Thematic Session 1-B

# Standards, design and regulation

12:15 – 13:45

Tuesday, 19th March 2019

Taj Mahal Hotel, New Delhi

# The Panel

## Chair

- UK*

## Moderator

- Russell Muir, World Bank Group

## Speakers

- Toshihiro Kamatani, MLIT Japan
- Dr Sudhir Jain, IIT Gandhinagar
- Mark Johnson, International Code Council

## Discussants

- Luke Brown, Emergency Management Australia
- Phil Rizcallah, National Research Council, Canada
- Prof CVR Murty, IIT Chennai

# Session Format

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

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

# Overview

Standards play an important role in disaster risk reduction and creating resilience. In order to be effective, they need to be rational, need to be enforced, and need to be updated regularly to keep pace with the evolving understanding of natural hazards and advancements in engineering technology. International standard setting bodies such as the International Organisation for Standardisation (ISO), the International Electro-technical Commission (IEC) and the International Telecommunication Union (ITU), develop and provide such standards for countries to voluntarily adopt. Infrastructure standards under these bodies are regularly updated and are already incorporating resilience elements, towards achieving the targets of the Sendai Framework. For example, the United Nations Office for Disaster Risk Reduction (UNISDR) agreed in 2015 (within the context of the Sendai Framework) to work with ISO to develop new standards for disaster proofing cities. ISO is currently in the process of developing new Indicators for Resilient Cities under their Sustainable Development in Communities project.

National frameworks for design and construction standards need to be strengthened through better regulation, state-of-the-art technology, incentives (financial and non-financial) and innovation. These frameworks should incorporate the structural engineering aspects of physical infrastructure as well as for Operation and Maintenance (O&M) of this infrastructure. Lack of O&M standards can increase the impact of hazard events or even trigger new ones; for e.g. urban floods due to inadequate maintenance of sewage systems.

This panel will discuss the following questions:

1. Are emerging risk factors such as climate change manifestations being considered adequately while developing standards? What are the regulatory gaps that must be plugged to address these risks better?
2. Are the standards for operation and maintenance adequate for existing levels of disaster risk, without even taking climate change into account? Are they being suitably updated?
3. How can enforcement of standards be improved? How can compliance be improved in cases where state capacity for enforcement is limited?
4. How can regulation of professions play a role in improving compliance with standards?

# Background and context

Standards are one of the most important mechanisms for incorporating resilience into infrastructure. On the design and engineering side, standards pertain to standards for materials and construction which may take the form of building codes or bye-laws, and land use planning and zoning regulations. On the management side, standards can take the form of regulations for Standard Operating Procedures (SOPs), inspection, monitoring and surveillance, operations & maintenance (O&M), and crisis/emergency management.

The gaps in global practice of creation and implementation of standards for design and implementation have been identified as:

1. Lack of enforcement of standards
2. Lack of licenced disaster resilience professionals — civil engineers with expertise on building disaster resilient infrastructure
3. Lack of standards for operations & maintenance
4. Overlapping standards in some cases
5. Lack of systems to evolve standards as capacity, technology, and knowledge of risk management evolves
6. Standards for Contingency Planning

These gaps have been elaborated on below:

1. **Lack of enforcement of standards**

Enforcement of standards in developing countries tends to be lax.[1] This can be a result of any of a multitude of factors such as ineffective command and control, insufficient qualifications of officials in charge of enforcement, lack of focus on risk management, opaque bureaucratic procedures, and corruption.[2] The outcome of these lapses is that infrastructure and communities in developing countries is more vulnerable to damage than in developed countries.

2. **Lack of licenced disaster resilience professionals—civil engineers with expertise on building disaster resilient infrastructure**

[1] World Bank, 2010.

[2] GFDRR, 2014.

Often in developing countries, personnel with knowledge of building disaster resilient infrastructure are not easily available.[3] This holds good for both developers of infrastructure, as well as inspectors / regulators. Anecdotally, it has been observed that in India, typical civil engineering courses did not include training on how to incorporate resilience to seismic shocks into buildings.[4] Without having the capacity to build according to standards, having high building standards becomes a moot point.

### 3. Lack of standards for operations & maintenance

Typically, building standards may provide very detailed parameters for the engineering and design but standards for O&M are not given as much attention. Resilience of any infrastructure is inextricably linked with proper O&M, since without it the infrastructure will deteriorate over time. For example, anecdotally it is commonly observed that road quality in developing countries is bad: once a road gets built it is not properly maintained and repaired. The scores for Road Quality Index — from the Global Competitiveness Index — partially confirm this observation. Most developing countries score less than 5 (out of 7) on road quality.[5]

### 4. Overlapping standards in some cases

While the lack of standards is a problem in some instances, in some cases there may be more than one standard for the same kind of infrastructure. This may arise out of the complexity of that particular infrastructure project (e.g.: a bridge meant to serve both railways and road vehicles), or they could arise out of overlapping jurisdictions.[6]

Creating a uniform building code is necessary in such cases. The USA underwent such a process starting from 1966.[7]

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[3] World Bank, 2010.

[4] Source: DRR Roundtable discussions.

[5] See: http://reports.weforum.org/global-competitiveness-report-2014-2015/rankings/

[6] Advisory Commission on Intergovernmental Relations, Federal Government of USA, 1966.

[7] Ibid.

5. **Lack of systems to evolve standards as capacity, technology, and knowledge of risk management evolves**

Most developing countries lack the systems and the capacity to develop their own standards. Further, as pointed out earlier in this report, creating new standards requires thorough risk assessments and cost-bene t analyses. The data gaps and capacity gaps for these two components have been described earlier. As a result, usually, standards are borrowed from other developed countries, and mandated top-down without consideration for local needs, resource availability and capacities.[8]

6. **Standards for Contingency Planning**

Sometimes, despite the greatest care in planning, construction and O&M, an extremely rare event can destroy infrastructure built to the best of standards. An example of such a situation is the earthquake and tsunami which led to the Fukushima-Dai'ichi nuclear disaster in Japan in 2011. The nuclear reactor was designed to withstand earthquakes of up to magnitude 7 on the Richter scale. However the earthquake which occurred in 2011 was higher than magnitude 9: it was the most powerful earthquake in the history of Japan. For large infrastructure whose failure can have far-reaching negative e_ects, standards are needed for contingency planning to handle infrastructure failure due to extreme rare hazard events. The infrastructure has to be "safe to fail", i.e. systems need to be put in place in order to minimise the downstream impacts of the failure.

[8] World Bank, 2010.

## Key insights from IWDRI 2018[9]

1. **Manual of Practice for end users:**
    - A bouquet of state-of-the-art standards must be made available for end users of information on resilient infrastructure. A Manual of Practice (MoP) for Climate Resilient Infrastructure that is being developed by the American Society of Civil Engineers (ASCE) is a good example.
    - A more comprehensive MoP maybe co-created by experienced practitioners, government representatives and researchers to collate systematic knowledge in the field that provides necessary guidance to practitioners. The Coalition provides an important platform to capture lessons learned and manage their dissemination towards creating a required pool of knowledge.

2. **Adopting a lifecycle approach for adaptive standards:**
    - Past statistical trends are no longer a good guide for future standards. Hence, “stationary, non-time variant” prescriptive standards must give way to “evolving adaptive” standards to continually tackle changes from climate risks and other externalities that impact the life span of infrastructure.
    - The adaptive design framework may lead to “real options” that are pre-decided responses to changes in the infrastructure project environment. E.g. The Los Angeles to San Diego (LOSSAN) rail corridor uses the “Observational Method” for constant monitoring to update risk models and take decisions about upgrading or discontinuing the use of the infrastructure.

3. **Standards for soft infrastructure:**
    - The “systems approach” must attribute due importance to soft infrastructure. This underpins the vital knowledge base, supporting institutions and capacity development needs for technical specialists.

4. **Interdisciplinary standard setting:**
    - Appropriate standards may provide the first line of defence against shocks and stresses. However, standards permeate through disjointed phases of procurement, design review and failure analysis. The “design phase” of any

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[9] Workshop Summary, IWDRI 2018

project is critical to enable comprehensive inclusion of good standards for resilience.

- A multidisciplinary design phase that includes land-use planning, climate science, disaster management in coherence with the engineering sector can make for better informed decisions underpinning investment in resilient infrastructure.