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SHORT ARTICLE

Fourteen Actions and Six Proposals for Science and Technology-Based Disaster Risk Reduction in Asia

Second Asian Science and Technology Conference for Disaster Risk Reduction: *Science-Policy Dialogue for Implementation of the Sendai Framework*, April 2018

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1 Introduction

The *Sendai Framework for Disaster Risk Reduction 2015–2030* shifts the focus from managing disasters to reducing risks. Such a shift requires a better understanding of risk in all its dimensions of environment, hazards, exposure, and vulnerability; a disaster risk governance that ensures disaster risk is factored into planning and development at all levels across all sectors, as well as into disaster preparedness, rehabilitation, recovery, and reconstruction; and cost–benefit analyses to support the prioritization of investments in disaster risk reduction (DRR) for long-term resilience.

The Sendai Framework clearly identifies the primary responsibility of each state to prevent and reduce disaster risk and emphasizes the role of science and technology. It calls for prioritizing the development and dissemination of

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science-based risk knowledge, methodologies and tools, science and technology work on DRR through existing networks and research institutions, and a strengthened interface between science and policy to support all four priority areas.

In January 2016, the "Science and Technology Roadmap to Support the Implementation of the Sendai Framework for Disaster Risk Reduction 2015–2030"[1] was agreed on as the outcome of the United Nations Office for Disaster Risk Reduction (UNISDR) Science and Technology Conference. The Roadmap includes expected outcomes, actions, and deliverables under each of the four priorities of the Sendai Framework. In support of the implementation of the Science and Technology Roadmap, the Global Forum on Science and Technology for Disaster Resilience 2017, which was co-hosted by UNISDR in Tokyo, approved the "Tokyo Statement" and reemphasized the importance of developing guidelines for strengthening national platforms for DRR and implementing periodic synthesis reports on the state of science and technology for DRR.

Asia has a large population and very uneven economic and social development. It faces all potential hazards in the world, which have featured with high frequency, high intensity, large disaster losses, and a high proportion of global disaster losses. At the same time, Asia has been the world's hotspot of economic development and innovation in terms of science and technology over recent decades. In the context of global climate change and globalization, disaster risk is increasing. The 2030 global goals on DRR set by the United Nations can be hardly achieved if DRR indicators such as disaster casualties and property losses and their proportions relative to the rest of the world do not decrease in Asia. Therefore, in order to achieve the global targets, there is an urgent need to strengthen the overall science and technology-based DRR capacity in Asia, especially in countries (regions) with high population densities, weak economic and social development, and accelerated urbanization processes.

2 Asian Science and Technology Conference for Disaster Risk Reduction

The First Asian Science and Technology Conference for Disaster Risk Reduction (ASTCDRR) was held in Bangkok, Thailand, 23–24 August 2016. Aligned with the Science and Technology Roadmap, 12 actions[2] were recommended. These actions were echoed in the Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR) in Delhi, India and implemented with the joint efforts of countries in the Asia and Pacific region.

The Second Asian Science and Technology Conference for Disaster Risk Reduction, held on 17–18 April 2018 in Beijing, China, brought together about 300 senior researchers and academics, policymakers, practitioners, social organizations, and the private sector in the realm of disaster risk reduction from across Asia, and more widely, to discuss how to strengthen science-based DRR policy development in support of the implementation of the Sendai Framework in Asia.

The Conference was co-hosted by the Expert Committee of the National Commission for Disaster Reduction of China, the Ministry of Civil Affairs of China, the Ministry of Emergency Management of China, Beijing Normal University, and UNISDR, co-organized by the Academy of Disaster Reduction and Emergency Management/Faculty of Geographical Science, and the National Disaster Reduction Center of China, and supported by the UNISDR Asia Science, Technology, and Academia Advisory Group (ASTAAG), Integrated Research on Disaster Risk (IRDR), the United Nations Office for Outer Space Affairs (UNOOSA), the World Meteorological Organization (WMO), the Chinese National Committee/Integrated Risk Governance Project (IRG) for Future Earth, and the Geographical Society of China.

The participants renewed their commitment to the accelerated implementation of the *Sendai Framework for Disaster Risk Reduction 2015–2030* as the pivotal means to achieve the goals of sustainable development and resilience, and committed to developing and disseminating science-based disaster risk reduction defined by technology and innovation and reaffirmed the importance of the twelve actions identified in the First Asian Science and Technology Conference for Disaster Risk Reduction in 2016, as well as adding two more actions that emerged from this conference.

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[1] https://www.unisdr.org/files/45270_unisdrscienceandtechnologyroadmap.pdf.

[2] https://www.unisdr.org/files/49240_49240finaloutcomedocument1stastcdrr.pdf.

3 Fourteen Actions for Science and Technology-Based Disaster Risk Reduction

Priority 1: Understanding Disaster Risk:

1. Enhance disaster loss and damage accounting, national and local disaster risk assessment, and communication of disaster risk, with specific focuses on the risks of urban and less developed regions.
2. Use space and disaster risk mapping technologies and emerging technologies and strengthen the capacity for using these technologies for improved understanding of disaster risks at global, national, and local levels.
3. Strengthen regional exchange on disaster risk information and science in order to better understand complex disaster risks, including risks of transboundary, cascading, and compound disasters.
4. Develop a synthesis system under international cooperation to share integrated grassroots and scientific knowledge among a broad range of stakeholders and promote dialogue in the national platform.

Priority 2: Disaster Risk Governance:

5. Strengthen the science-policy-practice nexus at all levels (national, local, transboundary, and regional).
6. Develop interdisciplinary national science and technology plans to support the implementation of the Sendai Framework. This includes actions by academia/universities to develop their own disaster risk management plans.
7. Enhance collaboration between local governments, academia, and other partners to promote local communities' knowledge and traditions and to sustain and replicate many good practices that exist locally for science-based decision making.

Priority 3: Invest in DRR for Resilience:

8. Make DRR an area of focus within education, including networking between universities.
9. Ensure risk-sensitive investments through enhanced role of the science and technology community.
10. Develop young professionals in the field of multidisciplinary disaster risk reduction.
11. Enhance and showcase projects that promote science and technology-based DRR and encourage governmental and social investment in disaster risk reduction.

Priority 4: Enhance Disaster Preparedness for Effective Response and to Build Back Better:

12. Promote the role of multidisciplinary science and technology in effective pre-disaster planning, preparedness, response, rehabilitation, recovery, and reconstruction to build back better.
13. Develop an efficient and effective cooperation among the science community and business sector by utilizing the advancements of the fast-developing information and communication technology (ICT), including big data.
14. Research innovative and practical solutions to promote whole-of-society engagement.

These 14 actions are in alignment with the global Science and Technology Roadmap and provide concrete guidelines for the actions of science, technology, and academia stakeholders in the next two years in Asia. These recommended actions will also contribute to the forthcoming Asian Ministerial Conference on Disaster Risk Reduction in July 2018 and one of its expected main outcomes: the 2019–2020 Action Plan for the implementation of the Asia Regional Plan for Implementation of the *Sendai Framework for Disaster Risk Reduction 2015–2030*.[3]

4 Six Proposals for Science and Technology-Based Disaster Risk Reduction

The participants acknowledged that all experts and scholars engaged in science and technology-based DRR should commit to the four priorities enacted by the Sendai Framework and each country's (region's) DRR goals, implement the priority actions identified in the 2nd ASTCDRR, develop targeted science and technology, support their national platforms, strengthen the goals' inclusion in policy-making, and proactively contribute to the development of resilient society and communities. At the same time, the United Nations and governments at all levels should fully support innovative development of science and technology-based DRR and DRR science and technology innovations in natural, social, economic, medical, engineering, and other fields to advance the gradual implementation of the Sendai Framework.

To enhance the 14 recommended actions, the participants agreed to six proposals for science and technology-based DRR in Asia:

Strengthening the transdisciplinary research and development of disaster risk science, technology, and policy We should further promote our understanding of the mechanisms and processes of disaster risk formation at various temporal-spatial scales, explore systemic risk assessment models for multihazards, disaster chains (cascading disasters), and disaster compounds, and strengthen the research of integrated disaster reduction and risk governance policy and legislation systems. There is an urgent

[3] https://www.unisdr.org/2016/amcdrr/wp-content/uploads/2016/11/FINAL-Asia-Regional-Plan-for-implementation-of-Sendai-Framework-05-November-2016.pdf.

need to develop space technology-based disaster monitoring and assessment technologies, innovate high-precision disaster forecasting, early warning, and emergency response technologies, innovate engineering and non-engineering prevention technology systems, develop various types of low-cost disaster reduction equipment and products, and develop efficient medical care technology systems. Research and develop technologies for disaster insurance underwriting, loss adjustment, and indemnification, technologies for multiscale and high-precision disaster risk mapping techniques, as well as technologies for rapid evacuation, relocation, and better recovery.

Enhancing the inclusion of science and technology groups in DRR activities Share synthesized scientific knowledge on DRR and promote dialogue among all stakeholders of the national platforms. Mobilize all types of DRR-related research and development groups to actively participate in regional, national, and international integrated DRR actions. Establish effective evaluation systems and incentive mechanisms at group and individual levels to promote the involvement of science and technology groups in DRR activities. Strengthen cooperation between disaster reduction science and technology groups and educational institutions, promote the popularization and dissemination of disaster reduction knowledge and self and mutual rescue skills, and foster education resources on DRR. Strengthen the communication and cooperation between the science and technology groups and governments, communities, and other stakeholders to promote the transformation, popularization, and application of the scientific and technological achievements of DRR.

Accelerating the initiatives of multidisciplinary flagship programs of science and technology-based DRR Science and technology groups should summarize, refine, and share experiences of effective DRR practices at the community, region, country, and international levels by different economic, political, cultural, social, and ecological environments, in order to form new integrated risk governance paradigms in the context of global changes and disaster risk trends. We need to actively promote various types of effective science and technology-based DRR paradigms in communities, regions, and countries (regions) with different disaster risks, and initiate a set of engineering and non-engineering demonstration programs of science and technology-based DRR. With the help of modern communication and computer techniques, accelerate the sharing of practical and advanced science and technology-based DRR experiences, cases, and successful paradigms.

Increasing the investment from governments, societies, and other stakeholders in the research, capacity building, and development of DRR science and technology The scientific and technological innovation of DRR requires extensive attention and input from governments at all levels and society. The following items should be prioritized for input into DRR science and technology: building scientific and technological research and development (R&D) institutions, improving the research and development environment, and increasing the resources available for researchers, especially for young researchers/early career researchers. The focus of input should include the construction of disaster information sharing systems, the establishment of technology development centers and incubators, and the implementation of science and technology-based DRR demonstration programs. We need a good environment to foster a large number of experts for DRR science and technology innovations, entrepreneurs who promote the DRR technology, as well as practitioners and professionals for DRR science and technology applications.

Increasing the support of governments, societies, and other stakeholders for innovations and partnership development Governments at all levels, all sectors of society, and other stakeholders should strongly support the establishment of science and technology institutions, the development of DRR disciplines, and profession training agencies, in order to cultivate experts and professionals, including supporting the creation of DRR technology enterprises, promoting the research and development of DRR technology, optimizing the national (regional) and international DRR technology standards to facilitate the application of advanced technology, and supporting the establishment of non-profit DRR technology service systems to boost the sharing of disaster risk information. Comprehensively improve the legislation, institution, and mechanisms for scientific and technological innovations, to foster the DRR culture of productivity protection by science and technology.

Increasing the support of governments, societies, and other stakeholders for the international cooperation and exchange on science and technology-based DRR Governments at all levels, societies, and other stakeholders should promote the sharing of advanced DRR technology by various forms of international collaboration and exchange activities, including the collaboration of Asian regions on rapid loss assessment, comprehensive loss assessment, and recovery and reconstruction demand assessment, joint efforts on disaster surveys in high risk regions, community disaster risk assessment and mapping with high accuracy and high resolution, establishment of Asian regional disaster risk assessment standards and remote-sensing database systems, regional and subregional platforms for DRR technology sharing, and joint expert panels of loss assessment for major natural hazard-induced disasters, thus to holistically improve the science and technology capacity for DRR in Asia. Each country is encouraged to contribute to the online synthesis system, developed under action 4 above, and link the system to different stakeholders in the national platform.