GDLN Seminar on Disaster Risk Management in East Asia and the Pacific – 2011 series – Summary of March 2, 2011 Video Conference

Open-source Risk vs. Proprietary Risk Models

Speakers:

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Main moderator:

- **Dr. Richard Sanders**

Key topics discussed:

1. Open-source Risk vs. Proprietary Risk Models
2. Strength and Weaknesses of Open-source Risk and Proprietary Risk Models
3. Challenges of Catastrophe Risk Models

Executive Summary

This seminar on Disaster Risk Management in East Asia and the Pacific focused on comparing open-source and proprietary risk models for catastrophes. The discussion about differences between these two models/approaches and the overall challenges of catastrophe risk models provided valuable insights for the projection of risk scenarios. Key findings are as follows:

- Firstly, catastrophe risk models aim to estimate risk through the interconnection of different types of hazards and vulnerabilities in a defined geographical space. Since the 1990s, when faster computers became available, catastrophe risk models have become increasingly more developed and regarded as an indispensable tool to manage potential damages and losses from disasters.
- Secondly, catastrophe risk models are provided either by private companies (proprietary risk models) or from open-source platforms. Whereas the former have the primary interest to meet client's needs (mostly insurance companies), the latter advocate that risk scenarios for catastrophes should be freely available for everyone. Proponents of proprietary risk models argue that good and reliable catastrophe risk models cannot be developed free of cost and thus, open-source risk models developed by volunteering scientists and developers may not be accurate enough. On the other hand, the open-source community complains that proprietary risk models create a 'black box' with an unidentified content.
- Thirdly, the precision of catastrophe risk models is challenged by underlying uncertainties which are difficult to measure, particularly in relation to the changing natural hazard patterns due to climate change.

Finally, the accuracy and number of catastrophe risk models worldwide would increase if more risk-related data would become available and more specialists engaged in this field.

Summary

1. *Open-source Risk vs. Proprietary Risk Models*

This seminar focused on the applicability of open-source risk vs. proprietary risk models in the field of measuring risk for different types of disasters, for example, floods, earthquakes or storms. Two presentations, from advocates of open-source risk and proprietary risk models, and several discussion rounds during this seminar revealed that there are fundamental differences in the perception of these models.

Catastrophe risk models are in general defined by the connection between the vulnerability of a certain geographical space to a potential hazard. Hence, risk is defined by the severity and frequency of hazards and the exposure and sensitivity of a defined geographical area.

Proprietary risk models are developed by private companies to serve mostly insurance companies with detailed risk scenarios for specific hazards. Thus, the risk or catastrophe model is developed to meet clients' needs and interests. The detailed components of a proprietary risk model are not shared with the wider public.

In contrast, open-source risk models are characterised by their transparency in disclosing the information that feeds into a catastrophe risk model; and tend to be supported by scientists with no direct financial interests. In essence, both approaches have the same ambition to provide catastrophe risk models.

The application of catastrophe risk models has its origin in the 1970s when the first types of models were developed. The topic however received more attention in the 1990s when faster computers with the capacity to run complex datasets were invented. For both open-source and proprietary risk models, a large range of indicators is used to calculate the above mentioned composition of risk. Therefore, apart from historical records of past events such as floods, earthquakes, storms, etc., also local characteristics of the investigated area (vulnerabilities) feed into a catastrophe risk model.

2. *Strength and Weaknesses of Open-source Risk and Proprietary Risk Models*

During this seminar, there was a shared sense that catastrophe models are defined by hazard and vulnerability indicators, but little consensus was reached whether the detailed components of these models should be shared with the wider public. Advocates of the proprietary risk models argued that developing good and reliable catastrophe risk models requires intensive research and data collection which is not without costs. On the other hand, the open-source community argued that models which don't disclose their detailed components create a 'black box'.

Open-source risk models not only depend on the people to provide information on the above mentioned indicators free of cost, but they also depend on scientists to share concepts on how to define risk to hazards. Thus, the key strengths of open-source risk models lie in their openness, transparency, and accessibility to the wider public. The weaknesses of such models rest with the fact that they are not necessarily tailored to the needs of the final users.

While the proponents of proprietary risk models argue that good and reliable models need to be developed specifically for the needs of the final users (or clients), advocates of open-source risk models emphasise that especially in poorer countries the affordability for proprietary risk models is not given. As a result, the development of catastrophe risk models provided by private companies do not have the ambition to serve the interests of the wider public, but rather the specific needs of clients, such as insurance companies.

Open-source advocates see, however, a growing potential for their models, offered on various platforms, due to the rising interconnectedness of people across the world.

3. Challenges of Catastrophe Risk Models

This seminar not only focused on the viability of proprietary or open-source risk models, but also considered the challenges linked to catastrophe risk models in general. The biggest challenge discussed during this seminar was how uncertainties of risk models can be integrated or measured. Uncertainties exist due to the limitations of current catastrophe risk models to calculate or project the entire risk scenario for a selected geographical space. For example, the exact advent of a catastrophe or intensity cannot be forecasted. Neither is it possible to estimate its exact damage and loss patterns. It was highlighted during this seminar that more attention must be given to uncertainties particularly in relation to climate change as natural hazard patterns are likely to change. Thus, catastrophe risk modellers put increasingly more emphasis on measuring uncertainties and their related costs.

The lack of concrete standards (e.g. wind or rainfall levels) provided by international agencies, which could define uniformly catastrophe risk models, hinder the wider development of risk scenarios. It was suggested, during the seminar, that the World Meteorological Organization (WMO), the World Bank or other relevant international organization could set such standards to offer catastrophe risk modelling organisations the development of more transparent and reliable risk scenarios.

In relation to the lack of uniform standards, seminar participants from various developing countries emphasized that in their countries, the availability of historical data for various hazard types is often very limited. As a result, the reliability or precision of developed catastrophe risk models is unfortunately significantly reduced, although not entirely useless, according to the discussants.

Another challenge faced by many countries, particularly, in the Asian region, is the limited willingness of governmental agencies to share risk-related data, such as weather data or historical records of past catastrophe events for various considerations. However, North America Geographical Information System (GIS) data is freely available. Thus, concerns were raised that some governments may not (for political reasons) be interested in accessing and disseminating the information about their country's catastrophe risk patterns.

Due to the limited establishment of catastrophe risk model organisations in the Asian region, there are comparatively (to North America and Europe) few catastrophe risk scenarios available in these countries. Hence, it was suggested that courses teaching catastrophe modelling could be offered more widely at universities to increase the number of available specialists capable of modelling such risk models. Additionally, open-source proponents argued that given that the world is increasingly more interconnected bears potential for a more rapid development of catastrophe risk models in the Asian region.

One of the reason why there are so few specialists for catastrophe risk models is linked to the requirement of cross-specialisations of experts, which enables them to conduct comprehensive catastrophe risk assessments. Accordingly, 'traditional' universities may often have limited cooperation and interchange among departments which would foster multidisciplinary programmes at their institutions.

Further Information

For more information about open-source private organisations related to catastrophe risk modelling, please visit the following links:

Open-source Organisations:

- Open Source Initiative (OSI) (a non-profit corporation with global scope formed to educate about and advocate for the benefits of open source and to build bridges among different constituencies in the open source community):
  http://www.opensource.org/
- Open Sees (aims to improve the modelling and computational simulation in earthquake engineering):
  http://opensees.berkeley.edu/
- Alliance for Global Open Risk Analysis (AGORA) (a non-profit, international virtual promoting and coordinating development of open-source risk software and methodologies to perform end-to-end risk modelling):
  http://www.risk-agora.org/old/
- Global Earthquake Model (GEM) (global effort to bring state-of-the art science, national, regional and international organisations and individuals aimed at the establishment of uniform and open standards for calculating and communicating earthquake risk worldwide):
  http://www.globalquakemodel.org/

Private Organisations:

- EQECAT (consulting company providing catastrophe risk modelling products and services):
  http://www.eqecat.com/
- *Risk Management Solutions* (RMS) (consulting company providing catastrophe risk modelling products and services):
  http://www.rms.com/