UNIVERSIDAD NACIONAL DE COLOMBIA
SEDE MANIZALES
INSTITUTO DE ESTUDIOS AMBIENTALES

IRDR ICoE
Integrated Research on Disaster Risk
International Centre of Excellence

*Institute of Environmental Studies (IDEA)*
*National University of Colombia*
*Disaster Risk Management Task Force (DRM-TF)*

# *IRDR Center of Excellence in Understanding Risk & Safety ICoE:UR&S*





# GAR 2015 - WCDRR
## *Why a Global Risk Assessment ?*

UN World Conference on Disaster Risk Reduction
14-18 March 2015, Sendai, Japan

- ✓ *Measure is essential to decide; what is not dimensioned cannot be administrated*
- ✓ *An operational picture of risk improves risk knowledge and provides an overall risk landscape*
- ✓ *Risk assessment is key to aware but also to concern decisionmakers of their responsibility*
- ✓ *Disaster risk is a contingent liability and therefore a sovereign risk for the society*
- ✓ *Risk reduction and prevention are duties for risk governance and for the nations' accountability*
- ✓ *Track DRM progress overtime means considering the development transformation trade-offs*

CAPRA
Probabilistic Risk Assessment Initiative

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# COMPREHENSIVE APPROACH TO PROBABILISTIC RISK ASSESSMENT

GFDRR
Global Facility for Disaster Reduction and Recovery

THE WORLD BANK

IDB

UNISDR
The United Nations Office for Disaster Risk Reduction

# Risk Modelling

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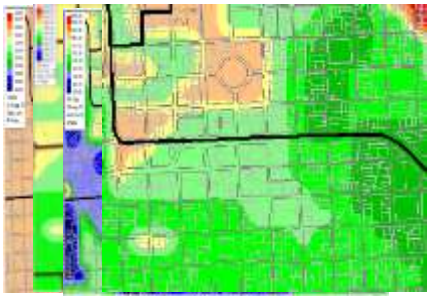
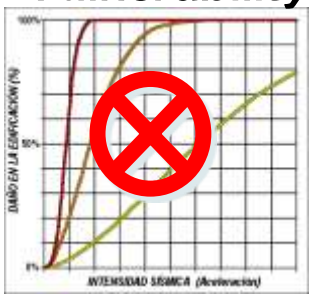
Hazard

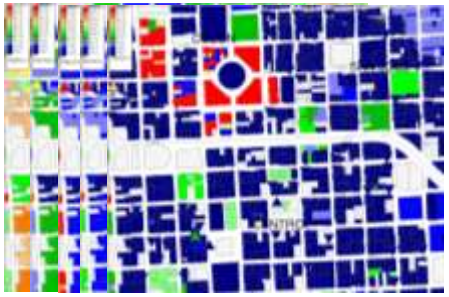


Exposed Assets

Vulnerability



Loss



Risk

PDF of loss

Losses

*Economic*

*Human*

***LOSS EXCEEDANCE CURVE***

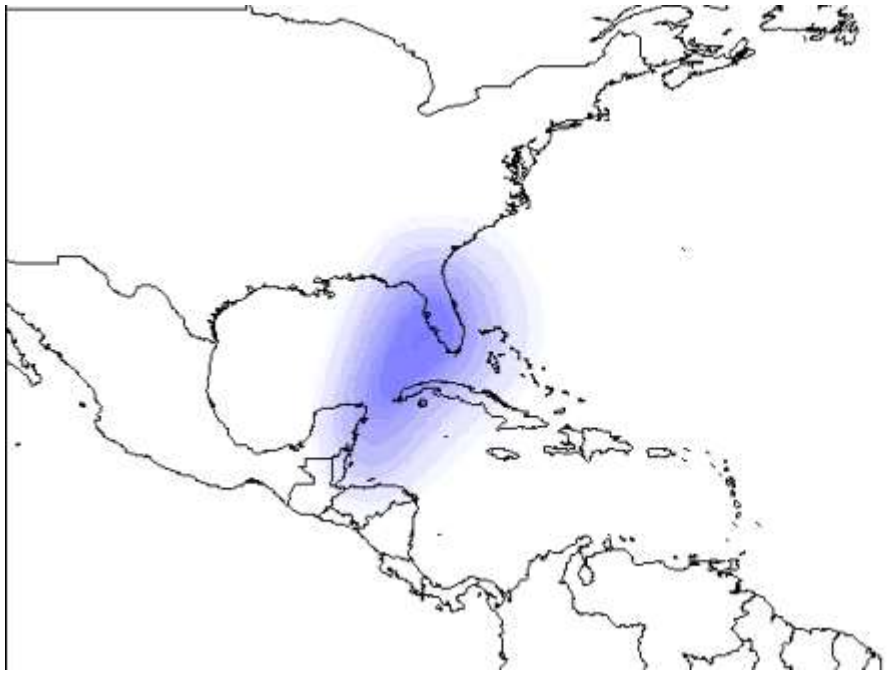
***PROBABLE MAXIMUM LOSS***

***AVERAGE ANNUAL LOSS***

# Cyclonic / Seismic Hazard

## Set of stochastic scenarios

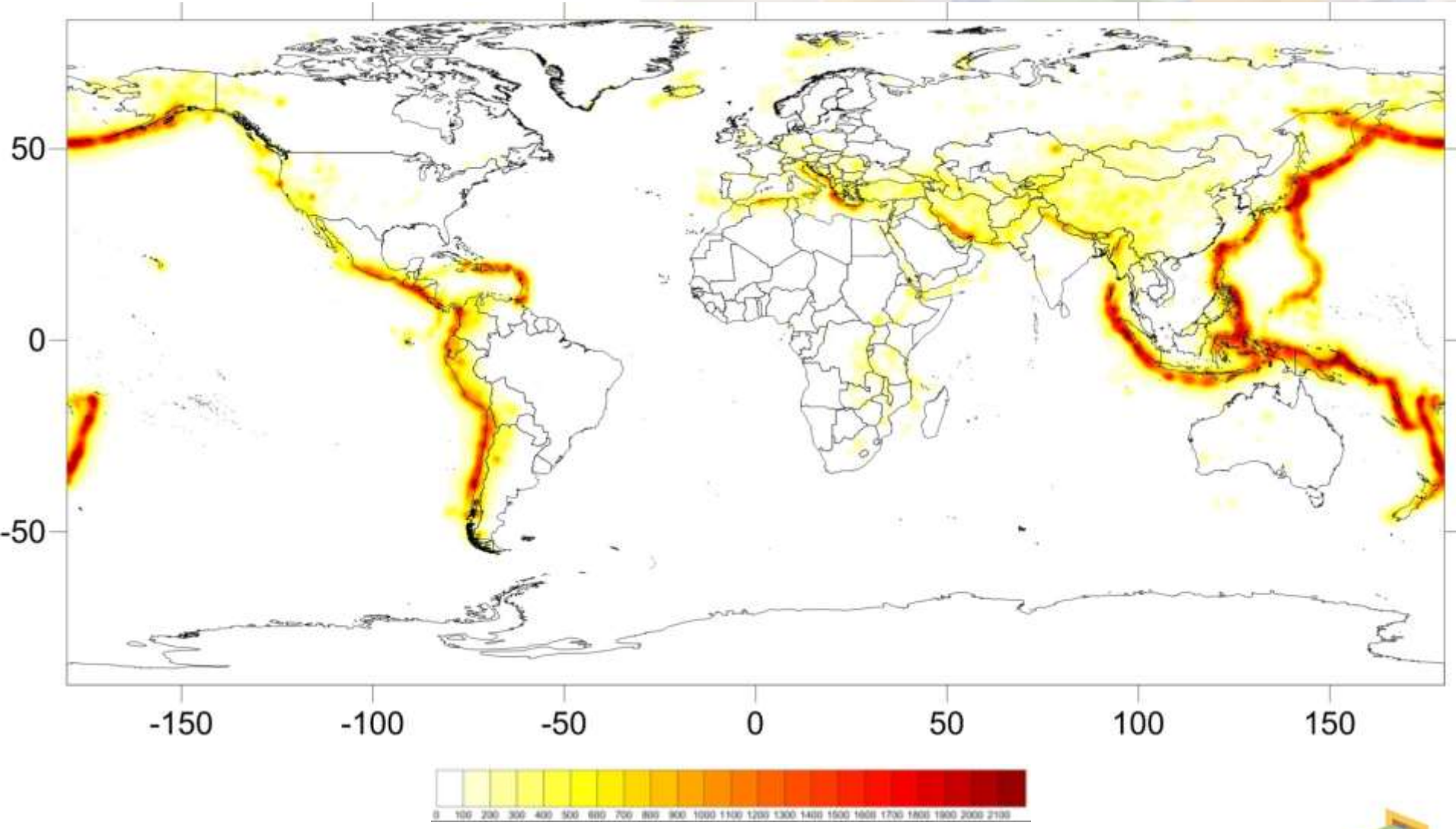
- ✓ *Mutually exclusive*
- ✓ *Collectively exhaustive*
- ✓ *Admit probabilistic representation*



**.AME FORMAT**

# Seismic Hazard Assessment

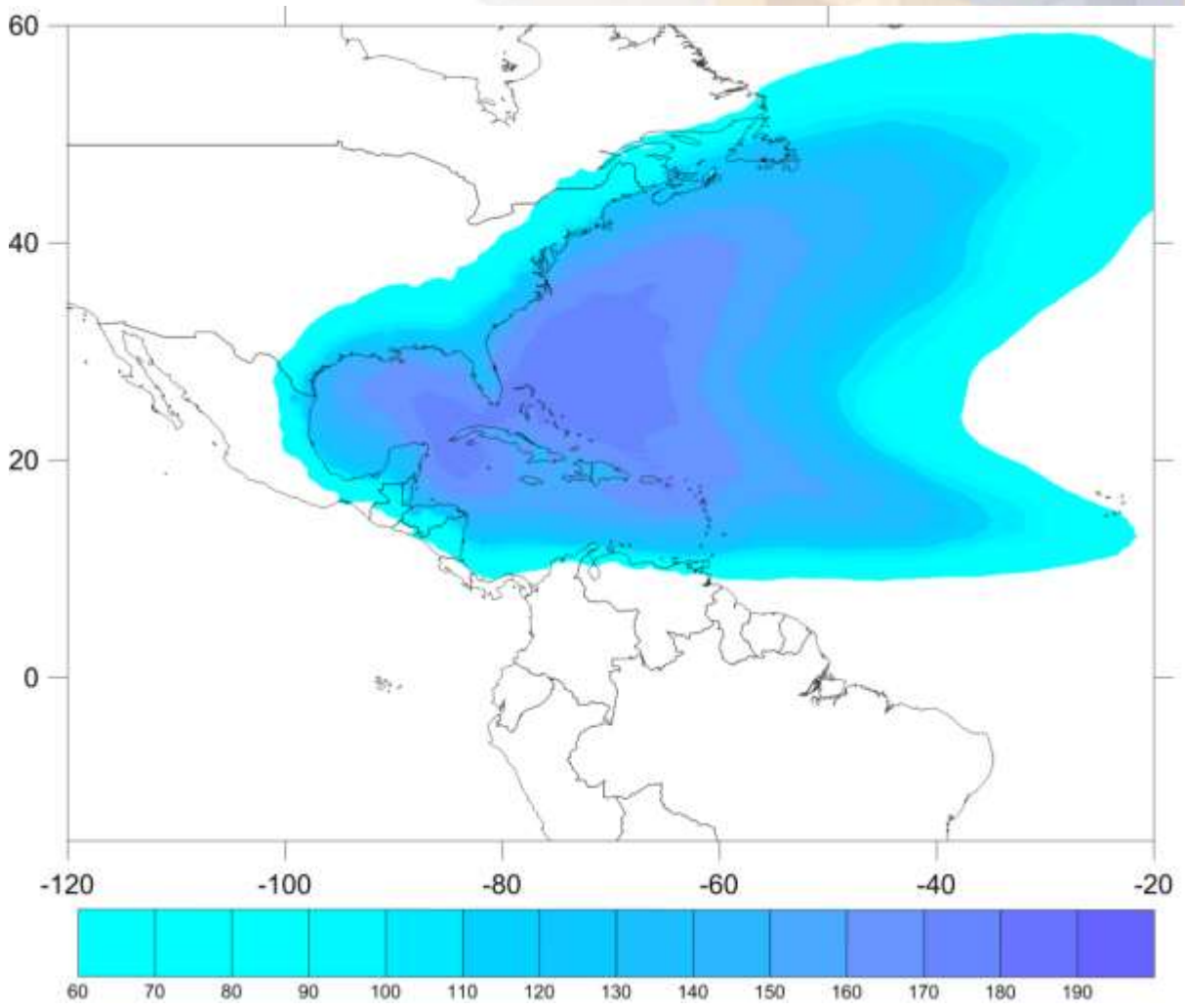
## Seismic Hazard Maps




0.2sec, 1,000 años

# Cyclonic Wind Hazard

## Cyclonic Wind Hazard Maps




*TR=50 years*

# Global Exposure Database

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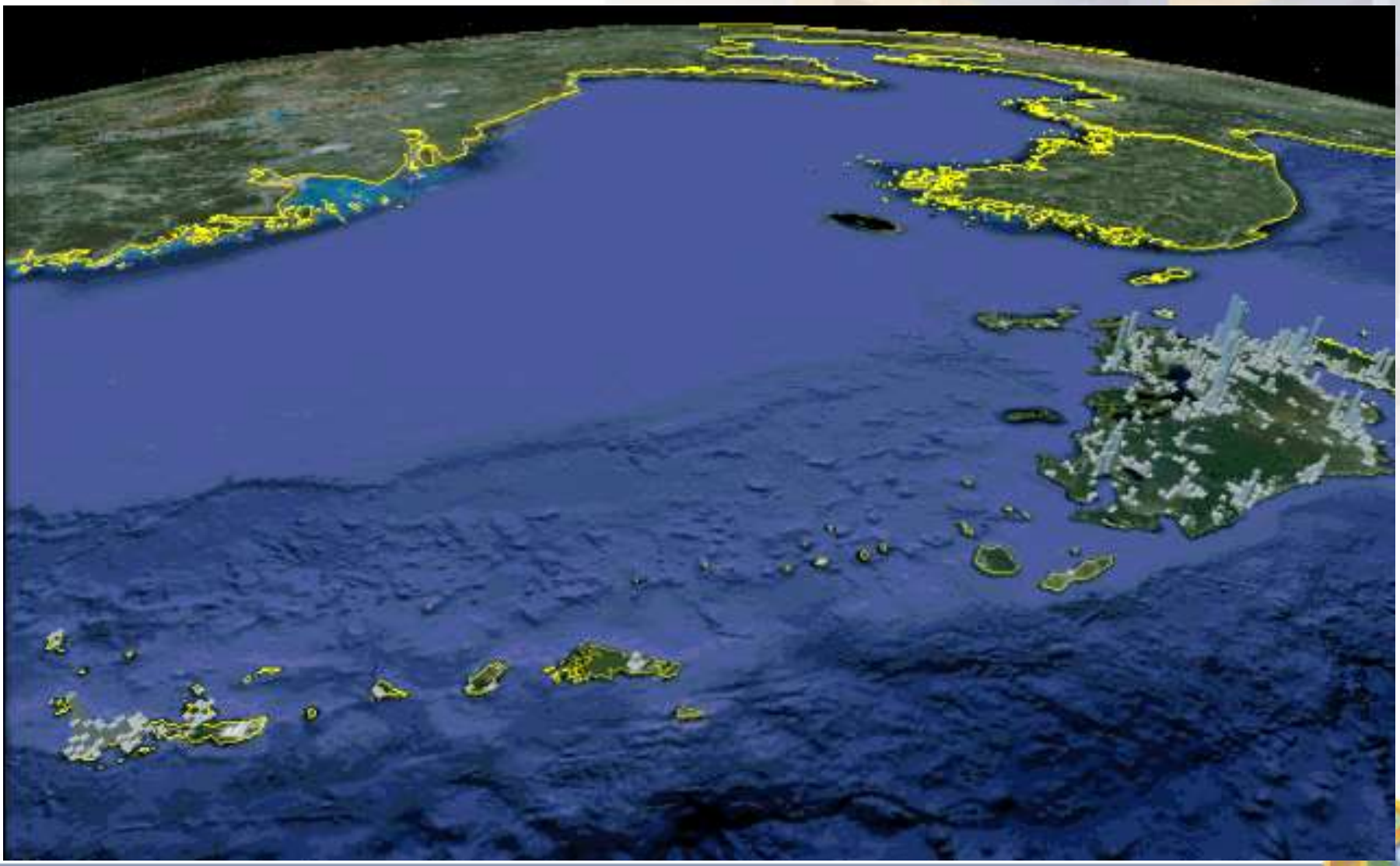
## Definition and parameters

- ✓ *Building classes according to WHE and WAPMERR*
- ✓ *Vulnerability functions for different quality structural design levels*
- ✓ *Vulnerability assignment to building classes in accordance with:*
  - ✓ *Country development level*
  - ✓ *City complexity level*
  - ✓ *Regional hazard level*
  - ✓ *Construction class*

# Global Exposure Database

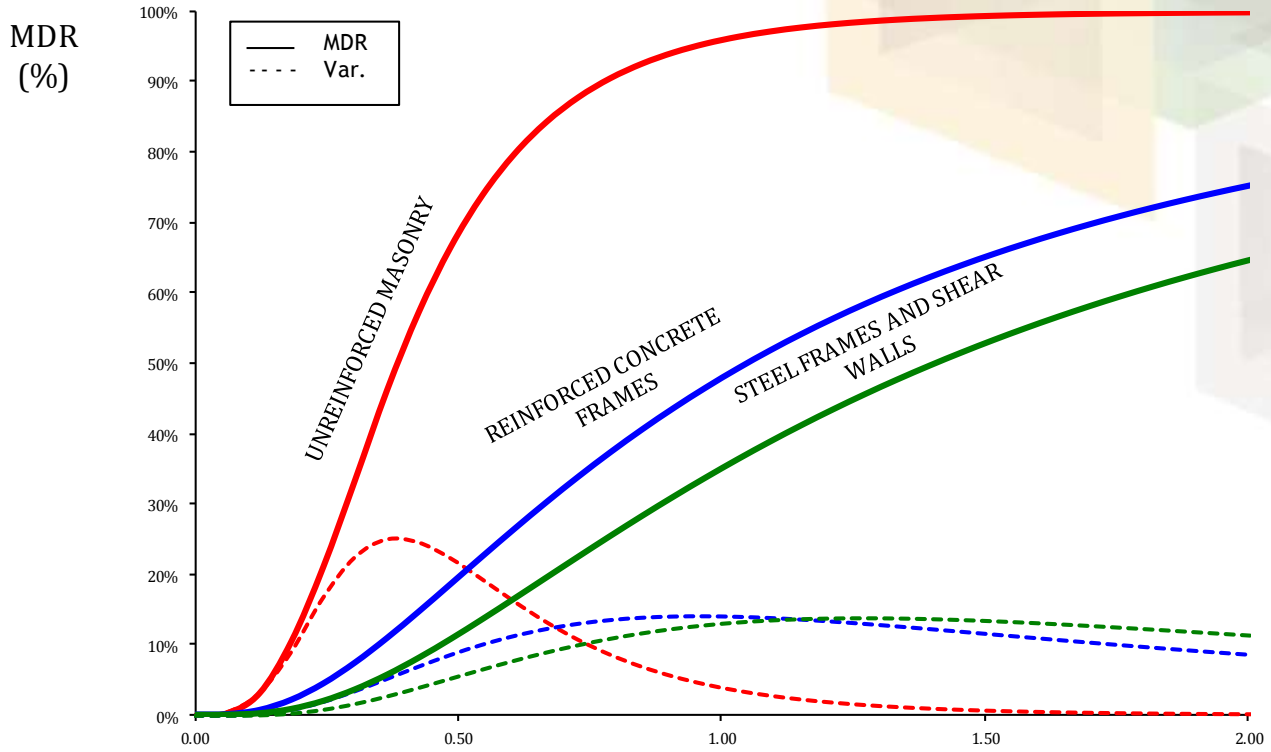
5x5 km grids & 1x1 km in the coast



# Vulnerability

## Vulnerability functions for earthquakes

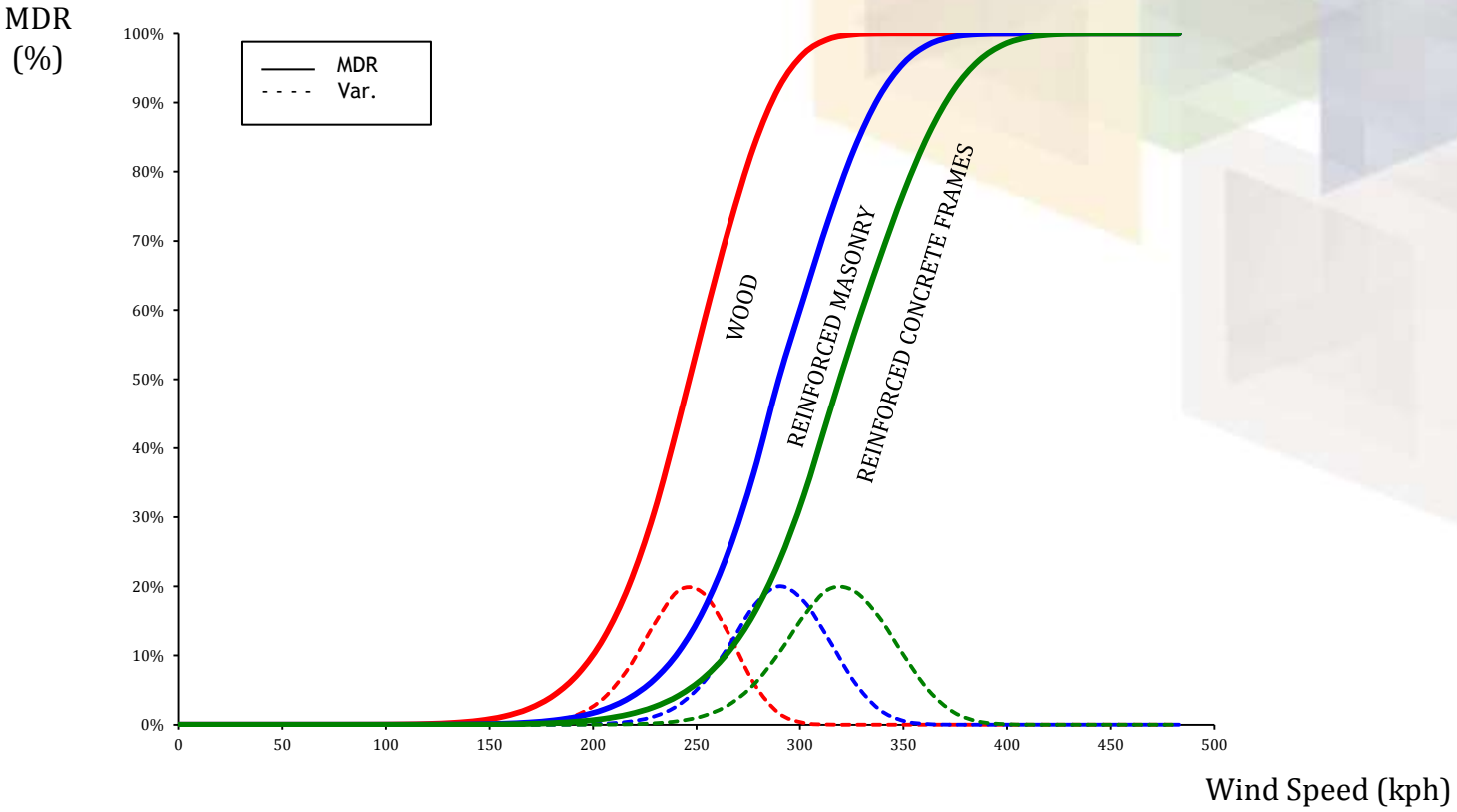
SEISMIC DESIGN LEVEL: M



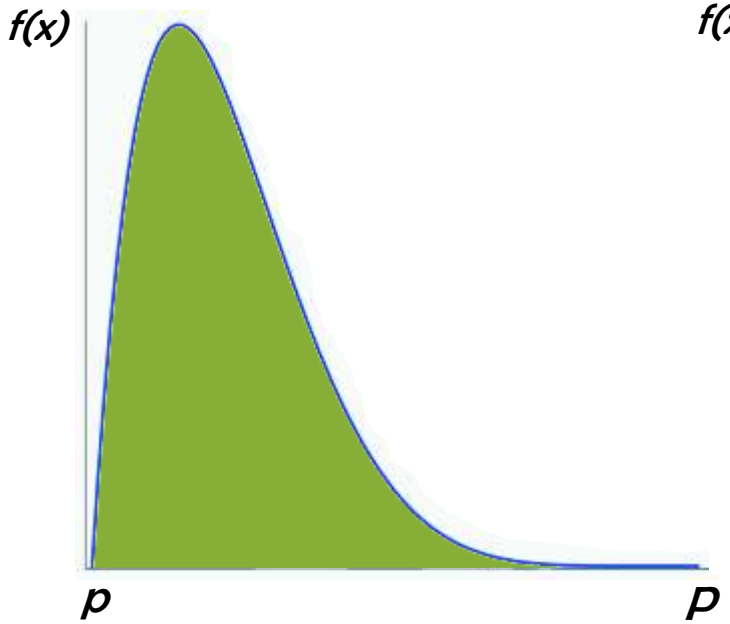
# Vulnerability

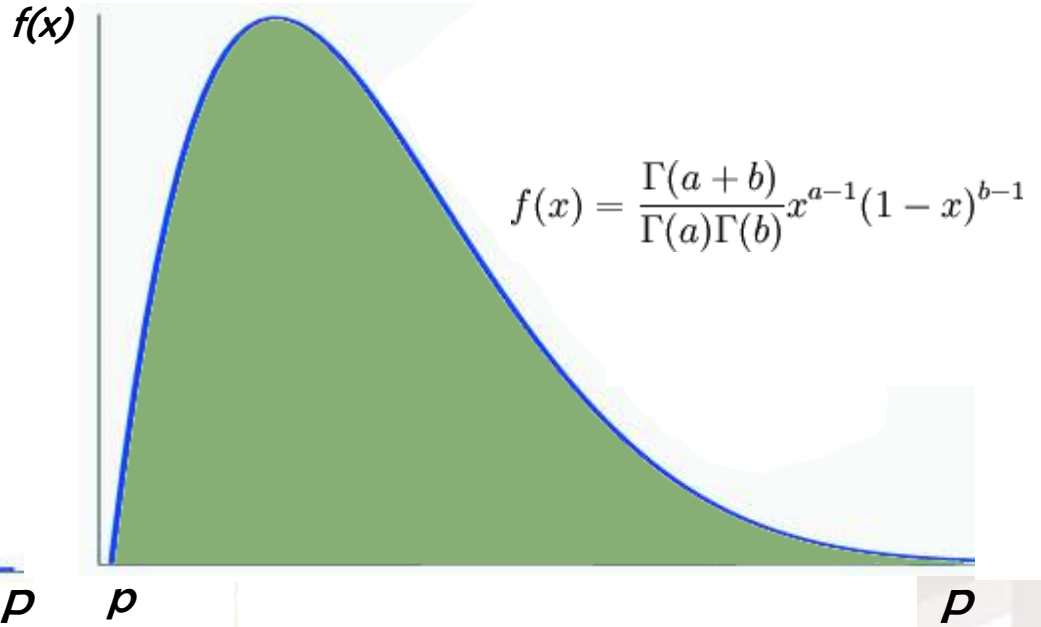
## Vulnerability functions for wind

QUALITY
LEVEL: M



$$f(l \mid Event\ i) = \int_0^{\infty} \underbrace{f(l \mid Sa)}_{Vulnerability}\ \underbrace{f(Sa \mid Event\ i)}_{Hazard} dSa$$




$$f(x) = \frac{\Gamma(a+b)}{\Gamma(a)\Gamma(b)} x^{a-1}(1-x)^{b-1}$$

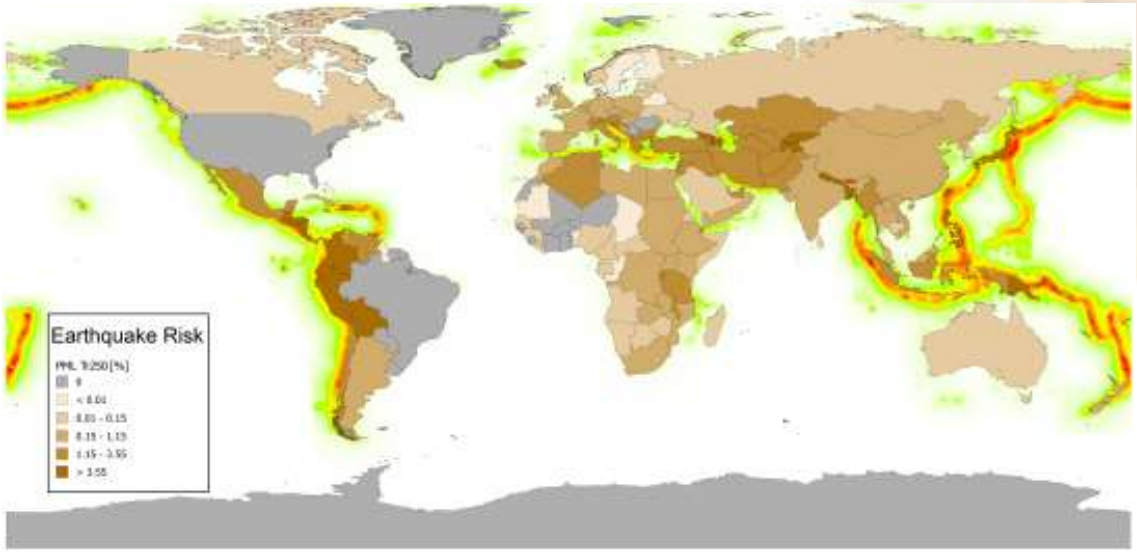
$$v(p) = \sum_{i=1}^{Events} \Pr(l \geq L \mid Event\ i) \cdot F_A(Event\ i)$$

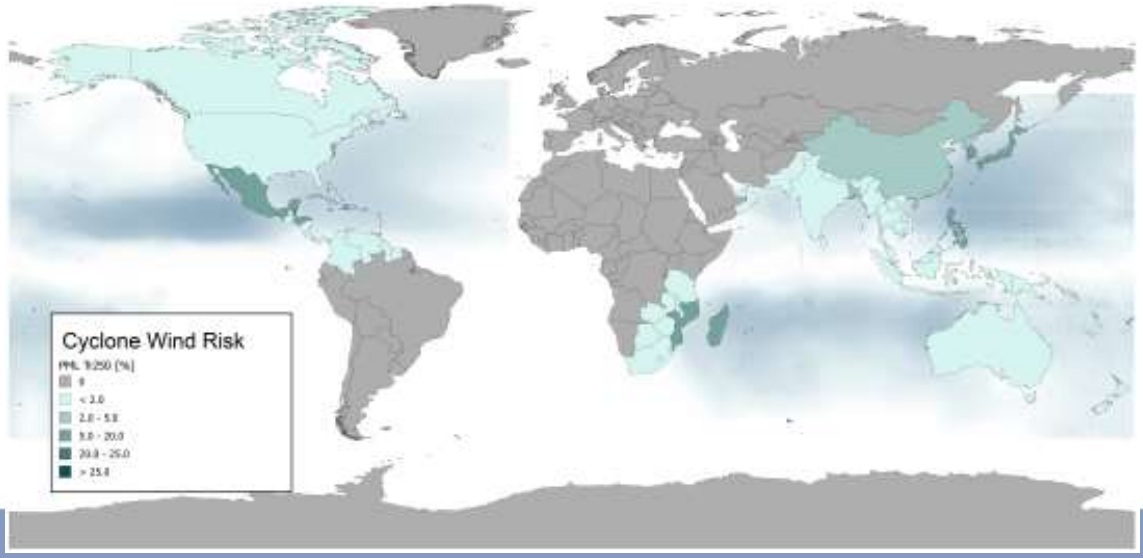
Loss exceedance rate (#/year)

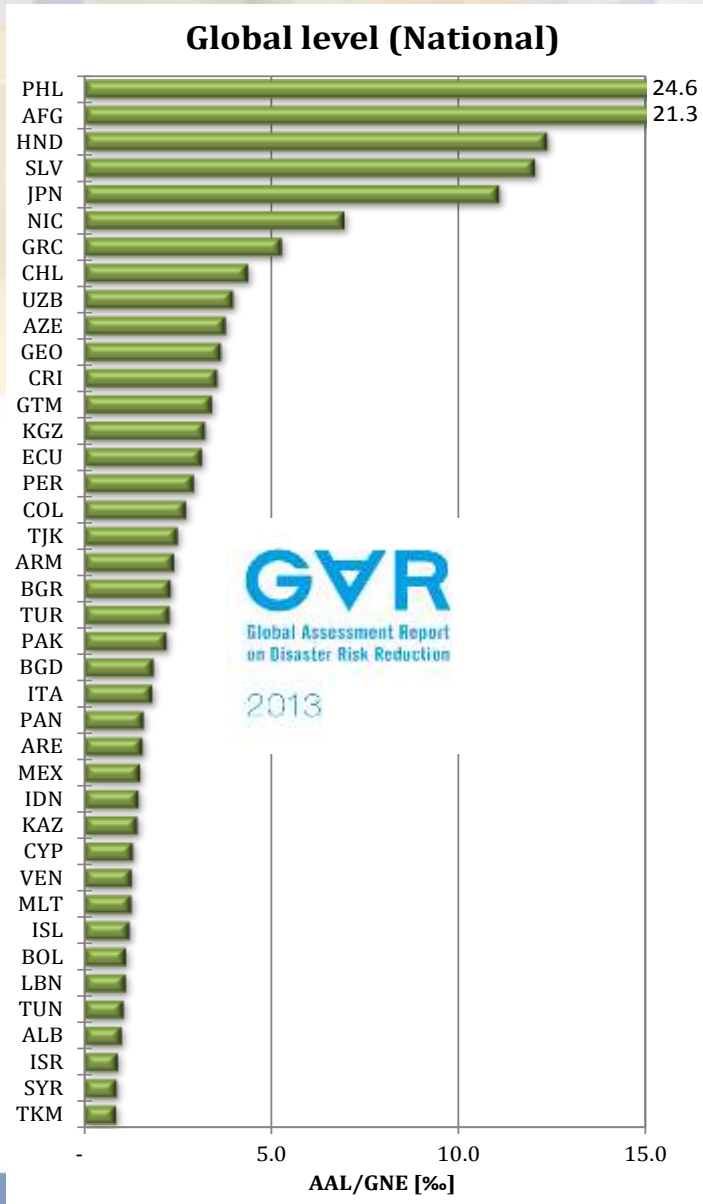
Losses

# Risk Maps and Rankings

## Using AAL and PML results



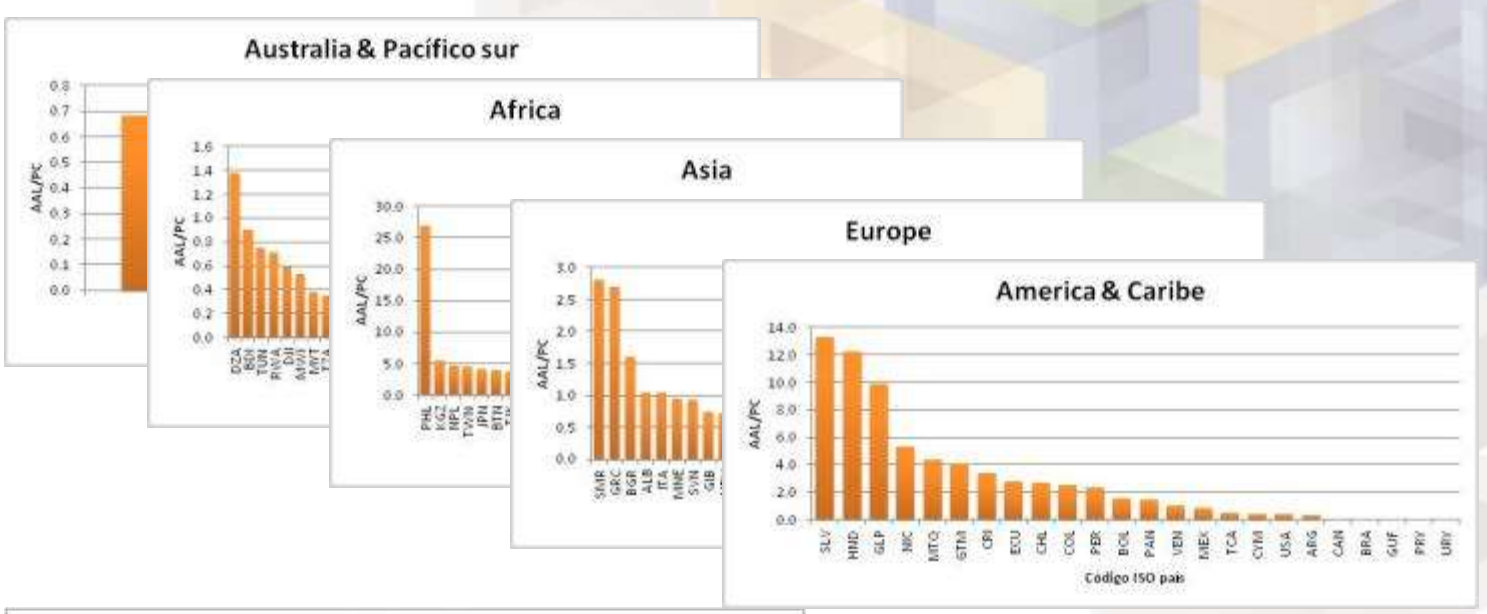



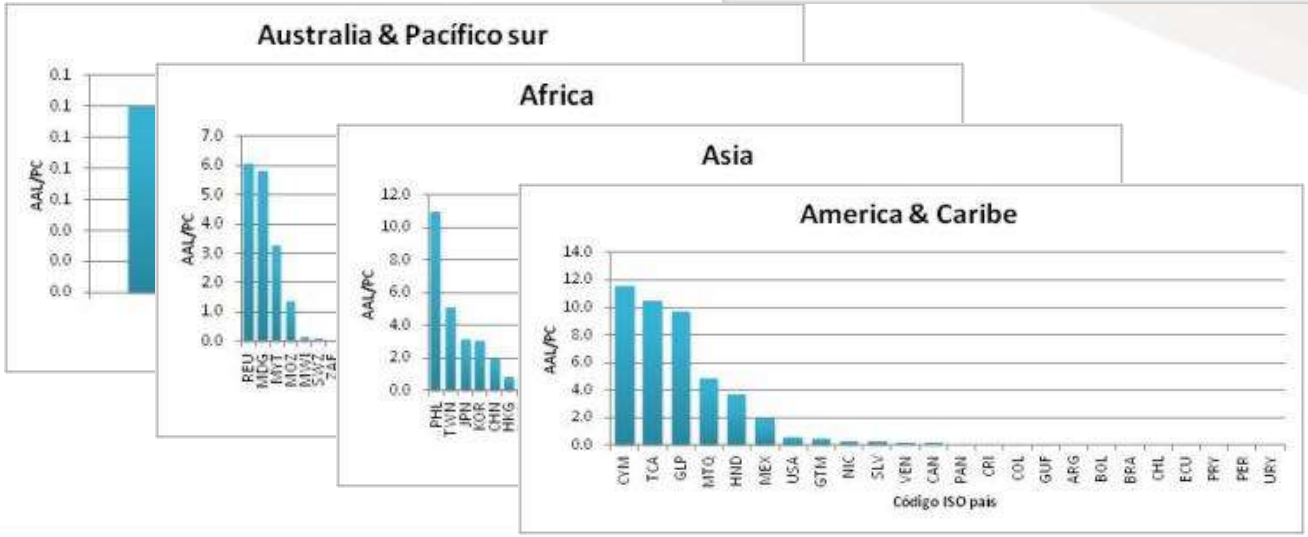
# Risk Indicators

## AAL/PC (EQ & W) by region

**Earthquake**

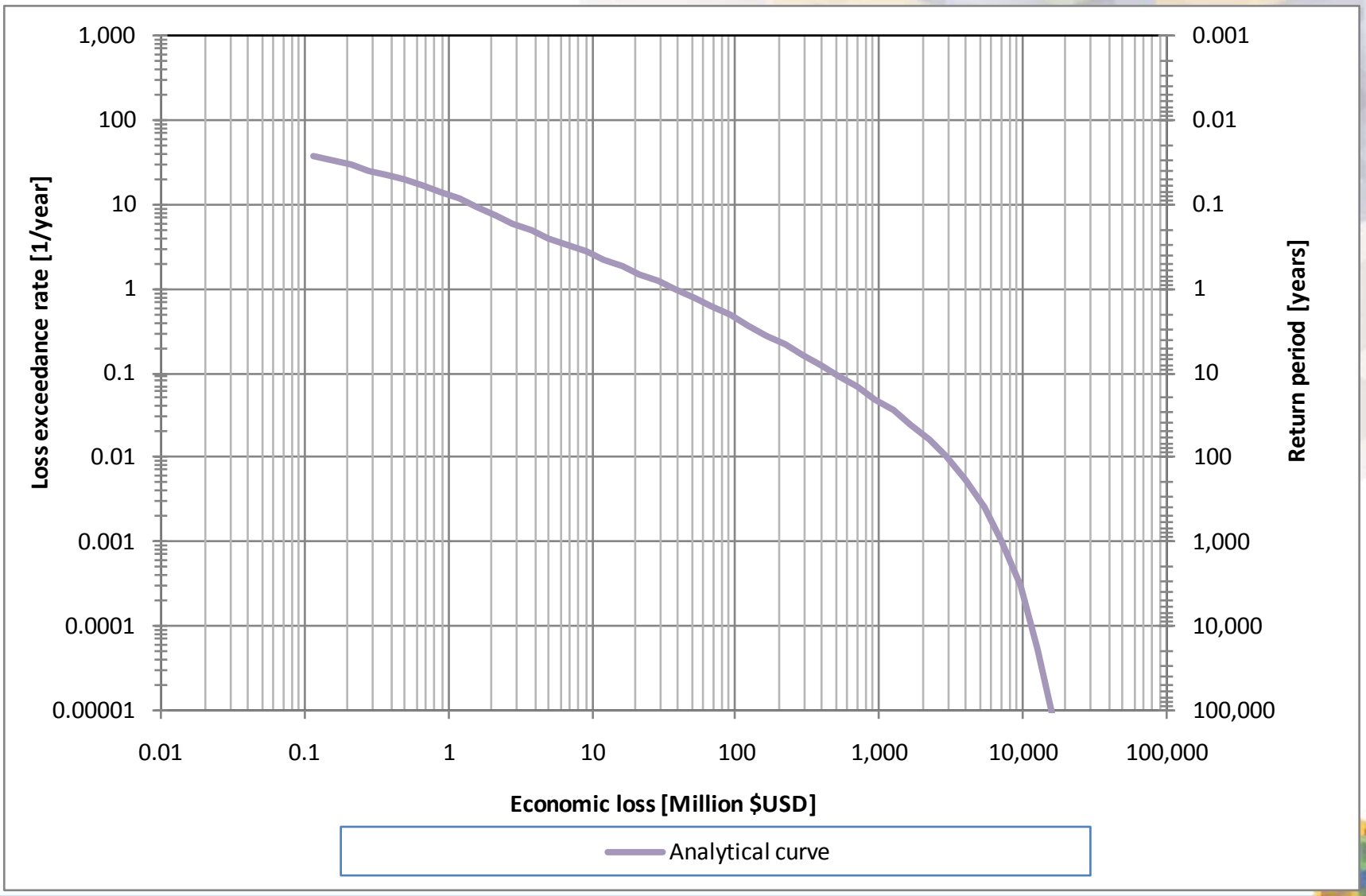



**Cyclone Wind**



# Extensive and Intensive Risk Assessment

- Proposal of a “Hybrid” Loss Exceedance Curve



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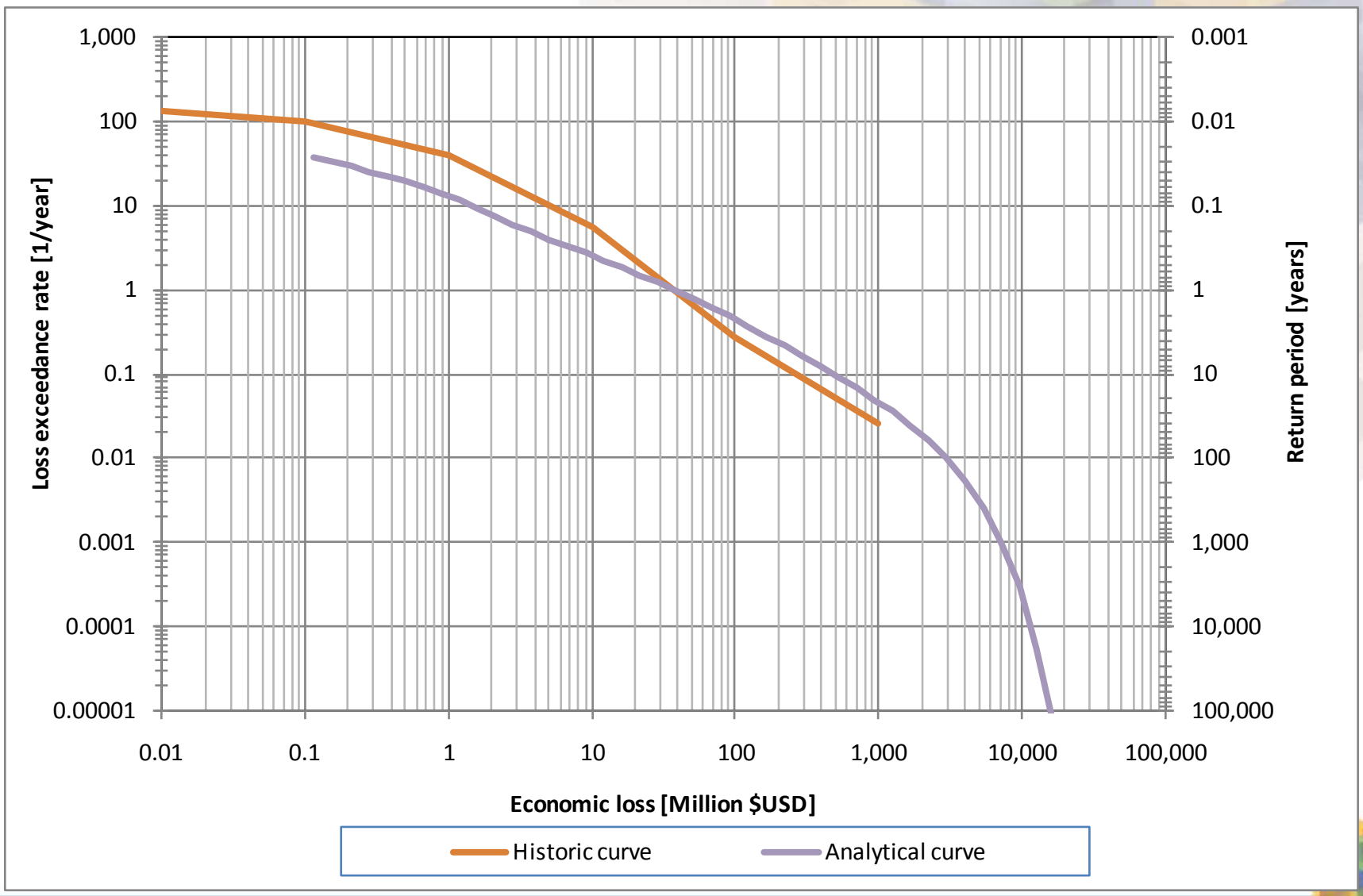

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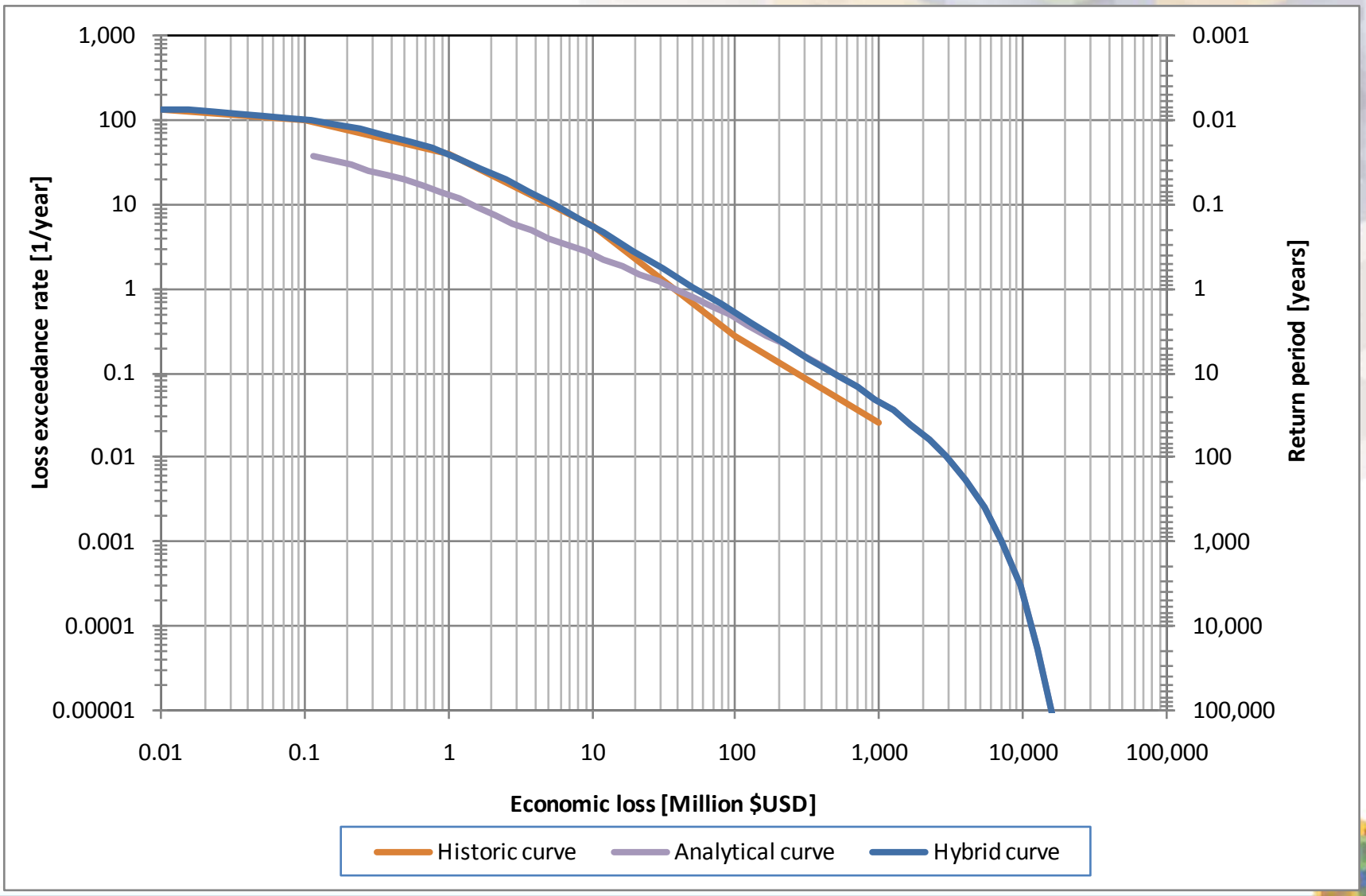
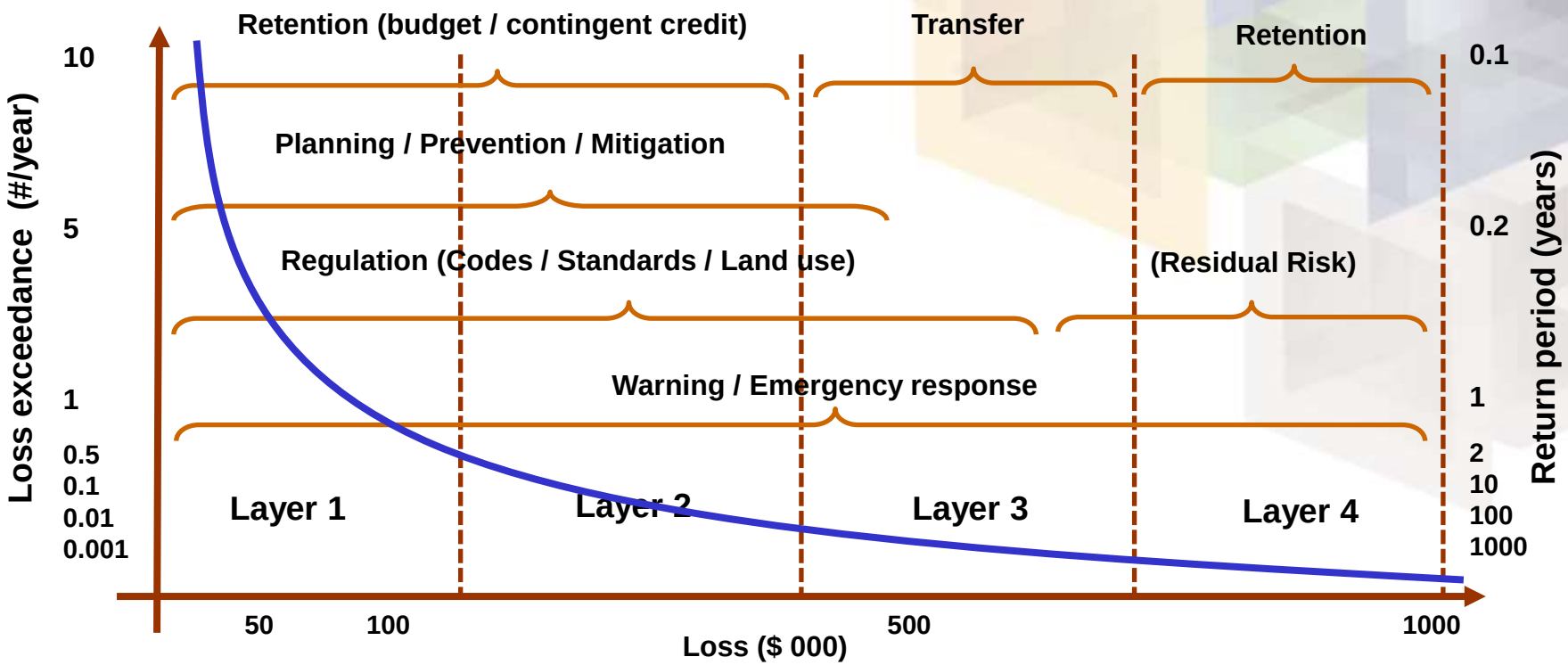


# Loss Exceedance Curve

## Governments need to define a risk reduction/financing strategy




1 = High probability & low/moderate losses
2 = Medium probability & moderate/high losses
3 = Low probability & high losses
4 = Very low probability & very high losses

# Regarding the GAR's GRM:

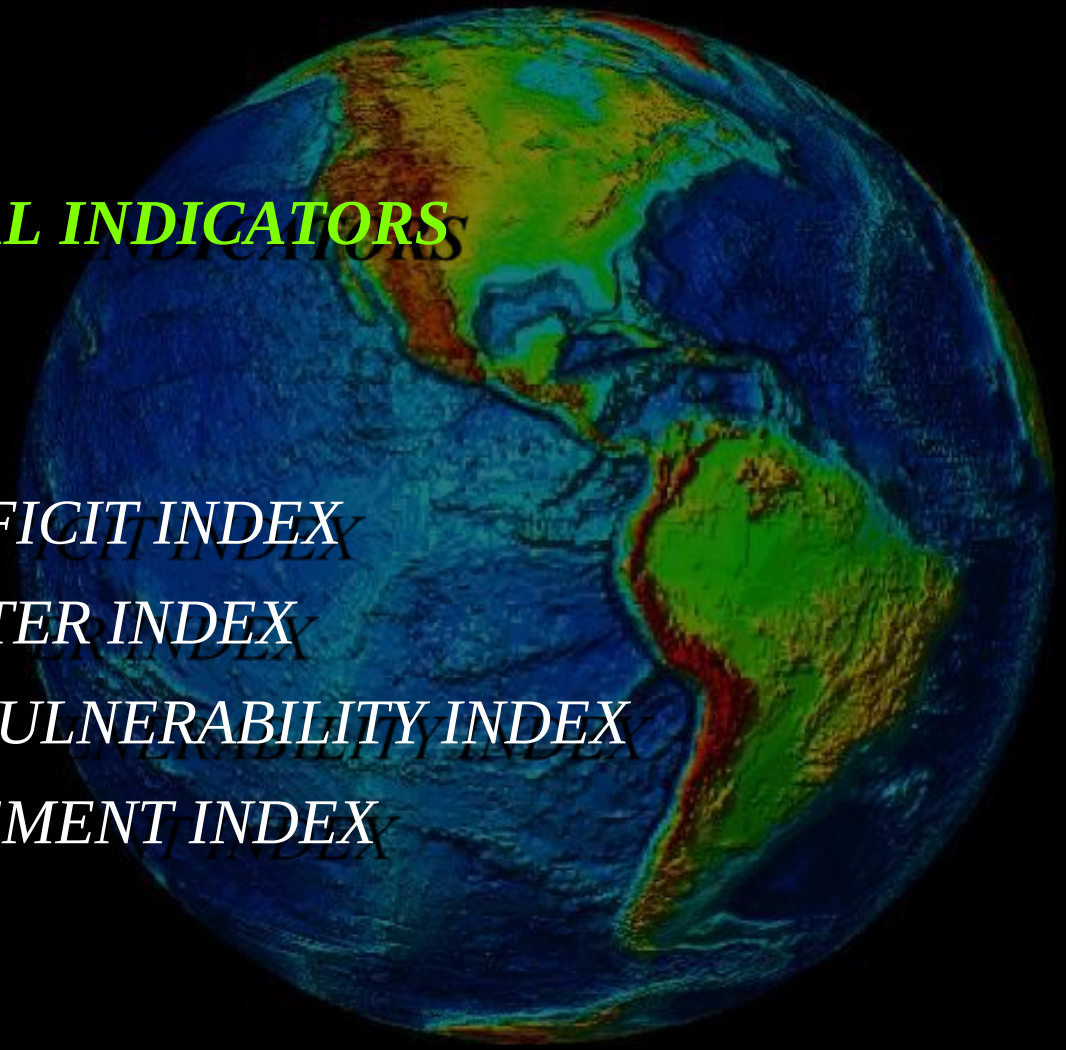
- ✓ *A fully probabilistic earthquake risk assessment has been conducted at global level. Results are useful for comparisons and rankings among countries*
- ✓ *Risk had been estimated mainly based on historical records. The GAR's Global Risk Model takes into account events that have not yet occurred*
- ✓ *Countries must carry-out risk assessments with higher resolution at sub-national and local level when the required information is available*
- ✓ *From global to local: the same "arithmetic" can be used for any resolution level.*

# INDICATORS OF DISASTER RISK and RISK MANAGEMENT

Program for the Americas
IDB – IDEA

***SYSTEM OF NATIONAL INDICATORS***

***( IDB – IDEA )***



***DDI*** *: DISASTER DEFICIT INDEX*

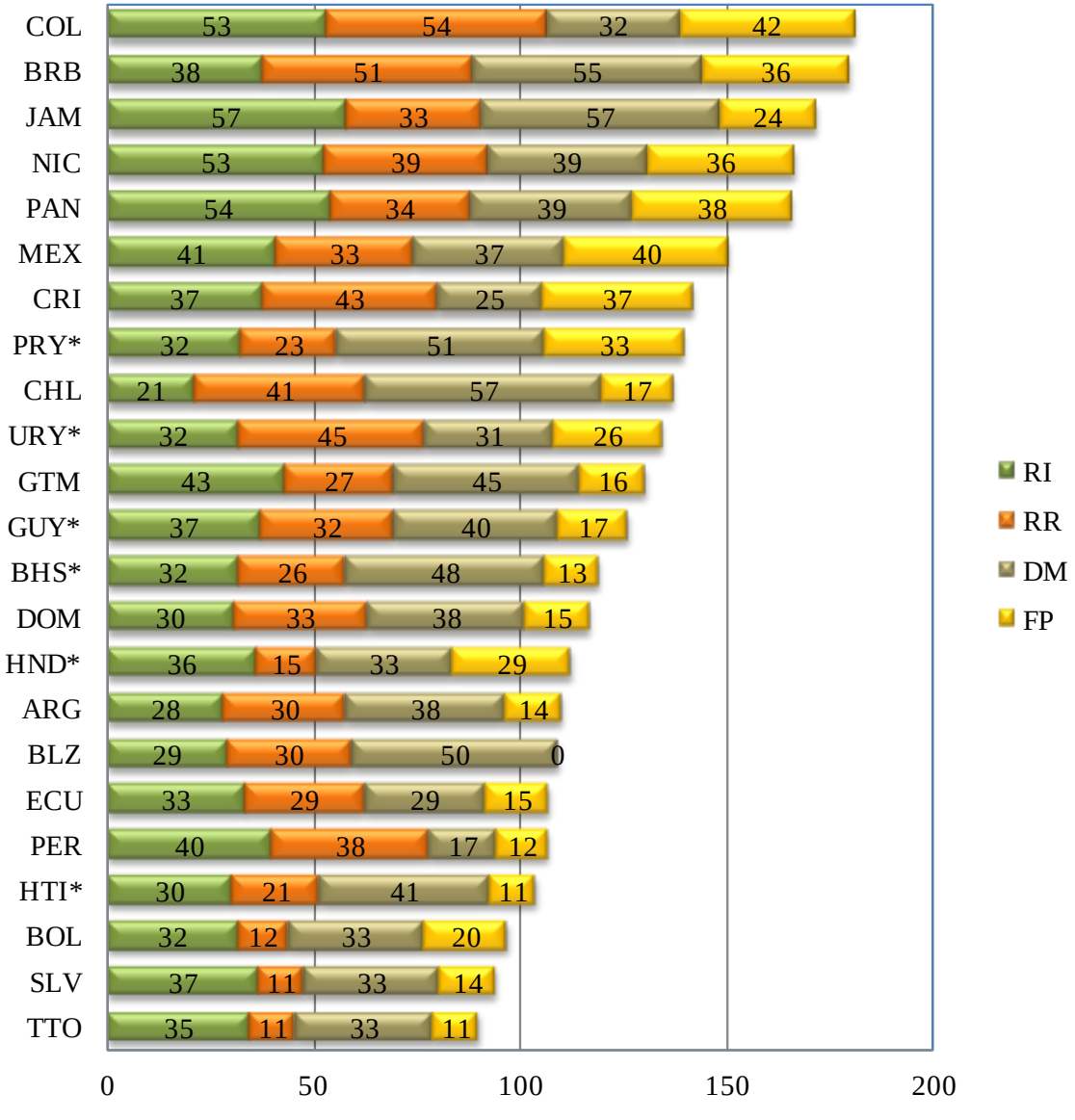
***LDI*** *: LOCAL DISASTER INDEX*

***PVI*** *: PREVALENT VULNERABILITY INDEX*

***RMI*** *: RISK MANAGEMENT INDEX*

# RISK MANAGEMENT INDEX

## - RMI -



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# National and Local Initiatives

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## DISASTER RISK MANAGEMENT PROGRAM OF MANIZALES

*Risk knowledge and information systems (5 projects)*

*Instrumentation, monitoring and early warning systems (6 projects)*

*Using risk for planning and awarness (5 projects)*

Gestión del Riesgo
Manizales - Colombia

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