國立臺北大學自然資源與環境管理研究所
101 學年度第一學期『環境災害與風險管理』

課程講義（三、四）：天然災害與巨災
Natural Hazards/Disasters and Catastrophes

S.: Smith, K. and D. N. Petley *Environmental Hazards – Accessing Risk and Reducing Disaster*, 5th Edition, Routledge, London, 2010.
D.: Dilley, M., R.S. Chen, U. Deichmann, A.L. Lerner-Lam, and M. Arnold, *Natural Disaster Hotspots: A Global Risk Analysis*, World Bank, Washington, D.C., 2005.
A.: Arnold, M.; R.S. Chen, U. Deichmann, M. Dilley, A.L. Lerner-Lam, R.E. Pullen, Z. Trohanis, *Natural Disaster Hotspots: Case Studies*, World Bank, Washington, D.C., 2006.

- ENVIRONMENTAL HAZARDS AND RISK ASSESSMENT
  - Risk = Hazard × Elements at Risk × Vulnerability (**S.** p.50)
  - $\text{Risk} = \frac{\text{Hazard (probability)} \times \text{Loss (expected)}}{\text{Preparedness (loss mitigation)}}$ (**S.** p.53)
  - Exposure and Vulnerability
    - ⇨ 'End-Points' (Receptors) vs. Scales (Temporal, Spatial, etc.): Chronic vs. Acute

- NATURAL DISASTER HOTSPOTS: A GLOBAL RISK ANALYSIS (**D.**&**A.**)
  - Natural Disasters
    - ⇨ Geophysical hazards: earthquakes and volcanoes
    - ⇨ Hazards driven by hydro-meteorological processes: floods, cyclones, and landslides
    - ⇨ Drought
  - Indexes of Disaster Risk:
    1. Mortality risks, assessed for global gridded population
    2. Risks of total economic losses, assessed for global gridded GDP per unit area
    3. Risks of economic losses expressed as a proportion of the GDP per unit area for each grid cell
  - 國家災害防救科技中心
    - ⇨ 氣象災害、洪旱災害、坡地災害、地震災害、人為災害

- SEISMIC (TECTONIC) HAZARDS (**S**. Chp.6&7)
  - Earthquake
    - ⇨ Ground shaking
    - ⇨ Soil liquefaction, Landslides, Tsunamis, *etc.*
  - Volcanoes
    - ⇨ Pyroclastic flows and Volcanic gases
    - ⇨ Ground deformation, Lahars, *etc.*

- MASS MOVEMENT HAZARDS (**S**. Chp.8)
  - Rock Falls, Landslides and Debris Flows
  - Snow Avalanches => *c.f.* Land Subsidence

- ATMOSPHERIC HAZARDS (**S**. Chp.9)
  - □ Tropical Cyclones
  - □ Severe Summer Storms
  - □ Severe Winter Storms

- BIOPHYSICAL HAZARDS (**S**. Chp.10)
  - □ Thermal Extremes => Frost Hazards
  - □ Disease Epidemics
  - □ Wildfire

- HYDROLOGIC HAZARDS (**S**. Chp.11&12)
  - □ Floods
    - ⇨ River floods vs. Costal floods => *c.f.* Forecasting vs. Warning
  - □ Droughts
    - ⇨ Meteorological, Hydrological, Agricultural, and Famine droughts

- CATASTROPHE MODELING
  - □ Definition of Catastrophe
    - ⇨ An unexpected or unanticipated natural or man-made event that has wide ranging negative socioeconomic impacts; also known as a disaster.
  - □ Stakeholders

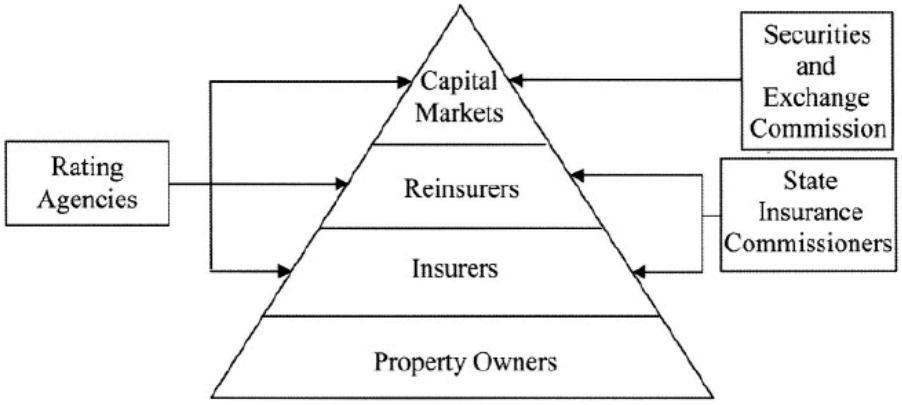

Figure 1.3. Key private sector stakeholders in the management of risk

  - □ Catastrophe Model
    - ⇨ A computer-based model that estimates losses from natural or man-made hazards, such as earthquakes, floods, hurricanes and acts of terrorism.
    - ⇨ Components: Hazard, Inventory => Vulnerability, Loss

- Homework Assignment #2 (2012/10/11 Due)

1. 請簡要定義「再保 Re-Insurance」、「存款保險基金 Deposit Insurance Fund」、「保險安定基金 Insurance Guaranty Fund」，並請比較相關機制之差異。
2. 請簡要說明巨災風險管理（Catastrophe Risk Management）之重要利害關係者（Stakeholders），並解釋透過 Capital Markets 建立“Catastrophe Bond”之實質內涵。
3. 台灣曾否發行 “Catastrophe Bond”？若有，請蒐集資料說明其運作情形。