資料 1-8

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Statement on Science and Technology for Disaster Risk Reduction[1] from the member academies of IAP for Science

1. Background

Negative consequences of natural hazards, such as earthquakes, tsunamis, volcanic eruptions, landslides, avalanches, wind storms, heavy rains, floods, heat and cold waves, prolonged droughts and subsequent water shortage have increased in recent years and resulted in major disasters around the globe. The impact of these events can be exacerbated by human activities, including uncontrolled urban and rural development, poorly-engineered infrastructures and buildings, as well as socio-economic and other human factors such as rapid population growth, increased population density in areas prone to hazard impact, and drastic changes in land use practices. Thus, many cities and populations are more exposed and vulnerable now than before. This is particularly the case for developing countries without adequate resilience capacities to cope with disasters, especially when subject to low probability-high impact events.

In some cases, the impact can be far-reaching and beyond our immediate comprehension. For example, in 2011 the Tōhoku earthquake, followed by both a tsunami and a nuclear power plant disaster in east Japan, resulted in the displacement of more than two hundred thousand people, with disruptions in socio-economic activities experienced country-wide. In the context of a global economy, the effects of a disaster may have significant impacts on regions far from the site of the actual event and long after it occurred. Certain vulnerable groups can be affected even more severely.

In 2015, the international community agreed on three major accords: the Sendai Framework for Disaster Risk Reduction 2015-2030, the Sustainable Development Goals, and the Paris Agreement on Climate Change. 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[2] was held in January 2016 in Geneva, Switzerland. The role of science, technology and research in providing evidence and knowledge on disaster risks and 'How to' reduce risks have been emphasized in all major international and regional frameworks and agendas. Examples of recent efforts by IAP to address these issues include a panel

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[1] Note: This Statement is a consolidation, with additions and revisions, of the Tokyo Statement, the Tokyo Action Agenda, a proposal entitled "the Promotion of International Study for Disaster Risk Reduction and Resilience and the Reduction of Disaster Risks", and a statement entitled "Strengthening Disaster Resilience is Essential to Sustainable Development". The Tokyo Statement was adopted in January 2015 and the Tokyo Action Agenda was approved at the same time at the Tokyo Conference on International Study for Disaster Risk Reduction and Resilience. "Promotion of International Study for Disaster Risk Reduction and Resilience and the Reduction of Disaster Risks" was issued by the Science Council of Japan in February 2016, and "Strengthening Disaster Resilience is Essential to Sustainable Development" was published in April 2016 as part of the G-Science Academies Statement 2016.

[2] See: http://www.unisdr.org/partners/academia-research/conference/2016/

on "Science advice in the time of emergencies" organized during the IAP Conference in Hermanus, South Africa, in early 2016[3]. Likewise, the *Accademia Nazionale dei Lincei*-IAP conference in October 2016, "Florence 1966-2016 - Resilience of Art Cities to Natural Catastrophes: the Role of Academies", proved that there are still considerable concerns towards the issues in this area[4].

Science, technology and research into issues relating to disaster risk reduction have progressed significantly on all fronts and across all sectors. Scientists and researchers have brought a deeper understanding of the hazards, vulnerabilities, disaster risks and their linkages to the development processes. However, there are ongoing challenges and gaps in translating this scientific information into policy so that disaster risk reduction policies are based on science and evidence. Given the different levels at which disasters can affect our society, it is essential that we consider how the physical and social sciences can be fully deployed in an integrated way, with technology, to reduce both disaster risks and their impacts.

2. Key directions

Strategies need to be developed in order to reduce disaster risks before an event, manage the emergency as it happens, ensure effective recovery afterwards, and enhance resilience. Hence, it is essential that there are concerted international actions to address:

- implementation of the existing scientific and engineering knowledge into general practice;
- how society should promote disaster risk reduction and resilience;
- how science and technology can support such societal efforts while incorporating good practices based on local knowledge; and
- methodologies for the creation of demand for safety and integration of safety with economic benefits.

To support the building of societies that are more resilient to disasters, concerted and coordinated international action is necessary to ensure that all stakeholders, including policymakers, practitioners, private enterprises and community groups, understand disaster risks and be able to access and utilize the latest scientific knowledge and applicable technology. Reducing disaster risks and building a resilient society is the shared responsibility of all stakeholders and brings benefits to all. Consequently, each country should develop a common platform for all stakeholders to discuss these issues, taking into consideration the need to provide diverse stakeholders with opportunities for engaging in discussions with scientists in local languages. These discussions will empower citizens to strengthen community-based disaster risk management while addressing local challenges concerning gender, vulnerable groups and other issues. For example, the Council of Europe has recognised the special vulnerability of people with disabilities and their legal protection.

[3] See: http://www.interacademies.net/News/29857.aspx

[4] See: http://www.interacademies.net/2952/30966.aspx

Science and technology can offer innovative solutions for increasing their resilience.

It is essential that governments, private entities, international agencies and science academies invest appropriate funding necessary for the capacity enhancement of the scientific community to collect the required data, and develop methodologies and analytics to create new approaches for integrating associated social needs and physical processes to reduce risks associated with natural hazards. These goals require an interdisciplinary approach involving researchers from the natural sciences, engineering, medical science, social sciences and humanities, with continuous input from all stakeholders.

3. Recommendations

1) Promote and strengthen the development of a common platform at the national level through which all stakeholders and scientists maintain constant dialogues in local languages, and assist the efforts of the governments and citizens in disaster risk reduction and resilience by creating stronger inter-disciplinary and trans-disciplinary ties.

- Establish a disaster monitoring system that is comprehensive, high-quality and sustainable, with support from space-based earth observation and, when appropriate, supported by crowdsourcing.
- Conduct integrated assessments of the socio-economic impacts of disaster risks and possible measures for disaster risk reduction and resilience.
- Use big data technologies and strengthen the capacity for their use in monitoring and reporting progress.
- Improve understanding of the earth processes and history at various stakeholders' levels and disseminate knowledge about solid earth, atmosphere, ocean and human actions and their interplay to a wider audience.
- Improve disaster literacy by providing systematically organized education, as well as developing good practices and effective approaches for communication and education of all stakeholders. The training should include discussions about vulnerable groups, including gender, and their specific needs.
- Develop guidelines for strengthening national and local platforms for disaster risk reduction and their coordination mechanisms through enhanced contributions from science and technology with due consideration of traditional knowledge systems.

2) Assign an important role in disaster risk reduction to disaster science, disaster mitigation engineering, environmental science, and social sciences; particularly sociology, geography and economics, health science, earth science, earth observation, and other relevant areas. In collaboration, these areas should create a framework to ensure inter-disciplinary efforts to increase the resilience of local communities to disasters.

- Strengthen links between disaster science and environmental science to enhance risk governance and negotiate the gap between time-scale and political urgency for the reduction of disaster and

environmental risks in an inclusive manner.

- Develop better engineering methods and materials to improve the safety of structures, including mega structures. Also, retrofit and strengthen existing vulnerable structures as soon as possible.
- Develop a health management system to support citizens' health and mental conditions all through the post-disaster process, from emergency rescue efforts to rehabilitation and reconstruction.
- Provide information that facilitates disaster investment necessary for building a resilient society, and inform citizens of disaster risks by providing impact-based early warning information and mapping of risks.
- Develop portable and community-usable warning and response systems applicable to cases such as landslides, floods, etc., which are common to numerous localities.
- Develop standard operating procedures for science advice, inputs and communication at the time of disaster emergency situations.
- Understand the root causes and drivers of disasters through detailed investigations of events, lessons learned, successes and failures in order to promote sustainable risk management and risk reduction through evidence-based research.

3) Promote scientific and technological research at local, national and international levels to establish inclusive, effective and sustainable national platforms to support the efforts in disaster risk reduction and resilience through trans-disciplinary cooperation.

- Establish and implement an institutional system that ensures scientific knowledge-based decision making on disaster management at all levels, such as compulsory risk impact assessment, including the roles of science and technology in monitoring, measuring, predicting, modelling and mitigating disaster risks, prior to any development permission.
- Conduct consolidated and integrated syntheses of global-scale disaster studies on a regular basis.
- Create international consultation functions through which the science and technology community provides professional advice to support locally-based risk reduction activities, taking into account diverse local characteristics.
- Promote effective utilization of unexplored scientific disaster data coming from research projects especially in developing countries.
- Share among countries their experiences about the implementation of open big data discovery, geospatial data interoperability and infrastructure related to the assessment of disaster risk and resilience.
- Better coordinate existing networks and scientific research institutions at all levels and all regions to advance disaster risk reduction.
- Develop appropriate metrics so that nations can document and monitor their progress and improvements.

4) For effective implementation of existing knowledge into the development process and people's daily lives, we need to create demand-driven science for safety, especially in developing countries where safety is not necessarily a top priority for either the government or the public. Creating demand can be done through:

- Strengthening risk communication for making peoples' demand for safe housing, safe cities, safe infrastructure, reliable energy, good water management and clean air, a public good.
- Translating the demand for safety into an economic benefit and integrating safety with incentives for enhanced economic benefits.
- Implementing building codes, safety standards and land use regulations, and taking other small and affordable measures to ensure safety such as the development of standards for the evaluation and ranking of buildings for quality and safety.