Progress in Disaster Science 11 (2021) 100188

Contents lists available at ScienceDirect

Progress in Disaster Science

journal homepage: www.elsevier.com/locate/pdisas

Invited view point

Knowledge exchange through science diplomacy to assist disaster risk reduction

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ARTICLE INFO

Article history:
Received 1 June 2021
Received in revised form 5 July 2021
Accepted 11 July 2021

Available online 15 July 2021

Keywords:
Knowledge exchange
Science diplomacy
Science advice
Interdisciplinarity
Informed decisionmaking
Disaster risk reduction

ABSTRACT

This paper analyses science diplomacy efforts to reduce disaster risks and proposes establishing national knowledge exchange centers (KECs) to help individual states adhere to their Sendai Framework goals. KECs are considered to be interconnected globally and work together to promote resilience efforts by facilitating sharing of information and strategies in risk monitoring, assessment, and ultimately reduction across the globe. KECs can provide high-quality scientific evidence for informed decisionmaking along with a component related to disaster science media to ensure that appropriate knowledge reaches a variety of people who need it in different forms tailored for them. KECs can promote transdisciplinary education in disaster-related science diplomacy (i.e., disaster diplomacy). The United Nations Office for Disaster Risk Reduction (UNDRR) and the International Science Council (ISC) can provide assistance to KECs through UNDRR National Platforms and ISC Members.

1. Introduction

Disaster risk reduction (DRR) is a universal imperative, which requires continuous collaboration between all levels of society tasked with advancing our understanding of risks (i.e., research), managing risks (i.e., policymaking and implementation), financing DRR (i.e., government, industry, and non-profits), communicating risks (i.e., media, the public, government and many others), and listening to those adversely impacted (i.e., everyone). Since drivers and impacts of disasters frequently cross geopolitical borders, continuous collaboration and knowledge exchange between international counterparts is essential.

Efforts of the United Nations Office for Disaster Risk Reduction (UNDRR) in overseeing the Sendai Framework for Disaster Risk Reduction 2015–2030 (Sendai Framework), supporting countries in its implementation, monitoring and sharing what works in reducing existing risk and preventing the creation of new risks exemplify disaster-related science diplomacy (hereafter disaster diplomacy), whether formal through governments or more informal through NGOs, civil society and scientific organizations. UNDRR has been implementing disaster diplomacy by bringing together governments, intergovernmental organizations (e.g., UNESCO, the World Meteorological Organization, the World Health Organization), and non-governmental scientific organizations (e.g., the International Science Council (ISC)). In doing so, UNDRR has created synergies among

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http://dx.doi.org/10.1016/j.pdisas.2021.100188
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partners and communities in view of their common interests, noting that international cooperation "has proven to be key to reducing disaster risk" as elaborated in the Sendai Framework.

Over the five years since the Sendai Framework adoption, its ambitious objectives are far from being achieved, and assessment, monitoring, and overall understanding of risks remain challenging. At least 80 states (for 2015–2019; https://sendaimonitor.undrr.org) have failed to provide information related to their efforts in reaching the Sendai global targets. Reasons range from individual states struggling with adequate risk assessment and monitoring to non-compliance with or even neglecting to abide to their reporting commitments.

Disaster science integrates multiple domains of natural and social sciences. There is a great value in having national units of disaster evidence synthesis to integrate knowledge in forms appropriate for the risk profile of a country. Already several countries have established centers of excellence under the umbrella of the Integrated Research on Disaster Risk (IRDR) program co-sponsored by UNDRR and ISC. These are primarily units of evidence synthesis but built on local disaster risk research activities. This concept could be extended to facilitate disaster diplomacy efforts (e.g., [1–3]) through the development of national knowledge exchange centers (KECs). The disaster diplomacy efforts could assist individual states adhere to their Sendai Framework goals by sharing expertise, supporting each other in the tasks, and providing templates to make reporting easier. National KECs that are globally interconnected could help advance resilience efforts by facilitating sharing of information and strategies in risk monitoring, assessment, and ultimately reduction in an ethical and efficient manner.

2. Global challenges require collaborative solutions

Disasters are complex phenomena which are driven by multiplex ties between political and socio-economical factors. The macro- and micro-scale social processes are producing vulnerabilities that are unsustainable, degrading social and infrastructural services, social inequities, and wealth/livelihood disparities [4]. Disaster risk will continue to increase if vulnerability is not reduced, and the economic impact will far exceed the cost of mitigation and preparedness [5,6]. National efforts to support DRR through a combination of research and resilience building can enhance sustainable development efforts. UNDRR Global Assessment Reports and responses from a consortium of non-governmental organizations provide a comprehensive description of global risks and measures needed to reduce these risks [7]. There are a number of factors, especially related to cognitive biases and accountabilities, that can inhibit expert assessment of disaster risk being converted into policy actions and investment [8]. Greater efforts are needed to communicate the risk assessments, their socio-economic impacts, evaluations of mechanisms for risk reduction, and options for translating scientific findings to practice [9].

Disaster diplomacy can assist in promoting science-based risk assessments and responses among nations. Continuing to link DRR to the broader Sustainable Development Goals requires proactive and community-based resilience efforts. This would become possible with the knowledge exchange generated through international, inclusive, holistic and convergent research on and periodic and systematic assessments of disaster risks that are effectively communicated to society and governments [9]. Mechanisms and tools to support knowledge exchange are critical to provide guidance for the provision of scientific advice in pandemic and other global disasters. To ensure efficient and effective policies, advice should be based on inter- and trans-disciplinary collaborations [10,11] of DRR's stakeholders including policymakers.

Although many disasters are local or nation-wide, some are immediately seen as transnational and transboundary. For example, the 2004 Indian Ocean earthquake and tsunami affected many countries around the ocean; the 2010 volcanic eruption in Iceland interrupted European flights for several days; and peat fires of Southeast Asia contributed to the air pollution. Others, such as many viral outbreaks, including Ebola, Zika or the African Swine Fever, take longer to cause transnational impact. COVID-19, while seen for a short-time as a Chinese-only concern, rapidly became a global concern. And the outbreaks of the disease quickly became conflated with great power interests, and national interests were deemed to be at stake. Scientists are having to navigate geopolitical issues, which will be compounded in the case of COVID-19 by growing concerns regarding vaccine nationalism and the use of vaccine availability as a form of soft power. While slow burning, tensions between science and nationalism are prominent in global responses to climate change. The Intergovernmental Panel on Climate Change attempts to manage that interface but despite strong scientific consensus, progress at an individual member state level is generally slow or negligible.

Human losses due to floods have been significantly reduced in several Asian countries (e.g., Bangladesh, China, and Japan), mainly because the countries developed a cross-border cooperation and knowledge transfer using integrated approaches to disaster response co-evolved with knowledge from geoscience, engineering, land use and urban planning, psychology, and political science, as well as the local knowledge about organizational and institutional schemes, political leadership, budget, policymaking, and news media [11]. Another example of the challenges requiring collaborative solutions is the Arctic region. Although diplomatic channels among the nations surrounding the Arctic region can fluctuate, science diplomacy efforts led to promotion of scientific cooperation in the region, including DRR research (e.g., [12]). International collaboration on Arctic disaster-related activities (e.g., [13]) provides a strong baseline for Arctic science and disaster diplomacy. Kontar et al. [3] detail Arctic disaster diplomacy with a basis in science, while informal approaches for Svalbard are covered by Grydehøj [14], who provides examples involving risks and disasters. International research cooperation with emergency response capacities in the Arctic is seen more broadly in view of building common interests with global inclusion [15].

3. Knowledge exchange centers to facilitate risk reduction through disaster diplomacy

Disaster diplomacy incorporates collaboration across all sorts of boundaries: regional, institutional, cultural, and disciplinary. KECs for DRR will help traverse these boundaries. The KECs' mission will be to help experts work together and support each other, even through differences of opinion, in order to overcome any limitations by building on strengths. Connecting a large number of disciplines from social, physical and medical sciences, engineering, law, social work, arts, humanities, indigenous knowledge and professions, the KECs will support advances in all relevant disciplines and disciplinary approaches, so that the scientific knowledge would include theory, empirics, and application, melding quantitative, qualitative, and conceptual. Mechanisms necessary to support knowledge exchange include knowledge hubs designed to inform DRR policy and practices through the production, storage, and communication of the meta-analyses of data such as: PreventionWeb; RiskKAN; European Commission Disaster Risk Management Knowledge Centre; Global Health Network; and the UK Government What Works Network.

We propose the KECs to be linked to UNDRR via its National Platforms providing participating countries with adequate knowledge related to disaster risks and recommendations on the risk reduction, as well as mechanisms and channels to foster cross-border cooperation (Fig. 1). The KECs will deal with several challenging issues, including (V) volatility of vulnerability, that is, the nature and dynamics of vulnerability change; (U) uncertainties in predictability of extreme events, in risk assessments, and in public awareness and understanding of extreme hazard events; (C) complexities of disasters (e.g., associated with multi, compound or concatenated hazard events) and of risk reduction at all levels from local/national to regional/global; and (A) ambiguity in governance in disaster risk reduction strategies and in national coordination for disaster response, rehabilitation and reconstruction, and preparedness. Resolving the four

[1] VUCA elements reflecting on the volatility, uncertainty, complexity and ambiguity of general conditions and situations were drawn on the leadership theory by Bennis and Nanus [16]

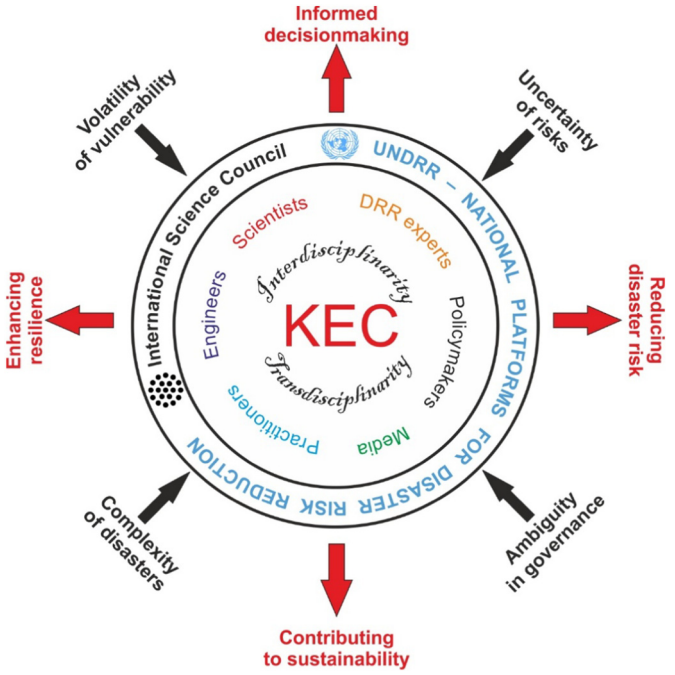


Fig. 1. Examples of transnational knowledge exchange in disaster risk reduction for the benefit of humankind.

major VUCA[1] elements in KECs will assist in reducing disaster risks, enhancing resilience, providing informed decisionmaking, and contributing to sustainability.

Effective disaster diplomacy means that science is not just for, by, and with scientists; rather it is a collective, inclusive effort, in which everyone affected and involved learns and contributes. The goal of KECs is hence to foster inclusive discourse that would inform proactive decisionmaking, aimed at reducing risks and enhancing global resilience. The four pillars of KECs include:

1. ***Supporting scientists in individual (i.e., peer-to-peer, project-to-project) international collaborations***. For example, Cuban and American scientists were able to work together on weather- and climate-related topics despite extended hostility between the two governments [17]. Due to the official antipathy, the collaborations were not always straightforward to implement. In such contexts KECs could assist in connecting scientists from countries at loggerheads and facilitate collaboration.
2. ***Fostering knowledge co-production between scientists and non-academic DRR experts and practitioners***. Promoting inter- and transdisciplinary approaches KECs can provide a venue for making extended and reciprocal stakeholder connections beyond sectors and for everyone to come together on an equitable footing for expressing and sharing their knowledge forms and how to use them in tandem. Mercer et al. [18] provide a framework for doing so for disaster risk reduction which could be implemented through KECs.
3. ***Initiating and facilitating discourse between DRR experts and policymakers from local to global level***. True transdisciplinary approaches will allow scientists, policymakers and a broad range of community and civil society stakeholders to integrate their understandings and knowledge and promote accessible but robust analyses. Although trans-disciplinarity remains a challenge especially in academia, disaster risk reduction and indeed progress on many of the issues of the global commons require inter-stakeholder discourse. Also, KECs would provide advice and a virtual and physical location for people from different backgrounds to interact, exchange, teach, and learn equitably.
4. ***Engaging the global diplomatic community given that diplomatic efforts will be needed to turn such analyses into effective programs***. Kontar [19] uses Russia-USA diplomacy in the Arctic as an example of scientists fostering links, progressing knowledge, and collaborating. KECs could highlight similar agendas more broadly for disaster-related science and science diplomacy, building on this approach to have scientist-diplomat cooperation in creating and pursuing specific science-based projects and programs on DRR across international borders.

The KECs would also help to promote interdisciplinary and transdisciplinary cooperation instead of exploitive and extractive multidisciplinary research, where outsiders come in, complete their work, and then leave, with the areas researched gaining little from the knowledge [11]. Leaving all work up to local people for themselves only means that external advice and new ideas are missed, plus less opportunity exists for exchange. The KECs would support efforts that are aimed at reaching a balance, so that working together means using everyone's own experience elsewhere while gaining from others. Each national KEC would provide a hub for enhancing the efforts of scientists working on disaster risk issues, for communicating the scientific knowledge (gained or already available) to help in informed decisionmaking [20], and for promoting successful international collaboration on DRR via domestic linkages to the policy, diplomatic and political communities.

In disaster diplomacy, formal disaster governance approaches have tended to be the most reported and accepted, yet they are also critiqued as being too slow, too top-down, and too inflexible [21]. DRR and response, especially across boundaries, can be impeded through efforts to impose overly formal or excessively political structures or processes, especially when they ignore or sideline local realities and more individual and ad hoc efforts [22]. Consequently, informal disaster governance becomes important, especially embracing its far-reaching extent and impacts. This form of governance is about people developing their own roles and pursuing their own actions irrespective of official, expected, or defined positions and mandates. In borderlands, for instance, informal disaster governance efforts may cross national borders whose geopolitical significance may not extend to local practices dictated by human need and proximity. The KECs would support cross-boundary activity that can lead to informal relationships.

KECs would provide high-quality scientific evidence for informed decisionmaking along with a component related to disaster science media to ensure that appropriate knowledge reaches a variety of people who need it in different forms tailored for them. UNDRR and ISC can promote activities of the KECs via UNDRR National Platforms and through ISC Members such as international scientific unions and associations as well as national academies and research councils. Moreover, KECs may promote transdisciplinary education in disaster diplomacy at universities, especially at departments dealing with diplomatic relationships, sustainability, climate/environment, and DRR. Finally, the KECs would foster the use of disaster diplomacy to inform effective planning and decisionmaking to reduce risks and the impact of disasters.

4. Conclusion

Governmental entities, institutes, and officials responsible for supporting international cooperation should be prepared to assist scientists in facilitating their science diplomacy efforts. When engaged in science diplomacy, scientists can inadvertently create diplomatic issues, and KECs will provide necessary space for building cooperation and partnership. To be effective, KECs should be ever evolving with the events in both scientific and diplomatic spheres. They should not be a product to be set up as a tick-box exercise and then left for a fixed time period. They would require continual support, monitoring, evaluation, and progression aiming for long-term outcomes, not just short-term outputs. KECs should not be limited by the Sendai Framework, Sustainable Development Goals, Paris Agreement, and other international processes, including with the COVID-19 disaster and future pandemics confronting humanity on a planetary scale. They should push beyond established frameworks, aiming to do

better and to drag the international agreements and diplomats towards substantial improvements, especially thinking long after 2030.

Authors contribution

All co-authors contributed to the conceptualization of the paper. YYK and AIZ performed writing – original draft preparation. All co-authors performed writing – review and editing. AIZ visualized the concept.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. The opinions expressed in this publication are those of the authors.

Acknowledgments

The authors are thankful to Rajib Shaw for inviting the paper for publication, and reviewers for constructive comments, which improved the initial manuscript.

The authors also thank the Global Health Security team of Public Health England for funding the costs related to publication of the paper.

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