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POLICY BRIEF: CLOSING THE GAP BETWEEN SCIENCE AND PRACTICE AT LOCAL LEVELS TO ACCELERATE DISASTER RISK REDUCTION

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This policy brief analyses the existing gap between science and technology (S&T) and its incorporation into disaster risk management at local levels. It includes a set of key messages highlighting specific issues and barriers that hinder the effective uptake of existing knowledge. It also sets out policy recommendations for enabling easy access to existing knowledge and for translating such knowledge into concrete applications and measures for enhancing disaster risk reduction (DRR). The key messages and recommendations are supported by a set of case studies showcasing best practice in the application of science at local levels. The policy brief is aimed at local authorities and research and academic institutions.

Photo: Building Seawalls. Tarawa, Kiribati (Lauren Day / World Bank).

INTRODUCTION

In a complex and changing global risk landscape in which extreme hydro-meteorological events are on the rise, and vulnerabilities and disasters such as the COVID-19 pandemic occur simultaneously with other hazards, there is a danger that development trends and gains will be reversed. Governments worldwide must therefore urgently translate their global commitments into action by improving their national strategies and policies and enabling more effective and impactful change at the local level.

The Sendai Framework for Disaster Risk Reduction attempts to guide national governments by providing a global roadmap for reducing risk and achieving sustainable development. It operates alongside other intergovernmental frameworks such as the 2030 Agenda for Sustainable Development and the Paris Agreement on Climate Change. National and local DRR strategies and policies, as called for in the Sendai Framework Global Target E, depend on knowledge for informed and effective decision-making and integrated action. Science provides this knowledge base and can improve resilience by: identifying the key drivers and indicators of risk and their implications for development; informing prevention and mitigation strategies; and supporting the development and implementation of appropriate preparedness for, and effective responses to, disasters.

The processes of risk creation interweave across space and time but are driven by development choices and are therefore amenable to policy change and local action. Ensuring inclusive risk reduction at local and national scales is therefore key to achieving tangible progress on targets set out in the Sendai Framework. Whether a hazard turns into a disaster or not depends on both socio-economic and geographical conditions. Local governments should be equipped with the best knowledge of local conditions and needs, and thus have a key responsibility for reducing disaster risk to protect the lives and livelihoods of local populations and secure development gains. In the case of emergencies, they have a central role in providing response and recovery mechanisms.

Even though a large body of disaster-related research dealing with both drivers and consequences has been produced over recent decades – and despite an increased recognition of the centrality of this research in supporting strategies for disaster risk management – there continue to be significant gaps in the co-design and application of knowledge for action. This is due not only to an insufficient uptake of science into DRR management and implementation, but also to inadequate engagement between scientists and practitioners: there is a lack of mechanisms and incentives to facilitate such an exchange. Narrowing the gap between knowledge and local action must therefore be a key priority for the Mid-term Review of the Sendai Framework.

KEY ISSUES

1

Despite a growing volume of disaster-related research, as well as an increased frequency over the past 50 years of hydro-meteorological disasters, there is still a significant gap between what is known about hazards, vulnerabilities and exposure, and the application of integrated approaches to mitigate risks in order to save people's lives and livelihoods at local levels. In essence, scientific evidence is not appropriately reflected in the development of concrete local applications to reduce risk.

2

The efforts of local governments and authorities still predominantly focus on post-disaster response and recovery, and these processes often do not fully benefit from existing national and local S&T expertise. In a warming world characterized by a broader and more challenging risk landscape, national and local authorities need to shift away from an ineffective and isolated focus on post-disaster strategies. Instead, they should adopt integrated and multi-hazard approaches[1] to risk reduction, with full support from S&T communities as well as other relevant stakeholders.

[1] https://council.science/wp-content/uploads/2020/06/UNDRR_Hazard-Report_DIGITAL.pdf

3

There are still gaps in the science–policy–practice interface preventing the effective use of scientific evidence in policy-making and action at a local level. The value of co-creation among experts, policy-makers and practitioners is not sufficiently acknowledged and promoted in science and practice. Mechanisms and capabilities for working at the science–policy–practice interface are often weak or lacking. In addition, the role of the scientific community is often not clearly identified and defined in relation to a specific local government institution, and this hinders effective scientific contribution to actions for DRR.

4

The knowledge–action gap reflects the inadequate engagement of scientists with society at large. Current metrics to assess the performance of scientists and scientific institutions rarely incentivize them to engage in a conversation with society and local actors. In addition, the career path of scientists playing the role of 'knowledge brokers' is not fully legitimized within fully developed science systems. As a result, scientific knowledge and innovation usually published in peer-reviewed academic journals are not translated for different audiences, and therefore are not easily accessible to local practitioners who have a central role in DRR.

5

Not enough early career scientists are involved in the field of DRR, even though their work has been recognized as an important addition to that of other stakeholders engaged in policy design, implementation, monitoring and review. New perspectives are needed to assess a constantly changing environment altered by climate change.

CASE STUDY: A MULTI-STAKEHOLDER PARTNERSHIP FOR LOCAL DISASTER RISK REDUCTION IN MÉRIDA, VENEZUELA

In terms of human and economic losses, earthquakes, floods and landslides are among the biggest disaster risks in Venezuela. Mérida State, located in the west of the country, has been one of the hardest hit areas: during the 500 years of recorded seismic activity in the country, it has been completely devastated on a number of occasions. Even though national and local authorities are aware that another large earthquake could hit Mérida at any time, a disaster risk strategy that could increase preparedness for response and recovery, and thus strengthen resilience, has not been put in place.

A risk assessment can help support the design of policies and investments for an effective risk reduction strategy. However, it is a data-intensive process that involves gathering information from a wide range of stakeholders. In Mérida, a successful collaborative partnership has promoted an improved understanding of local risks and helped design appropriate responses with multiple co-benefits. The partners involved include local government and institutions, local and national universities, national research institutions and international organizations. Local, national, and international data and knowledge were integrated to develop a local disaster risk strategy using the analytical tool Hazus[2].

Integrating disaster preparedness into the culture of governance can take many years. In Mérida, where efforts are locally owned by stakeholders and the scientific community, the city's disaster risk strategy plan is moving forward.

CASE STUDY: DESIGN AND IMPLEMENTATION OF EARLY WARNING SYSTEMS IN LONGCHI TOWN, SICHUAN, CHINA

Longchi Town, Sichuan Province, is in the southwest of China, approximately 3 km from the epicentre of the 2008 Wenchuan Earthquake. Due to post-earthquake fractured rock and loose soil on steep slopes, Longchi has repeatedly suffered mass movements such as landslides and debris flow. The most destructive debris flow events occurred in August 2010, causing 495 casualties and substantial economic losses, with almost all houses and roads near the river and gullies being destroyed.

To reduce the risk posed by such disasters, scientists were engaged by the Longchi town council to provide solutions that best suited local conditions. Given the local social-economic situation, it was decided that the DRR measures should be *cost-effective*, *demand minimal technical knowledge from end-users* and *cover as much area of the town as possible*.

A three-step procedure was implemented. Firstly, following the risk assessment, medium- and high-risk regions were prioritized to receive DRR measures. Secondly, due to the limited budget, a rainfall-triggered early warning system (EWS) – rather than debris flow dams – was selected as the main tool of DRR. The proposed EWS was tailored using thresholds derived by scientists, and integrated new monitoring technology on flow velocity and density. Thirdly, disaster response planning mainly focused on the evacuation process. Agent-based modelling was adopted to simulate the evacuation process after a disaster warning was received, and the most efficient escape routes to safety shelters were identified. These routes were marked in every village using a signboard and training was provided to residents. This system worked very well when flash floods and debris flow struck the town in 2020, and no casualties occurred.

This case study shows how S&T can help decision-makers prepare for disasters even within a limited budget. In this example, the DRR objective was to minimize casualties rather than control property losses. EWS was therefore adopted as an appropriate and less stringent approach.

[2] Bendito A., Rozelle J., Bausch D., 2014. Assessing potential earthquake loss in Mérida State, Venezuela. *International Journal of Disaster Risk Science* Vol. 5, No. 2, pp. 176–191

FROM SCIENCE TO ACTION: THE NEED FOR KNOWLEDGE INTEGRATION AND BROKERAGE TO ACHIEVE HOLISTIC RISK MANAGEMENT

The need to bolster science–policy–practice interfaces

All too often, action to reduce disaster risk is not supported by the S&T expertise available at national and local levels. Frequently, the latest research is not readily available or effectively reflected in local efforts to reduce risk. For example, prior to the 2015 Nepal earthquake, building standards existed but were written in technical English and therefore not easily accessible to local communities and professionals such as stone masons. This could be one of the reasons why more than 80% of housing was built with no adherence to formal construction guidelines, and was therefore for the most part destroyed by the 2015 earthquake[3]. Similarly, building guidelines for post-harvest facilities that were developed in Rwanda to deal with problems such as post-harvest losses have still not been implemented. Rwanda is currently following for its urban development British Standards and standards set by the European Committee for Standardization, neither of which address local environments or hazards[4].

In some cases, local government institutions are able to mobilize expertise – for instance through their national disaster management office. In the aftermath of a major disaster event, experts can be called upon to analyse the causes of the disaster. However, these experts' reports are not necessarily highly valued as 'state-of-the-art' academic papers, even though such enquiries can have significant impact in terms of enhancing awareness and preparedness for future disasters. An important example in this regard is the 2009 Victorian Bushfires Royal Commission, which was set up to conduct an extensive investigation into the causes of, preparation for, response to and impact of the fires that burned throughout Victoria, Australia in late January and February 2009[5]. This commission ultimately aims to reduce the risk of such a tragedy occurring again in the future.

One of the key factors leading to insufficient uptake of scientific evidence in the shaping of DRR policies to support action and implementation is the communication gap between scientists and policy-makers. This is in part due to an absence of institutions, structures and spaces for enabling dialogue. Without such structures, researchers and relevant stakeholders are prevented from co-creating knowledge, driving effective uptake of evidence and strengthening science–policy–practice interfaces. The COVID-19 pandemic has demonstrated the need for such structures, and an institutionalized role of science to ensure that policy responses and solutions are supported by the latest and best available scientific knowledge.

Addressing the science–policy–practice gap is also of critical importance in realizing the necessary shift in emphasis from managing disasters to preventing and managing risks. Given the existing global trend towards more complex and compound risks with multiple drivers and the potential for cascading impacts, effective DRR requires a systems approach. Central to this approach is the engagement of a wide range of scientists and scientific disciplines, as well as various stakeholders, at the science–policy–practice interface.

Improved communication of scientific evidence, and a strengthened dialogue and collaboration in the processes of co-creation, requires scientists, policy-makers and practitioners to work together at this interface. In particular, it requires a mutual understanding of the methods, practices and values of the communities engaged, as well as the existence of mechanisms facilitating the iterative framing of questions and joint analysis of evidence. This includes, for example, identifying new ways of clarifying and structuring complex problems so that they are accessible to policy-makers and practitioners (e.g. multi-risk maps).

[3] Ahmed, I., Gajendran, T., Brewer, G., Maund, K., von Meding, J., Kabir, H., Faruk, M., Shrestha, H.D., Sitoula, N. Opportunities and challenges of compliance to safe building codes: Bangladesh and Nepal. *APN Science Bulletin* Vol. 9, No. 1. DOI https://doi.org/10.30852/sb.2019.834

[4] Bendito, A., Twomlow, S. 2014. Promoting climate-smart approaches to post-harvest challenges in Rwanda. *International Journal of Agricultural Sustainability* Vol. 13, Issue 3, pages 222–239

[5] http://royalcommission.vic.gov.au/Commission-Reports/Final-Report.html

Transforming science systems to better support implementation

Academic and research institutions generate a wealth of S&T knowledge. However, most of the time this knowledge is published only in international peer-reviewed academic journals often written in English and not translated into any other language. Such a narrow presentation of S&T knowledge, and the way in which research is evaluated and rewarded through competitive research grants, are major obstacles to implementation and progress on DRR. More efforts are needed in dissemination, science communication, and public outreach to translate and transfer scientific knowledge to the public.

To rectify the situation, greater attention should be paid to assessing how the findings of peer-reviewed publications incorporate local knowledge and experience and examine the roots of disaster risk, so that they can better contribute to improved decision-making at the local level. Scientists and practitioners should work together on joint reviews of scientific findings and local experiences in order to develop knowledge that is useful, relevant and credible. In addition, the practical achievements of DRR scientists working as 'knowledge brokers' at the science–policy–practice interface should be better acknowledged in academic societies and rewarded accordingly.

POLICY RECOMMENDATIONS

Recommendation 1

Local authorities in cooperation with science institutions should establish multi-stakeholder knowledge-sharing platforms to enable local DRR stakeholders to access and benefit from existing scientific knowledge, data and technological innovations. Access to knowledge, lessons learned and best practices compatible with local geographic conditions, governance and development contexts are essential to ensure the effectiveness of risk management and the full participation of local communities. The introduction of external experiences, lessons and resources can only be effective when on-site stakeholders are fully engaged in pursuing disaster resilience and sustainable development. One example of such networks is the Making Cities Resilient 2030 initiative, which aims to improve local resilience through advocacy; share knowledge and experiences, as well as resources and tools; connect multiple layers of government; and build partnerships[6]. Another example is the Building Information Platform Against Disaster (BIPAD) Portal in Nepal, developed with support from the Youth Innovation Lab.

CASE STUDY: INFORMATION PORTAL DEVELOPED BY YOUNG PROFESSIONALS IN NEPAL

Many local municipalities in Nepal lack the capacity to collect, manage and use DRR information for informed decision-making. To address this issue, and to help local municipalities obtain up-to-date and comprehensive DRR information, the Innovation Lab of Nepal (YI-Lab)[7] provided technical expertise to support the Ministry of Home Affairs and the National Disaster Risk Reduction and Management Authority in developing the Building Information Platform Against Disaster (BIPAD) portal.

BIPAD is an integrated disaster data portal allowing easy access to and visualization of spatial and temporal data for risk alerts, incidents and real-time damage and loss – along with hazard, risk and climate change information – on a single platform. The portal integrates scientifically sound data on the risks, vulnerability and exposure of local communities to natural hazards. It is equipped with new tools such as 'impact-based forecasting', which combines flood forecasting with vulnerability and exposure information to help decision-makers analyse risk and undertake effective early action.

Many young professionals have been placed with local municipalities to provide training on BIPAD and transfer technical capacity to local youth and governments. So far, some 40 local municipalities have benefited from the work of YI-Lab and are able to use the BIPAD portal. It is expected that eventually all municipalities in the seven provinces of the country will benefit from the portal.

[6] https://mcr2030.undrr.org/
[7] https://www.youthinnovationlab.org/about

Recommendation 2

To empower local government leaders and enhance their capacity to implement DRR, the interface between science, policy and practice must be strengthened. This requires building institutional capacity, and the individual skills of scientists, to deliver effective scientific and technical advice through synthesizing available knowledge and translating it for different users. Likewise, it is essential to build the capacity of local governments to effectively work with and systematize the use of scientific and technical knowledge in decision-making and policy development. The scientific institutions participating in national platforms for DRR must also provide support in this regard. The International Network for Government Science Advice[8], an affiliated body of the ISC, represents an example of a global network aimed at sharing experiences, building capacity and developing theoretical and practical approaches to using scientific evidence to inform more effective policy-making.

Recommendation 3

Local authorities and scientific communities should foster the development of knowledge brokerage and evidence synthesis[9] to identify the DRR S&T knowledge fit for particular localities, in order to support implementation and help in co-producing knowledge along with decision-makers and communities. This could take the form of 'facilitators'[10] working at the interface between local authorities, universities, disaster research centres, scientific institutions, practitioners and civil society. Such a role would include identifying knowledge and technical support needs, facilitating open access to information, and disseminating good practice and success/failure stories from other locations, as well as lessons learned to improve future action. The facilitators would be key in supporting the establishment of partnerships or multi-sector alliances on particular issues or for particular geographic regions. Scientific communities should foster the role of facilitators in collaboration with local universities, disaster research centres and scientific institutions, and in mutual cooperation with wider society. In addition, such facilitator roles should be better acknowledged and rewarded by academic institutions in order to encourage more scientists to choose this career path.

CASE STUDY: MOBILIZING A NURSING RESPONSE TO DISASTER RISK IN NEPAL

Nepal is one of the most disaster-prone countries in the world and faces many natural hazards: earthquakes, landslides, cold waves, floods and more. At the same time, the number of doctors and nurses per 1,000 population in the country is significantly lower than that recommended by the World Health Organization, and the national healthcare system is overstretched and lacks reliable health data.

Following a major disaster, most nurses mobilized to disaster sites tend to be emergency nurses, who have experience in hospital-based rather than community-based care. As a result, they are unfamiliar with the local community. On the other hand, local nurses who reside in a disaster-affected area know their community but lack a bird's-eye view and the multifaceted perspectives necessary for mitigating future disasters.

Nepal's EpiNurse project[11] attempts to equip local nurses with the skills and technology necessary to deal with disasters and disaster risk. Local epidemiology nurses working in the community were provided with smartphones with health surveillance apps, and given workshop training. They were then mobilized to remote shelters to assess communicable diseases in the rural population. An innovative ICT reporting and mapping system was developed to collate and share the daily epidemiological monitoring data. Surveillance was carried out to evaluate the local living environment using a participatory approach, and vital information was shared with government, donors and other relevant authorities.

Based on its success, EpiNurse was awarded the 2017 Risk Award on the occasion of the 2017 Global Platform for Disaster Risk Reduction in Cancún, Mexico.

[8] https://ingsa.org/about/

[9] Evidence synthesis and knowledge brokerage are two distinct components of science advice: evidence synthesis aims to establish the state of available knowledge on a given issue through a range of methods including literature reviews, scientific assessments and expert inputs; and knowledge brokerage is essentially about bringing scientific evidence to bear by helping decision-makers to interpret scientific information, and its meanings, implications and limitations, in order to inform deliberations and decision-making (https://council.science/wp-content/uploads/2020/06/Science-advice_ISC_INGSA-updated-24022022.pdf).

[10] https://www.scj.go.jp/ja/info/kohyo/pdf/kohyo-24-t298-1en.pdf

[11] EpiNurse project in Nepal was initiated by the Disaster Nursing Global Leadership Program, the University of Kochi, the Japanese Society of Disaster Nursing, the World Society of Disaster Nursing, the Nursing Association of Nepal, Tribhuvan University and Ateneo De Manila University. https://www.epinurse.org/

Recommendation 4

Universities and research institutions should incentivize students and scientists, including early career researchers, by offering training opportunities to develop skills to support the co-production and implementation of context-specific solutions, strategies and policies that enhance DRR. Scientists tend to specialize only in their own area of expertise: they are seldom given a chance to develop holistic thinking. Universities should therefore improve their curricula in order to promote empirical work that supports the development of implementation science using transdisciplinary, co-production and systemic approaches. One example of a university network involved in such DRR capacity building is Periperi U[12], which is a significant endeavour that has brought together universities from twelve African countries.

Recommendation 5

Mechanisms should be established at national, regional and international levels to create enabling environments that allow early career scientists to play a central role in co-creating and sharing knowledge. To this end, support is required for existing and emerging networks of young researchers and practitioners – such as the U-INSPIRE Alliance and its national divisions and IRDR (Integrated Research in Disaster Risk) Young Scientists. The ISC recently announced that it would prioritize the development of stronger collaborations with young academies and associations as a way of more actively engaging these networks in international science organizations. Further, governments and international DRR organizations need to explore concrete means of support, including for instance technical training, the promotion of best practices and the provision of seed funding.

CASE STUDY: BUILDING COLLABORATION THROUGH THE U-INSPIRE ALLIANCE

Formed in 2018, the U-INSPIRE Alliance is a network of youth, young scientists and young professionals (YYP) working in science, engineering, technology and innovation, and non-governmental organizations to support DRR and resilience building. U-INSPIRE Alliance has grown into 12 national divisions comprising nearly 1,000 YYPs[13].

A primary function of the U-INSPIRE Alliance is to create experimental spaces for collaboration among scientists, policy-makers, governments, private sector entities, social entrepreneurs and civil society organizations. A series of U-INSPIRE Talks has been organized online on the subjects of school safety, early warning systems, DRR knowledge management, nature-based DRR solutions, and reflections on past and present DRR experience. The national divisions are also active in organizing workshops, training sessions and practical experience exchanges.

It is expected that, with further support from DRR research communities, youth networks like the U-INSPIRE Alliance will become key players in connecting developments in S&T with national and local practices in need of support.

Recommendation 6

Local governments and funders, as well as research institutions, should be more proactive about developing funding streams or assigning existing funding towards the aforementioned recommendations. By doing so, they can ensure that existing DRR resources and incentives are aligned in new ways, including engaging youth or incentivizing scientists to connect with local practitioners and stakeholders, and creating new local DRR functions and mechanisms for more effective transfer and utilization of existing evidence (e.g. through facilitators). Current funding cycles and patterns obviously do not incentivize enough, nor do they go in the direction of supporting these efforts. This action is therefore key for moving towards new systems in which local DRR work is informed, cooperative and preventative – rather than uninformed, siloed and too often focused on post-disaster responses.

[12] https://www.riskreductionafrica.org/about.html
[13] https://uinspirealliance.org/

Cover image
Women carrying clean water to their homes from a water source far from the village, Abeche, Chad. (Photo: Amors photos / Shutterstock).

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The ISC coordinates the Scientific and Technological Community Major Group for the Sendai Framework for Disaster Risk Reduction, aimed at strengthening the input from the scientific community into disaster risk reduction processes in the multilateral space and at advancing a strong science-policy interface for an ambitious and integrated approach to achieving risk-informed development.

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