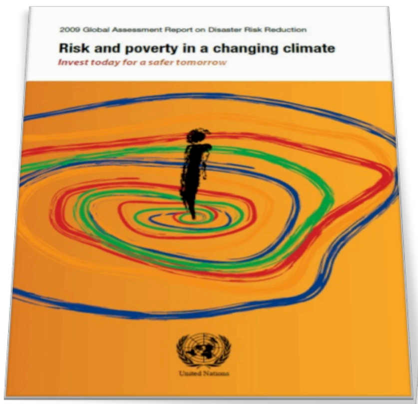
UNISDR Global Risk Assessment

GAR 15

Andrew Maskrey:
Coordinator, Global Assessment Report on Disaster Risk Reduction

UN Global Assessment Report on Disaster Risk Reduction

2009



2011

2013

And now… GAR15

UNISDR
The United Nations Office for Disaster Risk Reduction

GAR

Partners

CIMNE
Centro Internacional de Métodos Numéricos en Ingeniería
International Centre for Numerical Methods in Engineering
&
ITEC S.A.S. - INGENIAR LTDA. - EAI S.A.

RESEARCH FOUNDATION
cima
OBSERVE TO PREDICT,
PREDICT TO PREVENT.

AUSTRALIA
Australian Government
Geoscience Australia

NGI

THE LEAGUE OF ARAB STATES
THE ARAB CENTER FOR THE STUDIES OF ARID ZONES AND DRY LANDS
ACSAD 1968 أكساد

WAPM

KOKUSAI KOGYO HOLDINGS CO.,LTD.

BEIJING NORMAL UNIVERSITY 1902

World Meteorological Organization
Weather • Climate • Water

UNESCO
United Nations
Educational, Scientific and
Cultural Organization

GFDRR

GEM
GLOBAL EARTHQUAKE MODEL
working together to assess risk

FEWS NET
FAMINE EARLY WARNING SYSTEMS NETWORK

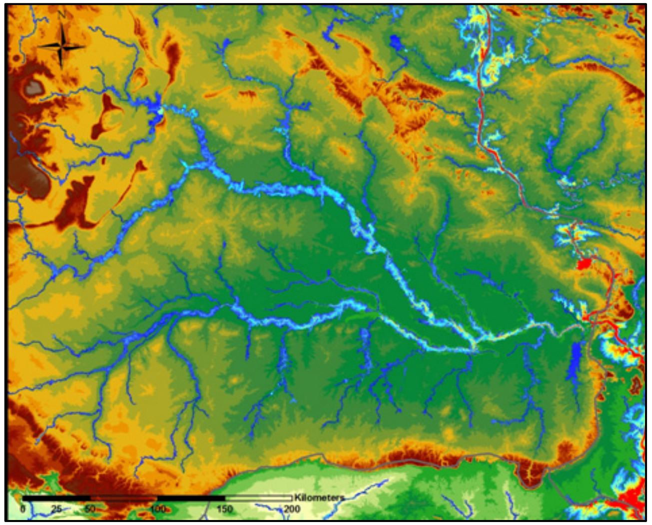
UNEP

GVM
GLOBAL VOLCANO MODEL

GRID-Geneva

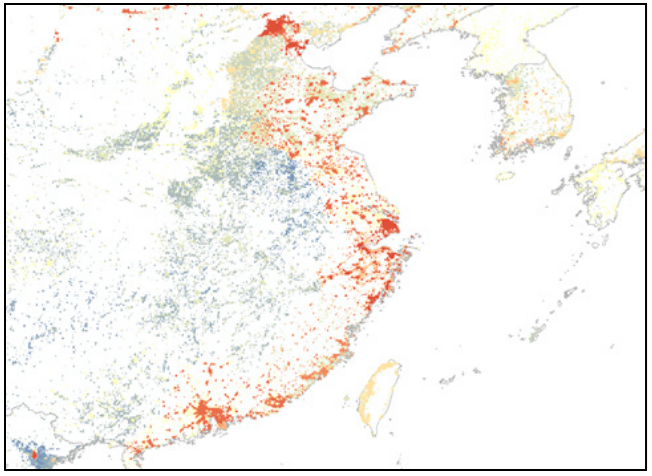
- **Global Flood model**

  In collaboration with CIMA Foundation, GRID-Geneva is doing the geospatial analysis for six returning period.



- **Global Exposure Model**

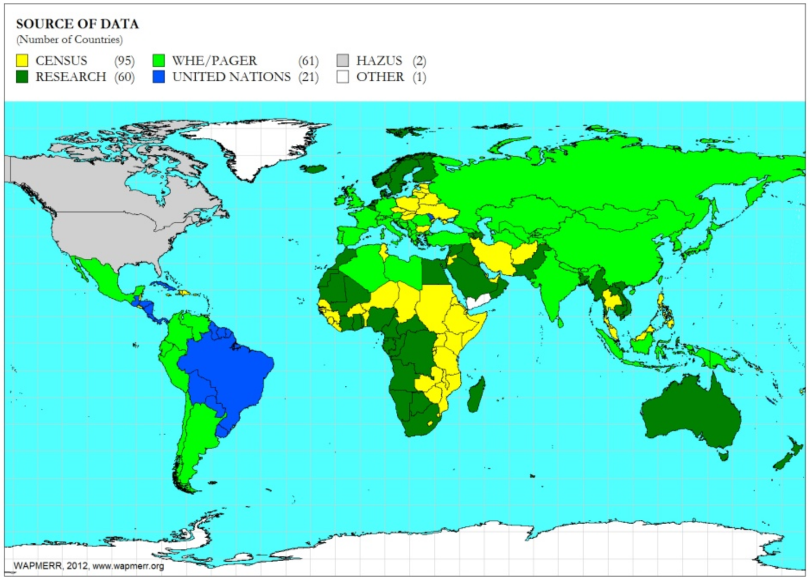
  In collaboration with WAPMER, GRID-Geneva is coordinating the global exposure model and performing the spatial modeling. GRID-Geneva is also supporting the research on floods and climate change



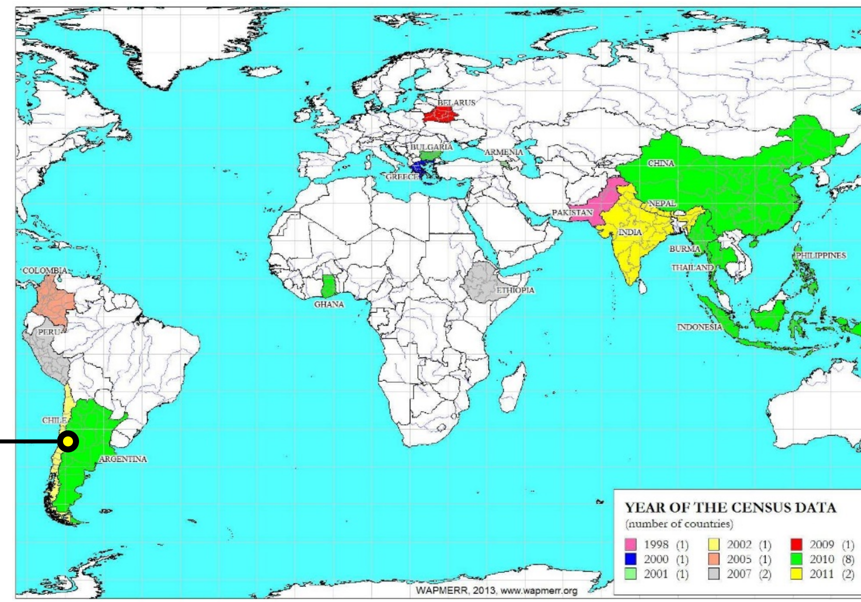
- **PREVIEW Global Risk Data Platform**

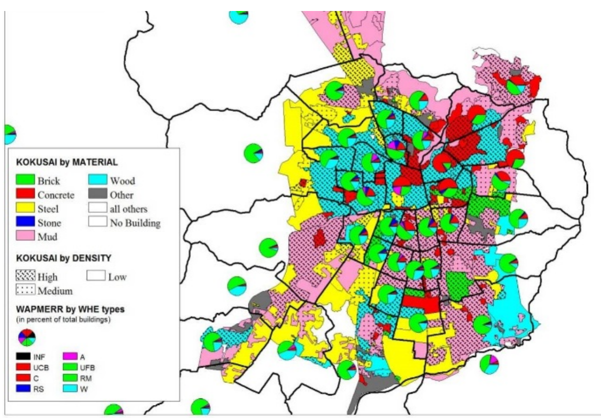
  GRID-Geneva is distributing the geospatial data related to the global risk analysis through SDI technology.

WAPMERR: Building stock and population distribution at national, regional and local scales



The building stock for 18 countries: The building stock is based on various sources and defines the built environment in World Housing Encyclopedia (WHE) types for three size categories of settlements (rural, medium city and large city) at the national level



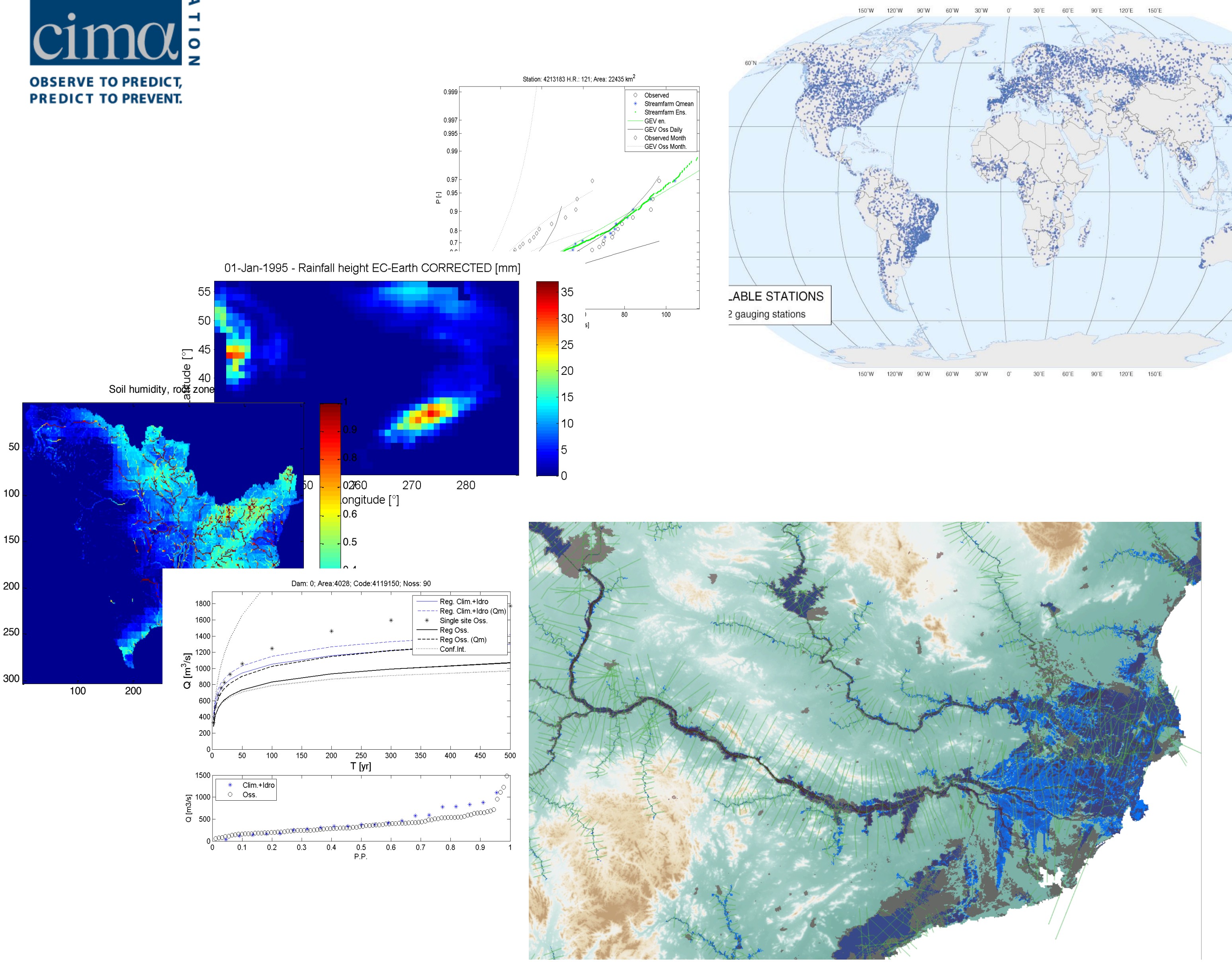


Building distribution of Santiago by administrative districts (comparison with KOKUSAI data)

RESEARCH FOUNDATION

OBSERVE TO PREDICT, PREDICT TO PREVENT.

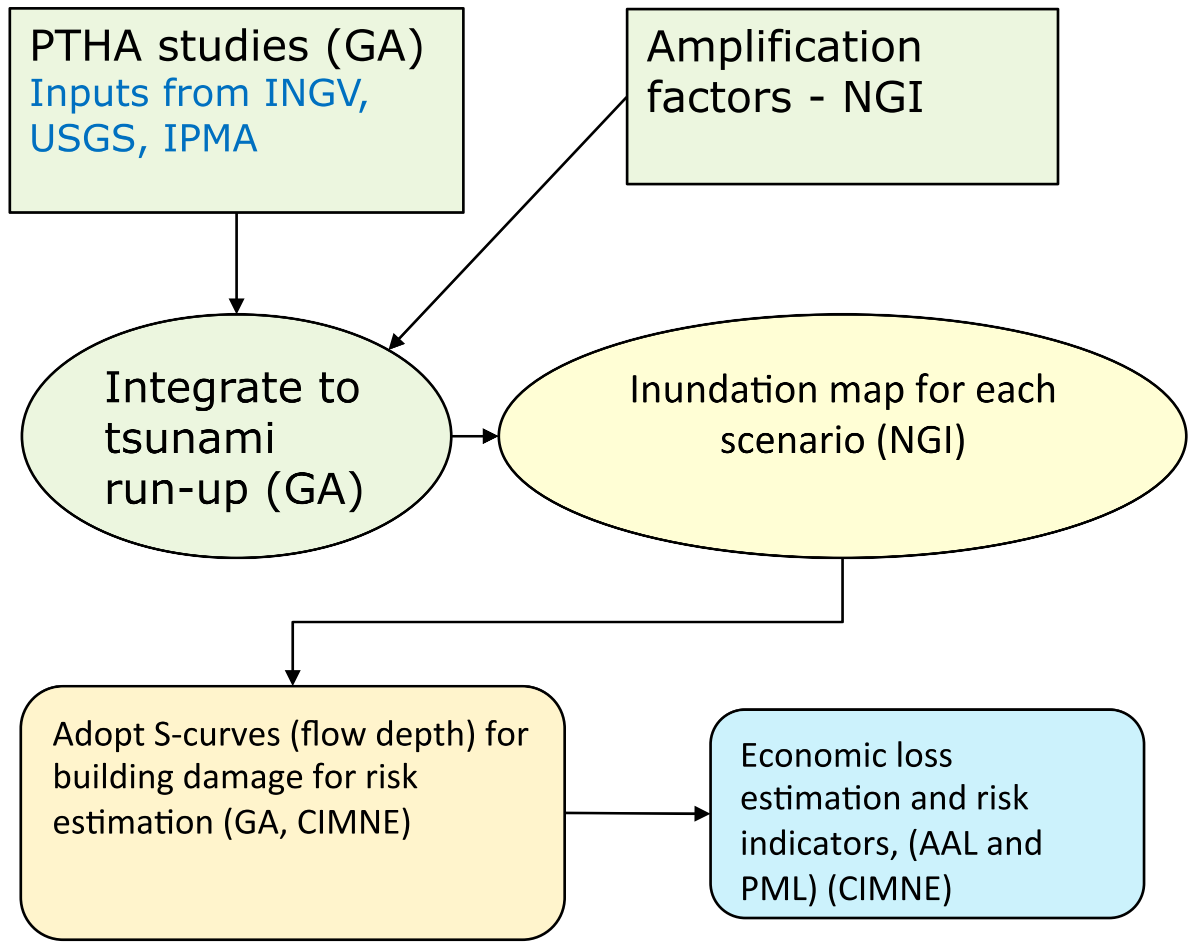
CIMA Foundation: A Global Flood Model



1. Statistical Analysis
2. Meteorological Input preparation
3. Hydrological modelling
4. Hazard mapping
5. Scenarios building
6. Statistical Analysis in CC
7. Hazard Mapping in CC
8. Scenarios building in CC

NGI and GA:

Global probabilistic tsunami loss calculations and risk estimation

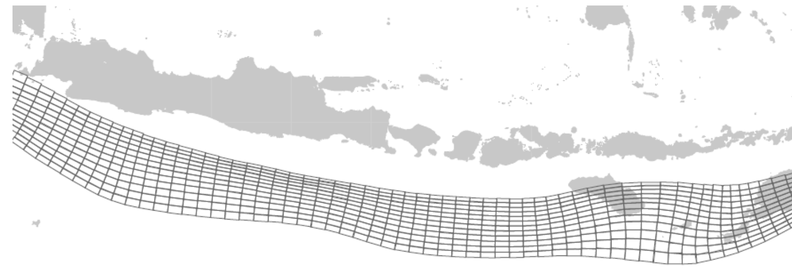


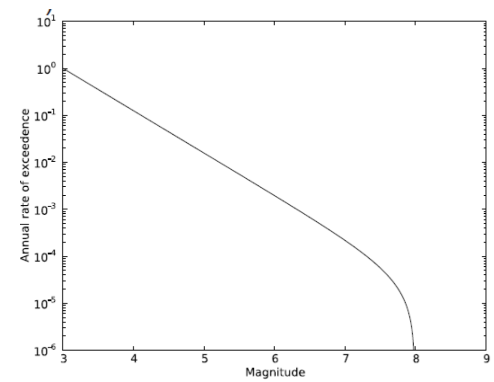
PTHA Methodology

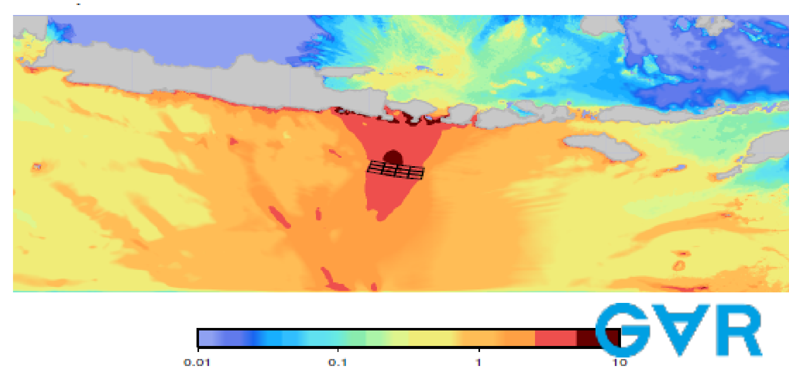
(Probabilistic tsunami hazard assessment)

We employ a probabilistic method for estimating the probability of exceeding a certain run-up height at the coastline

1. Define hazard points near coast
2. Select fault sources and subdivide into subfaults
3. Define magnitude-frequency distribution for fault source and create synthetic earthquake catalogue
4. Tsunami modeling for unit-sources (1m slip)
5. Sum and scale tsunami heights from unit-sources for each event in catalogue
6. Use amplification factor method to take nearshore height to run-up for each event in the catalogue



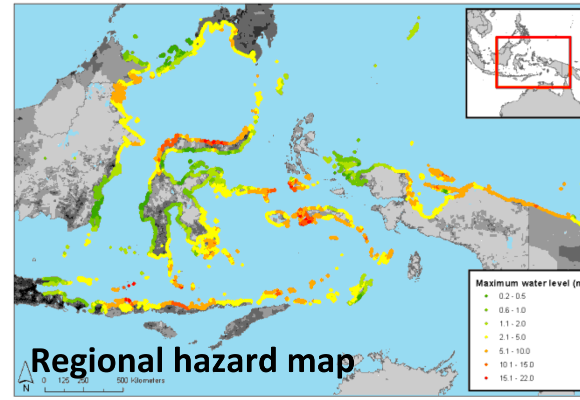




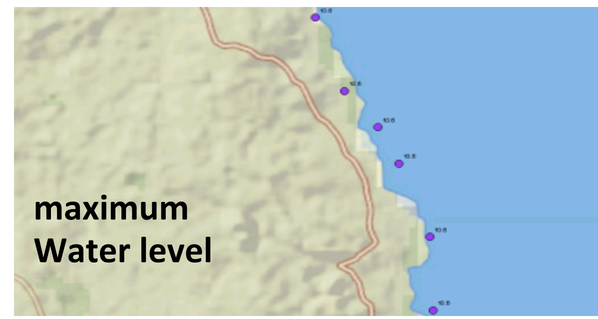
The method provides a set of events (several tens of thousands), each with a unique inundation map and probability

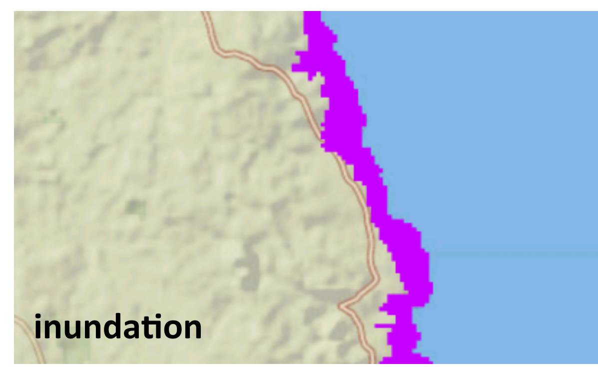
GVR

Tsunami amplification and inundation mapping for each event



- Use a simplified amplification factor method estimate the maximum water level at the shoreline
- Assume that water is elevated uniformly → water level equals run-up
  - Use SRTM topography
  - Extrapolate the maximum water level over dry land using the inverse distance weighted function
  - Limit maximum horizontal inundation due to friction effects





GVR

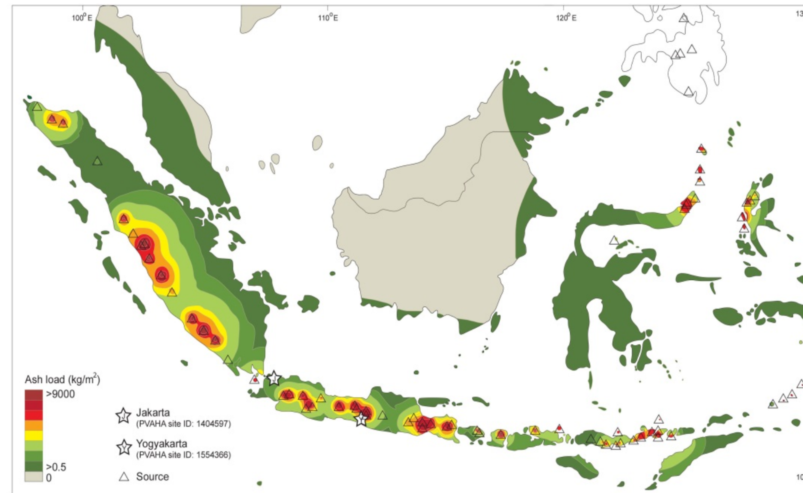
Australian Government
Geoscience Australia

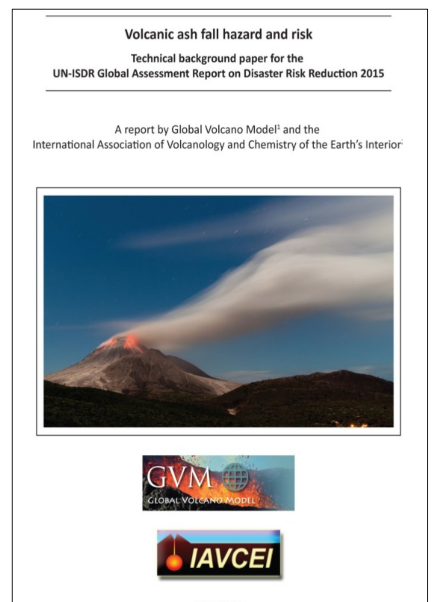
Geoscience Australia

1. Probabilistic Volcanic Ash Hazard: Asia-Pacific region

- A new method for assessing volcanic ash hazard at regional to global scales was developed by GA staff for GAR15.
- An analysis of the Asia-Pacific region was undertaken and maps for volcanic ash hazard were produced for 12 return periods.
- GA's new model allows for the hazard results to be disaggregated, which is a useful tool for analysing hazard at a site of interest or for identifying priority areas for more detailed hazard modelling at the local-scale.
- These results were provided to CAPRA for a probabilistic volcanic ash risk assessment

Funded by Australia's Aid Program




Volcanic ash fall hazard and risk

Technical background paper for the
UN-ISDR Global Assessment Report on Disaster Risk Reduction 2015

A report by Global Volcano Model[1] and the
International Association of Volcanology and Chemistry of the Earth's Interior

GVM GLOBAL VOLCANO MODEL

IAVCEI

May 2014

Top: Example volcanic ash hazard map for Indonesia at the 1000 year return period.

Left: Background technical paper on global volcanic ash hazard and risk results

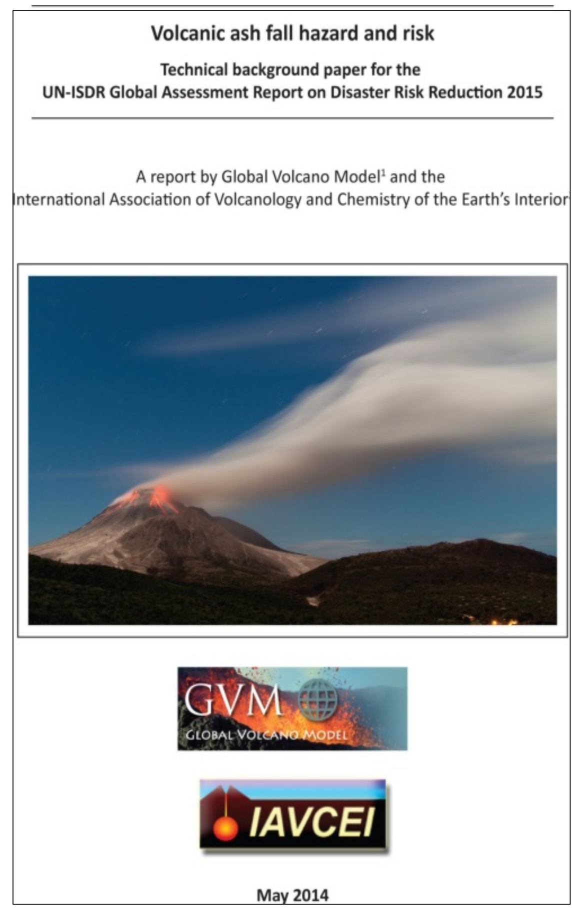
GAR

Global Volcano Model

GVM constitute of 31 institutions from around the world in collaboration with the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI)

A new addition for GAR 15:

- First global assessment of volcanic hazard and risk
- First global probabilistic Volcanic Ash hazard modelling
- Regional and countries profile
- Many case studies with wide range of topics including disaster risk management strategies.


Volcanic ash fall hazard and risk

Technical background paper for the
UN-ISDR Global Assessment Report on Disaster Risk Reduction 2015

A report by Global Volcano Model[1] and the
International Association of Volcanology and Chemistry of the Earth's Interior

May 2014

Four Reports from GVM

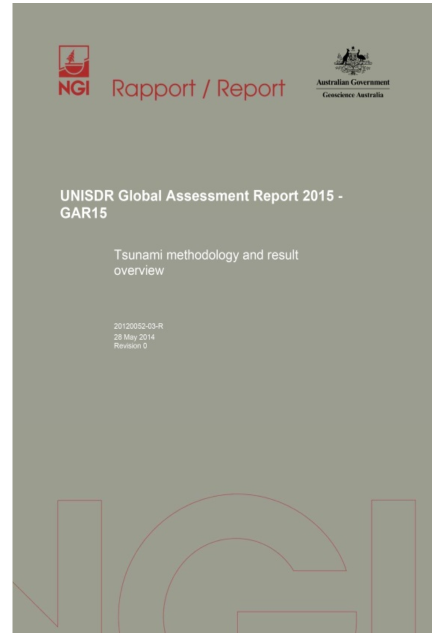
Australian Government
Geoscience Australia

2. Probabilistic Tsunami Hazard: Global

3. Building vulnerability models: Asia-Pacific region

- The aim of this work was to develop vulnerability functions for a variety of building types across a number of different hazards with a focus on the Asia-Pacific region

- This entailed hosting a multi-hazard engineering vulnerability workshop to facilitate the heuristic development of a suite of regional models for GAR15 across five hazards (earthquake, severe wind, flood, volcanic ash and tsunami) attended by invited international experts from the Asia-Pacific region and around the world.


NGI Rapport / Report
Australian Government
Geoscience Australia

UNISDR Global Assessment Report 2015 - GAR15

Tsunami methodology and result overview

20120052-03-R
28 May 2014
Revision 0

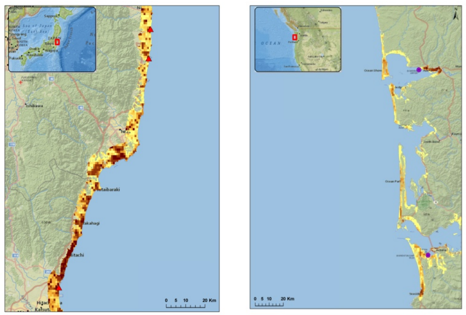
Background technical report on global tsunami hazard assessment methodology and results

An example of a river rock unreinforced masonry building in Pariaman, Indonesia

GVR

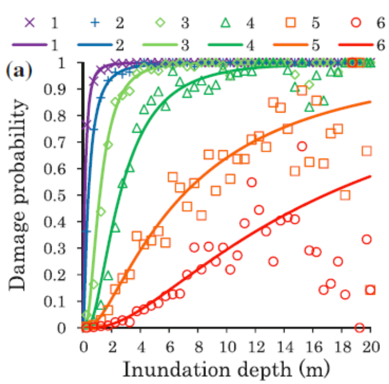
Probabilistic risk analysis in CAPRA GAR 2015

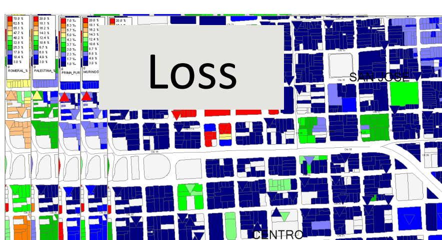
Hazard (flow depth vs return period)

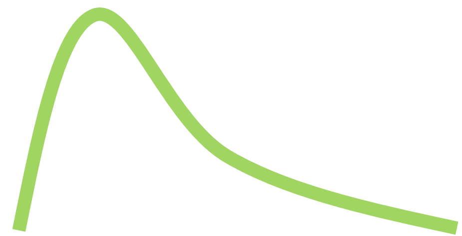


Exposed assets

Vulnerability



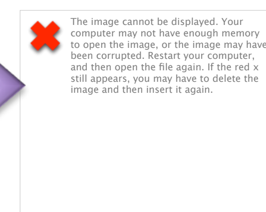




Loss pdf

Loss

Economic



Casualties

Loss excess curve

Annual Average Loss

Probable Maximum Loss

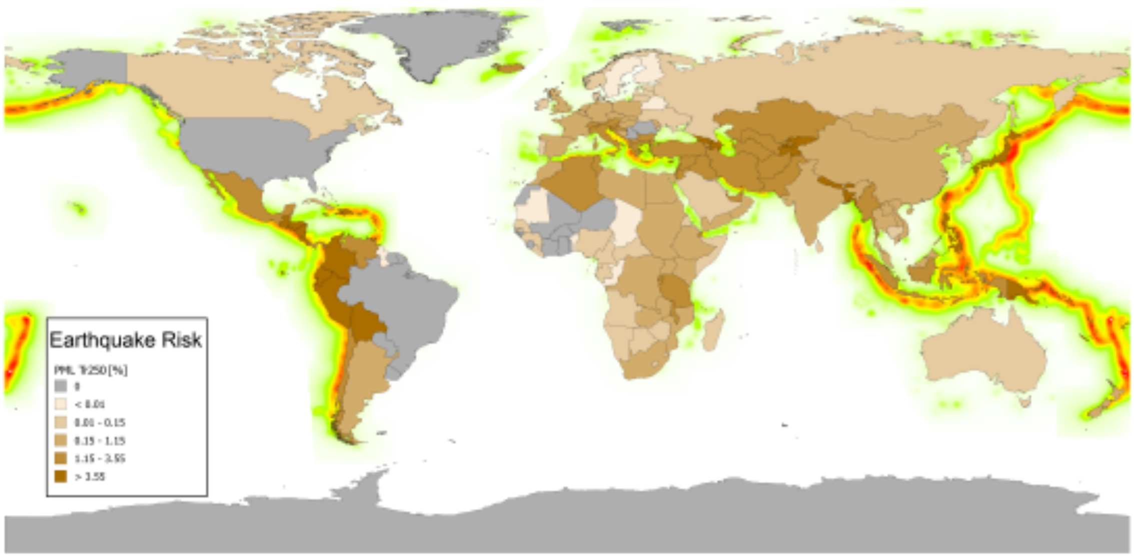
CIMNE & INGENIAR

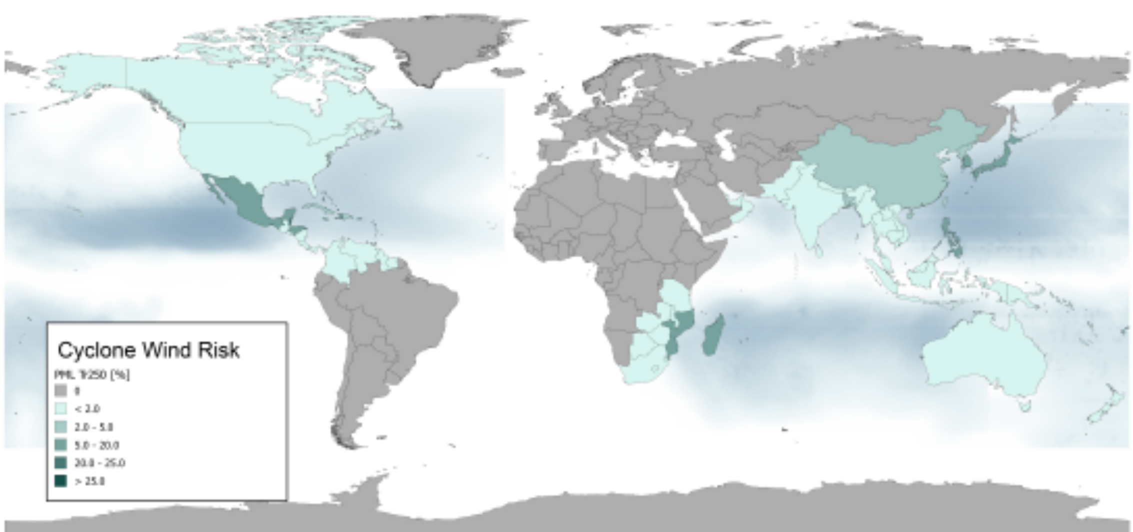
CONTRIBUTIONS TO GAR15 GLOBAL RISK ASSESSMENT:

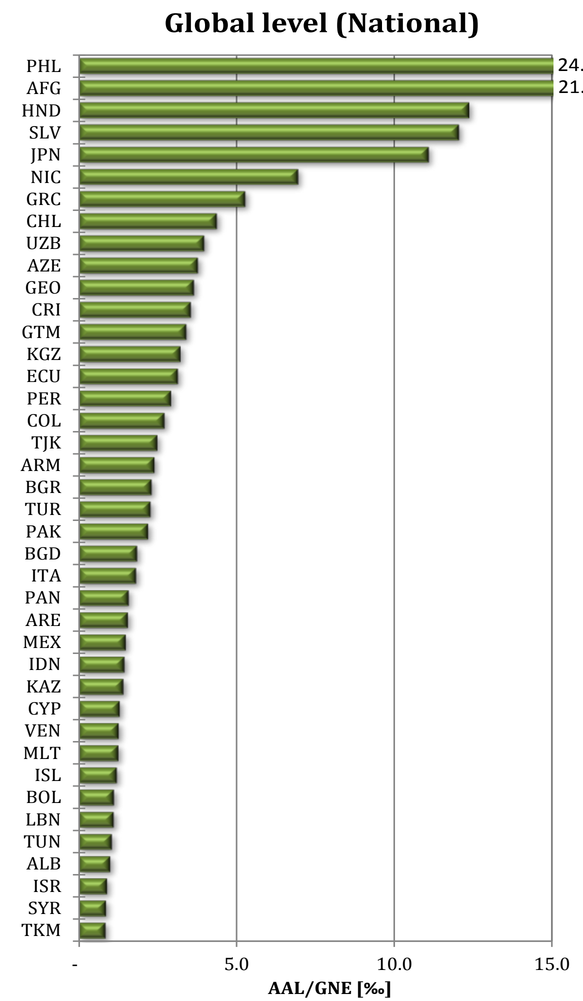
- Fully probabilistic earthquake and tropical cyclone (wind + storm surge) hazard and risk assessment at global level
- Compute the Loss Exceedance Curve and other probabilistic risk metrics using the Comprehensive Approach to Probabilistic Risk Assessment (CAPRA) Platform.
- Calculation of Hybrid Loss Exceedance Curves to reflect the extensive and intensive risk
- Examples of risk evaluations at local level for earthquake, tropical cyclones, floods and volcanoes
- Country's risk profile based on coarse-grain information for risk awareness and comparison among countries
- Develop a good-enough risk assessment methodology to replicate the global approach at the local level
- It is the first time that a Loss Exceedance Curve is calculated for 215 countries using the same arithmetic and base information

Risk maps and rankings

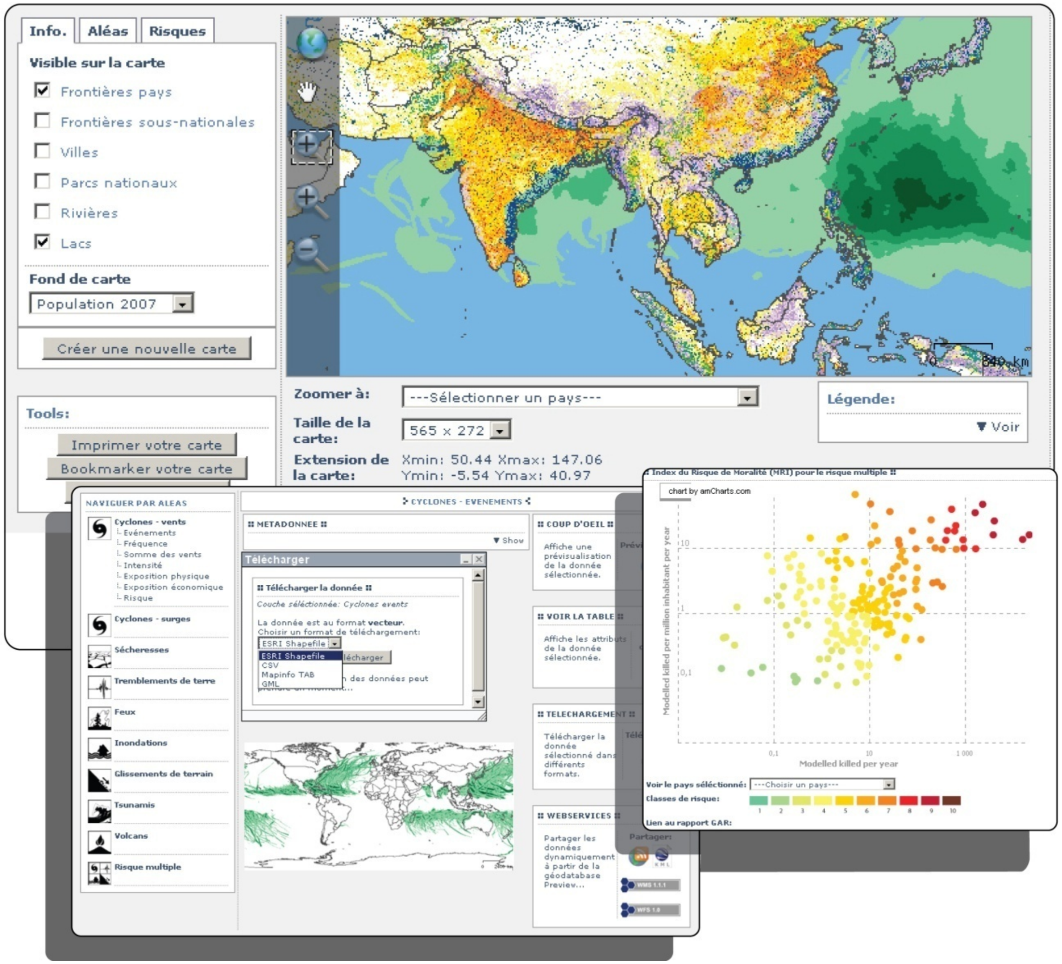
Using AAL and PML results and macroeconomic data





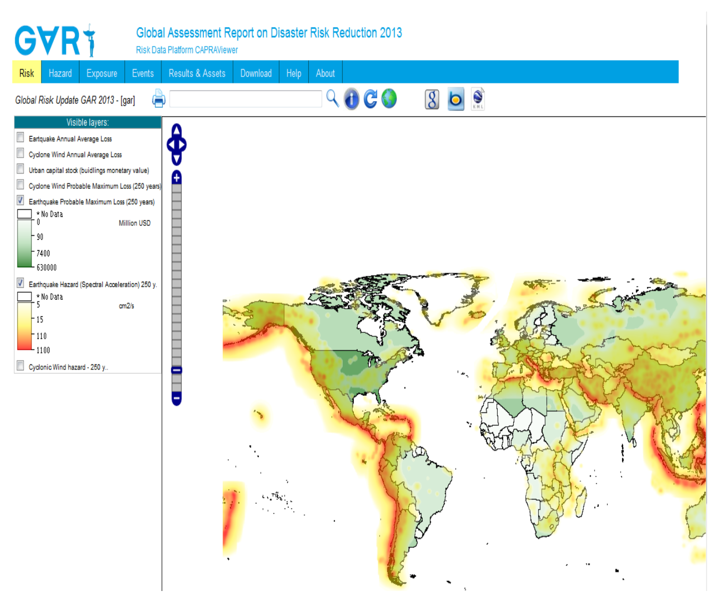


Dissemination: Various Platforms



PREVIEW: a geoportal to serve and share global data on risk to natural hazards

CAPRA Viewer: GAR 13



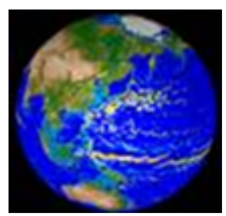
Dissemination:



Tangible Earth: Live or Static hazard and risk data on a Physical Globe or as a Tablet App.

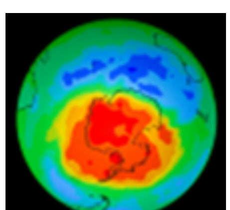
Data Examples

Jet stream

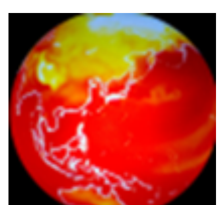


Sea current

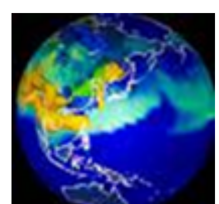
Earth quakes



Ozone hole

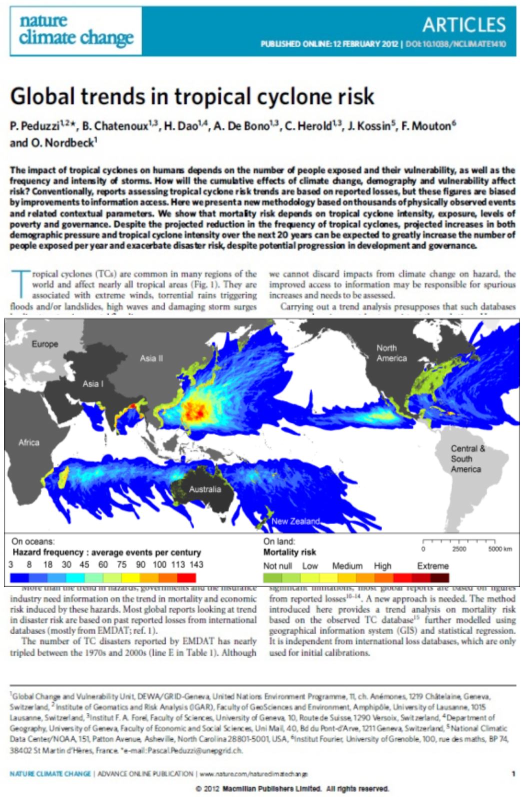


Global warming



Air pollution

Dissemination: Scientific Publications



nature climate change | ARTICLES

PUBLISHED ONLINE: 12 FEBRUARY 2012 | DOI: 10.1038/NCLIMATE1410

Global trends in tropical cyclone risk

P. Peduzzi[1,2]*, B. Chatenoux[1,3], H. Dao[1,4], A. De Bono[1,3], C. Herold[1,3], J. Kossin[5], F. Mouton[6] and O. Nordbeck[1]

The impact of tropical cyclones on humans depends on the number of people exposed and their vulnerability, as well as the frequency and intensity of storms. How will the cumulative effects of climate change, demography and vulnerability affect risk? Conventionally, reports assessing tropical cyclone risk trends are based on reported losses, but these figures are biased by improvements to information access. Here we present a new methodology based on thousands of physically observed events and related contextual parameters. We show that mortality risk depends on tropical cyclone intensity, exposure, levels of poverty and governance. Despite the projected reduction in the frequency of tropical cyclones, projected increases in both demographic pressure and tropical cyclone intensity over the next 20 years can be expected to greatly increase the number of people exposed per year and exacerbate disaster risk, despite potential progression in development and governance.

Tropical cyclones (TCs) are common in many regions of the world and affect nearly all tropical areas (Fig. 1). They are associated with extreme winds, torrential rains triggering floods and/or landslides, high waves and damaging storm surges

we cannot discard impacts from climate change on hazard, the improved access to information may be responsible for spurious increases and needs to be assessed.

Carrying out a trend analysis presupposes that such databases

More than the trend in hazards, governments and the insurance industry need information on the trend in mortality and economic risk induced by these hazards. Most global reports looking at trend in disaster risk are based on past reported losses from international databases (mostly from EMDAT; ref. 1).

The number of TC disasters reported by EMDAT has nearly tripled between the 1970s and 2000s (line E in Table 1). Although

significant limitations, most global reports are based on figures from reported losses[10–14]. A new approach is needed. The method introduced here provides a trend analysis on mortality risk based on the observed TC database[15] further modelled using geographical information system (GIS) and statistical regression. It is independent from international loss databases, which are only used for initial calibrations.

[1]Global Change and Vulnerability Unit, DEWA/GRID-Geneva, United Nations Environment Programme, 11, ch. Anémones, 1219 Châtelaine, Geneva, Switzerland, [2]Institute of Geomatics and Risk Analysis (IGAR), Faculty of GeoSciences and Environment, Amphipôle, University of Lausanne, 1015 Lausanne, Switzerland, [3]Institut F. A. Forel, Faculty of Sciences, University of Geneva, 10, Route de Suisse, 1290 Versoix, Switzerland, [4]Department of Geography, University of Geneva, Faculty of Economic and Social Sciences, Uni Mail, 40, Bd du Pont-d'Arve, 1211 Geneva, Switzerland, [5]National Climatic Data Center/NOAA, 151, Patton Avenue, Asheville, North Carolina 28801-5001, USA, [6]Institut Fourier, University of Grenoble, 100, rue des maths, BP 74, 38402 St Martin d'Hères, France. *e-mail: Pascal.Peduzzi@unepgrid.ch.

Partners publish on various scientific journals in their field

A special issue of International Journal of Disaster Risk Reduction

Use and Application

- Monitoring framework of HFA 2
- Country Risk profiles providing a first cut of risk information for national governments financial planning and policy considerations
- Any global tool requiring global level hazard, exposure, or risk data
- Any global index requiring comparative view of risk levels among countries
- Insurance Industry
- Private sector and investors
- Awareness of public and politicians on a level of hazards and risk