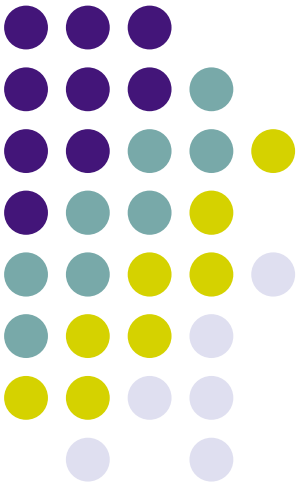
Disaster Risk Management (DRM) or Disaster Risk Reduction and Management (DRRM)



Benito M. Pacheco

Session on Disaster Risk Management, UP CIDS Workshop on Environment
27 September 2011 and 21 November 2011

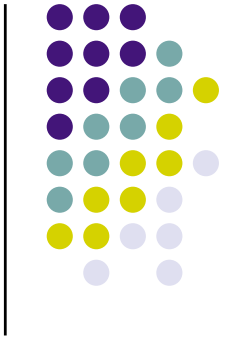
“Environmental Risk”

Featuring the Fragile Earth

“Environmental Risk”
Featuring the Fragile Human

Disaster Risk as Environmental Risk

Outline of the DRM Session



- National DRRM Framework 2011
  - Benny Pacheco (College of Engineering)
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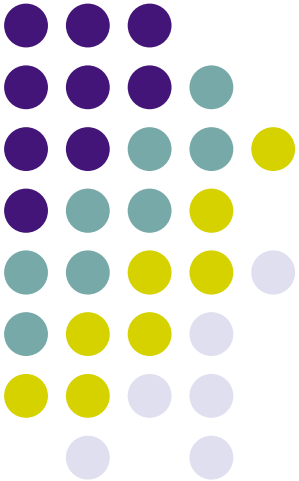
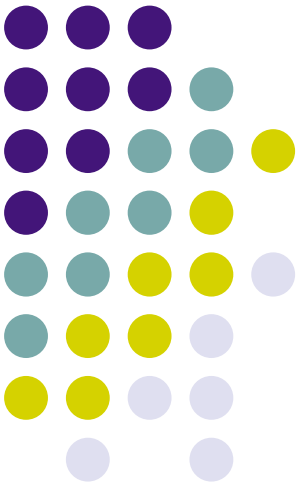
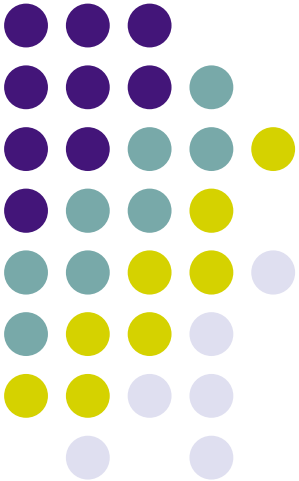
National DRRM Framework 2011



National Disaster Coordinating Council

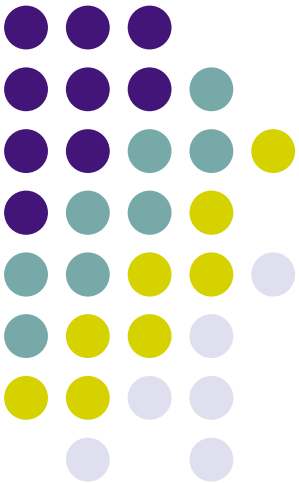


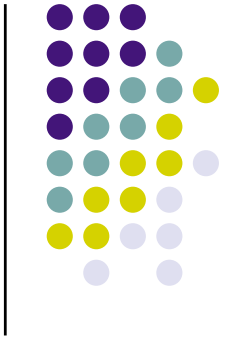
National Disaster Risk Reduction and Management Council



NEW
R.A. 10121
May 27, 2010

Disaster versus Risk





RISK Management

R ecognize the risk or risk factors

I mpute an estimate of the risk or risk factors

S urvey the risk or risk factors over time

K eep the risk or risk factors within tolerance

DISASTER Management

Prevention (before)

and Mitigation (before, during)

Preparedness (just before)

Response (during and just after)

Rehabilitation and Recovery (after)

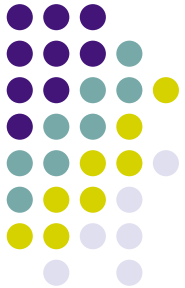
DISASTER RISK Management

Mitigation and Adaptation with Prevention (before, during)

Preparedness (just before)

Response (during and just after)

Recovery and Rehabilitation (after)



DISASTER Risk Management

Mitigation and Adaptation with Prevention (before, during)

Preparedness (just before)

Response (during and just after)

Recovery and Rehabilitation (after)

DRM = DRR + CCA + …

Disaster Risk Reduction

Climate Change Adaptation

…

National DRRM Council

Chair: Sec. Dept. of National Defense (DND)

Vice-Chair for Prevention and Mitigation:

Sec. Dept. of Science and Technology (DOST)

Vice- Chair for Preparedness:

Sec. Dept. of the Interior and Local Govt. (DILG)

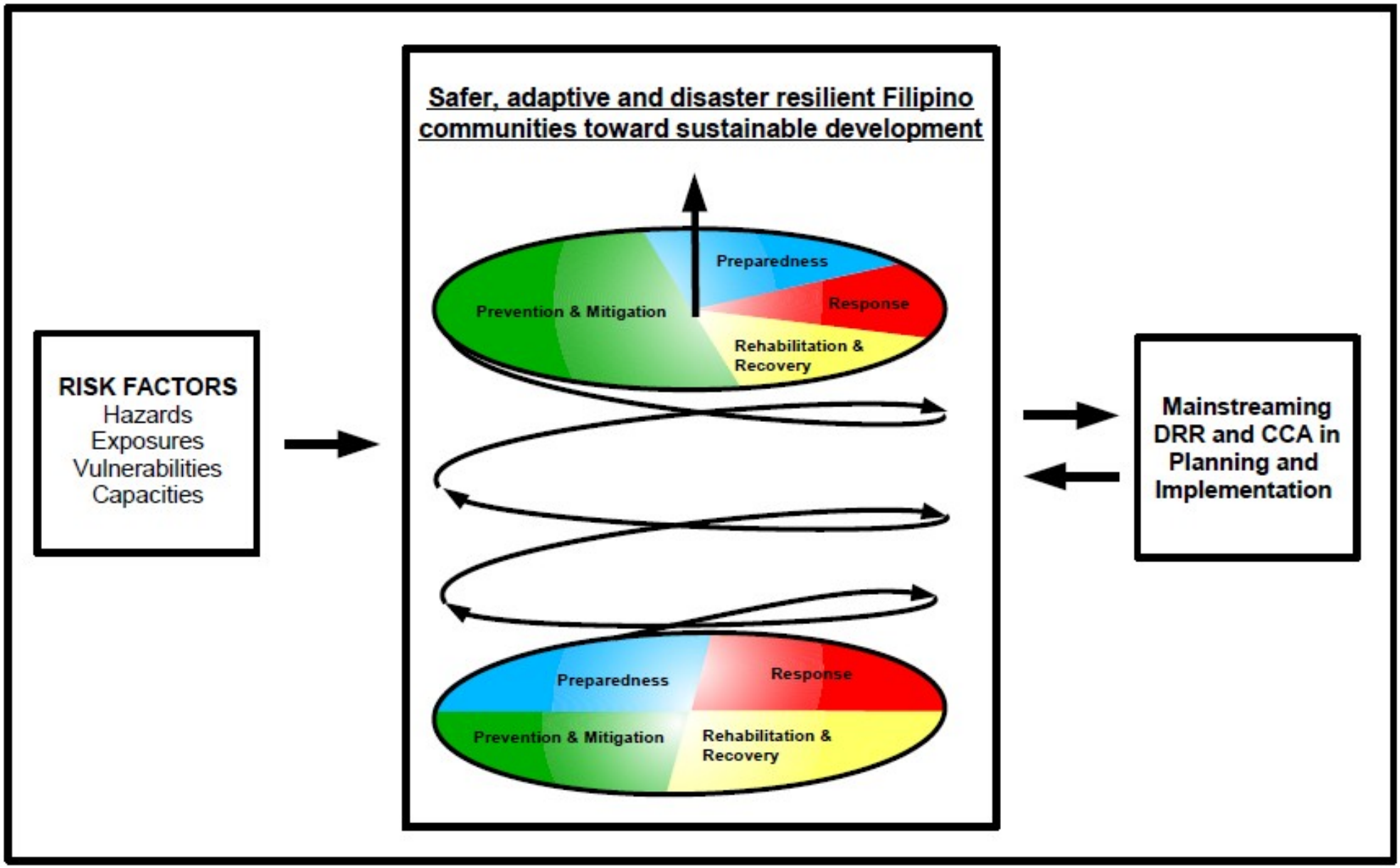
Vice-Chair for Response:

Sec. Dept. of Social Welfare and Devt. (DSWD)

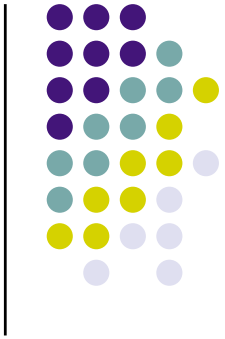
Vice-Chair for Rehabilitation and Recovery:

Dir. Gen. National Economic and Devt. Authority (NEDA)

National Disaster Risk Reduction and Management Framework



Outline of the Session



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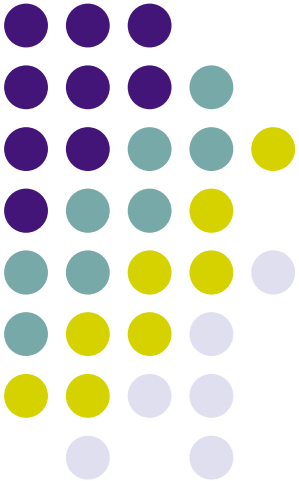
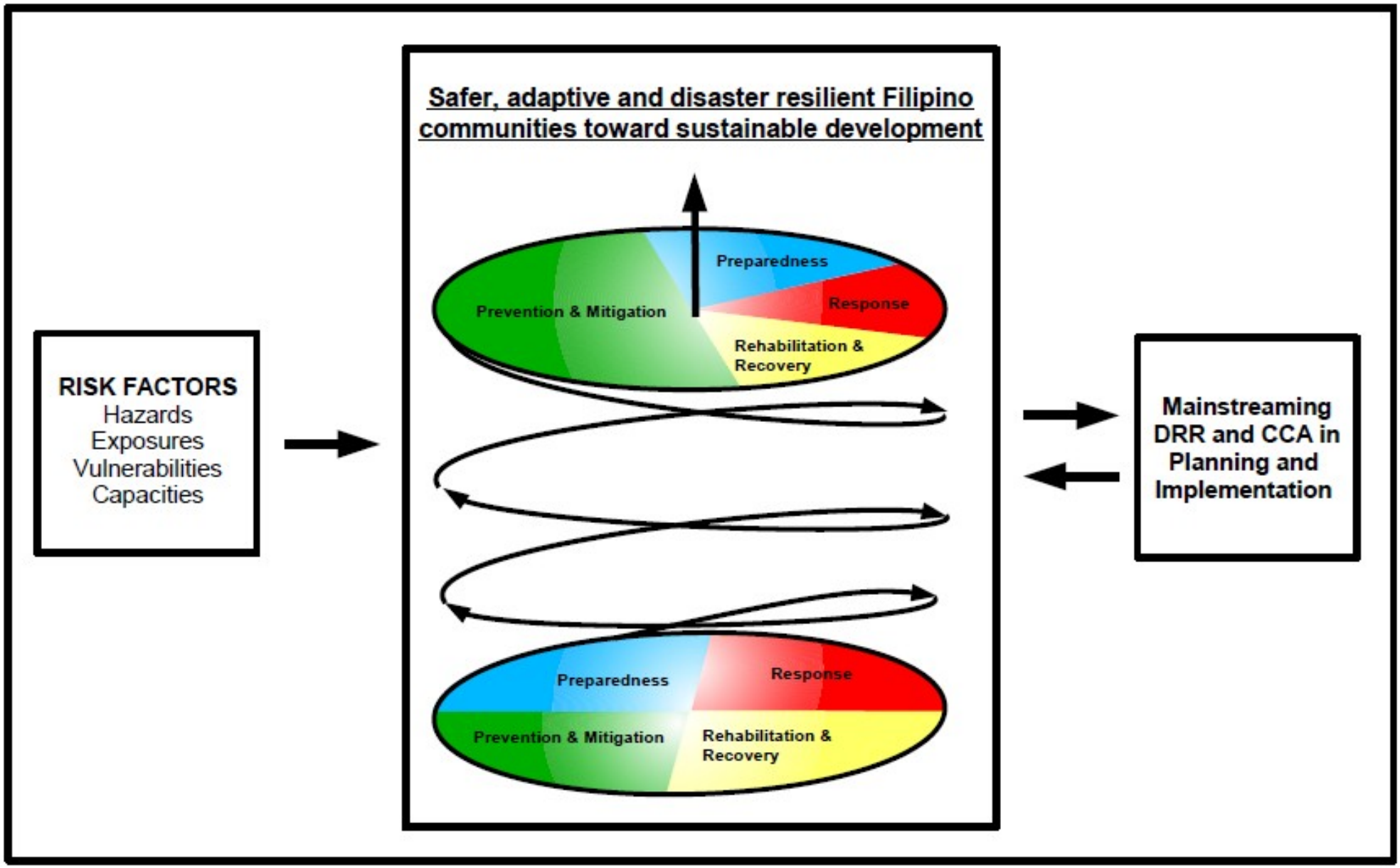
“Actors in the Management of Disaster Risk Factors”



National Disaster Risk Reduction and Management Framework



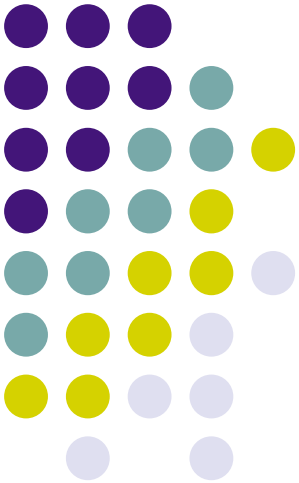
DR. HEV would like to remember 5 keywords:

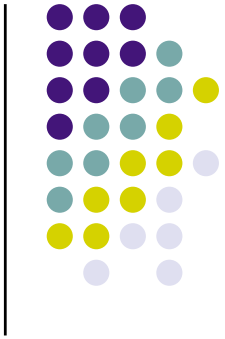
Disaster **R**isk =

Hazard *x*

Exposure *x*

Vulnerability





Disaster risk (e.g. due to earthquake, cyclone, flood or landslide) may also be classified under **environmental risk**. We may also have **economic risk, geopolitical risk, societal risk,** and **technological** risk: depending on the **cause** of risk.

Meanwhile, depending on the element **affected**, the risk may be measured as a **financial risk** (in amount of pesos or dollars) or a **mortality risk** (in number of lives).

PART 1: TYPES OF RISK

Mortality risk for tropical cyclones in two countries with similar exposure: Japan and the Philippines

Note: See note to figure on p.7 for explanation of risk classes.

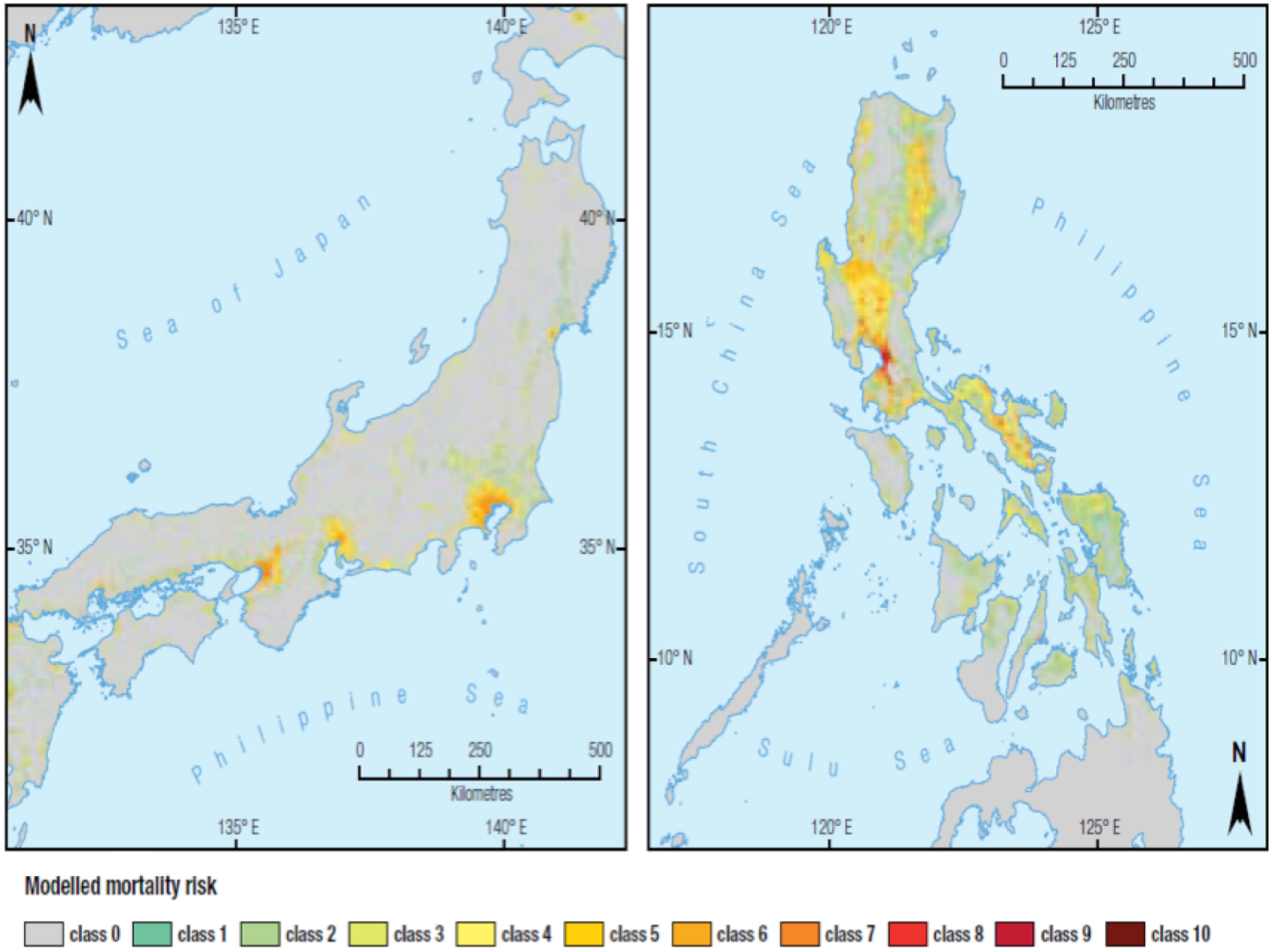
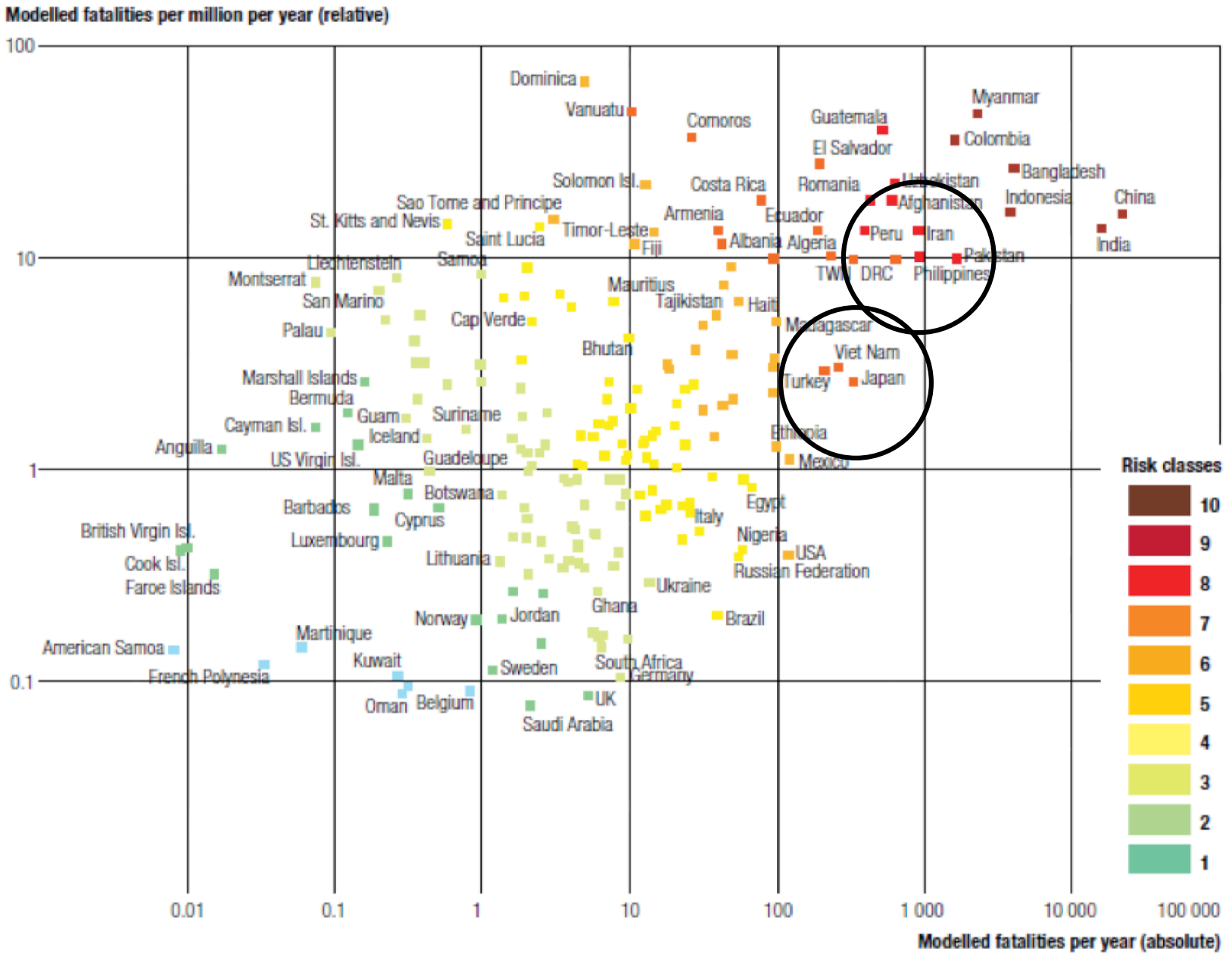
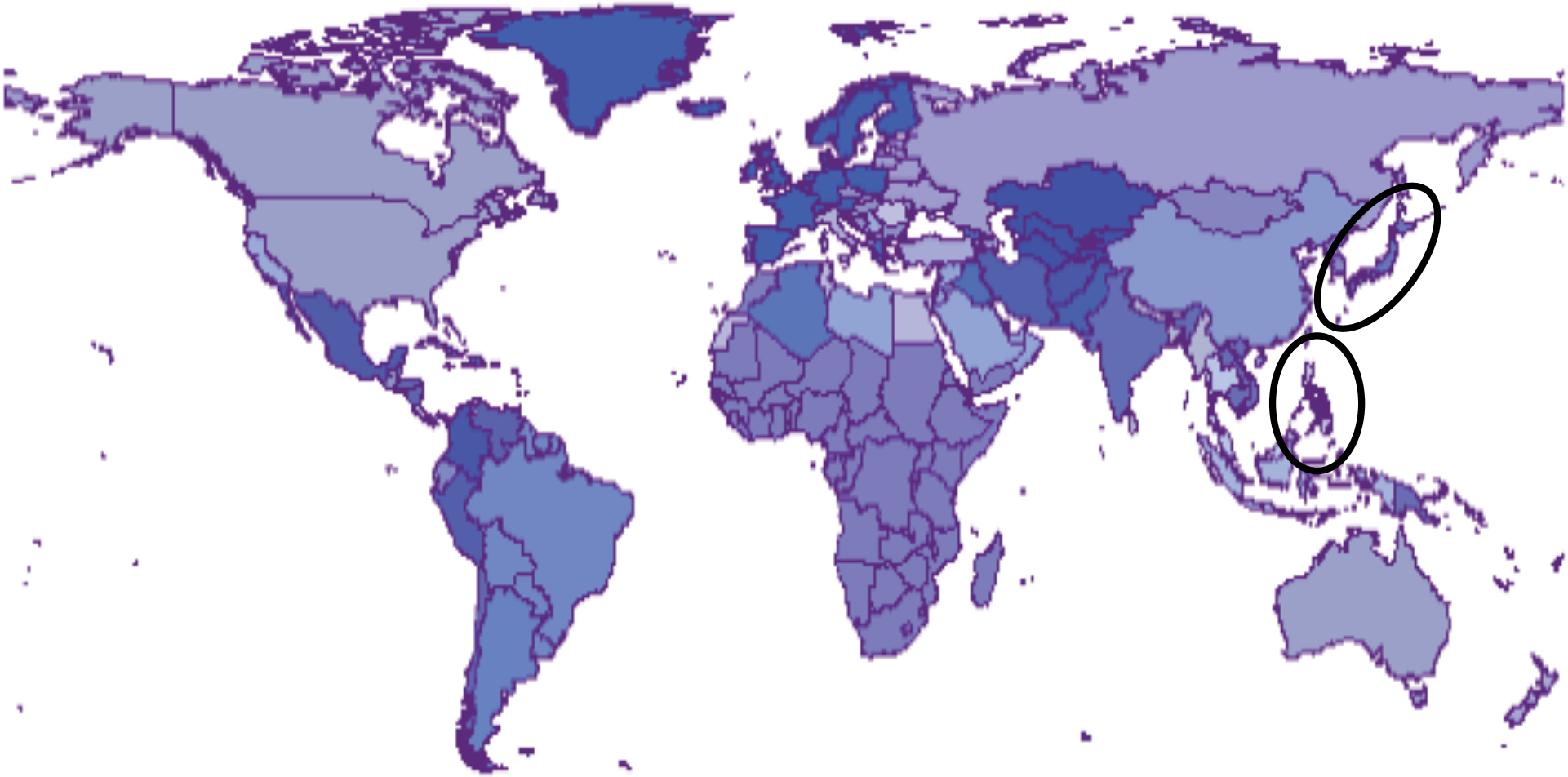


Figure 2.34: Absolute and relative multi-hazard mortality risk for tropical cyclones, floods, earthquakes and landslides

Note: DRC, Democratic Republic of the Congo; TWN, Taiwan, province of China; UK, United Kingdom of Great Britain and Ireland; USA, United States of America.

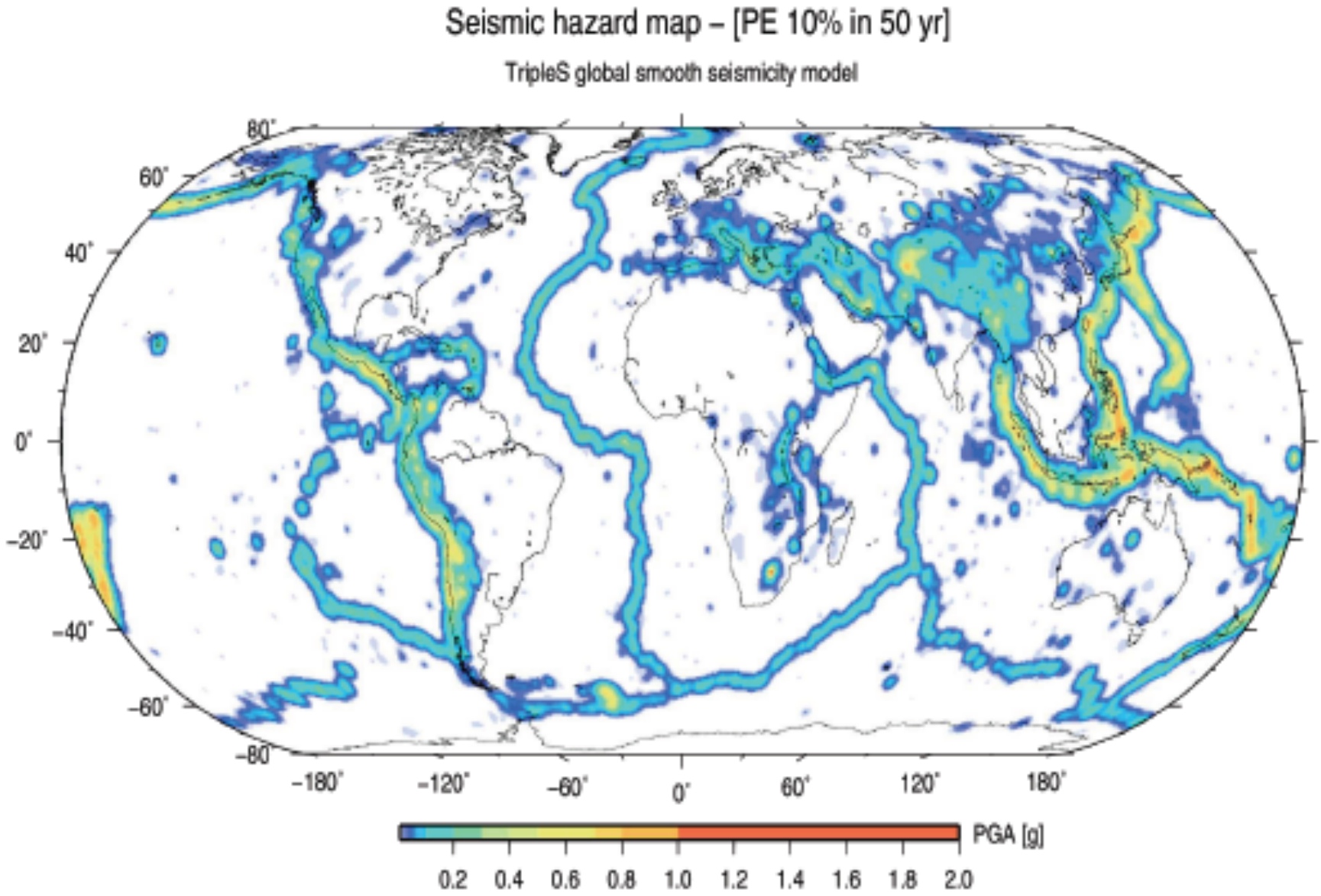




Let us take earthquake as example.

The global smooth seismicity model

- Hazard map calculated on a 0.5 by 0.5 grid (computation time ~ 52 hours)




A view from the 42nd Floor of Discovery Suites in Pasig
Approximate location of West Valley Fault
September 2003


JULY 16, 1990 - EARTHQUAKE
Maxim
90 7 20
PHIVOLCS

Houses on stilt in Candaba (included in the exposure)

vulnerable to multiple hazards

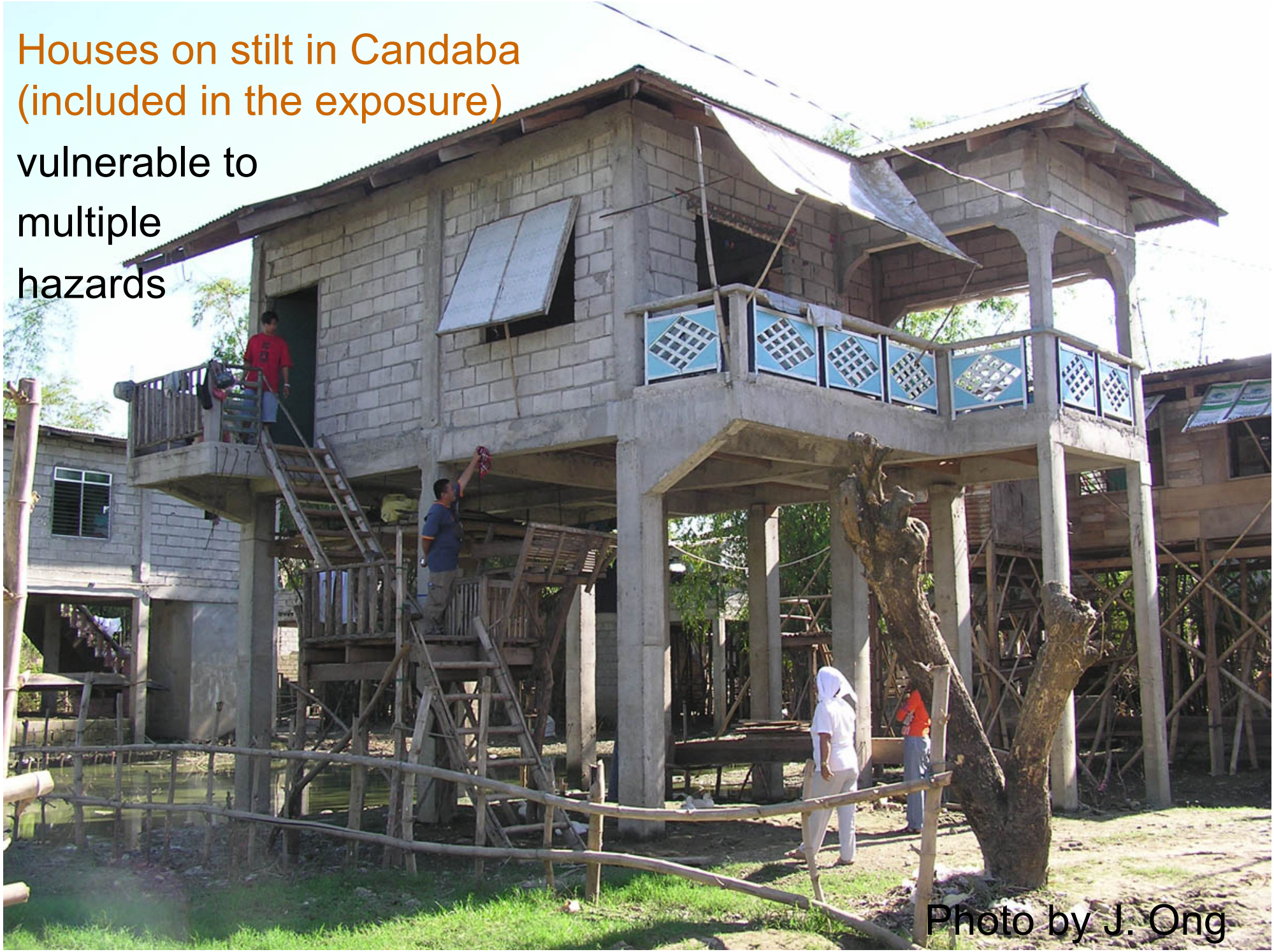


Photo by J. Ong

TALK of the TOWN

Please send feedback to jsarmiento@inquirer.com.ph

Editor Juan V. Sarmiento Jr.

10 FREQUENTLY ASKED QUESTIONS

Safety of PH structures during quakes

By Benito M. Pacheco

10 *Are magnitude and intensity of an earthquake the same?*

They are not. Magnitude is a measure of the energy that is released during an earthquake, while intensity is a description of the variable shaking that is experienced in different areas.

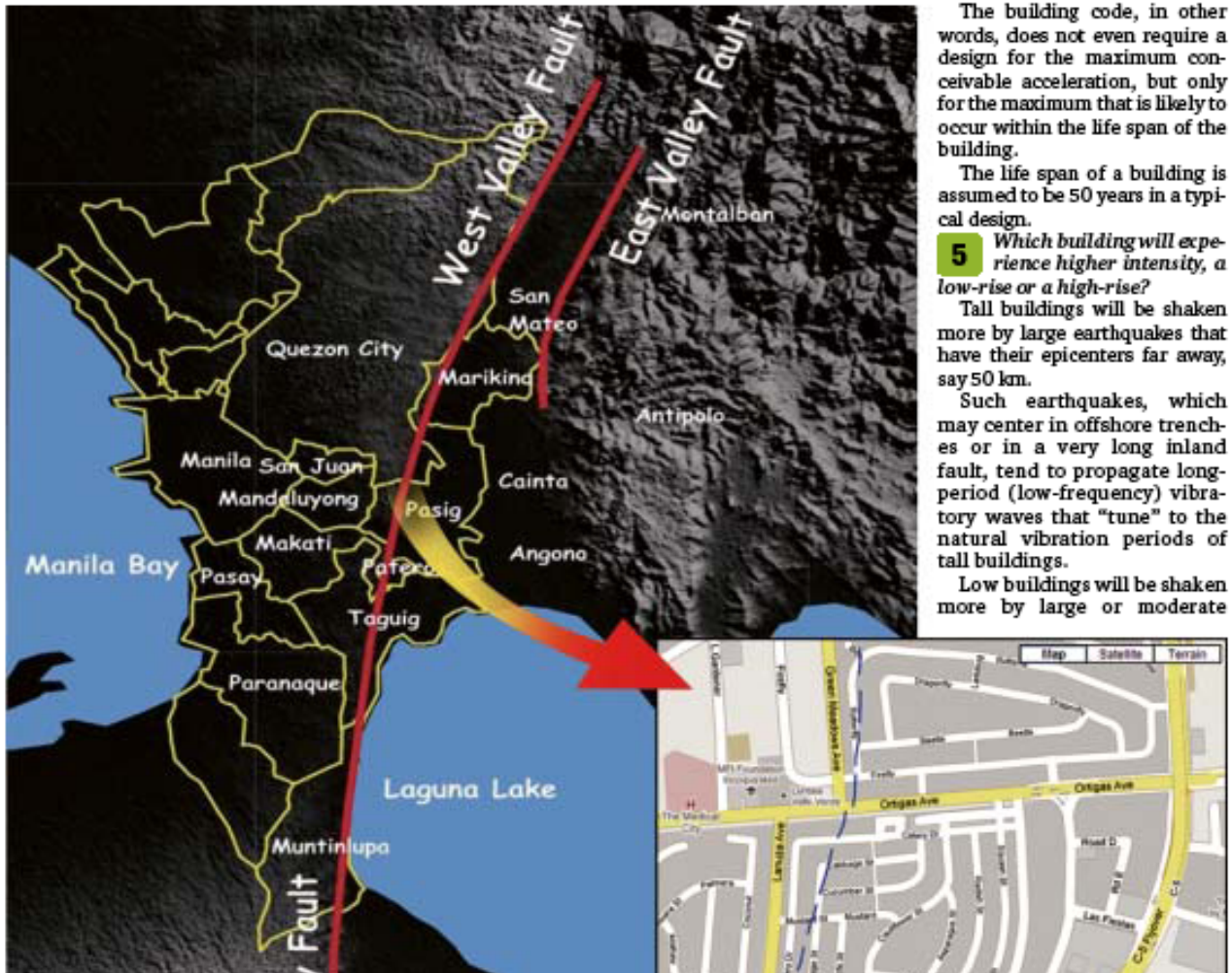
Intensity is usually written in Roman numerals (for better distinction from magnitude, which is usually in Arabic numbers).

The magnitude of an earthquake is a single number. For instance, a magnitude 7.2 is expected from the West Valley Fault that transects from Sierra Madre through Metro Manila to Batangas.

The magnitude scale is logarithmic: between magnitudes 7.2 and 7.3, the increment of energy is about 1.4 times; between magnitudes 7.0 and 8.0, about 32 times!

The wattage of a light bulb is analogous to the magnitude of an earthquake. The intensity of light or intensity of an earthquake varies according to several factors, including distance from the bulb or distance from the epicenter.

Other factors that affect earthquake intensity are rock or soil types, ground sublayer, and depth, length and type of fault displacement.



The building code, in other words, does not even require a design for the maximum conceivable acceleration, but only for the maximum that is likely to occur within the life span of the building.

The life span of a building is assumed to be 50 years in a typical design.

5 *Which building will experience higher intensity, a low-rise or a high-rise?*

Tall buildings will be shaken more by large earthquakes that have their epicenters far away, say 50 km.

Such earthquakes, which may center in offshore trenches or in a very long inland fault, tend to propagate long-period (low-frequency) vibratory waves that "tune" to the natural vibration periods of tall buildings.

Low buildings will be shaken more by large or moderate kill some or all occupants.

A building that follows the minimum standards may still be significantly damaged in the next major earthquake to the point that it will require considerable repairs before it can be reused.

Unlike in the United States or Japan, we do not provide in the building code the choice of next higher level(s) of design criteria, the kind that will ensure uninterrupted use of the building.

Some owners of major buildings choose to require their engineers to design for higher performance standards. BPO companies and global semiconductor and electronics plants are among the examples.

Tougher or more massive structural design is not necessary even in the next higher standard.

Over the past 10 years, base-isolation technologies for low-rise buildings in which this writer became involved in the seismic design have been introduced in the country.

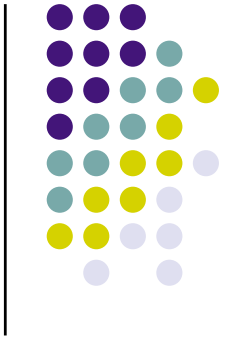
Dampers or damping devices against vibrations have also been introduced in a few very tall buildings.

In a few major projects, worst-case scenario earthquakes have been considered in the analysis and design, over and above the standard requirement of the code.

3 *What is the safest spot in a building during a strong earthquake?*

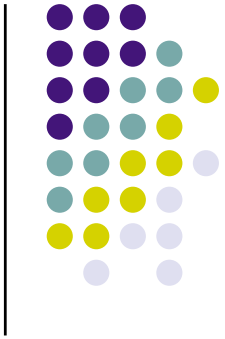
As explained earlier, significant

MMEIRS Scenario



- Magnitude 7.2 earthquake from WVF
- Heavily damaged:
  - 13% (**168,300**) of residential bldgs/units
  - 10% of public purpose bldgs incldg schools, hospitals, …
  - 11% of 10-30-storey bldgs
  - 2% of 30+ storey bldgs

MMEIRS Scenario



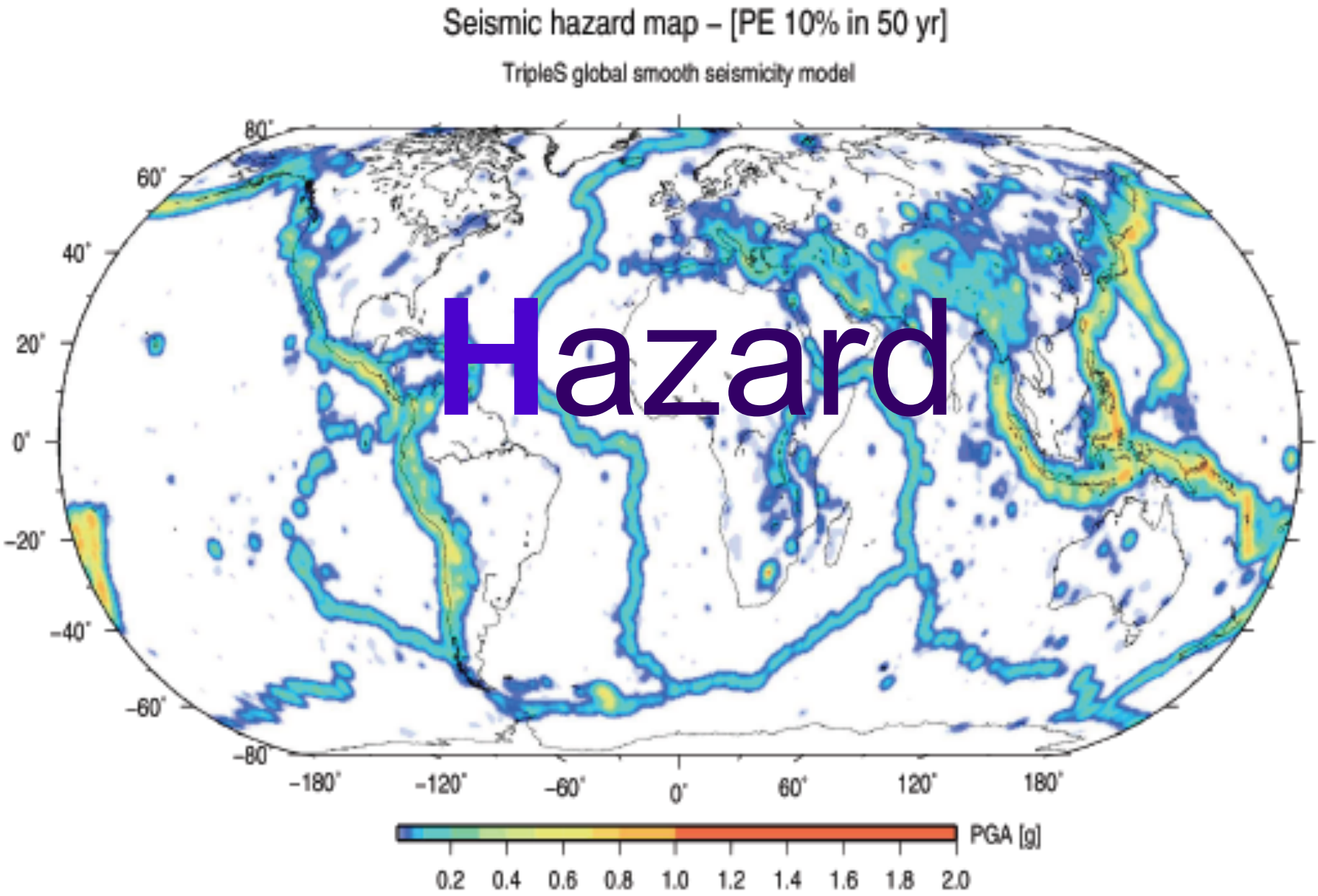
- Magnitude 7.2 earthquake from WVF
- **Partly damaged:**
  - **26% (339,800) of residential bldgs/units**
  - **25% of public purpose bldgs incldg schools, hospitals, …**
  - **27% of 10-30-storey bldgs**
  - **12% of 30+ storey bldgs**

Everything that contributes into a risk is a risk factor.

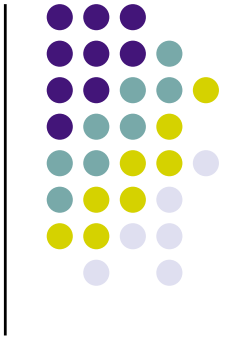
PART 2: RISK FACTORS

The global smooth seismicity model

- Hazard map calculated on a 0.5 by 0.5 grid (computation time ~ 52 hours)



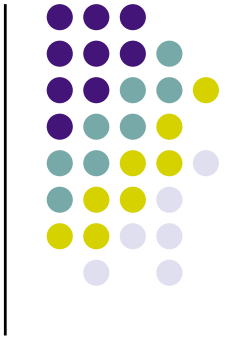
Hazard



- **Hazard could be stated as the likelihood of a certain effect** to the exposed elements, as estimated for a certain window of time and within a certain degree of confidence.
- Example: **0.10 (or 10%)** chance of Intensity VIII ground shaking (approx. 0.5g PGA) in the next 50 years, with 95% estimation confidence

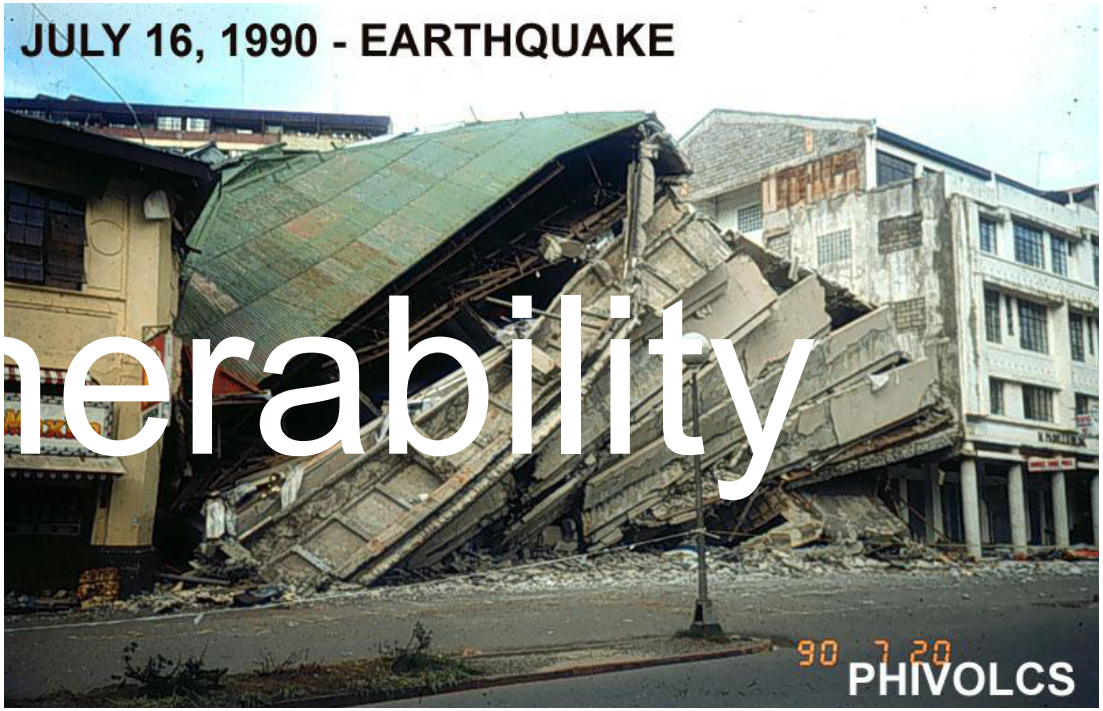

A view from the 42nd Floor of Discovery Suites in Pasig
Approximate location of West Valley Fault
Exposure
September 2003

Exposure

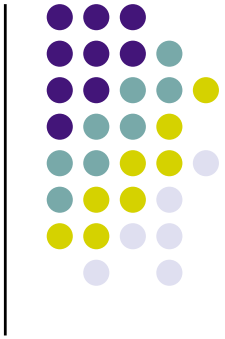


- **Exposure could be stated as the number of elements at risk**, as estimated for that window of time and within that degree of confidence.
- Exposure and risk could be in the same unit of measure, such as **number of lives, number of buildings, number of jobs, or amount of pesos**.
- Example: **1,350,000** housing units

Vulnerability

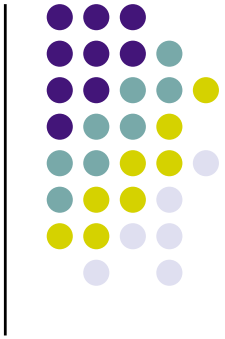


Vulnerability



- **Vulnerability could be stated as the fraction or percentage of expected loss** from the exposure, given the occurrence of the effect of hazard.
- Example: Considering an Intensity VIII ground shaking, then **0.37 (or 37%) of the cost** of a certain building structure, or **0.37 (or 37%) of the number of buildings** with a certain structural type

Oversimplified example risk to housing units



Hazard of 0.5g pga in 50 yrs = 10%

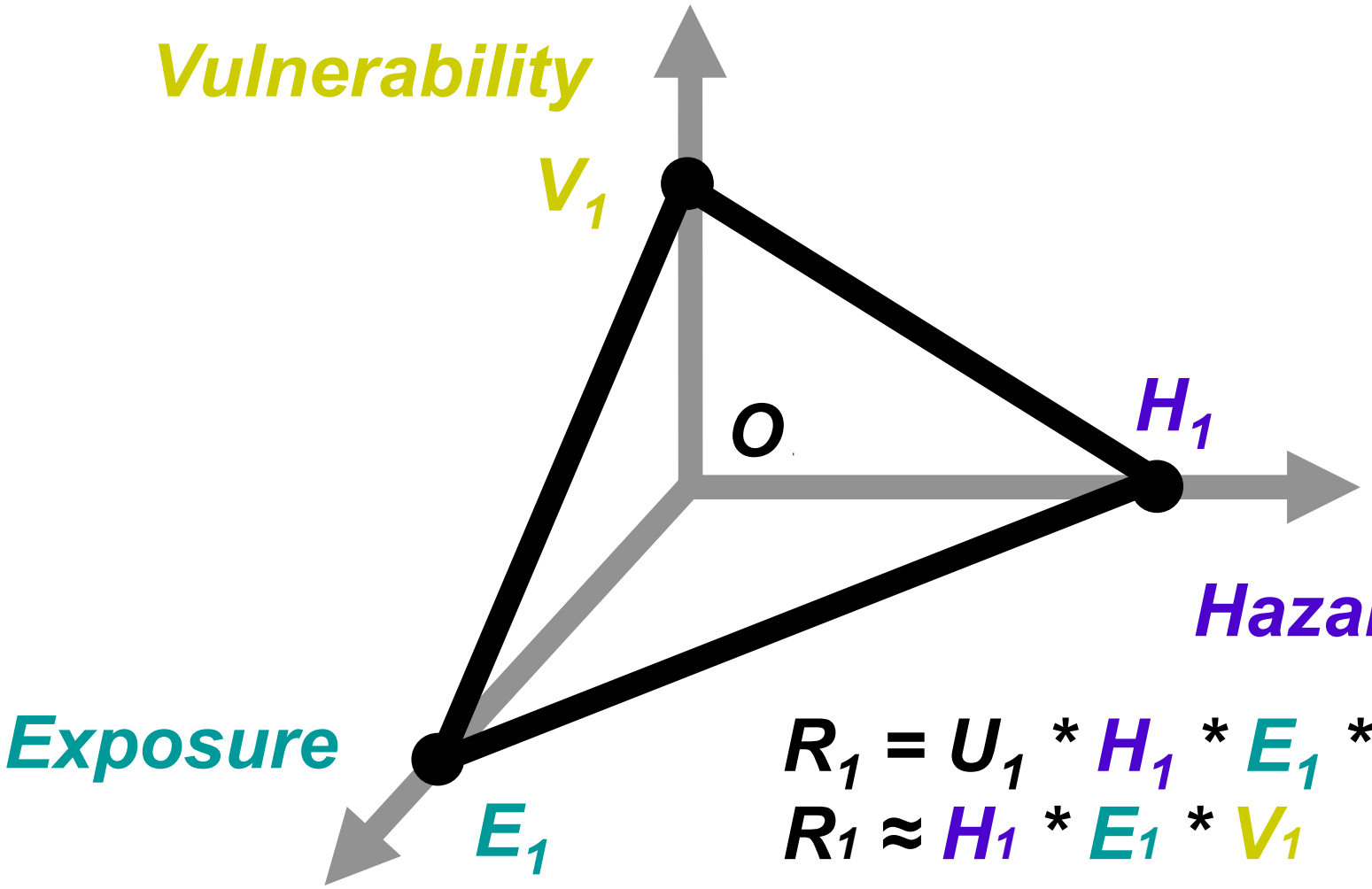
Exposure = 1,350,000 housing units

Vulnerability of housing units to 0.5g = 37%

Risk = 0.10 * 1,350,000 * 0.37

≈ 50,000 housing units

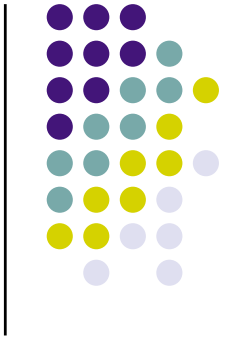
Hazard*Exposure*Vulnerability



$R_1 = U_1 * H_1 * E_1 * V_1$

$R_1 \approx H_1 * E_1 * V_1$

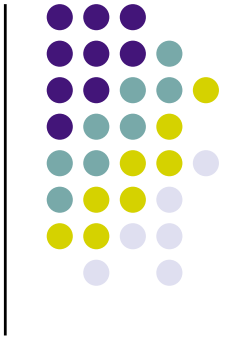
$R = R_1 + R_2 + \ldots - R_{1,2} - R_{1,3} \ldots$



Risk management action may target a risk or a risk factor.

PART 3: RISK MANAGEMENT

Insights

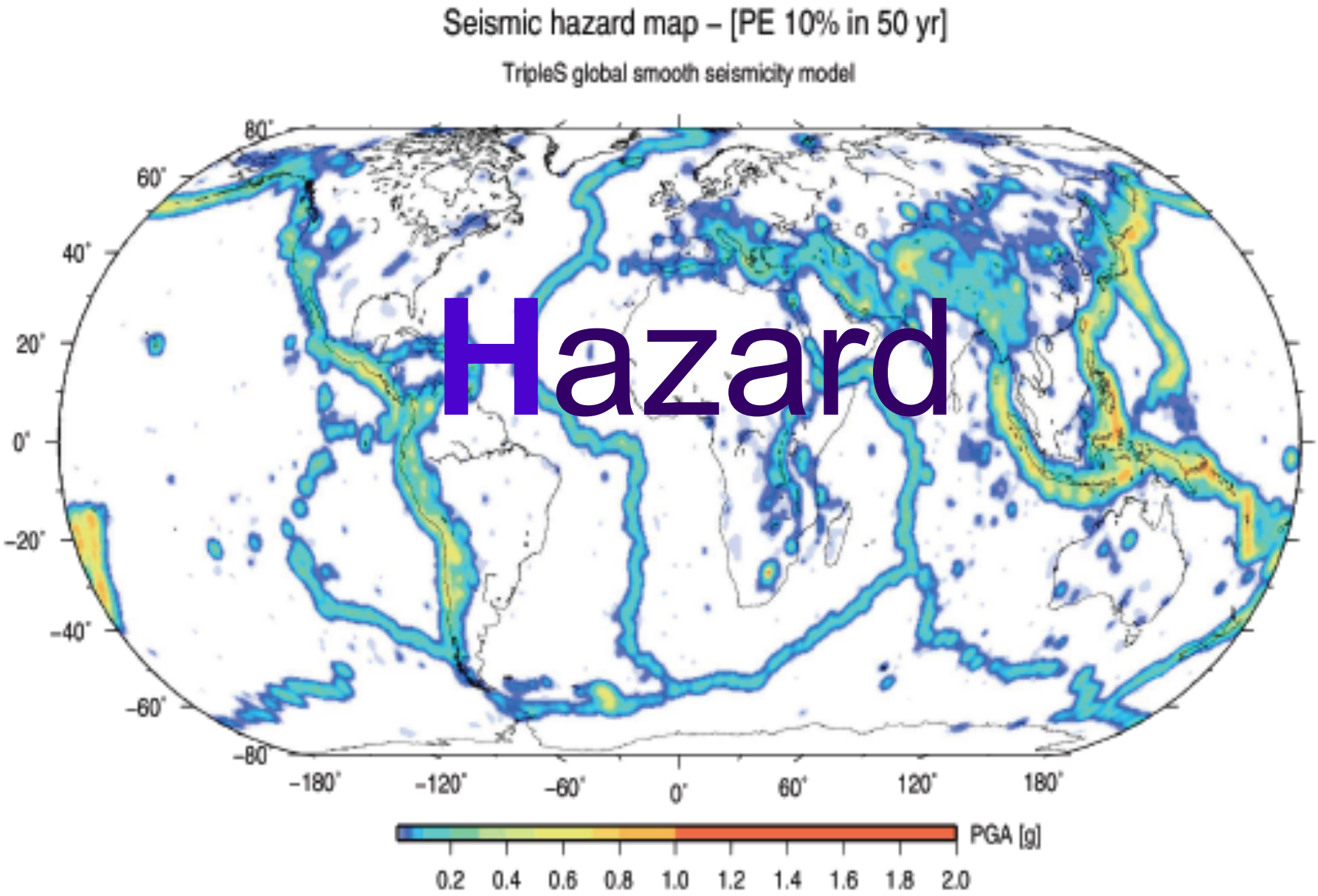


- The risk may become a disaster anytime (within the time interval considered).
- The disaster risk may be managed; it may even be reduced (if actions are taken quickly enough within the time interval considered; but beware of side effects on other risks).
- The risk may be managed systematically as the product of 3 generic risk factors:

Hazard*Exposure*Vulnerability

The global smooth seismicity model

- Hazard map calculated on a 0.5 by 0.5 grid (computation time ~ 52 hours)

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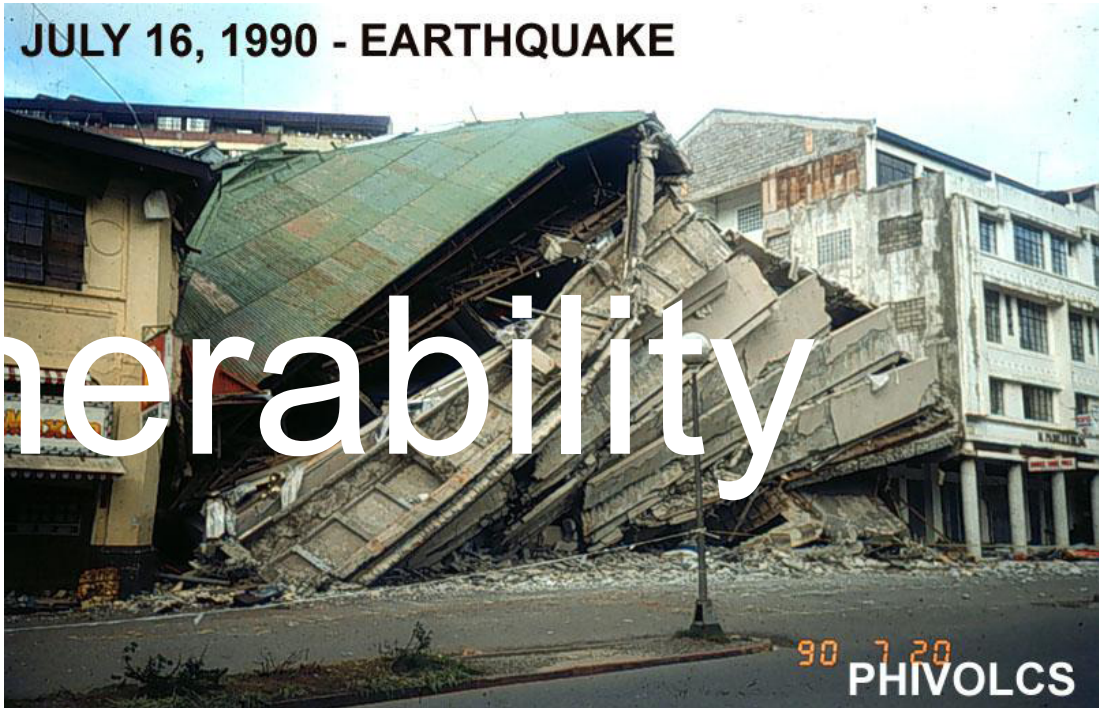
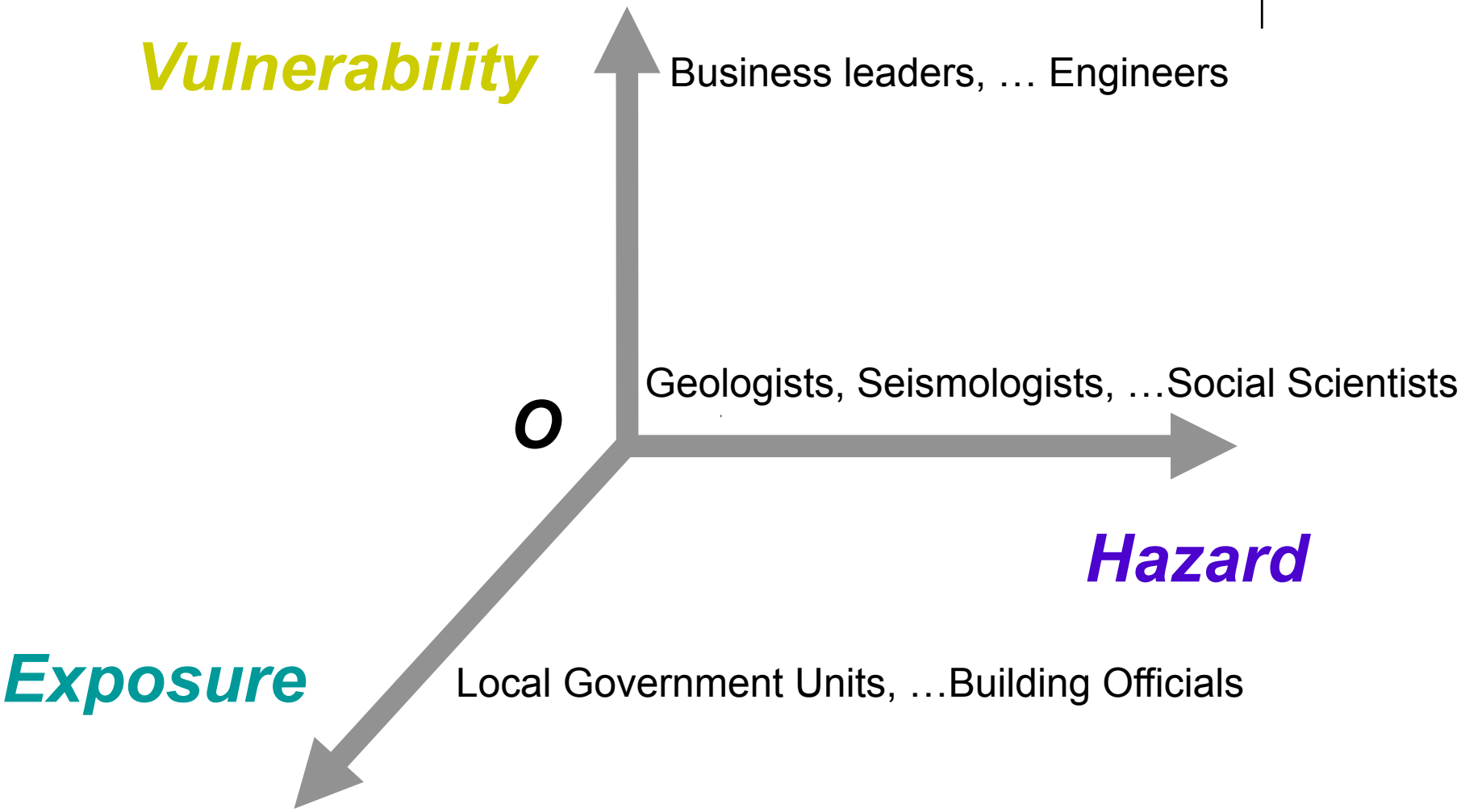
Vulnerability



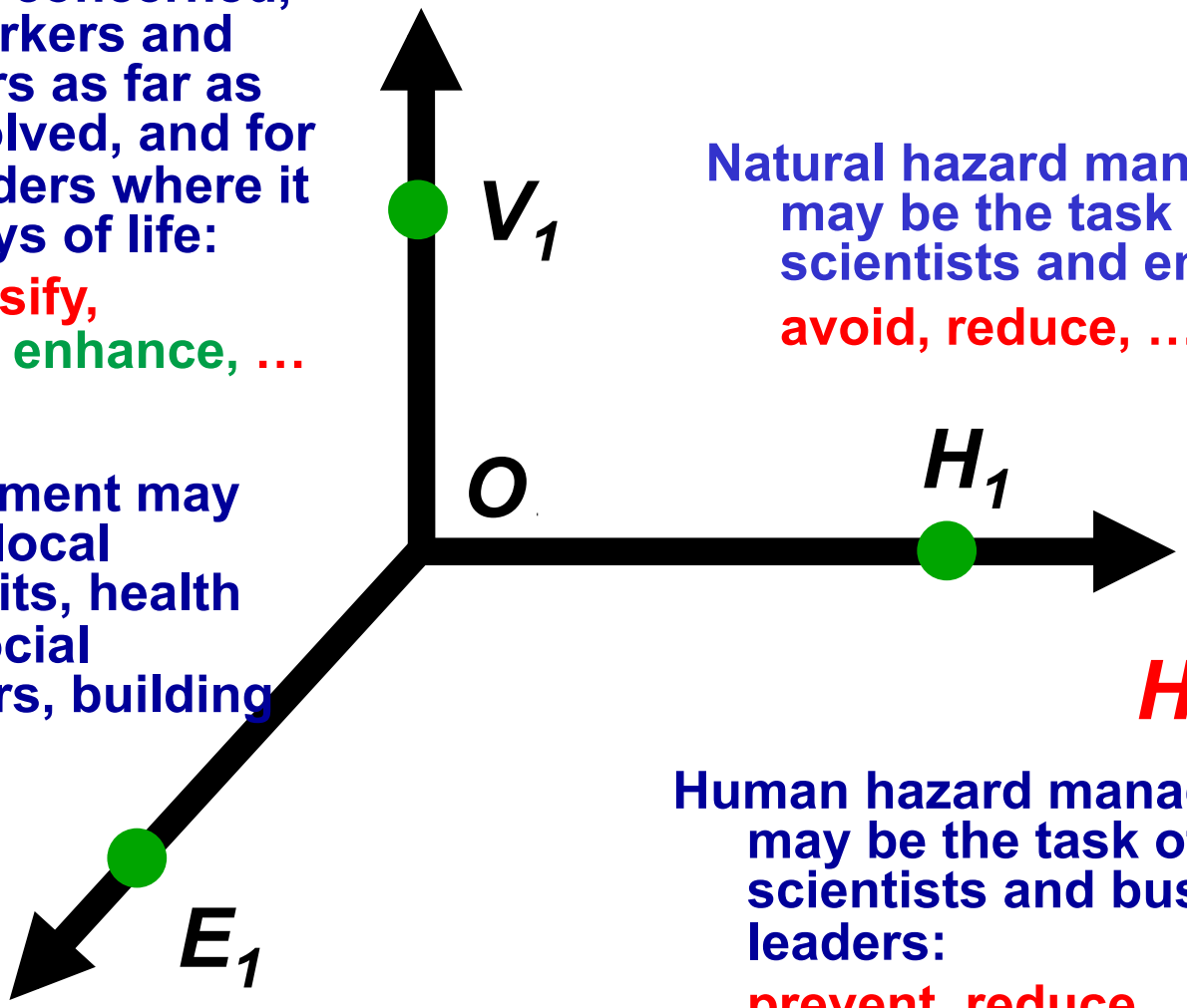
Hazard*Exposure*Vulnerability



Vulnerability management may be for engineers as far as properties are concerned, for farmers as far as food is concerned, for health workers and social workers as far as lives are involved, and for business leaders where it concerns ways of life:

reduce, diversify, share, retain, enhance, …

Vulnerability = Resilience $^{-1}$



Natural hazard management may be the task of natural scientists and engineers:

avoid, reduce, …

Exposure management may be the task for local government units, health workers and social workers, farmers, building officials:

defer, transfer, reduce, …

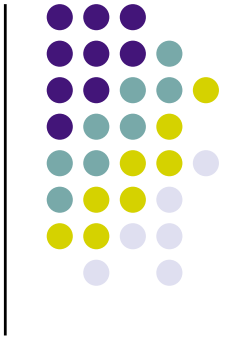
Exposure

Hazard

Human hazard management may be the task of social scientists and business leaders:

prevent, reduce, …

Outline of the DRM Session



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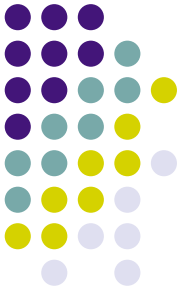
Workshop guide questions



1. Do you have researches that have not been updated to OVCRD/ are not in the database? Why?

2. What are the areas that are not being addressed? How would we address this?

3. What can we prioritize to come up with a policy options paper/ brief?

   -including researches that are already completed

4. What possible collaborative themes can we work on starting with our baseline?