Chapter 1. IRDR: an evolving science programme

This Integrated Research on Disaster Risk (IRDR) Compilation is made at a critical conjuncture in time. Five years after the Sendai Framework for Disaster Risk Reduction was launched in 2015, and at the beginning of the UN's Decade of Action for Delivering Sustainable Goals, the world's communities expect science to play a stronger, more innovative, and more productive role in the coming years to generate the changes and transformations towards a safer, more inclusive, equitable, and sustainable world.

To move forward, it is important to first look back, to learn from and be inspired by the past. IRDR represents one of the early attempts of international science communities to bring together researchers from their various research areas to work together to tackle disaster risk, a common and complicated challenge facing human societies. Over the course of ten years, much has changed. For example, public health related risk was not marked at the beginning as a priority research area for IRDR except as related to direct impact of natural disasters. Obviously, this is no longer the case. Indeed, even before the Covid-19 pandemic came into the picture, IRDR was increasingly aware of the developing need to consider the risk of public health. Our understanding on hazard, risk, vulnerability, and exposure, in particular as to systemic and cascading nature of risks, is constantly evolving and more comprehensive than 10 years ago. It is important to note, however, that such improvement stemmed and benefitted from the initial design of IRDR mission and programme setting. Many thanks are therefore due to those individuals who helped to craft the IRDR Science Plan during 2007-2009 for their innovative and far-sighted work.

1.1 Initial rationale and programme setting[1]

The International Council of Science (ICSU) Priority Area Assessment on Environment and its Relation to Sustainable Development and the ICSU Foresight Analysis both underlined 'Natural and human-induced hazards' as an important emerging issue. The executive summary of the ICSU Priority Area Assessment on Capacity Building in Science pointed out the widening gap between the advances in science and technology and society's ability to capture and use them. The ICSU Planning Group (established in 2006) concluded that, beyond the then existing or

1 The content of this section is mainly extracted from the original Science Plan (International Council for Science, 2008).

planned work on natural hazards, an integrated research programme on disaster risk reduction, sustained for a decade or more and integrated across hazards, disciplines and geographical regions, was imperative. The Planning Group viewed such a research programme as one whose value would rest with the close coupling of the natural, socio-economic, health and engineering sciences, and recommended that it be named IRDR – addressing the challenge of natural and human-induced environmental hazards (acronym: IRDR).

Looking back today, there is much foresight in the formulation of IRDR's scientific rationale, with the following arguments considered:

- Natural disasters are a global issue and they can result in great loss of human lives, livelihoods and economic assets in both developed and developing countries. Hundreds of thousands of people are killed and millions injured, affected or displaced each year because of disasters, and the amount of property damage has been doubling about every seven years over the past 40 years. Part of the increase in numbers of disasters reported in disaster statistics may be explained by the increasing numbers of smaller and medium-level events that are registered as being related to natural and human-induced or socio-natural phenomena, and by better reporting mechanisms. Nonetheless, the increasing trend make this an increasingly serious issue.

- Natural disasters are capable of cancelling out development gains, and the risk to development stemming from disasters was clearly recognized by UN Member States in the Millennium Declaration (2000), with the growing losses seen as a major constraint towards meeting the Millennium Development Goals.

- In many parts of the world, especially hazard-prone areas, poverty and population growth mean that more people and communities are at risk from natural hazards. The context in which natural hazard events occur is changing rapidly. In examining effective approaches to risk reduction, it is necessary to understand the extent to which the increase in hazard losses can be attributed to the rapid growth in human numbers and the wider spread of human settlements, and how much is contributed by the manner in which the growth and/or development takes place.

- Human interventions in the environment can also increase the numbers and types of hazards and vulnerability to natural hazards. Globalization results in a world more closely interconnected, with changing senses of responsibility towards countries and localities. The movement of people, trade, communications and financial flows are all increasing rapidly. Hazard events, even in remote places, can have repercussions at a great distance. When they occur in the centres of world trade, finance, and communications, the impacts can be global. Hence, environmental disasters, wherever and whenever they occur, have become a common concern of humankind. Indeed, some (though not all) would say, a common responsibility.

- Globalization also impacts the geophysical environment in new ways. The most salient, though not the only, example is climate change. Although the impacts of climate change are highly varied from place to place, there are connections between some of the related events. The acceleration in the pace of scientific and technical advances has occurred in a time-frame that is short compared with the return frequency of the most extreme events, so that society has only a limited experience base with the new emerging vulnerabilities.

- Changes in the global climate will continue to alter the risks associated with natural hazards. According to the Intergovernmental Panel on Climate Change (IPCC), climate change is accelerating. While the linear warming trend over the last 50 years (0.13°C per decade) was nearly twice that of the last 100 years, a warming of about 0.2°C per decade is projected for the next two decades. With

that will come, over the 21st Century, more frequent hot extremes, heat waves and heavy precipitation events (very likely), and more areas affected by drought (likely). Widespread changes in extreme temperatures and more intense and longer droughts have been observed over the past few decades. Extra-tropical storm tracks are projected to move poleward, with consequent changes in wind, precipitation and temperature patterns.

- As the tropical sea-surface temperatures increase, it is likely that future tropical cyclones (typhoons and hurricanes) will become more intense, with larger peak wind speeds and more instances of heavy precipitation. Glacier- and permafrost-related hazards such as glacier lake outburst, ice and rock avalanches and impacts on installation foundations are strongly connected to climate change and increasingly threaten human settlements and infrastructure. There is also the possibility of abrupt climate change occurring over relatively short periods of time, leading to increased risks of some hazards. These risks need to be accounted for in the risk analysis.

- Looking at the international context and the Hyogo Framework for Action (HFA) from the World Conference on Disaster Reduction, in particular the agreed expected outcome and strategic goals, the following items are key:

> 3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels
>
> …
>
> (iii) Research
>
> (n) Develop improved methods for predictive multi-risk assessments and socioeconomic cost–benefit analysis of risk reduction actions at all levels; incorporate these methods into decision-making processes at regional, national and local levels.
>
> (o) Strengthen the technical and scientific capacity to develop and apply methodologies, studies and models to assess vulnerabilities to and the impact of geological, weather, water and climate-related hazards, including the improvement of regional monitoring capacities and assessments.

- Research to identify and analyse successful risk reduction programmes is very important. For the field of disaster risk reduction, there is neither an established and ongoing scientific assessment process, like the IPCC, nor an internationally planned and coordinated scientific research programme. IRDR would fill that latter gap.

It is important to note that at that time, the emphasis of IRDR research was on natural hazard related risks. Echoing the IRDR Science Plan, the programme focused on hazards related to geophysical, oceanographic and hydrometeorological trigger events; earthquakes; volcanoes; flooding; storms (hurricanes, typhoons, etc.); heat waves; droughts and fires; tsunamis; coastal erosion; landslides; aspects of climate change; space weather and impact by near-Earth objects. The effects of human activities on creating or enhancing hazards, including land-use practices, were included. This focus on risk reduction and the understanding of risk patterns and risk-management decisions and promotion thereof at all scales from the local through to the international level. On the other hand, the IRDR Programme would deal with epidemics and other health-related situations only where they were consequences of one or more of the aforementioned events. Further, technical and industrial hazards and warfare and associated activities would not be included per se.

IRDR was also foreseen to leave the legacy of an enhanced capacity around the world to address hazards and make informed decisions on actions to reduce their impacts, such that in ten years, when comparable events occur, there would be a reduction in loss of life, fewer people

adversely impacted, and wiser investments and choices made by governments, the private sector and civil society. Comparing such with the much more recent 2015 Sendai Framework 2015-2030 for Disaster Risk Reduction (Sendai Framework) and its priorities, which serves as the document directing international cooperation on DRR till 2030, one has to agree the founders of IRDR were insightful and visionary in crafting the mission of IRDR back in 2006.

IRDR, a decade-long research programme, was established with the co-sponsorship of the International Science Council (itself established from the merger of the International Council for Science (ICSU) and the International Social Science Council (ISSC) in 2018), and the United UNDRR through a 10-year agreement with the CAST, which generously committed funding of equivalent to 300,000 Euro per year for a period of ten years[2] towards programme operations of the international programme office (IPO), and the CAS and its Aerospace Information Research Institute (AIR)[3], which agreed to host the IRDR International Programme Office (IRDR-IPO) for programme execution. IRDR-IPO, located in Beijing, thus became the first office of ICSU Interdisciplinary Body hosted in Asia. In parallel, CAST provided substantial funding per year to enable the Chinese scientists to carry out DRR research through IRDR cooperation.

Scientifically, IRDR is governed by a 14-member Scientific Committee (SC) set up by and on behalf of the Co-Sponsors. Its responsibilities are to define, develop and prioritise plans for the IRDR, guide its programming, budgeting and implementation, establish a mechanism for the oversight of programme activities, and disseminate and publicise its results. The SC is comprised of disaster and risk reduction experts from around the world. Members are chosen based on their standing in the international scientific community and their commitment to the strategic objectives of the Programme. The Committee aims to include a balanced representation of relevant disciplines in the natural, social and engineering sciences, taking into consideration regional and gender balance. A complete list of scientists who have served in the SC is provided in the Annex 8.

IRDR National Committees (NCs) and Regional Committees (RCs) support and supplement IRDR's research initiatives, and help to establish or further develop crucial links between national disaster risk reduction programmes and activities within an international framework. NCs and RCs help foster the much-needed interdisciplinary approach to disaster risk reduction within national scientific and policy-making communities, and serve as important national focal points between disciplinary scientific unions and associations.

IRDR International Centres of Excellence (ICoEs), established by the SC and the relevant NC(s) when applicable, provide regional and research foci for the IRDR programme. ICoE research programmes embody an integrated approach to disaster risk reduction that directly contributes to the ICSU/IRDR Science Plan for IRDR and its objectives, as well as the IRDR Strategic Plan (2013-2017). ICoEs and IRDR projects are collaborative in nature and geared towards global contributions to the intended IRDR legacy. In particular, ICoEs enable regional scientific activities through geographically-focused contributions based on more localised inputs, and act as visible centres of research to motivate participation in the IRDR programme. Figure-1 summarizes the overall functional structure of IRDR.

An important method by which IRDR conducts research is through its IRDR Working Groups (WGs). These WGs are comprised of experts

2 Based on an agreement between the above parties in 2020, the programme and its IPO have been extended to the end of 2021.

3 The host institution was named the Center for Earth Observation and Digital Earth (CEODE) when IRDR IPO was established. In 2012, CEODE merged with other institutes in CAS and became Institute of Remote Sensing and Digital Earth (RADI). In 2019, RADI merged with other institutes in CAS and became Aerospace Information Research Institute (AIR).

from diverse disciplines, and work to formulate new research methodologies, and to address shortcomings and weaknesses of in current disaster risk research. IRDR comprises six WGs, as illustrated in Figure 1-2. They cover a wide range of topics, including: disaster loss data and data systems, underlying drivers and social-environmental factors of disaster risk, risk interpretation, assessments of current integrated risk research, the connections between DRR, climate change and sustainable development goals, and synthesizing national reporting. The detailed specific contributions of these WGs are provided in Chapter II.

In 2016, IRDR further extended its mandate for integrated and trans-disciplinary research through capacity building by creating the IRDR Young Scientists Programme (YSP). IRDR's YSP encourages young researchers to undertake innovative, need-based and cross-cutting studies, and in doing so, to enhance science-policy and science-practice linkages in particular.

Figure 1-1: IRDR functional structure.

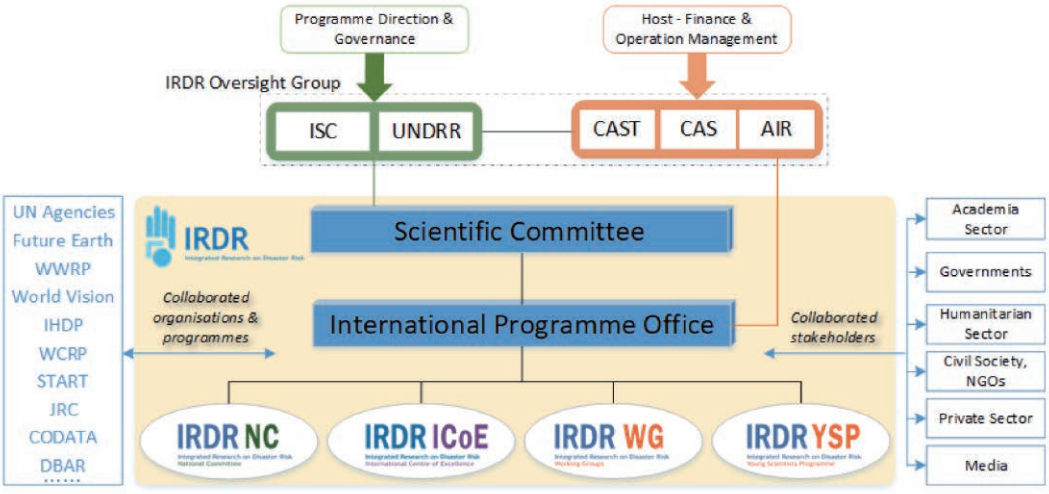


Figure 1-2: Six IRDR Working Groups under IRDR Scientific Committee.

1.2

Mission, Research Objectives and Cross-cutting Themes

IRDR's mission is to develop trans-disciplinary, multi-sectorial alliances for:

- in-depth, practical disaster risk reduction research studies, and
- the implementation of effective evidence-based disaster risk policies and practices.

Research Objectives:

The research objectives of IRDR were proposed to, when projects make successful contributions to them, lead to understanding of hazards and vulnerability and risk and enhanced capacity to model and project risk into the future; to the understanding of the decision-making choices that lead to risk and how they may be influenced; and how this knowledge can better lead to disaster risk reduction.

Objective 1: Characterisation of hazard, vulnerability and risk.

This objective concerns the identification and assessment of risks from natural hazards on global, regional and local scales, and the development of the capability to forecast hazardous events and their consequences. Recognizing that risk depends on hazards, exposure and vulnerability, the research will be of necessity interdisciplinary. Understanding of the natural processes and human activities that contribute to vulnerability and community resilience will be integrated to reduce risk. The objective addresses the gaps in knowledge, methodologies and types of information that are preventing the effective application of science to averting disasters and reducing risk.

The objective can be further broken down into three sub-objectives:

1.1 Identifying hazards and vulnerabilities leading to risks;

1.2 Forecasting hazards and assessing risks; and

1.3 Dynamic modelling of risk.

Objective 2: Effective decision-making in complex and changing risk contexts

This objective focuses on understanding effective decision-making in the context of risk management – what is it and how it can be improved. Closely connected with the other objectives, the emphasis here is on how human decisions and the pragmatic factors that constrain or facilitate such decisions can contribute to hazards becoming disasters and/or may mitigate their effects. The political, institutional, cultural and economic aspects of decision-making and behaviour are important and need to be explored. The salience of strategic societal choices, and of competing rationalities, which cannot be subsumed within the language of risk and risk management, is recognized, a broader context that is addressed by the Programme as the research moves beyond a simple management framework to lay out the complexity of the political and social challenges encountered.

This objective too can be broken down into three specific sub-objectives:

2.1 Identifying relevant decision-making systems and their interactions;

2.2 Understanding decision-making in the context of environmental hazards;

2.3 Improving the quality of decision-making in practice.

Objective 3: Reducing risk and curbing losses through knowledge-based actions.

'Reduction of risk' refers to all the factors that contribute to growing hazards and disaster losses and is generally the overall objective for the IRDR Programme. Objective 3 integrates outputs from Objectives 1 and 2. The central thrust of research under this Objective is therefore to investigate how to combine the understandings from many different fields of expertise into an integrated understanding of the causes of disaster in order to provide practical guidance on the risk reduction and the curbing of losses. Research under Objective 3 develops a new approach to understanding rising risks by bringing to bear and integrating to the extent practicable all existing knowledge of risk factors, hereby providing better diagnoses and laying a scientific basis for more effective policies and actions.

Specifically, there are two separate sub-objectives:

3.1 Vulnerability assessments;

3.2 Effective approaches to risk reduction

Cross-cutting Themes:

Three cross-cutting themes further support these objectives.

Theme 1: Capacity building

Capacity or capability can be defined as a combination of all the strengths and resources available within a community, nation or region that can reduce the level of risk, or the effects of a disaster. It includes physical, institutional, social or economic means such as financial, political and technological resources, as well as skilled personal or collective attributes such as leadership and management at different levels and sectors of the society. Capacity building aims to develop human skills and societal infrastructures within a community, nation or region in order to reduce the level of risk.

The objectives would be to:

1.1 Map capacity for disaster reduction;

1.2 Build self-sustaining capacity at various levels for different hazards;

1.3 Establish continuity in capacity building.

Theme 2: Case studies and demonstration projects

IRDR SC is to commission and encourage case studies to identify major research needs and gaps at the interface of natural and social sciences, focusing in particular on analysing crises or disasters caused by natural phenomena from which lessons can be learnt. The case studies would involve a wide range of hazards, scales, geographical regions, cultural and economic contexts.

Theme 3: Assessment, data management and monitoring

In order to be able to determine the consequences of environmental hazards and disasters in terms of their impacts and effects, one needs baseline monitoring so as to provide the characteristics of the undisturbed environment and its populations, as well as episodic monitoring to provide the magnitude of the environmental hazard and the severity of the impacts and effects that led to the hazard becoming a disaster. For the disaster prevention and recovery community to be able to use such data it is important that a mechanism be in place to permit timely production and dissemination of easy-to-use, accurate and credible information to the appropriate authorities. To be able to achieve such a goal requires both long-term ground-based and remotely sensed monitoring, pre-determined methodologies for data presentation, and identification of the gaps in our ability to rapidly provide this information to the disaster managers.

Specifically, the objectives would be to:

3.1 Develop Guidelines for consistent data management and assessments of hazards, risk and disasters;

3.2 Apply local assessments globally and global assessments locally.

Through successful work on the aforementioned themes, especially by looking at successful case studies and demonstration projects, and improving data management and monitoring of hazards, risks and disasters, global capacity building and increased recognition of the value of risk reduction activities are likely to be maximized. These are the global benefits the Programme hopes to achieve.

Box 1-1: Comments from SC members

Jane Rovins

First Executive Director (2010-2013)

The IRDR mission was originally and continues to be important and relevant. The idea of bringing together social and natural sciences and research to inform policy and practice is as relevant today as it was 10 years ago when we opened the IPO. The Science Plan was a good starting point but needed clearer goals especially as it was several years old (i.e. a little out of date) by the time the IPO was opened and the IRDR programme got started. It needed to be reviewed and updated once the Sendai Framework was released.

Sálvano Briceño

IRDR Scientific Committee Chair (2011-2013), Member (2013 – 2017)

The IRDR Programme was established in 2008 as an international scientific complement to the UNDRR (formerly UNISDR), an international policy programme that followed the IDNDR (1990-1999) programme, which itself had a strong scientific component. Once the UNISDR was established in 2001, it was clear that its work required scientific guidance and advice. In this regard, it was evident that ICSU (now ISC) was the relevant organization with whom to partner in such an effort. Close collaboration was initiated on behalf of ICSU by Robert Hamilton (US NAS and former Director of IDNDR). He was followed by Gordon McBean, who led the establishment of the IRDR programme in collaboration with the UNISDR in 2008. IRDR and its Science Plan have informed the DRR international policy frameworks including both the 2005 HFA and its follow-up, the 2015 Sendai Framework. An earlier framework, the Yokohama Strategy and Plan of Action, which was formulated during the IDNDR process, provided IDNDR with relevant initial policy recommendations. The initial question that motivated the launching of the IRDR, remains as relevant in 2020, and indeed has taken on even greater urgency: *Why, despite advances in the natural and social science of hazards and disasters, do losses continue to increase?*

J.Richard Eiser

IRDR SC member (2009-2016). Previously, member of ICSU Planning Group (2006-2009) which lead to IRDR

In my opinion, the main achievement of the IRDR programme during the time of my involvement was the establishment of a truly interdisciplinary agenda for disaster risk research. Within the programme, I was particularly involved in the Risk Interpretation and Action (RIA) working group, the main output of which was the following article: *Eiser, J.R., Bostrom, A., Burton, I., Johnston, D.M., McClure, J., Paton, D., van der Pligt, J. & White, M.P. (2012). Risk Interpretation and action: A*

conceptual framework for responses to natural hazards. International Journal of Disaster Risk Reduction, 1, 5-16.

Although we made a major conceptual contribution in terms of agenda-setting, the fact that IRDR did not directly fund primary research meant that we all had to rely on funding agencies that were typically less international and interdisciplinary in their focus. Plus, I don't recall any serious discussion of the potential disaster risk of a pandemic like we are now experiencing.

Rajib Shaw

Executive Director (2016-2017), Member (2017-onwards)

Disaster Risk Reduction (DRR) is a fast-growing subject, and the context changes rapidly. One of the key aspects for the duration of the Science Plan was the formulation of the Sendai Framework and a few other important global frameworks like the Sustainable Development Goals (SDGs), the Paris Agreement, the New Urban Agenda etc. All these are inter-connected, and the relevance to IRDR mission and Science Plan is also very important. The Science Plan was formed at an early stage of HFA, and that's why it is aligned with HFA. The Science Plan hence focused significantly on hazard research. However, the trend has now moved towards resilience related research, and focuses more on socio-economic contexts. Complex, cascading disasters, climate risks become more prominent in recent years, and policy research on these have become increasingly important. Thus, I find the IRDR Science Plan to have been relevant and a good guide for directing research in the first half of the decade, but faced with new challenges had to reorient itself in the later part of the decade.

Shuaib Lwasa

IRDR SC Member (2013-2018), Vice-Chair (2014-2016), Chair (2016-2018)

My reflections on the science plan is twofold. First the science plan was quite ambitious and novel in mapping out the hazards, their interactions and possible outcomes thus framing an integrated approach to disaster risk. This framework has enabled a discussion that transcends single disaster events and stand alone responses to disasters. This has shaped some of the global and local discussions as well as actions recognizing that are constructed and not natural. This discussion has found its way into the Global Assessment Report on Disaster Risk Reduction (GAR) process of the UNDRR and a growth of a network of DRR professionals coming together as academics, researchers, humanitariansist, private sector and funders that are now organized under a global alliance. Second the science pan laid foundation for breaking new ground in conceptual and methodological approach to disaster risk management. By highlighting disasters as part of the core of development, methodological framings including forensic investigation of disasters (FORIN), risk interpretation and action, risk communication and multi-hazard risk analysis, systemic risk and risk and disaster data management that have influenced a discourse of on risk governance and investments.

1.3

From Hyogo to Sendai: IRDR contribution

The Hyogo Framework for Action 2005-2015 (HFA): Building the Resilience of Nations and Communities to Disasters provided critical guidance in efforts to reduce disaster risk and has contributed to the progress towards the achievement of the Millennium Development Goals. However, the implementation of HFA highlighted a number of gaps in addressing the underlying disaster risk factors, in the formulation of goals and priorities for action, in the need to foster disaster resilience at all levels, and in ensuring adequate means of implementation. Ten years after the adoption of the HFA, disasters continue to undermine efforts to achieve sustainable development. Against this background, and in order to reduce disaster risk, the Sendai Framework for Disaster Risk Reduction 2015–2030 was adopted at the 3rd United Nations World Conference on Disaster Risk Reduction (WCDRR).

IRDR actively contributed to and was integrally involved in the efforts to develop the Sendai Framework. IRDR, in partnership with China Association for Science and Technology (CAST) hosted the 2nd IRDR Conference from 7 – 9 June 2014 in Beijing, China on the theme "Integrated Disaster Risk Science: A Tool for Sustainability". The conference emphasised the importance of science as a tool to address hazard risks, integration and partnership. A key cross-sessional discussion considered the influence of science in HFA and preparations for a new DRR framework which developed into the Sendai Framework. The outcomes of the Conference covered issues on DRR research, education, implementation and practice, and policy implementation for the Sendai Framework[4].

IRDR and ICSU acted as the Organizing Partners for the Scientific and Technological Community Major Group (STMG) for the 3rd WCDRR, starting from the First Preparatory Committee Meeting (PrepCom1) in July 2014. IRDR provided an independent collective response to the pre-zero draft, which identified three specific needs, namely to: 1) Develop, on the basis of state-of-the-art prospective knowledge, a forward-looking agenda, notably in terms of linking disaster risk reduction science with the SDGs targets; 2) Emphasise the need for stronger support for science as the foundation for action-oriented cutting-edge knowledge, including necessary monitoring activities; 3) Emphasise the need to better connect national and local levels for the collection and analysis of the necessary vulnerability and loss data as prerequisite for both responsive and preventive planning and investment[5].

Meanwhile, IRDR proposed a '4+2' formula, which it issued as a STMG statement, to support the implantation of Sendai Framework at the 3rd WCDRR[6]. The four lines of action are:

- Assessment. Provide analytical tools to advance a comprehensive knowledge of hazards, risks, and underlying risk drivers → deliver regular, independent, policy-relevant international assessment of available science on DRR,

4 More details on the outcomes of 2014 IRDR Conference can be found on the IRDR website at the below link: http://www.irdrinternational.org/2014/08/21/planetrisk-irdrconference2014/

5 The detailed contribution from IRDR towards the Sendai Framework could be referred to the IRDR Annual Report (2014): https://www.wcdrr.org/wcdrr-data/uploads/579/IRDR%20Annual%20Report%202014.pdf

6 The detailed contributions from IRDR to the 3rd WCDRR can be found in IRDR Newsletter Vol. 6: http://www.irdrinternational.org/wp-content/uploads/2015/05/IRDR-Newsletter_Vol6-No2-April-2015.pdf

resilience and transformations.

- Synthesis. Facilitate the uptake of scientific evidence in policy-making → synthesize relevant knowledge in a timely, accessible and policy-relevant manner.
- Scientific advice. Translate knowledge into solutions → provide advisory capabilities, integrating all S&T fields in collaboration with practitioners and policy-makers.
- Monitoring and review. Support the development of science-based indicators, common methodologies and processes → harness / make use of data & information at different scales.

These are underpinned by efforts in two cross-cutting domains:

- Communication and engagement. Develop closer partnerships between policy-makers, scientists and society as well as between researchers → improve the communication of scientific knowledge to facilitate evidence-based decision-making (at all levels of government and across society).
- Capacity building. Promote risk literacy through curricular reform, professional training and life-long learning across all sectors of society.

Box 1-2: Priorities and Targets of Sendai Framework

The Sendai Framework[7] proposed four priority areas for sectors to take actions:

Priority 1: Understanding disaster risk.

Priority 2: Strengthening disaster risk governance to manage disaster risk.

Priority 3: Investing in disaster risk reduction for resilience.

Priority 4: Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction.

Seven targets were agreed upon, to be measured at the global level, and are to be complemented by work to develop appropriate indicators:

(A) Substantially reduce global disaster mortality by 2030, aiming to lower the average per 100,000 global mortality rate between 2020-2030 compared to 2005-2015;

(B) Substantially reduce the number of people affected [by disasters] globally b 2030, aiming to lower the average global figure per 100,000 between 2020- 2030 compared to 2005-2015;

(C) Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030;

(D) Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030;

(E) Substantially increase the number of countries with national and local disaster risk reduction strategies by 2030;

(F) Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of the framework by 2030;

(G) Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030.

7 https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030

1.4

Responding to the changing DRR landscape/contexts

1.4.1

IRDR Strategic Plan 2013 – 2017

The IRDR Science Plan originally published in 2008 was the fundamental document for the programme operations. After the establishment of IRDR programme, the strategic goals and activities to guide the operation of IRDR were further articulated through the *IRDR Strategic Plan 2013 – 2017*[8]. The original three research objectives and three cross-cutting themes were framed into six concrete goals. Attainment of these goals will lead to a better understanding of hazards, vulnerability and risk; the enhanced capacity to model and project risk into the future; greater understanding of the decision-making choices that lead to risk and how they may be influenced; and how this knowledge can effectively lead to disaster risk reduction.

The overall global benefits of the IRDR programme are dependent on the recognition of the value of risk reduction activities, which are likely to be brought about by concrete evidence arising from case studies and successful demonstration projects; assessments, data management and monitoring of hazards, risks and disasters; and capacity building, including mapping capacity for disaster risk reduction and building self-sustaining capacity at various levels for different hazards.

1. Promote integrated research, advocacy and awareness-raising.

This goal is concerned with developing and promoting integration and collaboration within the disaster risk reduction community to avoid unnecessary duplication and to maximise research outcomes.

2. Characterisation of hazards, vulnerability, and risk.

This goal looks at identifying hazards and vulnerability leading to risks from natural hazards on global, regional and local scales; the development of the capability to forecast hazard events and assess risks; and dynamic modelling of risk. It also addresses the gaps in knowledge, methodologies and types of information that are preventing the effective application of science to averting disasters and reducing risk.

3. Understanding decision-making in complex and changing risk contexts.

This goal focuses on understanding effective decision-making in the context of risk management – what it is and how it can be improved. It looks at identifying relevant decision-making systems and their interactions; understanding decision-making in the context of environmental hazards; and improving the quality of decision-making practices.

8 http://www.irdrinternational.org/2013/04/15/irdr-strategic-plan-2013-2017/

4. Reducing risk and curbing losses through knowledge-based actions.
This goal brings together the outcomes of Goals 2 and 3. It will be accomplished through the implementation of vulnerability assessments and effective approaches to risk reduction.
5. Networking and network building.
This goal focuses on the development, strengthening of and collaboration within the IRDR network at global, regional and national levels.
6. Research Support
This goal focuses on enhancing the support for research and the utilisation of findings.

1.4.2

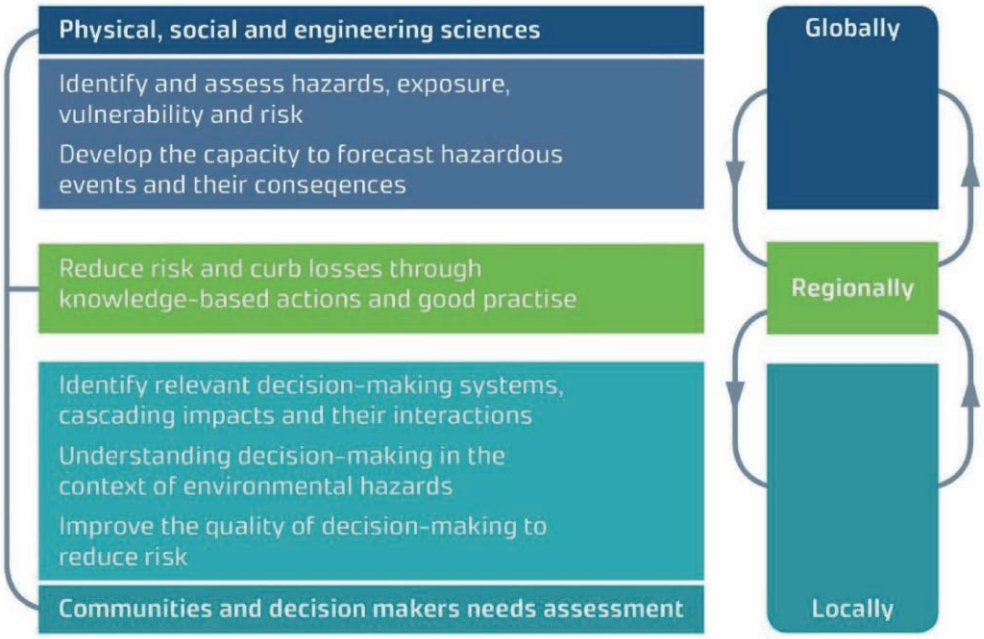
IRDR Action Plan 2018-2020

In early 2016, the three co-sponsors of IRDR commissioned an independent, forward-looking mid-term Review covering the first six years of the ten-year programme. The Review Report suggested "rethinking, reforming or reshaping IRDR's strategy" and "operating IRDR as an 'action network' towards collective impact". In response to these suggestions, the IRDR Scientific Committee presented a draft IRDR Strategic Plan of Action for 2017-2020 at the 16th IRDR Scientific Committee meeting. This document was designed to guide the IPO as well as other entities within the IRDR network in implementing specific actions towards scientific advice in disaster risk reduction. The document was further amended to take into account the SC meeting's decision to incorporate critical findings of the review committees, and place additional emphasis on more forward-looking strategic actions which arise from evidence and science-based decision making at a crucial time for the implementation of the Sendai Framework. A total of 23 actions on activities and deliverables were proposed on areas including 1) Science Advocacy at global, regional and national scales; 2) Sendai Framework indicators and strengthening national reporting system; 3) Thematic contribution by Working Groups; 4) Facilitating Associated Projects; 5) Strategic partnership with International Centres of Excellence (ICoEs); 6) Science capacity development: Young Scientists Program; 7) Science outreach by communication strategy and products.

Undergoing further edits, the document was further shaped into the IRDR Action Plan 2018-2020[9], which was adopted at 18th IRDR Scientific Committee Meeting. The new Plan does put forth the aforementioned more forward-looking strategic actions, specifically puts forth 22 actions grouped into three categories: 1) Improving the Governance of IRDR (2 actions); 2) Expanding the IRDR Network and Scientific Outputs (16 actions); and 3) Improving the visibility of IRDR (4 actions). Each action included detailed description, deliverables, lead group, and outcomes & impact. In the SC meetings following the adoption of the new Plan, IPO reported IRDR updates according to the implementation of these actions. Figure 1-3 illustrated the science behind IRDR.

9 http://www.irdrinternational.org/what-we-do/action-plan-2018-2020/

Figure 1-3: Science behind IRDR: the foundational multi-hazard framework of IRDR to understand and characterize risk, risk production processes and governance, and damage and losses (Fakhruddin & Bostrom, 2019).



1.5

Coherence with other UN 2030 agreements

In 2015, a number of landmark international agreements were reached at the United Nations. Apart from the Sendai Framework, the world community agreed on Transforming our World: the 2030 Agenda for Sustainable Development (2030 Agenda), the Paris Agreement, the Addis Ababa Action Agenda (AAAA) and the New Urban Agenda (NUA)[10]. Each of these agreements has interconnections with the Sendai Framework. It is therefore natural that there have been calls for coherence and synergy to realize the goals and targets of the post-2015 agreements (Figure 1-4) and update current approaches to risk assessment accordingly.

The Sendai Framework was the first of the world's best-known policy agendas. It set out the case for development to be risk-informed in order to be sustainable. In both the Sendai Framework and the SDGs, outcomes are a product of interconnected social and economic processes. As such, there is a lot of synergy between the two policy instruments. In fact, Sendai Framework monitoring is intended to complement monitoring of 11 SDG indicators (Figure 1-5).

10 The UN Global Assessment Report on Disaster Risk Reduction (GAR): https://gar.undrr.org/

Figure 1-4: Risk Reduction – a journey through time and space.

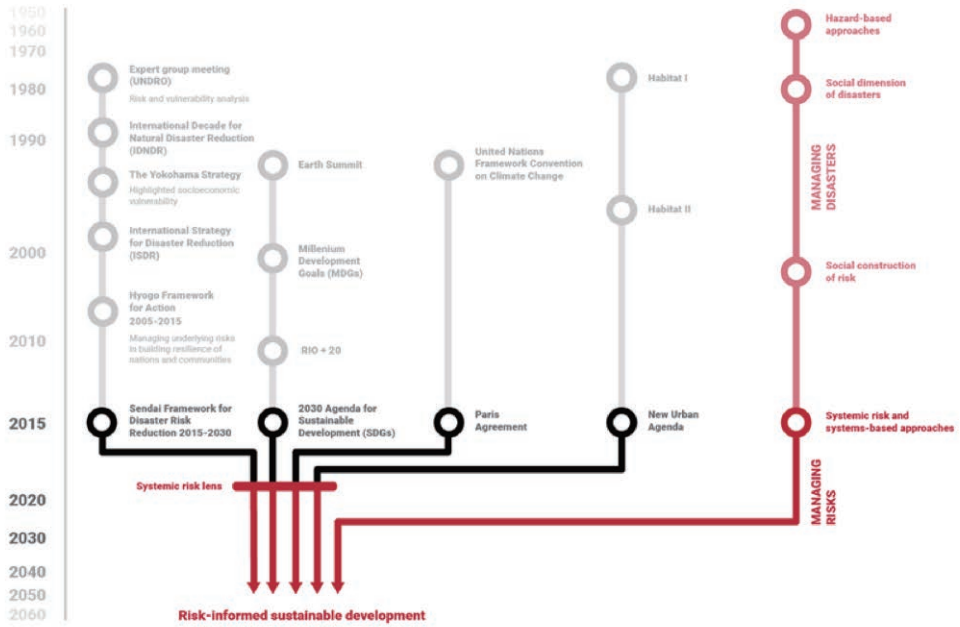
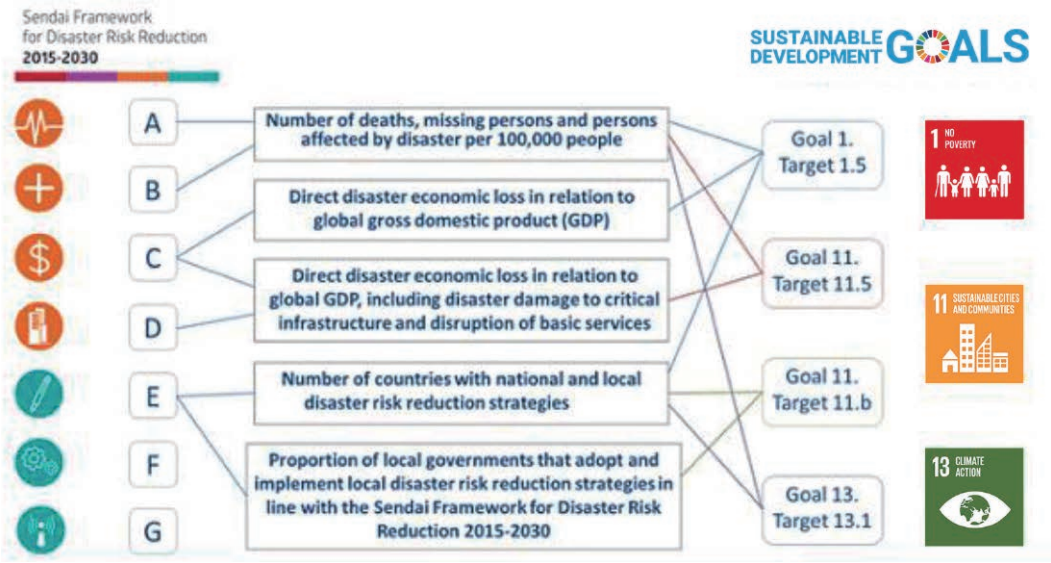


Figure 1-5: The coherence between Sendai Targets and SDGs indicators.

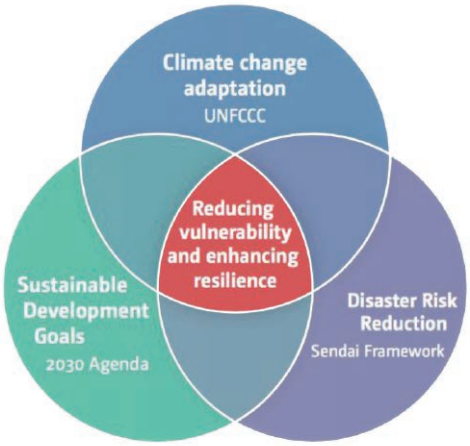


IRDR has started moving in this direction. In 2018, IRDR established a new Working Group (WG) on DRR-CCA[11]-SDG under its Scientific Committee, whose role is specifically to look into the Sendai Framework connections with the Paris Agreement, with SDG 11 on cities and with SDG 13 on climate change (Figure 1-6). Through research activities and strengthening of scientific networks, the WG aims to reduce vulnerability and enhance resilience.

Also in 2018, to further build the connections between the IRDR research objectives, Sendai Targets, Paris Agreement and SDGs, IRDR initiated its working paper series. It is the hope of the authors of the working papers and IRDR as a whole that the papers will not only bring new knowledge, experience and information toward disaster risk reduction, but also help build better coherence of DRR with the mainstream UN agenda of moving towards more inclusive, resilient and sustainable human societies. The following chapters will provide more details on the IRDR working papers.

Discussions and exchanges at IRDR related meetings are increasingly focusing on new

Figure 1-6: The concept behind DRR-CCA-SDGs.



risks, particularly daunting multi-dimensional, systemic, cascading and transboundary risks and disasters, as exemplified recently so starkly by the Covid-19 pandemic. It is clear that the inherent vulnerabilities of our environment and human societies will have to be addressed in transformative ways. In all of these IRDR will have roles to play and contributions to make.

11 CCA: Climate Change Adaption

Reference

Fakhruddin, B., & Bostrom, A. (2019). Integrated Research on Disaster Risk (*IRDR*). Retrieved from Contributing Paper to GAR 2019:

International Council for Science. (2008). A science Plan for Integrated Research on Disaster Risk: Addressing the challenge of natural and human-induced environmental hazards.