Thematic Session 1-A

Risk Assessment

12:15 – 13:45

Tuesday, 19th March 2019

Taj Mahal Hotel, New Delhi

The Panel

Chair

- China*

Moderator

- Andrew Maskrey, Risk Nexus Initiative

Speakers

- Prof Bilal Ayyub , Center for Technology, and Systems Management, University of Maryland [video keynote address]
- Prof PAN Tso-Chien, Nanyang Technological University
- Prof Ravi Sinha, IIT Bombay
- Dr Raghav Pant, ECI Oxford

Discussants

- TBD*

Session Format

This is a breakout session as part of Thematic Session 1.

It will have presentations by the speakers of 10 minutes each followed by a panel discussion.

Overview

A review of literature shows that there still are multiple gaps in the global practice of disaster risk assessments. While hazard and vulnerability data is being recorded in various forms around the world, there is a lack of standardisation in the data formats and collection methods. This, combined with the lack of accurate time-series data at the local level, and the lack of capacity to carry out complex risk analysis in various countries, leads to the end users being deprived of the information they require, to make risk-informed decisions about future development. This gap is further exacerbated by the effects of climate change that dynamically alter the patterns of hydro-meteorological hazards thereby limiting our ability to predict and mitigate their effects.

This session will address the following key questions:

1. What are the major challenges in incorporating new disaster risk assessment practices as part of the country's infrastructure investment approval process?
2. What new methods are being explored globally for quantifying uncertainty due to climate change?
3. How can countries organise a system of continually updating risk assessments across different scales (country, province, city) that will inform future development?
4. How can effective communication be facilitated between policy makers, infrastructure developers, regulators, and the general public regarding the findings of risk assessments?

Background and Context

Risk Assessment involves carrying out an analysis of historical data on hazards, and their interactions with exposed and vulnerable populations and assets. This helps to quantify and predict the probability and impact of a disaster in order to prepare for it accordingly. The gaps in the global practice of risk assessment have been identified as listed below:

1. Lack of mechanisms and systems to collect accurate data regularly
2. Lack of capacity to perform complex risk analysis
3. Data collected is not standardised and sometimes cannot be shared with the end user due to legal barriers
4. Lack of risk assessment models that take into account climate change
5. Inadequate dissemination / accessibility of risk data to end-users

Each of these gaps has been elaborated on below:

1. **Lack of mechanisms and systems to collect accurate data regularly**

Particularly in developing countries, the capacity, mechanisms, and systems to collect such detailed data do not exist. Disaster risk assessment is a complex task and it requires very detailed, accurate, time-series data on hazards, exposure and vulnerability. A related set of information which is required is data on damage and losses, after an event.

Of these, data on hazards is reasonably easy to acquire and record. In the case of large hazards such as major cyclones, or earthquakes, global monitoring systems and satellite imagery can accurately measure them. In the case of small and medium scale hazards, and hazards like landslides, there still are major data gaps. Small and medium hazards may not cause catastrophic damage in one go, but rather cause cumulative damage over time which leads to degradation of the infrastructure. They are also more frequent than large, catastrophic hazards.

On the point of exposure, the data are reasonably easy to acquire and record, though not as easy as hazard data. Anecdotally, in developing countries large gaps do exist in asset inventories and values data.

The third point viz. vulnerability, and also data on losses after an event is where the gap is most significant. Reliable data on these two points is sparse, and is tricky to acquire. A lot of developing countries do not have the capacity or the systems to collect and record such data, since it involves extensive monitoring and assessment, and meticulous record-keeping.

A related concept which is often ignored or not well developed in developing countries is the risk from infrastructure i.e. impact assessment. Creation of new infrastructure can lead to the creation of new risks for the surrounding areas even if the infrastructure itself resilient. E.g.: Building a large airport could disrupt watersheds, and increase the risk of flooding in the surrounding areas, as a result.

2. **Lack of capacity to perform complex risk analysis**

Risk analysis for disasters involves very complex analysis using statistical models which utilise hazard, exposure and vulnerability data. Another layer of complexity is added to this risk analysis when we consider cascading effects of non-resilient infrastructure. The failure of one piece of infrastructure can have a domino effect which causes the failure of several other pieces of infrastructure. A further layer of complexity arises out of climate change, and the need to incorporate climate models into risk analysis.

Performing these analyses requires personnel well trained in mathematical modelling and statistics. Further, these personnel need the right equipment, i.e. computers and other hardware and mathematical modelling software, and the know-how to use them. In a lot of developing countries, this kind of capacity does not exist within the government.

3. **Data collected is not standardised and sometimes cannot be shared with the end user due to legal barriers**

Countries themselves and other countries like them or in the same region can benefit greatly from exchanging data on disaster risk. However each country has different formats for collecting such data. The lack of standardised data poses a significant hurdle to compiling and sharing it, which in turn hampers research into infrastructure resilience. Lack of standardised data can also impede the development of smooth project pipelines which in turn discourages private and international investors from investing.[1]

In some cases legal barriers might prevent a country from sharing data with other countries. This presents an additional challenge.

4. **Lack of risk assessment models that take into account climate change**

The lack of reliable time-series data as pointed out earlier, is indispensable for conducting robust risk assessments. However, we also need to bear in mind that in the face of climate

[1] Preqin, 2016.

change, risk analyses based on past data on hazards — especially hydro-meteorological hazards — need to be augmented with estimates of emerging risk scenarios. Developing these models require extensive research, and involve incorporating climate models into risk analysis. Another significant knowledge gap in this respect is in methodologies to statistically downscale global climate models to the sub-regional levels. The Intergovernmental Panel on Climate Change (IPCC) provides projections downscaled to 35 world regions, but not below that. While a few countries such as USA, Australia and France have developed downscaled national and sub-regional level climate models, the vast majority of the developing countries have not, and do not possess the capacity to either.

5. Inadequate dissemination / accessibility of risk data to end-users

Even after risk data are collected and recorded, the systems which make it available to users may not always exist. Taking the example of India for vector data on flood-lines of rivers, the data are regularly collected but usually stored in individual silos — typically the irrigation/water-resources department offices at the district level, and in some cases at the state level.

This observation holds good for all categories of infrastructure, especially for developing nations. Usually such data are not consolidated into one centralised database, or published on a platform which can be easily accessed by parties who might actually use such data. As with data standardisation, the lack of data accessibility also impedes the creation of project pipelines, which in turn can lead to the infrastructure projects being perceived as less bankable which may discourage private and international investors.[2]

[2] World Bank's Global Infrastructure Facility, and G20's Global Infrastructure Hub, having identified this symptomatic gap and are now providing support to countries to develop project pipelines to make infrastructure projects more attractive to investors.

Key insights from IWDRI 2018[3]

1. **Understanding the fundamentals of resilience:**
   - Development of a framework for investing in DRI must be preceded by a clarification of the fundamentals of resilience. This includes ways of measuring resilience, performance metrics for different infrastructure classes and recovery profiles of infrastructure towards a range of disasters for a given context.
   - Resilience indicators must be able to measure performance, link it to achievement of SDGs, incorporate effects of climate change, Industry 4.0 and the cyber economy.

2. **Create better risk metrics:**
   - Infrastructure standards are not absolute, and must be seen as a function of resource availability, risk appetite and capacity to reduce risks. Therefore, using a notional definition of resilience can help in the development of metrics for measurement.
   - A comprehensive risk management strategy must move from creation of risk metrics to development of a national multi-hazard risk profile to a high-resolution infrastructure sector risk systems model. As systems level coordination may be time-consuming; a sector-wise approach may be recommended to begin comprehensive assessments. E.g. UK has: (1) A national risk assessment produced every two years; and (2) Sector security resilience plans.
   - Sharing of methodologies and information at a global-level will be valuable to create a workforce that is able to understand and use risk information to build resilience.

3. **Data standardization:**
   - While hazard and vulnerability data is being recorded in various forms, there is a lack of standardization in data formats and collection methods. Combined with the lack of accurate time series data at local-level and lack of capacity to carry out complex risk analysis; end users are being deprived of information required to make risk-informed decisions about development. This gap is further exacerbated by the effects of climate change that dynamically alter the patterns of hazards.

[3]Workshop Summary, IWDRI 2018

4. **Use local knowledge:**
    - While the quality of risk assessments may be sufficient for investment decisions, they may not be nuanced enough for policy and political decisions. Risk assessments must be aligned with the needs of the end-user and the local planning process. E.g. Mozambique, Kenya, Afghanistan and Kyrgyz Republic.
    - Chile has developed a “Supplementary Methodology to Reduce Disaster Risk in Public Investment” by integrating disaster risk assessment in the public infrastructure investment process. The supporting online spread-sheet tool enables site-level risk calculations that can inform decisions about mitigation measures.

5. **Create access to open source data and tools:**
    - The next generation of decision makers (engineers, town planners and infrastructure financiers) must be provided access to open source risk models to aid risk-informed infrastructure development. There is a need for a tech

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