Pakistan	KIT	Earthquake	
PNG	Papua New Guinea	PCRAFI	Earthquake	
PNG	Papua New Guinea	PCRAFI	Tropical Cyclone	
PNG	Papua New Guinea	PCRAFI	Tropical Storm	
PHL	Philippines	AIR	Earthquake	AIR Earthquake Model for Southeast Asia
PHL	Philippines	AIR	Typhoon	AIR Typhoon Model for Southeast Asia
PHL	Philippines	Catalytics	Earthquake	http://www.catalytics.asia/products/earthquake/
PHL	Philippines	Catalytics	Flood - River	CAESAR LISFLOOD based on the Bates methodology: :http://www.catalytics.asia/products/flood/
PHL	Philippines	Corelogic	Earthquake	
PHL	Philippines	Corelogic	Tropical Cyclone	
PHL	Philippines	Impact Forecasting	Tropical Cyclone	
PHL	Philippines	Impact Forecasting	Earthquake	
PHL	Philippines	KIT	Earthquake	
PHL	Philippines	KatRisk	Tropical Cyclone	http://www.katrisk.com/models
RWA	Rwanda	ARC	Flood	
RWA	Rwanda	ARC	Drought	
WSM	Samoa	PCRAFI	Tropical Storm	
WSM	Samoa	PCRAFI	Earthquake	
WSM	Samoa	PCRAFI	Tropical Cyclone	
STP	Sao Tome and Principe	KIT	Earthquake	
SEN	Senegal	ARC	Flood	
SEN	Senegal	ARC	Drought	
SEN	Senegal	KIT	Earthquake	
SLE	Sierra Leone	ARC	Drought	
SLE	Sierra Leone	ARC	Flood	
SLE	Sierra Leone	KIT	Earthquake	
SLB	Solomon Islands	PCRAFI	Tropical Cyclone	
SLB	Solomon Islands	PCRAFI	Earthquake	
SLB	Solomon Islands	PCRAFI	Tropical Storm	
SOM	Somalia	ARC	Flood	
SOM	Somalia	ARC	Drought	
SSD	South Sudan	ARC	Flood	
SSD	South Sudan	ARC	Drought	
LCA	St. Lucia	AIR	Tropical Cyclone	

LCA	St. Lucia	CCRIF-Carib	Earthquake	
LCA	St. Lucia	CCRIF-Carib	Excess Rainfall	
LCA	St. Lucia	CCRIF-Carib	Tropical Cyclone	
LCA	St. Lucia	Corelogic	Tropical Cyclone	
LCA	St. Lucia	Corelogic	Earthquake	
VCT	St. Vincent and the Grenadines	AIR	Tropical Cyclone	AIR Tropical Cyclone Model for the Caribbean
VCT	St. Vincent and the Grenadines	CCRIF-Carib	Tropical Cyclone	
VCT	St. Vincent and the Grenadines	CCRIF-Carib	Excess Rainfall	
VCT	St. Vincent and the Grenadines	CCRIF-Carib	Earthquake	
VCT	St. Vincent and the Grenadines	Corelogic	Earthquake	
VCT	St. Vincent and the Grenadines	Corelogic	Tropical Cyclone	
SDN	Sudan	ARC	Drought	
SDN	Sudan	ARC	Flood	
SWZ	Swaziland	ARC	Drought	
SWZ	Swaziland	ARC	Flood	
TZA	Tanzania	ARC	Drought	
TZA	Tanzania	ARC	Tropical Cyclone	
TZA	Tanzania	ARC	Flood	
TZA	Tanzania	Impact Forecasting	Earthquake	
TLS	Timor-Leste	PCRAFI	Earthquake	
TLS	Timor-Leste	PCRAFI	Tropical Cyclone	
TLS	Timor-Leste	PCRAFI	Tropical Storm	
TGO	Togo	ARC	Flood	
TGO	Togo	ARC	Drought	
TGO	Togo	KIT	Earthquake	
TON	Tonga	PCRAFI	Earthquake	
TON	Tonga	PCRAFI	Tropical Storm	
TON	Tonga	PCRAFI	Tropical Cyclone	
TUN	Tunisia	ARC	Flood	
TUV	Tuvalu	PCRAFI	Earthquake	
TUV	Tuvalu	PCRAFI	Tropical Cyclone	
TUV	Tuvalu	PCRAFI	Tropical Storm	
UGA	Uganda	ARC	Drought	
UGA	Uganda	ARC	Flood	
UGA	Uganda	Impact Forecasting	Earthquake	
VUT	Vanuatu	PCRAFI	Tropical Cyclone	
VUT	Vanuatu	PCRAFI	Tropical Storm	
VUT	Vanuatu	PCRAFI	Earthquake	
VNM	Vietnam	AIR	Earthquake	AIR Earthquake Model for Southeast Asia
VNM	Vietnam	AIR	Typhoon	AIR Typhoon Model for Southeast Asia
VNM	Vietnam	Catalytics	Earthquake	http://www.catalytics.asia/products/earthquake/
VNM	Vietnam	Impact Forecasting	Tropical Cyclone	
VNM	Vietnam	Impact Forecasting	Flood	
VNM	Vietnam	KatRisk	Tropical Cyclone	http://www.katrisk.com/models
YEM	Yemen, Rep.	Corelogic	Earthquake	
YEM	Yemen, Rep.	Corelogic	Tropical Cyclone	
YEM	Yemen, Rep.	Impact Forecasting	Earthquake	
YEM	Yemen, Rep.	Impact Forecasting	Earthquake	

ZMB	Zambia	ARC	Drought	
ZMB	Zambia	ARC	Flood	
ZWE	Zimbabwe	ARC	Flood	
ZWE	Zimbabwe	ARC	Drought	

Table A12.2 GPE partner country and risk model availability by modeling company and hazard.

Modeling Company	Drought	Earthquake	Excess Rainfall	Flood	Flood - River	Tropical Cyclone	Typhoon	Total
AIR		8				10	2	20
ARC	40			42		4		86
Catalytics		3			1			4
CCRIF-CA		4	4			4		12
CCRIF-Caribbean		5	6			5		16
Corelogic		16				12		28
Impact Forecasting		10		4		3		17
KIT		25						25
KatRisk						4		4
PCRAFI		10				10		30
RMSI		1			1			2
Total	**40**	**82**	**10**	**46**	**2**	**52**	**2**	**244**

Table A12.3 Summary of available models by hazard for 89 GPE partner countries.

Annex 13 Data for Madagascar Risk Modeling

Table A13.1 provides a compilation of available loss estimates for tropical cyclone events impacting Madagascar from 2004 to present.

		Actual Loss Estimates		*Modelled Loss Estimates*			
Storm Name	*Year*	*DesInventar*	*EMDAT*	*ARC*	*ARC rate*	*AIR*	*AIR rate*
Gafilo	2004	71,538,414	250,000,000	145,493,609	2.15%	345,039,184	0.99%
Indlala (+3)	2007	112,692,637	240,000,000	25,085,300	0.37%	82,387,273	0.24%
Ivan (+2)	2008	64,482,671	60,000,000	32,324,584	0.48%	491,977,959	1.41%
Giovanna	2012	39,422,485	100,000,000	118,936,595	1.75%	293,610,612	0.84%
Haruna	2013	-	25,000,000	7,763,803	0.11%	53,379,008	0.15%
Chedza / Fundi	2015	N/A	46,000,000	23,144	0.00%	N/A	N/A
Enawo	2017	N/A	N/A	52,784,690	0.78%	208,000,000	0.60%

Table A13.1 Summary of loss estimates for cyclone events in Madagascar since 2004. Sources: Desinventar data - www.desinventar.net; EMDAT data - www.emdat.be; ARC and AIR model data presented at the 8th meeting of the Regional Platform for Risk Transfer Mechanisms of the ISLANDS project in Mauritius, 18-20 January 2017.

To note in this data is that the AIR model includes loss and damage from rain during cyclones, while the ARC model does not. However, for events such as those in 2015, where loss and damage was almost entirely due to flooding, neither model will effectively capture such losses.

Further to this dataset, a detailed Post Disaster Needs Assessment was undertaken after the multiple storms in 2008, of which Ivan was the most severe. The PDNA provides a detailed sector-by-sector breakdown of damage and loss, and also compiles recovery / reconstruction needs. Table A13.2 provides a summary of the PDNA estimates, including the breakout for the education sector.

	Damage	*Loss*	*Needs*
Education	3,200,000	640,000	16,240,000
Total	174,130,000	158,830,000	154,820,000
Ed as % of total	1.84%	0.40%	10.49%

Table A13.2 Key data from the PDNA after multiple cyclones affected Madagascar in 2008.

Education is documented at just under 2% of the damage, and 0.4% of the loss (so low probably because softer ‘losses’ in the education sector are difficult to capture compared to the hard losses from infrastructure damage), but represents more than 10% of the identified needs. The source of this significant difference between relative impact and need is not clear.

However, a range of impact / needs of education relative to national needs can be identified, and is consistent with the 5% portion of the total exposure value assigned to education in the AIR Worldwide risk model, and the average spend on education in Madagascar since 2004 relative to total government spend (17.5%) and relative to GDP (3%).

Additional data which has not been utilized in this analysis but which may be useful to help calibrate a future education exposure database is provided in Table A13.3.

		Destroyed		*Damaged*		*Children Impacted*
Storm Name	*Year*	*Classrooms*	*Schools*	*Classrooms*	*Schools*	
Gafilo	2004		1,400		2,000	
Indlala (+3)	2007		136		591	150,000
Ivan (+2)	2008		691		71	295,200
Giovanna	2012		34		504	
Haruna	2013	166		119		
Chedza / Fundi	2015			1,011	50	
Enawo	2017	1,800		1,500		80,000

Table A13.3 Education-specific data in reports of impact for Madagascar cyclones since 2004.

Annex 14 Status of GPE Partner Countries in Existing Sovereign Risk Pools

Country	*Param Scheme*	*Hazards Covered*	*SIDS?*	*ACP?*	*Current Coverage?*
Madagascar	ARC	TC		Yes	
Mozambique	ARC	TC		Yes	
Comoros	ARC	TC	Yes	Yes	
Dominica	CCRIF	TC, XSR, EQ	Yes	Yes	Yes
Grenada	CCRIF	TC, XSR, EQ	Yes	Yes	Yes
Honduras	CCRIF	TC, XSR, EQ			
Haiti	CCRIF	TC, XSR, EQ	Yes	Yes	Yes
St. Lucia	CCRIF	TC, XSR, EQ	Yes	Yes	Yes
Nicaragua	CCRIF	TC, XSR, EQ			Yes
St. Vincent & the Grenadines	CCRIF	TC, XSR, EQ	Yes	Yes	Yes
El Salvador	CCRIF	TC, XSR, EQ			
Guatemala	CCRIF	TC, XSR, EQ			
Guyana	CCRIF	XSR	Yes	Yes	
Papua New Guinea	PCRAFI	TC, EQ	Yes	Yes	
Timor-Leste	PCRAFI	TC, EQ	Yes	Yes	
Kiribati	PCRAFI	TC, EQ	Yes	Yes	
Marshall Islands	PCRAFI	TC, EQ	Yes	Yes	Yes
Federated States of Micronesia	PCRAFI	TC, EQ	Yes	Yes	
Samoa	PCRAFI	TC, EQ	Yes	Yes	Yes
Solomon Islands	PCRAFI	TC, EQ	Yes	Yes	
Tonga	PCRAFI	TC, EQ	Yes	Yes	Yes
Tuvalu	PCRAFI	TC, EQ	Yes	Yes	
Vanuatu	PCRAFI	TC, EQ	Yes	Yes	Yes

Annex 15 Deal Term Sheet, Pilots A and B

Term Sheet, Pilot A

Pilot Title	Addressing child nutrition after drought in sub-Saharan Africa through African Risk Capacity (ARC)
Key Elements	Early warning, contingency planning, parametric drought risk transfer
Hypothesis	Rapid implementation of school feeding programs within a few weeks of a failed harvest, funded by an insurance payout triggered objectively and delivered quickly, reduces absence, drop-outs and malnutrition amongst school children, leading in turn to greatly reduced impact on long term education outcomes.
Duration	3 to 5 years, to increase the probability that a drought will occur and actions supported by risk transfer can be implemented and outcomes measured.
Focus Country(ies)	One or several sub-Saharan African countries already engaged with ARC, likely out of: Senegal, Mali, Burkina Faso, Mauritania, Niger, The Gambia, Malawi, Kenya, Ethiopia, Mozambique.
Counterparty	GPE working with ARC and other partners on supporting contingency planning and implementation in the event of a drought. ARC Ltd for risk transfer.
Risk Financing Deal Structure	National Treasury would be the 'insured party' on behalf of the Ministry of Education, likely working alongside the relevant drought management / food security agency. ARC provides three different potential deal structures, each utilizing its in-house modeling platform, *Africa RiskView* (ARV) to underpin a parametric insurance contract. Final deal structure would depend on which country(ies) was / were selected for the pilot and preferences amongst all partners, particularly ARC, on their level of involvement.
Conditions Precedent for a Transaction	All ARC deal structures would require presentation of a contingency plan for use of funds in the event of a payout prior to the transaction taking place. Early warning systems would already be in place under existing ARC program in-country, and ARV customization for specific country conditions would also be in place (or could be put in place if country is not already participating in ARC). Monitoring and evaluation processes in the event of a payout and response implementation would need to be pre-agreed.
Cost Factors	Risk transfer conditions are fully flexible, so program can be designed to meet premium availability. The example below is illustrative, but based on actual numbers: Trigger point for payout: 1 in 3 to 1 in 5 years; the lower the return period of the trigger, the more expensive the cover (because it pays more often). Premium to payout rate: assuming a cost of US$35 per beneficiary for a 5-month school feeding program, US$1 million in annual premium would cover up to 250,000 to 300,000 beneficiaries in an extreme (1 in 50-year) drought.

Budget Indication	US$11 million would cover premium costs for 5 years with half a million covered individuals each year, plus 10% margin to support technical assistance in contingency planning, use of early warning information, and general disaster risk management support for the education sector.
Potential Funding Sources	G7 InsuResilience initiative has a target of 400 million additionally insured vulnerable individuals by 2020. Germany and the UK are key drivers and both are actively considering premium financing to support sovereign and sub-sovereign participation in structured risk management and risk financing programs. ARC already meets likely eligibility requirements for concessional financing of risk transfer instruments, and management of education sector risk in this innovative way would likely be viewed as a positive development by these and other donors. For climate risk management, broad commitments made by Annex 1 countries under the Paris Agreement of the UN-FCCC are relevant to consideration of funding to build climate resilience across all government sectors and in all climate-exposed countries.

Term Sheet, Pilot B

Pilot Title	Covering cyclone risk to the education system in Madagascar through African Risk Capacity (ARC)
Key Elements	Early warning, risk reduction, contingency planning, parametric tropical cyclone risk transfer
Hypothesis	Rapid community-level response to re-start schooling after loss and damage by a tropical cyclone impact, funded by an insurance payout triggered objectively and delivered quickly. Aims to provide dependable and rapid financing to support further development of existing locally-managed response activities, to further reduce interruption to education for cyclone-impacted rural communities in Madagascar.
Duration	Minimum 5 years, to increase the probability that damaging cyclone will occur and actions supported by risk transfer can be implemented and outcomes measured.
Focus Country	Madagascar, which faces high tropical cyclone risk, and has an existing system for community-level recovery in the education sector.
Counterparty	GPE working with ARC and other partners on supporting risk reduction and contingency planning, and implementation in the event of a cyclone. ARC Ltd for risk transfer.
Risk Financing Deal Structure	National Treasury would be the ‘insured party’ on behalf of the Ministry of Education, working alongside the national disaster management agencies. ARC provides three different potential deal structures, each utilizing its in-house modeling platform, *Africa RiskView* (ARV) to underpin a parametric insurance contract. Final deal structure would depend on preferences amongst all partners, particularly ARC, on their level of involvement.
Conditions Precedent for a Transaction	All ARC deal structures would require presentation of a contingency plan for use of funds in the event of a payout prior to the transaction taking place. Additionally, there may be a requirement for active disaster risk reduction, through building stronger, for example. Early warning systems would already be in place under existing ARC program in-country. Monitoring and evaluation processes in the event of a payout and response implementation would need to be pre-agreed.
Cost Factors	Risk transfer conditions are fully flexible, so program can be designed to meet premium availability. The example below is illustrative, but based on actual numbers: Trigger point for payout: 1 in 5 to 1 in 10 years; the lower the return period of the trigger, the more expensive the cover (because it pays more often). Premium to payout rate: US$1 million in annual premium would provide US$9 million to US$10 million of cover in the event of a 1 in 50 year cyclone event, with smaller payouts for smaller events. For recent storm Enawo, this coverage would have generated a payout which would have met 75% of the stated needs in the education sector (per the UN flash appeal).

Budget Indication	US$5.5 million would cover premium costs for 5 years, plus 10% margin to support technical assistance in disaster risk reduction, contingency planning, use of early warning information, and general disaster risk management support for the education sector.
Potential Funding Sources	G7 InsuResilience initiative has a target of 400 million additionally insured vulnerable individuals by 2020. Germany and the UK are key drivers and both are actively considering premium financing to support sovereign and sub-sovereign participation in structured risk management and risk financing programs. ARC already meets likely eligibility requirements for concessional financing of risk transfer instruments, and management of education sector risk in this innovative way would likely be viewed as a positive development by these and other donors. For climate risk management, broad commitments made by Annex 1 countries under the Paris Agreement of the UN-FCCC are relevant to consideration of funding to build climate resilience across all government sectors and in all climate-exposed countries. For Madagascar in particular, World Bank has had long-standing project work on disaster risk management and risk financing.

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