UNISDR
The United Nations Office for Disaster Risk Reduction

UNISDR Science and Technology Conference
on the implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030

Launching UNISDR Science and Technology Partnership and the Science and Technology Road Map to 2030

To promote and support the availability and application of science and technology to decision-making in Disaster Risk Reduction

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Short concept note: Work Stream 4, Working Group 3

Research gaps

1) Overview

The Sendai Framework for Disaster Risk Reduction 2015-2030 recognizes the importance of science and technology for improving risk and disaster risk reduction (DRR) activities across the world. The framework calls for the enhanced use of scientific findings, improved research, and improved risk-reduction technologies through the coordination of existing networks and scientific research institutions, with support from the UNISDR Scientific and Technical Advisory Group. The overall goal of these efforts is to strengthen the evidence base for the implementation of the framework.

Among the many call to the scientific community in the Sendai Fa notable call is to "*identify research and technology gaps and set recommendations for research priority areas in disaster risk reduction; promote and support the availability and application of science and technology to decision-making*" (UNISDR 2015, p. 25g). Work Stream 4 will address this call. Specifically, Working Group 3 will focus on strategies for prioritising new research, building capacities in under-resourced countries and regions, and sharing research findings.

The breakout sessions for Working Group 3 will be structured as open discussion sessions. Specifically, participants are invited to share their views on what scientific knowledge is ready for implementation and what critical research gaps exist across avariety of dimensions, which are discussed below. We also intend to initiate a conversation around the critical contextual factors that can facilitate or impede research, capacity development, and the sharing of research globally (See Work Stream 4 Working Group 1 on Leveraging Science and Working Group 3 on Capacity Development for complementary discussions).

The information we collect from this Working Group will inform the critical direction and priority actions of the S&T Road Map and provide critical input into a substantive gap analysis that will be developed from the conference. It is hoped that the Working Group will be able to produce a framework for identifying research knowledge and gaps.

2) Stock taking

Scientific knowledge on the causes, characteristics, and consequences of hazards, disasters, and catastrophes has increased immensely over the past forty years. Even so, across the globe physical and social vulnerability and exposure have increased at all levels of development and this is thought to contribute to persistent if not increasing disaster losses (World Bank 2013; 2015; UNISDR 2015). The scope and severity of losses indicate there are fundamental gaps in our knowledge of how risk and disaster are created, distributed, and/ or reduced, as well as in our ability to transfer existing knowledge into practice to realise the potential of better understanding of risk and new knowledge, technologies and tools. This is reflected in the Sendai Framework's call to carry out "Enhanced work to reduce exposure and vulnerability, thus preventing the creation of new disaster risks, and accountability for disaster risk creation are needed at all level".

Despite efforts on the part of research and practice communities to create new understanding and be at the cutting edge of science, the vast scope and highly diverse nature of relevant research concepts, theories, methodologies, and empirical findings make it difficult to take stock of that knowledge, which is a critical step towards translating it into more effective disaster plans, policies, and programs. While there are a variety of strategies that could be used to frame the work of Group 3, five major areas for scientific reflection have been selected to guide this effort and provide different ways members of the global community might provide their input.

1) **Implementing an all-hazards approach:**

We believe the existing knowledge base can be assessed by focusing on knowledge relevant to different hazards and threats (UNISDR 2015). This strategy would include taking stock of research on specific hazard types, such as atmospheric, seismic, environmental, biological, and technological hazards. We could begin by asking "What do we know?", "What do we not know" and "What do we need to know?" about the nature of these threats. This area of research would also focus on ways that interdependencies among hazards (e.g. fires subsequently followed by floods and landslides) and cascading events (e.g. the 2011 earthquake-tsunami-nuclear disaster which affected Japan) add complexity to the hazardscape (UNISDR 2015).

It would also take into account the widespread acknowledgment that hazardscapes are becoming increasingly broad and complex with the impact of climate change but also rapid economic development (Intergovernmental Panel on Climate Change 2012). As Superstorm Sandy illustrated in the U.S., hurricane impacts can be expected to become more severe as a consequence of climate-change-induced sea level rise. Wildfires are becoming more dangerous and costly across the globe, in part because of settlement patterns that increase the exposure of people and property, but also because of our changing climate.

Our discussions will focus on linkages that need to be strengthened among hazard and disaster risk reduction research and practice, research on the relationship between climate change and extreme events, and climate change adaptation. Discussions will also focus on future research needs in light of climate and demographic trends, as well as on questions regarding the extent to which disaster risk reduction and climate adaptation activities are coordinated and mutually reinforcing or siloed and conflicting.

2) **Strengthening a multidisciplinary approach to research**

Second, assessments can be made of the knowledge base by considering the relative strengths and weaknesses of disciplinary and interdisciplinary work. Increased understanding of risk and disasters discussed cuts across many relevant disciplines-- for example, from public health to computer science, from civil engineering to social science, and from geoscience to environmental science. We have learned a great deal, but opportunities exist to further advance and apply disciplinary insights.

There has also been a strong movement over the past two decades towards interdisciplinary and multidisciplinary research involving collaboration between geophysical, social and engineering scientists. It is important to ask how the integration of existing knowledge through multi-disciplinary work has furthered our understanding or may do so in the future. As a result, Group 3 will explore how disciplinary knowledge can be expanded, and multi- and inter-disciplinary research can build on discipline-based insights. Further, we will explore best practices in these types of exchanges.

3) Science to support holistic disaster risk management

We will reflect on the knowledge base with regard to how risk is created and managed. This area will include consideration of all four phases of the disaster cycle, i.e., mitigation, preparedness, response and recovery. Focusing on all elements of disaster risk management allows us to consider how a wide range of activities associated with technology, development, governance, risk management, risk communication, and local capacity influence how we think about and approach disaster risk. This strategy will also distinguish between temporal phases that have been well-studied and those on which less research has been undertaken.

Extensive research exists to guide risk-reduction practices and organizational activities. Further, we will explore research paradigms that call into question the very nature of mainstream thinking with respect to disaster. Such paradigms do not view disasters as external threats to be minimized or controlled and instead ask us to consider how historic and current patterns of social organization, governance, and development create the contexts that contribute to the buildup of risks that eventually express themselves as disasters (Mileti 1999; Wisner et al. 2004; Tierney 2014). An acceptance of the idea that the roots of disaster are endogenous to the social order rather than external to it would necessarily call for a re-assessment of research and practice (UNISDR 2015).

4) Catalysing knowledge sharing

The global scale of this effort requires that we reconsider the factors that both facilitate and impede global science sharing and research applications. Variations in language, information access, expectations for scientific rigor, and culture influence how research data are shared, interpreted, and applied. Significant global differences with respect to wealth and economic well-being, political systems, governance quality (e.g., accountability, rule of law), and disaster risk reduction capacities raise questions about the extent to which knowledge and solutions developed in specific societal contexts can be generalized to others. Related questions exist regarding the scalability and transferability of risk-reduction knowledge and strategies. It is critical to begin to unpack these complexities and their implications for disaster risk reduction.

5) Knowledge co-production

Group 3 discussions will explore approaches that emphasize collaboration between researchers and at-risk communities and the co-production of knowledge related to hazards and disasters that addresses all hazards. Such collaborations could include (but are not limited to) the incorporation of indigenous perspectives and knowledge into the research process and a variety of “citizen science” programs.

Group 3 breakout sessions will aim to collect insightful observations and suggestions from session participants regarding needed areas of fundamental, basic and applied research, including disciplinary and multidisciplinary perspectives on multi-hazard disaster risk reduction through the analysis of mitigation, preparedness, response and recovery within multiple sectors and at multiple analytic scales. Examples of points to consider:

Expected Outcomes from the discussions held in the breakout sessions include:

- Observations on mature knowledge areas across the five areas discussed above.
- Observations of knowledge gaps across the various areas.
- A basis for prioritizing a comprehensive research agenda over a span of 15 years for disaster risk reduction to inform next steps in the Road Map
- Observations regarding mechanisms for building stronger research capacities in countries with low or limited research infrastructure.

3) The way forward

Participants in this working group are invited to consider the elements of the S&T Road Map relevant to this Working Group and whether these proposals can be strengthened further. What are specific next steps to? Where should urgent and longer term investments be made in this regard?

The following table shows the relevant priorities and key actions of the Science and Technology Road Map:

Priority for Action 1: Understanding Disaster Risk		
Expected Outcomes	**Key Actions**	**Review Progress and Needs**
1.1 Assess the current state of data, scientific knowledge and technical availability on disaster risks reduction and fill the gaps with new knowledge.	• Develop, update periodically and disseminate risk information, including on exposure and vulnerability, to • Conduct solution-driven surveys and research in disaster risk management	• UNISDR guidelines for recording disaster loss and disaggregated impact data • Methodologies and guidance for post-disaster reviews and damage

	and increase research for global, regional, national and local application;	assessments • Periodic national and regional surveys on disaster risk management capability
1.2 Synthesize, produce and disseminate scientific evidence in a timely and accessible manner that responds to the knowledge needs from policy-makers and practitioners;	• Ensure the synthesis and use of traditional, indigenous and local knowledge and practices • Promote partnership between scientists, policy makers, private sectors and community leaders to establish, disseminate and share good practices and lessons learned. • Engage scientific focus on disaster risk factors and scenarios, including emerging disaster risks;	• Good practises on use of indigenous and local knowledge • Methods for tracking and reporting investments in research programmes focusing on DRR • Case studies on DRR through science and traditional, indigenous and local knowledge and practises
1.3 Ensure that scientific data and information can support and be used in monitoring and reviewing progress towards disaster risk reduction and resilience building.	• Develop and monitor a set of core indices and indicators to measure progress • Promote the development of quality standards, such as certifications particularly at national and regional levels.	• Standards and best practises for DRR • National and regional peer reviews • National peer reviews to follow-up, assess and report on progress on implementation of Sendai Framework
Priority For Action 2: Strengthening Disaster Risk Governance to Manage Disaster Risk		
Expected outcomes	**Key Actions**	**Review Progress and Needs**
2.1 Ensure a stronger involvement of science in policy- and decision-making at all levels	• Promote and improve dialogue to facilitate a science-policy interface for effective decision-making	• Science and technology expertise for national and regional platforms for DRR • Information sharing of case studies of strong involvement of science in policy and decision-making to improve

		implementation
Priority For Action 3: Investing in Disaster Risk Reduction for Resilience		
Expected outcomes	**Key Actions**	**Review Progress and Needs**
3.1 Provide scientific evidence to enable decision-making of policy options for investment and development planning	• Develop and disseminate economic, social, structural, technological and environmental impact assessments to strengthen disaster-resilient public and private investments • Promote cooperation between academic, scientific and research entities and networks and the private sector to develop new products and services to help reduce disaster risk	• Periodic reports on State of Science in DRR at national, regional and global levels. • Guidance on disaster risk and impact assessments
Priority for Action 4: Enhancing Disaster Preparedness For Effective Response, and to "Build Back Better" In Recovery, Rehabilitation and Reconstruction		
Expected outcomes	**Key Actions**	**Review Progress and Needs**
4.1 Identify and respond to the scientific needs of policy- and decision-makers at all levels to strengthen preparedness and resilience	• Provide knowledge and guidance for the development of national and local strategies and plans for DRR • Promote regional model for science and technology- based DRR plans • Identify the special needs of women, children and old age population together with animals in national and local strategies aimed at disaster risk reduction.	• Local and national DRR strategies and plans in line with Sendai framework • Local and national resilience actions plans
4.2 Build capacity to ensure that all sectors and countries understand, have access to, and can use scientific information for better informed	• Build local knowledge and the use of existing training and education mechanisms and peer learning • Promote transdisciplinary work in disaster risk reduction research. • Develop the workforce capacity in all sectors in understanding disaster risk and implementing	• National and regional help desks for technical advice on risk assessment and risk management capability • National and regional training and capacity building programmes in DRR

decision-making	DRR approaches • Enhance knowledge and technology transfer and promote the use of global technology pools to share know-how, innovation and research • Promote research innovations in insurance sector particularly in developing regions	

A few elements to inform discussions of next steps in the Road Map are described below.

The most direct relevance is to the actions proposed to undertake Priority for Action 1: *Understanding Disaster Risk*. This section calls for conducting solution-driven surveys and research in disaster risk management and increase research for regional, national and local application, and for periodic reports on the state of Global Risk Knowledge. Undertaking an analysis of knowledge gaps with regard to risk reduction is critical to this process.

Furthermore, this topic is central to Priority for Action 1, section 1.2 which proposes to synthesize, produce and disseminate scientific evidence in a timely and accessible manner that responds to the knowledge needs from policy-makers and practitioners, including engaging in scientific focus on disaster risk factors and scenarios, including merging disaster risks. In addition, this discussion is relevant to Priority for Action 1, section 1.3 that is focused upon ensuring that scientific data and information can support and be used in monitoring and reviewing progress towards disaster risk reduction and resilience building.

Furthermore, development of a gap analysis of existing scientific knowledge will be very relevant to Priority for Action 2: Strengthening Disaster Risk Governance to Manage Disaster Risk and Priority for Action 3: Investing in Disaster Risk Reduction for Resilience. These priorities areas stress actions to ensure stronger collaboration between scientists and policy and decision-makers, including a call for periodic reports on the state of science in DRR at national, regional and global levels.

Finally, the outcome of Work Group 3 are relevant to Priority for Action: Enhancing Disaster Preparedness for Effective Response, and to “Build Back Better” in Recovery, Rehabilitation, and Reconstruction by emphasizing capacity building to ensure that all sectors and countries understand, have access to, and can use scientific information for better decision-making.

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Annex: Relevant text from the Sendai Framework

24k - To promote investments in innovation and technology development in long-term, multi-hazard and solution-driven research in disaster risk management to address gaps, obstacles, interdependencies and social, economic, educational and environmental challenges and disaster risks;

25g - To enhance the scientific and technical work on disaster risk reduction and its mobilization through the coordination of existing networks and scientific research institutions at all levels and in all regions, with the support of the United Nations Office for Disaster Risk Reduction Scientific and Technical Advisory Group, in order to strengthen the evidence-base in support of the implementation of the present Framework; promote scientific research on disaster risk patterns, causes and effects; disseminate risk information with the best use of geospatial information technology; provide guidance on methodologies and standards for risk assessments, disaster risk modelling and the use of data; identify research and technology gaps and set recommendations for research priority areas in disaster risk reduction; promote and support the availability and application of science and technology to decision-making; contribute to the update of the publication entitled “2009 UNISDR Terminology on Disaster Risk Reduction”; use post-disaster reviews as opportunities to enhance learning and public policy; and disseminate studies;