Note on the conceptual framework of integrative risk assessment

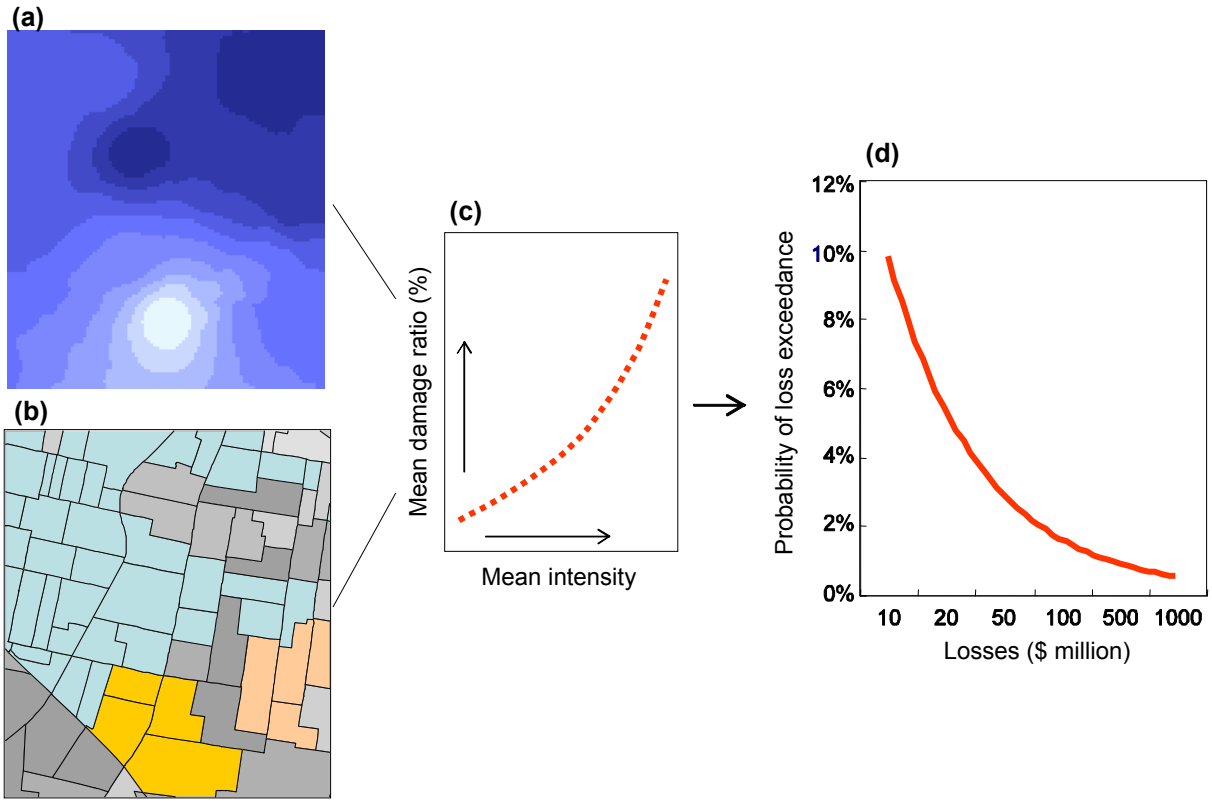

Figure 1: Conceptual framework of integrative risk assessment

(a) Hazard analysis relates to the physical characteristics of a hazard event, including magnitude-frequency relations and intensity distributions (e.g., wind speed and ground shaking).

(b) Exposure analysis identifies and evaluates underlying elements at risk, including the built environment and socioeconomic elements such as population and economic activity.

(c) Vulnerability analysis assesses the proportional damage or the lives lost as a function of the hazard intensity. Vulnerability curves (or sometimes matrices) are typically constructed from an engineering perspective and are specific to building construction classes or occupancy types (physical vulnerability); quantitative vulnerability curves may also be pursued for socioeconomic exposures such as various age groups and different economic sectors (socioeconomic vulnerability). For hazards like industrial pollution and disease, this curve may equate to the “dose-response” function.

(d) Loss analysis synthesises the above three components and determines the resulting losses as a function of return period or as an exceedance probability.

In this framework, explicit recognition of the “hazard-exposure” duality as a basis for integrative vulnerability and loss analyses affirms the old view that disasters have both “natural” and “human” components, and to simply argue whether a disaster is “natural” or “human” is unnecessary. It also helps explain the escalation of the cost of natural catastrophes over the past few decades that has arisen primarily as a result of the accumulation of population and wealth in high-risk areas.

Each risk assessment component has explicit spatial and temporal dimensions, and modern geospatial analysis is of vital use. Note that the conceptual framework shown here is not just restricted to natural hazards and is also applicable to risk or impact assessment of man-made and technological hazards (e.g., terrorism and industrial pollution), epidemic diseases (e.g., SARS and Bird Flu), and even broader environmental problems.

Dr. Keping Chen
Risk Scientist

Risk Frontiers - Natural Hazards Research Centre
Division of Environmental and Life Sciences
Macquarie University, NSW 2109
AUSTRALIA
Phone: (+61 2) 9850 9473
Fax: (+61 2) 9850 9394

Email: kchen@els.mq.edu.au
Web: www.riskfrontiers.com