Policy, Science Technology & Local Actions in Post-Tohoku Disaster: Reflections from Asia

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Disaster Risk Reduction: 25-Year Journey

People have long lived with different types of natural disasters. Before the governance system came into existence, it was people who were dealing with disasters either in formal or informal ways. Through the advancement of science and technology, and enhanced governance systems, disaster management became a government responsibility. However, until the 1980s disasters were more response oriented.

The formal relationship between science and technology in inter-governmental issues dates back to the 1980s, when Frank Press, then president of the International Association of Earthquake Engineering and president of the US National Science Academy, perceived the idea of an international decade of disaster reduction, as follows: "I believe there is great need, and much support can be found, to establish an International Decade of Hazard Reduction. This special initiative would see all nations joining forces to reduce the consequences of natural hazards…"

The basic idea behind this proclamation of the United Nations International Decade of Natural Disaster Reduction: UN IDNDR (1990-1999) was and remains the unacceptable and rising levels of losses, which disasters continue to cause on the one hand, and the existence, on the other hand, of a wealth of scientific and engineering know-how which could be effectively used to reduce losses resulting from disasters. A 1987 UN General Assembly Declaration

"…calls upon all Governments to participate during the decade for concerted international action for the reduction of natural disasters and, as appropriate, to establish national committees, in co-operation with the relevant scientific and technological communities, with a view to surveying available mechanisms and facilities for the reduction of natural hazards, assessing the particular requirements of their respective countries or regions in order to add to, improve or update existing mechanisms and facilities and develop a strategy to attain the desired goals."

In the concluding year of the IDNDR, the Geneva Program Forum identified the need of the International Strategy of Disaster Reduction (ISDR), which was established in the year 2000, to undertake coordinating tasks for disaster reduction. From 2000 onward, there has been more focus on regional level collaboration and networking, while keeping the global agenda in perspective. The key change from IDNDR to ISDR was to develop a comprehensive framework of disaster risk reduction (focusing on *"risk reduction"* issues), to identify priorities, and to measure the periodic progress. At the 2nd World Conference on Disaster Reduction in Kobe, hosted by the government of Japan and Hyogo Prefecture, the Hyogo Framework for Action (HFA: 2005-2015) was adopted by the UN member states as a comprehensive framework of risk reduction with five specific targets: governance, risk assessment, education, reducing underlying risk, and disaster response.

Thus, from 1990 to 2015, there has been a big change in the concept, approach and methods to reduce the impacts of disasters. While in the 1990s, the focus was more on multi-stakeholder and local governance, from 2000 onward more risk-sensitive investment planning has been emphasized, and risk-informed decision-making has become the core of risk reduction.

Japan's Experience of Mega-Disasters

Japan is known for its hazards and vulnerability to natural disasters. Located in the "Ring of Fire", the country is exposed to major earthquakes and volcanic eruptions. Also, having a long coastline, the country is also vulnerable to tsunami and typhoons. Over 70% of the country consists of mountains, and therefore landslides and floods are also very frequent. Over the years, Japan has learnt to strengthen its disaster management system through bitter experience of mega-disasters. The 1923 Great Kanto Earthquake changed the building and planning aspects of urban areas in Japan in the post-Meiji era, with earthquake-induced fires getting utmost attention; the 1959 Isewan Typhoon initiated the Early Warning System (EWS) for typhoon disasters, which is one of the most advanced in the world; the 1960 tsunami caused by an earthquake in Chile, when waves arrived on the east coast of Japan 18 hours later, prompted the creation of a circum-Pacific tsunami EWS. Japan learnt from these experiences, making different innovations to reduce the impact of disasters, and appeared as a high-technology country in disaster risk reduction.

However, the Great Hanshin Awaji Earthquake of 1995 centered on Kobe showed that in spite of such high technology 6,400 people still lost their lives. The key lesson was the social dimension of disaster risk, which needs to be linked to the technical capacities under an effective policy environment to protect people's lives. This earthquake showed the importance of community cohesion and preparedness, and the concept of community-based disaster risk reduction emerged strongly as a global practice.

Sixteen years after the Kobe earthquake, the Great East Japan Earthquake of 2011 jolted the whole country, leaving more than 19,000 casualties and significant economic and social losses. The collateral damage from the continuing nuclear disaster is inestimable. But as the region recovers, people and communities have shown their resilience in reconstructing a better Tohoku region. A tsunami EWS was in operation, and several areas were protected by coastal dyke systems; emergency drills and evacuation practices had also been held. *Photos* show the landmark sea dyke in the village of Taro in Miyako, Iwate Prefecture, before and after the disaster. Sometimes these types of mega-infrastructure give a false impression of safety. However, the scale of the disaster had been underestimated, and consequently there were significant damages in Taro town also. Thus, a key lesson was that a system-based approach, with a combination of physical infrastructure, social networks, and local government response, is required to effectively reduce the impact of disasters. Major changes in

Photos: Author

Coastal dyke in the village of Taro in Miyako, Iwate Prefecture, seen before (left) and after (right) the tsunami disaster

the legislative countermeasures are required to clearly identify the roles of different stakeholders. Disaster risk reduction is no longer just a government or community responsibility: it is the collective responsibility of society with the involvement of a wider group of stakeholders. After the Kobe earthquake, we used to talk about three types of help: "self-help", "mutual help" and "public help". However, after the Tohoku disaster, a further type emerged — "N-help" (N=network), which links people, communities, government and businesses.

Progress of Risk Reduction Policy-Making in Asian Region

Asia has seen several devastating natural disasters over the past 10-15 years. These have prompted different legislative measures in Asian countries. A number of recent reports and literature have supported the accelerated paradigm shift from response to disaster risk reduction in different countries, especially in Asia. Below are several examples of national policies in Asia recognizing this need and ongoing paradigm shift.

- India enacted the country's first Disaster Management Act in 2005 with the following key features: each state and district is required to develop a body responsible to manage issues concerning disasters; more power is dissolved from the national level to the states and districts level; and stronger efforts required to enhance the preparedness and capacity of communities to increase the country's action for disaster preparedness and mitigation.
- Pakistan's National Disaster Management Ordinance was promulgated in December 2006. The National Disaster Management Authority was established and assigned to manage a complete spectrum of all types of disasters through a paradigm shift, where they moved away from a response and relief-oriented approach and adopted a disaster risk reduction perspective from local government level upwards.
- Bangladesh's National Plan for Disaster Management 2005-2006 specifies "Our future direction is to ensure we achieve a paradigm shift in disaster management from conventional response and recovery to a more comprehensive risk reduction culture."
- Indonesia passed the Disaster Management Law in 2007 and also has other disaster risk reduction policies and regulatory frameworks. Several ancillary regulations derived from the law have also been enacted at the national as well as regional level. Nearly all ministries have developed policy frameworks that contain mitigation aspects. State ministries' strategic plans for 2010-2014 have also factored in disaster risk reduction and Climate Change Adaptation (CCA) that aims at ensuring their commitment to both issues.
- The Philippines' National Disaster Risk Reduction and Management Plan 2011-2028 mentions that "the enactment of Republic Act 10121 otherwise known as the Philippines Disaster Risk Reduction and Management Act 2010 has led the bases for a paradigm shift from disaster preparedness and response to disaster risk reduction and management."
- Laos' latest draft National Disaster Management Plan 2012-2015 specifies that "the plan has been developed on the basis of a national vision and mission to reduce the vulnerability of all the people of Laos to the effects of natural, environmental and human induced hazards to a manageable and acceptable humanitarian level by bringing a paradigm shift in disaster management from conventional response and relief practice to a more comprehensive risk reduction culture."

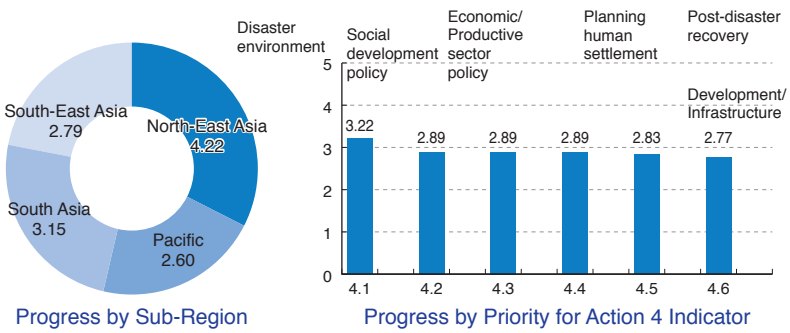
The government of Vietnam has also recently promulgated a Law on Disaster Preparedness and Prevention, which took effect from May 2014. The law highlighted that disaster risk reduction will be integrated into policies and plans at all levels. The government of Myanmar also adopted a Disaster Management Law recently. Both the governments aim to establish institutional structures and allocate financial resources for the implementation process in the near future.

Community & Underlying Risk Factors

It is argued in substantive literature on this issue that disaster risk reduction is important and essential at the local level. More than 25 years ago, Andrew Maskrey made strong arguments for a community-based approach to disaster management (*Disaster Mitigation: A Community Based Approach*, Oxfam, 1989). Other works and cases of disasters have documented, argued and advocated for risk management at the local level (e.g. *Community-based Disaster Risk Reduction*, ed. R. Shaw, Bingley, UK, 2012, and *From Disaster to*

CHART 1

Asia-Pacific progress of HFA priority areas



Source: UNISDR 2013: HFA in Asia-Pacific 2013 Regional Synthesis Report 2011-2013

Sustainable Civil Society: the Kobe Experience, R. Shaw and K. Goda, *Disasters* 28(1), 2004). However, the definition of local varies according to author, context and country. In defining the local disaster risk management, there needs to be a clear link between local governments and local communities, irrespective of the country and context in the Asia-Pacific region.

Community-based disaster-related activities are termed differently over time. Over 100 years ago, before the existence of most states, people or communities took care of themselves through collective actions after disasters. After the formation of modern states, government-based disaster risk reduction programs began, but they failed to serve the needs of the people and communities. During the last 20-30 years we have been talking again about the need for community-based disaster risk reduction (CBDRR). Thus, a community-based approach is not new. Rather, we are going back to the old and traditional approaches to risk reduction. Community-based disaster management was a popular term in the late 1980s and 1990s, but gradually evolved into community-based disaster risk management (CBDRM) and then also into community-based disaster risk reduction (CBDRR). CBDRM and CBDRR are often used with similar meaning, with enhanced focus on "risk", but there still exists a thin line of distinction. While CBDRR focuses more on pre-disaster activities for risk reduction by communities, CBDRM focuses on a broader perspective of risk reduction activities by communities, before, during and after a disaster.

The CBDRR approach has been taken by NGOs as a common approach to building resilient communities in their disaster risk reduction efforts. It was initially implemented in the developing world by NGOs followed by international organizations like the Red Cross and Red Crescent. This approach is now being increasingly promoted among local governments in order to strengthen the links between the official disaster management system and community-based organizations.

The periodic progress of the Hyogo Framework for Action tells us several things about the health of disaster risk reduction as an evolving subject. As is obvious, HFA 5 (disaster response) has always got priority historically in the disaster management context. Progress in this area has been steady, and the highest among the five priority areas. As mentioned above, several countries have adopted the legal framework, many countries have established disaster management institutions, and thereby HFA 1 progress has also been steady. Significant progress has also been seen in recent years for HFA 2, which is risk assessment. Different new tools and technologies are used in risk assessment for disaster reduction. Interestingly, HFA 3 did not get that much priority at the initial stage. Training, capacity building, and education are longer-term invisible impacts and need time for their actual practice. However, the ISDR's "Safer School Campaign" (2006-2007) has brought this issue to the highest levels of government and policy attention in most countries, and tremendous progress has been observed in HFA 3 over the past several years.

The key challenge for HFA remains in the priority area 4, which is "reducing underlying risk factors". There has been least progress in this priority area globally and regionally. *Chart 1* shows the reasons for this. HFA 4 consists of six different indicators: disaster environment linkages, social development policy, economic/productive sector policy, human settlement planning, post-disaster recovery, and development and infrastructure related issues. Most of these indicators cross the traditional boundaries of risk reduction and disaster paradigms. In most cases, they are linked to other ministries, which have little say in disaster risk reduction. However, the HFA 4 priority area is of utmost importance, because without addressing these vital issues disaster risk reduction cannot be fully achieved. Therefore, in post-HFA discussions, a key emphasis is being placed on this priority area.

Science & Technology in SFDRR

In 2015, the Third World Conference on Disaster Risk Reduction was hosted by the government of Japan and Sendai city. The Sendai Framework for Disaster Risk Reduction (SFDRR) was adopted by the member states for the period from 2015 to 2030. The SFDRR has seven specific goals:

1. Reduce global disaster mortality
2. Reduce number of affected people
3. Reduce direct disaster economic loss
4. Reduce disaster damage to critical infrastructures
5. Increase number of countries with disaster risk reduction strategies
6. Enhance international cooperation
7. Increase access to multi-hazard EWS, risk information and assessment.

To achieve these goals, there are four key targets:

1. Understanding disaster risk
2. Strengthening disaster risk governance
3. Investing in risk reduction
4. Enhancing disaster preparedness for collective response, and to "build back better" in recovery, rehabilitation and reconstruction.

Chart 2 shows a schematic diagram of the relative roles of stakeholder engagements. A quick analysis shows that Priority 1 features a strong role by the science and technology (ST) community in the following areas:

- National and local levels: data generation and management; baseline survey to measure progress; hazard, risk and vulnerability maps; GIS databases; good practices; training and

CHART 2

Relative level of engagement of ST in SFDRR priority areas

Priority areas	Relative level of engagements
1. Understanding disaster risk (assessment, data, baseline, capacity)	
2. Strengthening disaster risk governance (standards, certification, capacity building)	
3. Investing in disaster risk reduction (innovative products with private sector)	
4. Enhancing disaster preparedness (guidance, instruments)	

Source: Author

education; dialogue and cooperation of ST communities and policy makers; science-policy interface; strengthening technical and scientific capacity; promoting investment in innovations and technology development; and incorporating disaster risk knowledge in formal and non-formal education.

- International and regional levels: development and dissemination of science-based methodologies and tools; ST and academia partnership; enhancing ST work on disaster risk reduction through existing networks and research institutions with support of the ISDR's Scientific and Technical Advisory Group (STAG).

In contrast, in Priority 2 the roles of ST are limited to:

- Promoting the development of quality standards, such as certification and awards for disaster risk management with the private sector, civil society, professional associations, scientific organizations and the UN
- Promoting mutual learning and exchange of good practices and information through, *inter alia*, voluntary, self-initiated peer review among interested states

For Priority 3, ST roles are:

- Promoting disaster risk resilience in work places through structural and non-structural measures, and encouraging the revision of existing or new standards, codes, rehabilitation or reconstruction practices
- Promoting academic, scientific and research entities and networks and the private sector to develop new products and services to help reduce disaster risk

In the case of Priority 4, ST roles are:

- Developing guidance for preparedness and reconstruction (land use planning, structural standards improvements and learning from recovery)
- Promoting further development and dissemination of instruments as standards, codes, operational guides and other guiding instruments.

At the regional level in Asia, the Science, Technology and Academia Stakeholder Group has been part of the ISDR Asia Partnership. The core area of interest and work of the group is to increase support for research and academia related to disaster risk reduction, to be encouraged, supported and implemented across all geographic levels. This should be done in an integrated fashion to support sustainable development, augment existing activities and mechanisms and support new activities that adopt a trans-disciplinary approach. While there has been increasing interest among the science, technology and academia communities to be part of the national and/or regional process of disaster risk reduction (as evidenced from the HFA implementation), still there are remaining challenges to bring science into decision making or policy making at the national level, and implementation at the local level.

Therefore, an advisory group has been formed at the regional level (Asia Science and Technology Academic Advisory Group) to bridge the gap between regional discussions on national and local policy making, decision making and implementation. The following are some of the future urgent actions required on science and technology:

1. **Establish/Promote Science & Technology National Focal Group:** Several countries already have ST advisory groups which need to be re-focused or promoted among national disaster risk reduction priorities. Promotion will also ensure the focal group has enough financial and technical resources. Policy advocacy and informed decision making would be the key target of this group.
2. **Science & Technology Advancement Index:** A composite indicator needs to be developed to measure ST progress in the Asia-Pacific region, in terms of an index system. This would be linked to periodic monitoring, possibly coinciding with the earlier HFA monitoring system.
3. **Science & Technology Databases:** The Disaster Reduction Hyper-base is an existing database of different types of technologies in the field of disaster risk reduction. This database can be enhanced, updated and enlarged for wider usage.
4. **Professional Development and Higher Education:** Several universities in Asia are promoting higher education as well as professional development programs in disaster risk reduction. Efforts will be made to link these initiatives and to ensure certain levels of quality control.
5. **Using Social Media to Link ST to Actions:** The role of social media becomes important in disseminating knowledge and information of ST and breaking the digital divide. Proactive use of social media and/or SNS (social networking systems) would enable the sharing of knowledge and information.

System Approach in Risk Reduction

Over the next 15 years, countries will follow the SFDRR as a basic framework for disaster risk reduction. While each country will develop its own targets under the specific indicators of the SFDRR, a systematic approach is very much required to achieve holistic risk reduction. Such an approach denotes the combination of policies, regulations and implementation through participatory approaches by different stakeholders in the PDCA (plan-do-check-action) cycle. Each stakeholder needs to be responsible for certain actions under this holistic system. Risk reduction should not be a humanitarian effort only, but also a development practice with specific business opportunities. In this way risk reduction can become an integral part of sustainable development. JS

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