FORMATIVE REVIEW OF THE INTEGRATED RESEARCH ON DISASTER RISK (IRDR) PROGRAM

Final Report

November 2016

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EXECUTIVE SUMMARY

This report is the result of an independent mid-term, formative, forward-looking Review of the program of work of the *ICSU Integrated Research on Disaster Risk* Interdisciplinary Body, established in 2010 with co-sponsorship by the International Social Science Council (ISSC) and the UN Office for Disaster Risk Reduction (UNISDR), and with financial support primarily from the China Association for Science and Technology (CAST), a national ICSU member.

As the Review is intended to inform the unfolding of the next 4-5 year phase of the ten-year IRDR Program ('IRDR'), the seven-member Review panel focused their work purposefully on identifying critical areas for improvement.

The Review panel's overall assessment is that at the time of its establishment, IRDR was a well-conceptualized, timely and innovative (potentially even pioneering) initiative in the increasingly important domain of disaster risk reduction. Its design was ambitious. It reflected the effort needed to bring to fruition a global research program that had to promote and demonstrate new ways of thinking and working in order to influence policies and practices that benefit societies and vulnerable communities around the world.

However, decisions during the inception phase led to a pared down program that has yet to convince that IRDR's initial objectives can be achieved by the end of its ten-year lifetime. Despite the commitment of the excellent scientists on the Scientific Committee, their active engagement in important global and regional initiatives, four main research projects, and the establishment of a network that provides an IRDR footprint in 30 countries around the world (by June 2016), progress has been slow, and the program foci and results too limited to meet the goals of the Science Plan and the expectations created by the program.

The Review panel found the situation to be the result of a confluence of several key factors: decisions during inception, prompted in part by challenges in how such Interdisciplinary Bodies are set up; fast turnover in Executive Directors at the International Program Office (IPO) in Beijing (the first such IPO established outside Europe); and a series of governance, leadership and management weaknesses, including a failure to raise sufficient program funds to give life to its strategic intent.

The Review panel is convinced that IRDR remains a very worthwhile endeavour. In principle, it maintains a significant niche and comparative advantage that continue to provide a good value proposition for its stakeholders, both within and outside the scientific arena. It remains reasonably well positioned in an important area of work, and has been making fair progress in spite of significant obstacles. Many useful lessons have been learned, and there is goodwill among all parties concerned - the Scientific Committee, the main donor (CAST), the IPO, its host organization, the Institute of Remote Sensing and Digital Earth of the Chinese Academy of Sciences (RADI/CAS), and the co-sponsoring organizations - to collaborate to accelerate IRDR's path towards impact on science, policy and practice.

However, if success is to be visible by 2020, several key challenges need to be resolved with a sense of urgency as well as strong leadership. The Review panel shaped their recommendations around these challenges, and recommends that the following five aspects be addressed through dynamic cooperation among all key stakeholders, including the three co-sponsors, who are asked to take on a stronger role in future:

1. **Adjust the program scope and direction.** Reshape the program by building on the foundation laid in the first phase - strengthening and redirecting its efforts in order to achieve the objectives set out in the original Science Plan - and position it further in the 'disaster risk reduction for sustainable development' space. This will require an undertaking to expand the time horizon of the program to 2025 if progress is satisfactory over the next few years - thus with ongoing support subject to strong accountability measures.

2. **Improve the business model.** Change IRDR's business (strategic and resourcing) model by moving it away from the unsuccessful project-driven, ad hoc approach to a more strategic, programmatic approach, with concerted efforts to explore and tap unconventional sources of funding.

3. **Sharpen governance.** Adjust the governance system to remove conflicts of interest, support stronger leadership, ensure proper oversight and appropriate lines of accountability, engage the co-sponsors, and use the strengths of each component of IRDR in an appropriate way to relieve the very significant burden of work on the Scientific Committee.

4. **Improve management.** Put useful (yet 'light') monitoring, evaluation and knowledge management systems in place that can support a more strategic, adaptive, evidence-informed management approach for the whole IRDR 'family'. Enhance branding and communication systems to ensure clear program boundaries and greater, more targeted visibility. Ensure meaningful and respectful relationships between the Scientific Committee, the IPO, the program donor and host organizations, as well as the IRDR network nodes, the International Centres of Excellence (ICoEs), and its Regional and National Committees.

5. **Move towards collective impact.** Mobilize the different components and nodes of the IRDR network - based on the relationships built up over the years - to align and collaborate as a (global) 'action network', enhanced by solid, long-term partnerships wherever this makes strategic sense. Make use of the opportunity to do context-sensitive, innovative comparative work, respectful of different conditions and cultures, that can strengthen science for policy and practice.

1. THE REVIEW

1.1 INTRODUCTION

The **Integrated Research on Disaster Risk (IRDR)** Interdisciplinary Body was established by ICSU after approval at the 29th ICSU General Assembly in 2010. Its charge was to strengthen and use science and its interface with policy and practice to address the very significant and increasing challenges posed by natural and human-induced environmental hazards. The Science Plan for Integrated Research on Disaster Risk (the 'Science Plan') was developed as the foundation for the program of work that became known as the 'IRDR Program'[1].

ICSU, the International Social Science Council (ISSC) and the United Nations Office for Disaster Risk Reduction (UNISDR) are the three co-sponsors of IRDR. They jointly decided to establish the International Program Office at the Institute of Remote Sensing and Digital Earth (RADI) of the Chinese Academy of Sciences (CAS). IRDR is thus the first ICSU Interdisciplinary Body hosted outside Europe. The China Association for Science and Technology (CAST) has committed 300,000 Euro per year for a period of ten years to the IPO for program operations.

In early 2016, the three co-sponsors of IRDR commissioned this independent, forward-looking mid-term Review covering the first six years of the ten-year program period. It is to serve as guidance for planning and implementation during the next phase of the program, which ends in 2020. The seven-member Review panel therefore focused their assessment areas critical for improvement. Guided by the Science Plan, they studied and elaborated the key Review questions, identified the sources of information, and implemented the Review using seven data collection and analysis methods. A results framework[2] (Figure 1) and set of preconditions (Figure 2) were identified and made explicit based on the content of the Science Plan and initial interviews. The panel also used triangulation between methods, sources and panel members[3] as well as verification with program stakeholders to reduce bias and enhance the credibility of the findings.

This report presents a summary of key findings, relevant lessons and recommendations in five chapters. The *first chapter* provides the context for the Review and sets the scene. The *second chapter* presents the findings related to the performance of IRDR. The *third chapter* assesses IRDR's governance and management system. The *fourth chapter* considers the factors that have influenced the performance of IRDR, and relates them back to the preconditions that were initially identified or established. The *fifth chapter* draws lessons and proposes recommendations for consideration by the program stakeholders.

Acronyms are in listed *Annex 1*. The Terms of Reference for the Review are in *Annex 2*, while Review panel members are listed in *Annex 3*. Details of the program components and current status can be found in *Annex 4*. The panel's approach to the Review is described in *Annex 5*, the Review questions and sources of information given in *Annex 6*, the list of persons interviewed in *Annex 7* and the list of documents consulted in *Annex 8*.

[1] IRDR in this report

[2] The expected outputs, outcomes and impacts the program was intended to achieve

[3] Triangulation facilitates the validation of data and findings through cross-checking, using three or more methods, analysts and /or data sources and types.

1.2 THE IRDR PROGRAM AND ITS CHANGE LOGIC

KEY ELEMENTS OF IRDR OUTLINED IN THE SCIENCE PLAN

Vision

IRDR envisages an integrated approach to natural and human-induced environmental hazards through a combination of natural, socio-economic, health and engineering sciences, including socio-economic analysis, understanding the role of communications, and public and political responses to reduce the risk.

Mission

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.

Aim

IRDR seeks to (i) address the challenges brought by natural and human-induced hazards; (ii) mitigate their impacts, and (iii) improve related policy-making mechanisms.

IRDR is expected to leave a legacy of an enhanced capacity around the world to address hazards and make informed decisions on actions to reduce their impacts.

Research objectives

i. **The scientific characterisation of hazards, vulnerability and risk**.

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.

Addresses the gaps in knowledge, methodologies and types of information that are impeding the effective application of science to averting disasters and reducing risk.

ii. **Understanding decision-making in complex and changing risk contexts**.

Sub-objectives: (2.1) Identifying relevant decision-making systems and their interactions; (2.2) Understanding decision-making in the context of environmental hazards, and (2.3) Improving the quality of decision-making practice.

Calls for an emphasis on how human decisions and the pragmatic factors that constrain or facilitate such decisions contribute to hazards becoming disasters and/or may mitigate their effects.

iii. **Reducing risk and curbing losses through knowledge-based actions.**

Sub-objectives: (3.1) Vulnerability assessments, and (3.2) Effective approaches to risk reduction.

Requires integration of outputs from the first two objectives and can only be achieved through implementing and monitoring informed risk reduction decisions, and through reductions in vulnerability or exposure.

Cross-cutting themes

1. Capacity building, with sub-themes (i) mapping capacity for disaster reduction, (ii) building self-sustaining capacity at various levels for different hazards, and (iii) establishing continuity in capacity building.
2. The development of case studies and demonstration projects.
3. Assessment, data management and monitoring of hazards, risks and disasters, with sub-themes (i) guidelines for consistent data management and assessments, and (ii) applying local assessments globally and global assessments locally.

In the Science Plan IRDR was conceptualized as an integrated, global, interdisciplinary, coherent ten-year program operating on the interface between science, policy and practice. It was to support the shift from response recovery towards prevention-mitigation strategies and resilience building, and to "*cover, or understand the coverage of, all appropriate disciplines from all relevant hazards in all regions through survey, consultation, analysis, exchange research results, and bringing together programs to achieve common objectives*".

IRDR was therefore founded as an ambitious program, designed to interact with and build on other relevant initiatives. It would bring together the best scientific expertise from around the world to generate real-world and real-time evidence and understanding that would help prevent or reduce the risk of disasters and their social, economic, environmental (and by implication, their political) impacts. It was to operate in a series of sites representing vulnerable communities located in different contexts and cultures around the world, and in collaboration with relevant policy- and decision-makers. A network of partnerships and relationships would be mobilized to study and compare deep-rooted challenges and ways of thinking. It was to facilitate the synthesis, use and dissemination of knowledge to help effect transformative change in practice in the scholarly environment, in policy-making, and where decisions are taken in societies exposed to hazard and disaster. It was to have a strong focus on learning, and evolve its research priorities over time. The *integrated* nature of the efforts needed to enhance the resilience of such communities to prevent and deal with hazards and disasters compelled IRDR's emphasis on *integrated* solutions, and thus on *integrated* science for disaster risk reduction.

The 'change logic' or 'theory of change'[4] of a program shows how and/or why the program was to lead to the desired changes. The Review panel detailed IRDR's results framework (Figure 1; expected results organized in a specific type of framework)[5] and preconditions for change (Figure 2) to help understand which elements might be important to focus on during data collection and analysis. The Review then essentially tests this logic to the extent that limited time and resources allow.

Thus, if IRDR was to achieve its objectives, it would lead to the changes (outputs and outcomes) in its 'sphere of control', and contribute to the results in the 'sphere of influence'. The changes expected in the 'sphere of interest'[6] reflect the ultimate purpose of the research. IRDR is ambitious, and will have to have a focus on leveraging and being catalytic in order to amplify or accelerate progress towards the desired changes. Initial 'preconditions' need to be in place; when the programme is implemented and progresses, other conditions are established or emerge over time. They have to be sufficient and essential for the desired changes to take place. IRDR's success is also dependent on the recognition of the importance of context; its niche and position in the landscape; and the effective implementation of a set of interrelated tactics. There should be synergy between program activities and with those of other organizations. This requires strategic, systematic and adaptive management and strong coordination to make sure that 'the whole is more than the sum of the parts'.

[4] A 'theory of change' is a presentation of the logic of how change was intended to happen as a result of – in this case - the IRDR program interventions. In its most comprehensive form it details the preconditions, known or expected to enable success in combination with one another; the intended results (outputs, outcomes and impacts); the relationships between them; the 'impact pathways' that detail what led or is intended to lead to the results; and the underlying assumptions.

[5] These are not necessarily the only positive outcomes, and unintended negative consequences or outcomes might also emerge. Reviews, evaluations and monitoring efforts should search for such changes, both positive and negative.

[6] The program has full control over the actions, output qualities and results in IRDR's *sphere of control*. It has some influence on the outcomes in the *sphere of influence*; it can only contribute, together with others, towards the envisaged changes. And while it is interested in contributing to the impacts in its *sphere of interest*, these are frequently too long-term or far removed from the intervention, with pathways too convoluted, to be traceable.

Figure 1. Organizing results framework for IRDR's expected contributions to development impact

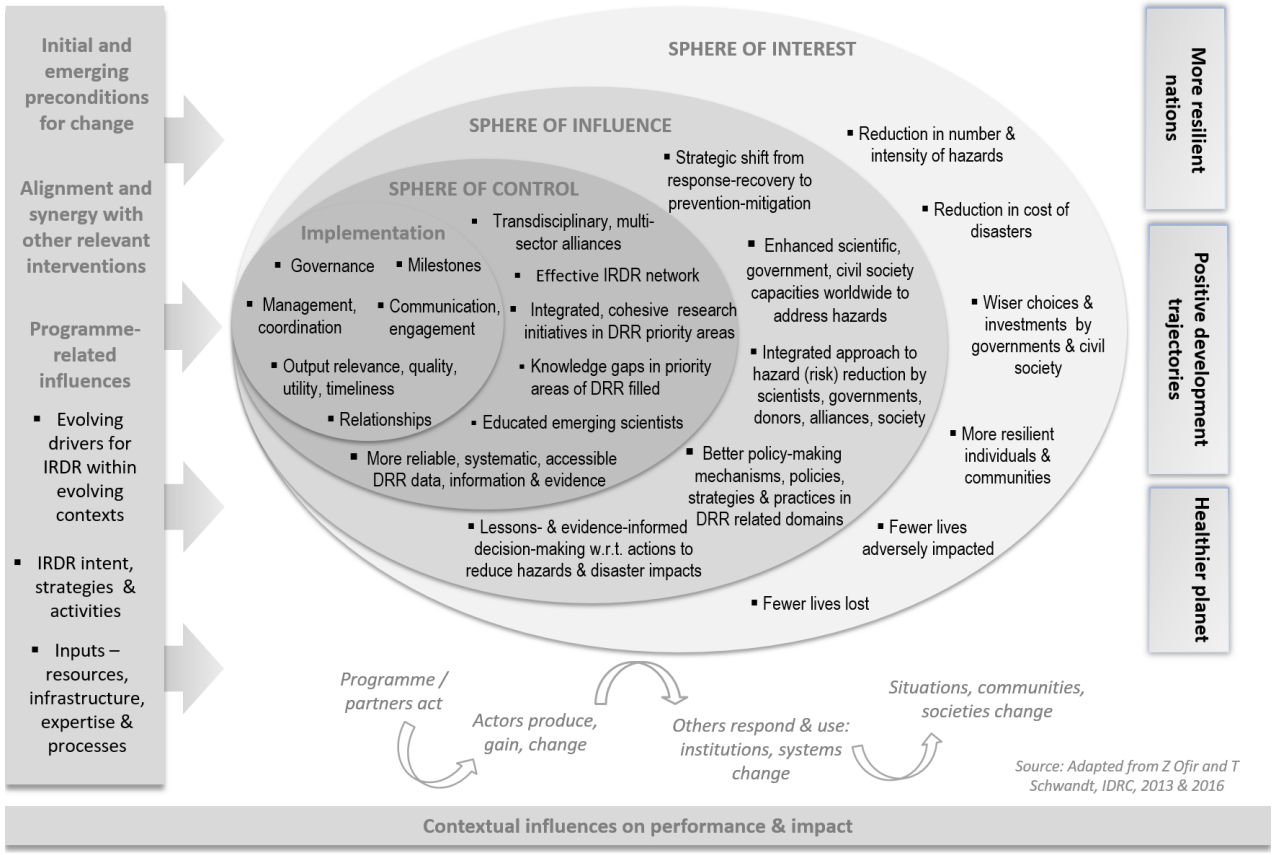
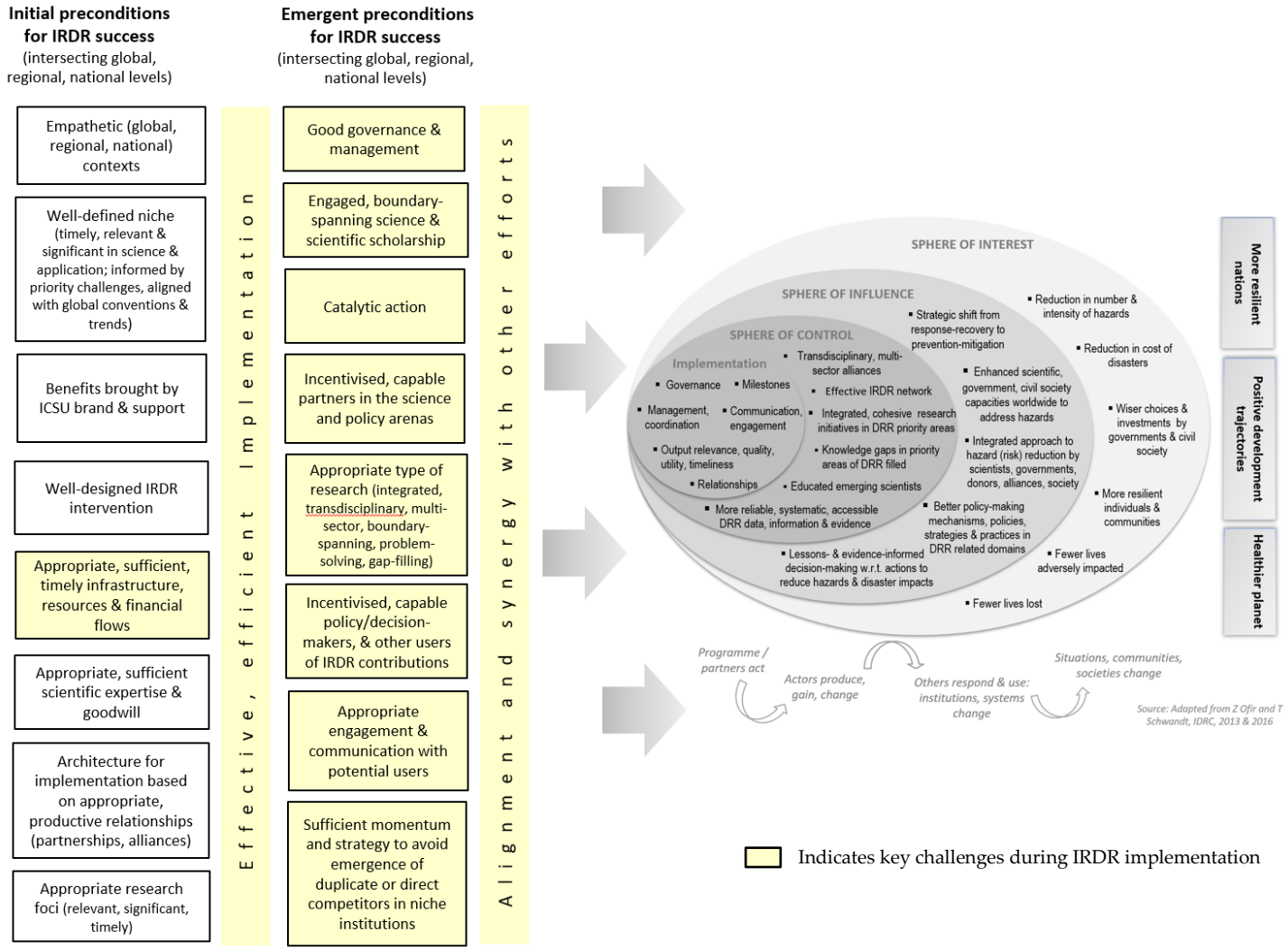


Figure 2: Preconditions perceived as essential for the changes IRDR is intended to bring about



1.3 THE CONTEXT IN WHICH IRDR OPERATES

IRDR has been implemented during a period of major developments worldwide in its area of operation. Most notably, since 2010 the space has been opening for relevant, useful science that can provide knowledge and evidence in support of societal wellbeing and development. Calls from influential platforms for a more robust role for science in solving the world's most urgent or intractable problems have grown stronger; this is so also in efforts to combat climate change and slow the pace of destruction caused by sudden and slow-onset disasters.

The global environment has been increasingly supportive of a program with the focus and scope of IRDR, and this influences policies and strategies at regional and national levels. The situation is set to become even more empathetic for programs with a disaster risk reduction (DRR) focus over the next decade. This is in large part the result of the Hyogo Framework for Action 2005-2015 and the landmark Sendai Framework signed at the 3rd World Congress on Disaster Risk Reduction (WCDRR) in Sendai, Tokyo in 2015. Nearly all countries signed up to these agreements. Both were intended to give momentum to efforts from global to local levels to reduce losses through disasters, as well as to a shift from managing disasters to managing risks, and from response to prevention and adaptation. The Sendai Framework provides a robust recognition of the key role of science[7].

Furthermore, the framework that is set to influence development policy and strategy over the next two decades, the 2030 Agenda for Sustainable Development signed by all 193 member states of the United Nations, explicitly recognizes the urgent need to reduce the risk of disasters, and highlights opportunities to contribute to the achievement of the Sustainable Development Goals (SDGs) by reducing such risk. Meanwhile, the new Paris Agreement on climate change which comes into effect in November 2016 calls for stronger action against climate change, especially the 'new normal' of extreme climate regimes. It also refers to the Cancún Adaptation Framework which recognizes DRR as a priority in relation to climate change.

IRDR is also operating in an era when the role of science and 'expert knowledge', as well as dominant development models are under increasing scrutiny - and changing. The dynamic, often disruptive developments on the science-technology interface (best expressed as the 'Fourth Industrial Revolution'[8]) demand attention even within the DRR domain. There is a growing interest in complex systems, including in development; in the democratization of science for development; in the implications of dealing with different cultures and contexts; stronger links between science, policy and practice; and in large-scale systems change through collective action by networked organizations.

Governments, civil society and major actors in the private sector are taking note, and these developments are influencing their behavior. It is therefore inevitable that more and more initiatives from global to local levels will operate in the spaces created by these movements and opportunities. There has been a proliferation of organizations and networks focusing on disaster prevention and risk management and reduction. IRDR has had to carve out a niche and position itself within this evolving context, and has to continue to do so until 2020.

[7] Science is mentioned in 16 different paragraphs of the text; data 12 times and research ten times.

[8] The increasing integration and merging of the physical, digital and biological worlds. See Klaus Schwab (2016). *The Fourth Industrial Revolution*. The World Economic Forum.

2. PROGRESS AND PERFORMANCE

2.1 PROGRESS TOWARDS MEETING IRDR'S OBJECTIVES

Key Review Question: To what extent has IRDR fulfilled its objectives?

2.1.1 In IRDR's sphere of control: Meeting research objectives

The Review panel was impressed with progressive and ambitious design of the program as captured in the IRDR Science Plan (summarized in section 1.2). The expert committee that developed the concept during 2008-2009 used a series of studies to conceptualize IRDR as an ambitious program that was to make a significant contribution to policy and practice in the disaster risk reduction domain.

As reflected in its first two objectives (Box 1), it had a robust focus on filling important gaps in knowledge. But elements of IRDR's second and third objectives indicate that this was to be done through engaged and boundary-spanning scholarship and research that could address important needs of policy-makers and vulnerable communities around the world. A critical component was the establishment of a network of sites where issues and challenges (especially after a disaster) within the themes identified in the Science Plan could be identified, studied and addressed in real-world situations and in an integrated manner, among others through a series of comparative and longitudinal studies. It was therefore seen as essential to engage, inspire and align multiple partners and networks of scientists with access to such sites, and to policy- and decision-makers. In other words relevant, context-responsive and integrated research would be amplified through a network of loosely connected 'nodes' that would facilitate the science as well as its translation into action. It was seen as important to build on what already existed, rather than develop new structures.

Progress during the first six years has been fair in some respects (summary in Annex 7), given that the program operated on little (centrally managed) funding and significant volunteer time committed by highly respected scientists. Good progress was made during the inception phase (2010-2012). Three co-sponsors (ICSU, ISSC and UNISDR) committed support. The 15-person Scientific Committee of highly respected scientists started to operate. Processes to build formal linkages with potential partners in research were launched. Four expert Working Groups each established a research project that could begin the process of responding to the program requirements. Memoranda of Understanding were signed with some key organizations such as the World Climate Research Program and CODATA. IRDR also organized some events and co-sponsored or participated in others around the world, providing opportunity for advocacy and relationship building with different organizations - some with good success. True to expectations, existing efforts were nurtured rather than new structures established.

Yet the Review panel found that implementation had fallen significantly short of the expectations articulated in the Science Plan. This was the result of a pared down program – one significantly less ambitious than foreseen when it was approved and established. Decisions made during the inception phase of IRDR had a direct and detrimental effect on how the program unfolded over the first six years compared to the intent (discussed in section 2.2).

The Review panel appreciates that the early implementers may have taken a pragmatic, conservative approach in the absence of funding and the long-term nature of the mindset changes

that would have been necessary to gather momentum. Constraints in terms of available frameworks, templates or guidelines, and lack of time and financial resource might have been some of the reasons for diverting from the conceptual framework for action.

However, if the Science Plan was seen as too ambitious, it should have been reflected in plans, in Scientific Committee discussions, and in reporting within a new performance framework. There is for example catalytic potential for later scaling in research initiatives such as AIRDR and FORIN (project summaries in Annex 7). But the pared down approach was never captured and clearly addressed in an adjusted strategy, with new objectives and results frameworks, milestones and targets that could show the intended evolution of the program. An 'IRDR Strategy 2013-2017' was developed, but according to persons interviewed, seldom used to guide implementation. This meant that the implementers lacked guidance and focus over the years on how the ambition of the initial plan would eventually be realized. Furthermore, as highlighted in the descriptions in section 2.1.2 and Annex 7, research results and outputs have been slow to emerge. On the other hand, although ad hoc and still fragmented, relationships established through the many interactions and joint activities over the past few years hold significant potential. But a more robust and systematic focus is required to take research to policy and action.

What is more problematic is that IRDR unfolded more or less based on "business as usual" – something that was expressly pointed out in the Science Plan as not desirable if IRDR's ambitious objectives were to be achieved. The ambitious core idea was lost and, perhaps despite the intent, has not (yet) been regained. This is unfortunate, given the fact that more than half of the program period has elapsed.

In the absence of a suitable framework, it is thus difficult to make a definitive statement about IRDR's performance to date. **What is certain is** that IRDR, as it is currently being implemented, (i) will not achieve the objectives stated in the Science Plan; and (ii) even if the pared down IRDR is to yield impressive outcomes in four years' time, it will have to overcome – with a sense of urgency - several challenges and weaknesses that are threatening its effectiveness and the value of its contributions.

On the other hand, IRDR has sufficient strengths to enable much greater impact over the next few years – if these strengths are appropriately used, and trade-offs and potential tensions are well managed. It will be worthwhile to use this period of review to consider how IRDR can direct itself to deliver at an amplified and accelerated pace while building on its significant strengths. Through network building, advocacy and advice, IRDR has laid a foundation for stronger future action towards its objectives. It can still make a very original, even ground-breaking difference on the science-society interface in the DRR domain if it can deliver faster and better on some of the key aspects highlighted in the Science Plan. But it will require IRDR to "think less about science as research, and more in terms of policy and practice", as noted by a prominent stakeholder. Such an undertaking will require strong leadership, adjustment in both strategy and management style, and a very determined effort to step away from business as usual. It is also likely to require another decade of implementation - something that can be readily justified, given the importance of the field, and the challenges inherent in a program of this nature.

2.1.2 Towards impact in IRDR's sphere of control

Attainment of IRDR's objectives through successful research projects were intended to lead to the following outcomes: "*a better understanding of hazards, vulnerability and risk; an enhanced capacity to model and project risk into the future; a better insight into decision-making that may increase risk exposure, as well as how choices may be influenced; and a better understanding of how new knowledge can guide disaster risk reduction levels at all levels*".

IRDR has no record of achieved or emerging changes (contributions to outcomes and impacts) as a result of its work. It also has not had any systematic monitoring data tracking progress towards its outcomes impacts. Even conventional metrics of research use and quality in the academic environment, such as article downloads and citation counts, have not been implemented until very recently. Reporting is entirely focused on what has been done rather than on a systematic assessment of progress towards objectives, or changes these actions (might have) brought about. The Review panel therefore used interview and survey data, and the retrospectively developed results framework, to inform the assessment of the extent to which IRDR is making a difference in the DRR domain. The following analysis is based on the changes expected in the Science Plan as presented in the results framework in section 1.2, figure 1.

Knowledge gaps in priority areas have yet to be filled. IRDR's research is seen by many as *in principle* 'relevant', 'problem-solving' and 'gap-filling'. However, given that the four IRDR research projects are too limited in scope, and the outputs of IRDR's network too undocumented, **it is too early to conclude that important knowledge gaps are being filled** – and certainly not in the manner and scope envisaged in the Science Plan.

The expectation of more reliable, systematic, accessible DRR data, information and evidence is also not yet being met, although research outputs are now emerging, and are reflected in for example uptake in databases in the case of DATA, in publications such as that of AIRDR, the GAR15 reports of RIA, and the FORIN 2 guidance. In six years, the program has (only) delivered a total of 28 designated 'IRDR publications', primarily from the four IRDR research projects. They are available on the IRDR and a few other websites and disseminated at relevant events. A good number of the publications were commissioned by UNISDR. Citations are few, and downloads have not been tracked. A few articles are behind publishing firewalls, indicating the challenge that IRDR has to make information available for uptake for the public good while also delivering in line with academic incentives and accountability demands.

It is of some concern that IRDR does not have a quality assurance system in place for its products, or a set of principles to which they should adhere, for example in terms of the type of stakeholder engagement or responsiveness to culture and context. It is also of concern that there is no 'branding' system that allows for a better understanding of which research project, ICoE and National Committee products fall within IRDR boundaries, and how they should be cited; there is almost no acknowledgement of IRDR in their publications. There are also several publications designated as 'IRDR publications', yet without acknowledgement of the program, or of authors' engagement in the program. These are weaknesses in management that have to be addressed.

Integrated, cohesive research initiatives operating in priority areas: Delivery on this important outcome has met with limited success. As noted earlier in this chapter, the four IRDR Working Groups have been established in isolation from one another and without a strong focus on engaging the network – or consistently, communities in vulnerable sites, in their actions, although a few ICoEs have collaborated on the projects. Social and natural scientists work together only to a limited extent,

and health scientists, economists, law experts and so on are hardly engaged. It is thus no surprise that according to multiple prominent persons interviewed, **IRDR has been more successful in promoting the notion of integrated research than in demonstrating it**.[9]

Transdisciplinary, multi-sector alliances: IRDR has engaged in establishing an impressive number of relationships with great potential to support its research and advocacy work. But transdisciplinary work and multi-sector connections have been limited primarily to relationships with UN bodies and National Committees, and many of the linkages still have to be activated to make substantive contributions to IRDR's work. The private sector is almost absent. The DATA Working Group with its engagement of diverse actors, including from the private sector, is a notable exception.

An effective IRDR network: As earlier discussed, IRDR's network shows good promise for the future, but there are no common projects or exchange programs across nodes that can stimulate collaboration around common interests and enhance connections with local sites (with vulnerable communities). This means that its potential still has to be explored and exploited.

Educated early career scientists: Although the scope of IRDR's engagement with early career scientists is still limited, it is likely that capacities are being developed, as well as an appreciation for integrated approaches in DRR. At the same time, workshops and more collaborative efforts such as those launched by RIA, ICoE-Taipei and others help to ensure that the program is not perceived as a comfortable 'club' for well-known senior scientists. Some National/Regional Committees and ICoEs also have related efforts.

2.1.3 Towards impact in IRDR's sphere of influence

In IRDR's sphere of influence, outcomes require uptake and use of the research findings and expert knowledge in policy processes and in applications in practice. Interview and survey data show that such outcomes are slowly emerging in line with expectations for the pared down IRDR.

The expected outcomes (section 1.2, figure 1) relate to shifts in mindset and action from response to prevention, and towards an integrated approach to risk reduction; improvements in policy and policy-making processes, including through the use of research evidence; and enhanced capacities around hazards and risk reduction. Without dedicated impact studies, such outcomes are difficult to trace, and even more so the enlightenment function of research – in other words, the education of policy- and decision-makers that lead to changes in mindset that might not be immediately reflected in action.

However, IRDR linked scientists have influenced policy at a global level by contributing to the profile of science and technology in the Sendai Framework, informing discussions around the SDGs and in contributing to the results of the Science & Technology Conference on the implementation of the Sendai Framework organized by the S&T Advisory Group (STAG) of UNISDR in January 2016 in Geneva, a pivotal event for the development of a global roadmap for integrating science into the DRR domain.

An important indication of the difference IRDR as entity is perceived to have made overall comes from the remarkably consistent survey results[10]. Stakeholder groups rated a series of IRDR's possible

[9] It is of concern that survey data and interviews showed that there is some confusion about the meaning of 'integration', or of 'trans'- or interdisciplinary research. This was reflected in discrepancies between survey and interview data, and between qualitative and quantitative insights. The Review panel used triangulation between its different sources of information to conclude that IRDR has not yet succeeded in demonstrating and illuminating the 'integration' it espouses.

[10] The results were consistent when when stratified per stakeholder group, as well as per aspect of IRDR's work.

contributions consistently between 2.5 and 3.0[11]. IRDR scored particularly low on aspects related to practical application - that is, better government or civil society capacity to address hazards in an integrated manner. The only ratings higher than 3.0 (up to 3.5) were for (i) raising awareness of the importance of science in the DRR domain; (ii) (encouraging) an integrated approach to DRR research across the natural and social sciences, (iii) interdisciplinary research, and (iv) international scientific collaboration.

The definitions and classification developed by DATA have been incorporated into several loss databases, one of which is used at national level in at least 30 countries around the world. It has also influenced similar work in the European Union. AIRDR and RIA contributed to GAR15 which is widely used, while FORIN is slowly gaining traction for application and case studies in countries such as Mexico and China. **But we found it perturbing** that just over half of survey respondents have read fewer than five of the 28 IRDR publications; 25 percent have read 5-10, and fewer than five percent have read 10-15. A total of 16 percent of those who said they knew IRDR, have read none at all! Citations for papers are also low. IRDR has to do more to get its products known and appreciated.

Among the nodes of the network there are scattered indications that IRDR has stimulated alignment with its objectives as well as interaction across geographic, disciplinary, stakeholder and organizational boundaries. Several ICoEs have also reported that ICSU and IRDR's global branding has helped them to gain a higher profile and greater credibility.

A critical issue for consideration is the extent to which IRDR's contributions in its sphere of influence can be attributed to the excellent, high profile individual scientists involved or to the actions of IRDR as a collective. In other words, did IRDR *as program* add any value? It was clear during interviews that this is a disputed issue.

2.1.4 Towards impact in IRDR's sphere of interest

Given that changes in IRDR's sphere of influence are only now slowly emerging, as well as the relatively short period of only six years of implementation, it would be unfair to expect impact in its sphere of interest (section 1.2, figure1). It will take a significant investment of time and expertise to trace its long-term impacts over time – something that might only be worthwhile towards the end of the decade of support, but that can already be integrated into a useful IRDR monitoring system.

At present, the potential that IRDR has to contribute over time to these important long-term changes can serve as motivation for everyone involved.

[11] Rubric for a rating of 2: "IRDR has made little difference. It has done some work in this aspect in the DRR domain, but this has hardly been noticed." Rubric for rating 3: "IRDR has made some difference. It has made a noticeable contribution, but it is one among many on this aspect of work in the DRR domain.

2.2 IRDR'S POSITION IN THE DRR LANDSCAPE

Key Review Question: How well is IRDR positioned in the disaster risk reduction space?

IRDR is doing well in the DRR space in terms of its thematic positioning, and has developed some visibility on the global stage. However, the potential offered by its relationships, partnerships and networks is largely unexplored, and its visibility even at a global level too low for comfort. Its actual reach to national and local level remains very limited, and its co-sponsors have not been a significant strategic support. This situation might improve in the near future. Actions following the Sendai Framework have encouraged IRDR's engagement with national DRR platforms, connections with at least one of its co-sponsors are growing, and ad hoc collaborations at both regional and national levels have given entry points for further engagement. Yet strategic, systematic work needs to underpin the connections and relationships. Otherwise the IRDR network and partnerships are likely to remain a group of scattered initiatives rather than a mechanism for collective impact, and IRDR will remain a limited program with limited reach and impact.

2.2.1 IRDR's visibility

IRDR has had some success in creating visibility and reach by 'piggybacking' or co-sponsoring some events, organising IRDR conferences and engaging early career scientists. Its policy influence potential was most felt at the WCDRR and the 2016 UNISDR S&T Conference in Geneva. Yet interview and survey respondents **assessed IRDR's visibility as low and its reach as inadequate** given its potential. This means that its role as a major entity in the scientific arena and even more so, outside of it – even at global level - cannot be confirmed with a sense of comfort.[12] Factors that influence its visibility include the following:

- Meetings: In spite of its wide participation, conferences and meetings might not have been strategic enough to leverage the most benefit. IRDR's absence as *visible entity* from notable meetings such as the annual International Disaster Risk Conferences in Davos, the World Bank Global Facility for Disaster Risk Recovery Understanding Risk conference, the Boulder Natural Hazard or the International Society for Integrated Disaster Risk Management conferences does not go unnoticed.[13]
- Value proposition: IRDR has not done enough to make its expertise, niche and comparative advantage, and its actual as well as potential contributions known among multiple influential stakeholders[14]. It tends to focus on highlighting single activities or projects, and interacts with scientists who are already among the 'converted'. **It is therefore indistinguishable** from the

[12] Although the Review panel does not have factual evidence, the perception was consistent among the sample of survey responses and during interviews with prominent stakeholders.

[13] RIA participated in 2014 through the World Social Science Fellows.

[14] Such as the World Bank and UNISDR – although the situation with respect to the latter has been improving in 2016.

plethora of other networks and platforms operating in the DRR domain – except for its strong promotion of 'integration'.

- Communication: With the lack of resources and, until recently, suitable capacities in the IPO, communication suffered from a lack of focus on multiple media (conventional and social media, blogs, webinars). In the survey, 45 percent classified IRDR's website as "quite useful". At the same time, among those who confirmed that they were 'involved' in IRDR, 18 percent had not received any communications. There are few references to IRDR on the Internet, and it is even rarely mentioned in co-sponsors' documents. It elicits few citations and references, and does not have high impact flagship reports that highlight its niche and contributions in a manner that inspires. And while a focus on academic publishing is important, different stakeholder groups need different types of communication.

- Research output visibility: IRDR's research results are still emerging, and they have yet to be applied in the field to the extent that they inspire. Publishing in regional journals with limited distribution does not provide for wide enough dissemination. Practically missing are papers that challenge concepts and hence are more likely to attract significant attention, and publications in high impact and widely read and cited journals like Nature or Science.

- Branding: IRDR's branding as an entity does not receive enough attention. It has suffered from (i) a lack of acknowledgment in published work, (ii) overlaps with activities in 'home' institutions, and (iii) lack of practical alignment between the program and its network nodes that can generate more publications under an IRDR banner.

- Accessibility: The information and data produced by the IRDR core projects are generally available and accessible, but it is not clear to what extent the information and data produced by the nodes and research institutes with their own research funding for IRDR related projects are freely available. Many journals require payment for access to publications. The website can also benefit from a comprehensive collection and searchable database of publications from the IRDR family; only a few reports are available.

2.2.2 Thematic positioning

IRDR's early focus on a holistic approach to DRR has positioned it well within the main frameworks that will determine the direction of DRR worldwide over the coming two decades. It continues to be an active part of the post-Sendai discourses on DRR.[15] IRDR is thus in several instances recognized in relevant documentation. Numerous references in these documents resonate with IRDR's priorities. The holistic approach IRDR espouses is also critical in connecting disaster risk reduction with the Sustainable Development Goals. However, these broad areas of work - and even those in the important S&T Roadmap - do not facilitate focus. It is therefore appropriate that the SC has grappled in meetings with how best to position IRDR's next phase of development within these important global frameworks.

[15] For example, the WCDRR, the UNISDR/STAG S&T Conference held in 2016 in Geneva, and the First Asian Science and Technology Conference for Disaster Risk Reduction Science-Policy Dialogue for Implementation of the Sendai Framework, also held in 2016.

IRDR is set to contribute to the new Science of Risk Project[16] in the Asia-Pacific region in partnership with the UNISDR Regional Office and ICSU-ROAP DRR working group. **The Review panel supports** this approach. If IRDR is to be more than 'just another scientific program', it has two main choices: *First*, to initiate completely new areas of work based on newly identified knowledge gaps that present major or intractable challenges for the field. *Second*, to strengthen, amplify and accelerate activities around its existing foci, and thus to move further in line with the scope and intent of the initial Science Plan. This project indicates a move in the latter direction and is the safest way to ensure that IRDR builds on its strengths and capitalizes on the niche it has carved out over the past six years.

The Science Plan also recognized that research to identify and analyse successful risk reduction programmes is very important, and that a core challenge is to scale up proven practices. The IPCC drew upon several internationally-planned and coordinated research programmes, but did not have the resource make a strong connection between extreme climate events and disaster risks in coordinated risk assessment. IRDR was designed to fill this latter gap, and might still evolve in that direction.

The Review panel found it commendable that IRDR has started to engage with one of the early features of the so called 'Fourth Industrial Revolution', the fast advances in new technologies, and their potential for DRR science and management.[17] But an issue that has not received attention is where to place the balance between supply- and demand-driven knowledge production. Policy- and practice-oriented scientific programs such as IRDR needs to maintain a careful balance between information and knowledge that are demanded by potential users (*i.e.*, policy-makers or vulnerable communities) and that are responding to needs, challenges or opportunities that they have not yet foreseen.

2.2.3 Horizontal positioning

In an increasingly crowded field, the strategic purpose and quality of IRDR's relationships with similar global programs or global organizations with a relevant mandate becomes ever more important. The program is dependent on well-targeted short- and long-term relationships as well as politically astute navigation of opportunities and obstacles. The extensive experience of IRDR's very well-connected Scientific Committee, and their understanding of the evolving global and regional DRR landscapes, serve this purpose well.[18] IRDR has thus established many useful linkages and ad hoc partnerships, mostly in the academic and government sectors, yet still lacks a strategic approach that reflects the value of catalytic and long-term partnerships towards influence and collective impact. It has also yet to attend to such partnerships outside its 'comfort zone', in particular in the private sector which would require careful consideration and targeted engagement. Creating alliances and collaboration with such group of actors will only succeed if there are clear benefits for them in terms of disaster risk prevention and resilience building; IRDR will need a strategic approach to achieve this.

[16] This regional project aims to develop national science advisory capacities for disaster risk reduction in the region, through collaboration with key regional partners within two major areas in the Sendai Framework: (i) creating or strengthening capacities of national DRR science-policy platforms, and (ii) focusing research on root causes and the underlying risk factors of disaster risk in line with the work of FORIN, and including the interlinkages between DRR, sustainable development, and climate change mitigation and adaptation. It will also ensure that DRR is mainstreamed into other sectors, policies, and strategies.

[17] Such as big data, smartphones, citizen science, new generations of early warning systems and so on.

[18] The 15 members of IRDR normally reflect a good geographic balance, as well as a wide variety of disciplines across the natural sciences, engineering and social sciences and to a lesser extent, economics and health sciences

IRDR appears to be thinly spread[19]. In spite of multiple useful relationships, it does not appear to have a sufficiently targeted and deliberate, long-term perspective on partnerships that can position it better in the global DRR and development agenda, and help catalyze actions for collective influence and impact. It is not clear whether decisions are taken that lead to action, and that long-term partnerships are strategically cultivated[20]. The impact of the partnership efforts of IRDR remains unclear.

UNISDR is a particularly important actor. The lack of collaboration between the two parties has been a missed opportunity for mutual influence and greater impact – given IRDR's niche, and the pivotal role of UNISDR's Scientific and Technical Advisory Group (STAG) which has most recently been given the responsibility to drive the Sendai Framework science agenda. The linkages seem mostly due to certain individuals rather than being strong institutional ones – for example, some IRDR SC members have been members of the STAG and several IRDR SC members have been involved in UNISDR's Global Assessment Report. Without such support, the designation of UNISDR as co-sponsor appears to be worthless[21]. Formal linkages through appointment of members to the respective steering committees can be useful, although they do not guarantee success.

The relationship with ICSU has also not yielded the expected benefits.[22] It has not rallied its scientific unions in support of IRDR's actions.[23] The lack of coordination between IRDR and ICSU's regional efforts in Africa, Asia, and Latin America is also a wasted opportunity to strengthen IRDR, develop a useful agenda and help it to become visible. ICSU's regional programmes could also have helped IRDR to develop stronger and more dynamic National or Regional Committees. A number of ICSU members, such as IUGG, are also active in the DRR field. Progress in future will require all co-sponsors, including ICSU, to assume a more active role.

The apparent opportunity to engage WMO in IRDR could strengthen its focus on the linkages between increasing disaster risks and extreme climate events at various scales. It might help IRDR to connect with the IPCC to perform joint assessments on extreme climate driven disaster risks - an increasing priority for the latter. Although several members of the IRDR SC participated in the 2012 IPCC special report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX), IRDR as entity was not involved - but it might be possible to use such connections to enhance the exposure and eventually the impact and reputation of IRDR. The IPCC AR6 and its three special reports present a good opportunity to help IRDR build a better relationship with other international efforts around DRR and climate change.

Future Earth poses another important opportunity. The Review panel does not support IRDR's assimilation into Future Earth. It will remove IRDR's current ability to be flexible and agile, which is crucial if it is to make fast progress in the next few years. However, close working relationships and

[19] Monitoring data should also capture its engagements

[20] For example, many partnerships were suggested at the 11th, 12th and 13th meetings of the Scientific Committee, but there are no records of decisions or follow-up actions.

[21] There are indications that the relationship is set to change, with the increase in contact and engagement between IRDR and STAG, including at the UNISDR/STAG S&T Conference in Geneva and in the joint organization of the regional conference on disaster science policy in the Asia-Pacific region.

[22] For example, ICSU coordinated the Major Science Group that advocated for the inclusion of science in the Sendai Framework, and co-sponsored several IRDR events

[23] For example, ICSU ROAP has recently organized a forum and roundtable with UNU-IIGH and UNDP on Advancing Science and Technology in the Implementation of the Sendai Framework for Disaster Risk Reduction. This could have been a good opportunity for ICSU to further position IRDR in the context of the Sendai Framework.

collaborations have to be established[24]. IRDR can assist in mainstreaming DRR with Future Earth support. This will be a test for IRDR's positioning in this arena. Such relationship might also provide an opportunity for engagement with the work of the IPCC.

It is unfortunate that with the exception of DATA's engagement, linkages with the private sector have not been explored in spite of the fact that major global players have very significant vested interests in the DRR domain. IRDR needs to get a better understanding of its value proposition for different important stakeholders such as the private sector and programs such as Future Earth or the World Bank's GFDRR.

2.2.4 Vertical positioning

Through its network of IRDR ICoEs and IRDR Regional/National Committees, IRDR has extended its reach from global to local level in around 30 countries, giving it access to a variety of policy-and decision-makers and/or vulnerable communities. The ICoEs provide in principle an interesting model to leverage national expertise at the international level and establish within nodes the IRDR network around specific thematic expertise. However, in the absence of clear Terms of Reference for ICoEs and clear articulation of their relationship with the program, alignment with and between the nodes of this network, and some coordinated action within a larger strategic plan, it is a network in theory rather than action. Without clear inspiration or incentives for collective action, this situation is unlikely to change.

Building a global-to-local network: IRDR never established the network of long-term hazard sites foreseen in the Science Plan. Instead, the role of the ICoEs is seen as crucial for providing access to sites to enable "cross-disciplinary research, community outreach (and their inclusion in research), comparative analyses, longitudinal studies, and resilience building". The IRDR Regional and National Committees – if they are active, which several are not, and have the appropriate reach, which several do not - provide a mechanism to interact with policy- and decision-makers, and with organizations that can provide access to communities and practices on the ground. There has as yet been neither systematic efforts to synthesize and map the expertise and access they can provide, nor to stimulate collaboration between them. In other words, IRDR has not yet engaged seriously with the network to strengthen its position in the DRR domain.

Position in the regions: It is commendable that IRDR tries to balance geographic representation from the Global South and the Global North (and across the different continents). This can be seen from the composition of its Steering Committee, the establishment of its centres of excellence, and the engagement of early career scientists. There are challenges. For example, the small island developing states (SIDS) are important yet do not have obvious centres of excellence; this will require innovative ways of engagement. It is a missed opportunity that for example ICoE-REaL, the Periperi U consortium spanning 11 countries in Africa, has not been systematically engaged in IRDR research or capacity strengthening efforts. There is much to learn from their more than a decade-long experience of doing integrated DRR across Africa.

Given the cross-border nature of many hazards and disasters, engagement at regional level is critical. A few jointly organized events appear to serve as an entry point into a region, which then provides potential for collaboration. The recent engagement of IRDR in the Digital Belt and Road (DBAR)

[24] This appears to be IRDR's intention with its recent invitation to Future Earth for mutual representation as observers on their respective Scientific Committees.

initiative, which is promoted by RADI and the International Society of Digital Earth (ISDE), is an example with potential for IRDR to work on the ground with a regional reach.[25] There are also connections with the Regional Offices of UNISDR and ICSU[26], and joint activities have been conducted especially in the Asia-Pacific region with its strong focus on disaster risk reduction.[27] But more can be done, especially in determining strategically and systematically how the 'tentacles' of each organization can complement the other and work in synergy.

From national to local levels: There appears to be little formal engagement between IRDR and its National Committees. This might change, as the outcomes of the Sendai Conference discussed at the UNISDR S&T Conference have introduced the idea that IRDR country capacities should have a formal advisory role to national disaster risk reduction platforms. IRDR might now have the opportunity to have a direct influence at national level. Until now the program has largely depended on the active promotion of its contributions by individual Scientific Committee members or on Regional/National Committees that are particularly active. IRDR did not systematically use the national (or regional) platforms of UNISDR as a base for introducing IRDR into countries - although in a few countries, such Colombia and France, the IRDR National Committee is formally part of the UNISDR national platform. The addition of a research component to national multi-stakeholder platforms would have helped to achieve links to policy and practice.

Another missed opportunity has been the lack of strategic engagement with the UNISDR platforms – whether through IRDR as program, its National Committees or individual IRDR-connected researchers. Such connection can be a 'match made in heaven', allowing influential policy and other processes to connect formally with scientists in order to develop a better understanding of each other's worlds, and how mutually beneficial collaboration can be structured.

Finally, there is no indication of the type of access that the IRDR ICoE nodes can provide to sites and communities. With the exception of a few engagements through the IRDR research projects (FORIN and RIA in particular), their value added in this regard is unknown in spite of the potential displayed by their well-documented scientific capacities and, in many cases, by their active or potential linkages to communities. Yet there appears to be significant potential for the ICoEs to support IRDR's objectives, once the 'rules' for cooperation and deliverables are established.

[25] DBAR is relatively new to IRDR, and the participation of IRDR in DBAR will likely be discussed at next Scientific Committee meeting.

[26] For example, initiatives with the ICSU Regional Offices for Latin America and Caribbean (ICSU ROLAC) and Asia-Pacific (ICSU ROAP).

[27] For example, IRDR co-sponsored the 1st Asian Science and Technology Conference for Disaster Risk Reduction Science-Policy dialogue for Implementation of the Sendai Framework (2016), together with the Hydro and Agro Informatics Institute (HAII) of the Royal Thai Government Ministry of Science and Technology and UNISDR, and UNISDR's Asian Science Technology and Academia Advisory Group (ASTAAG).

3. GOVERNANCE AND MANAGEMENT

Key Review Question: To what extent are IRDR's governance and management structures and processes appropriate for the effective management of the program?

The Review panel has great appreciation for the pro bono work of the SC as well as for the governance and management challenges presented by IRDR. It displays characteristics of a 'global action network' that strives to achieve transformative change through collective action and impact. It also has an ambitious design. The first few years of IRDR's existence has therefore provided for significant lessons, and several serious issues have had to be resolved. The Review found that the set-up of IRDR's governance system *does not* sufficiently reflect the demands imposed by the program, and that the absence of a strategic adaptive management approach and essential management systems has played a significant role in IRDR's underperformance. This situation has been exacerbated by a lack of clarity about accountability, roles and responsibilities. Furthermore, while IRDR is fortunate to have secure operational funding for ten years, failure to focus on fundraising has put progress at risk.

Weaknesses in the system have to be urgently addressed. With due attention, none of the remaining challenges will be insurmountable, and the location in Asia of an IPO in the DRR domain offers significant advantages. But the success of the program is highly dependent on finding a business model that works, and that can help sustain IRDR and/or its impacts in the long run. If IRDR is to enhance its performance and accelerate its impacts in the next phase of its existence, good governance and strong, effective management in line with the notions of a global (research) action network and collective impact will be essential.

3.1 THE NATURE OF IRDR

IRDR has a set of interrelated features that clearly reflects the characteristics of an action network[28] that strives to achieve transformative change through collective action and impact[29]. It also has a set of specific challenges that place further demands on its governance and management systems. Similar to many international scientific programs, it is heavily dependent on the volunteer time of highly skilled experts; this constrains productivity. Collective and catalytic action is crucial for achieving significant impact and mobilizing program resources. Yet IRDR has to draw together many different actors from diverse contexts in the Global North and the Global South who do not necessarily know or trust one another; may not be inspired or motivated by the same actions and incentives; may not share values, expectations or capacities; or have a collective understanding of 'integration', 'integrated research' or

[28] Steve Waddell (2016). *Change for the audacious: A doer's guide*. Networking Action Publishing, Boston. 222 pp. Note: Some call these networks also Global Solutions Networks or Global Issue Networks.

[29] Both action networks and a collective impact approach are premised on the belief that no single policy, government department, organisation or program can tackle or solve the increasingly complex social problems that societies face. They call for multiple organisations or entities from different sectors to abandon their own agenda in favour of a common agenda, shared measurement and alignment of effort.

'catalytic action', relevance, quality, legitimacy and usefulness. IRDR is also a first programme of this nature and scope in an evolving field of scholarship and work in policy and practice. It therefore cannot be conceived and executed with a rigid notion of what constitutes effective action and a trajectory towards 'success'. It has to adopt a learning approach while striving for accountability.

With these considerations in mind, the Review panel emphasizes that for IRDR to achieve its objectives requires a highly effective and accountable governance system, as well as a strong and strategic management system that can propel the program towards its desired impacts.

3.2 GOVERNANCE

IRDR's governance system has not been tailored for the strong oversight needed to ensure effective implementation and accountability independent of the goodwill, commitment and ethics of the persons directly involved. The Scientific Committee has to hold itself accountable without sufficient checks and balances. In essence it assesses its own performance as it plans and directs the programme, and oversees the research projects while the project managers are on the Committee. This represents a clear conflict of interest. It also complicates oversight. For example, several EDs confessed that they felt pressurized by Scientific Committee members to fund travel costs to conferences and meetings when these did not appear to be priority engagements for IRDR from a strategic perspective.

IRDR has thus operated for nearly six years without effective oversight. Progress and achievements have not been systematically recorded and used for decision-making, learning, improvement and accountability. Conflicting or unclear statements in the founding documents, for example about reporting requirements or the ED's performance management processes, have led to confusion about lines of authority and responsibility. And the Scientific Committee carries a significant burden. It has been given a management responsibility while operating on a voluntary basis.

In the absence of a set of explicit principles and/or guidelines according to which IRDR conducts its work, there are also no frameworks or standards against which IRDR can be held accountable. There is no monitoring and evaluation system in place, nor any form of systematic reflection on performance. Verbal and written reports to the Scientific Committee and annual program reports are updates of activities rather than strategic, evidence-informed analyses of progress against objectives (goals), expected milestones, results or targets. There are minimal or no data available on even the most basic aspect of program performance, such as number, types and impacts of scientific outputs, numbers of persons reached through targeted events, or milestones to be achieved, and very little indication of emerging impact. Reporting is further complicated by the lack of clear boundaries and guidance on what constitutes 'IRDR' products or actions, and how this should be reflected in partnership activities. Only some network nodes report to IRDR on their activities, and none have been held accountable for performance. The lack of ED performance assessments and of informative IPO reporting has also led to questions about, for example, the merit of the extensive traveling (according to some reports, accounting for more than 60 percent of certain EDs' time).

This situation has had a serious impact on performance and on perceptions about the program. There is no systematic, evidence-based narrative of IRDR's performance and the strength and significance of its contributions since its establishment, nor a strategic narrative and clear understanding of how it has proceeded to (try to) play the role envisaged at its inception. Although the Review could help to reconstruct some of this information, the absence of such evidence and accompanying narratives contributed to its low profile and lack of visibility in the DRR domain. This, in turn, has weakened its capacity and opportunities for fundraising and positioning on global, regional and national platforms.

The lack of pursuit of a Consultative Forum, partnerships and other activities proposed in the Science Plan has also contributed to IRDR's underperformance. Fresh perspectives through, for example, a well-designed Consultative Forum can complement the valuable insights of SC champions who are consistently engaged in IRDR over a significant period. At the same time, care is needed to ensure appropriate rotation so that evidence does not support the perception of some that the SC is an "exclusive, self-perpetuating club" that does not allow for enough rejuvenation.

The delay in resolving these and other weaknesses in leadership and management nearly derailed the first phase of IRDR. Management weaknesses also led to serious tensions with the host organisation - a situation that was addressed only in 2015 when the Executive Director resigned and a crisis management meeting had to be organized at ICSU between the three co-sponsors and RADI (refer also to section 3.2).

3.3 LEADERSHIP AND MANAGEMENT

The Review panel found that IRDR's program of work has not been *strategically and systematically* led and managed, and funding has been insufficient to act as an important driver and incentive for effective and efficient management, participation and performance. As a result, IRDR does not operate as an effective and visible 'program', but as a collection of activities that have been initiated or supported in parallel among the network nodes, and then more or less left to continue on their own. There are not enough connections between them; opportunities are not followed up; and participants lack a good sense of direction, coherence, alignment and accountability. Although the IRDR research project leaders are members of the SC, representatives of the other nodes in the IRDR network are only invited to meetings for ad hoc reporting; few specific actions follow as a result. Furthermore, as a result of the nomination process, SC members are primarily from the academic sector; practitioners, policy-makers and the private sector have been largely absent. The interface with policy and practice therefore has had to be strengthened through collective action with the National/Regional Committees and ICoEs, yet this has been hard to achieve without a clear strategy and priorities for action.

The Review panel has great sympathy with the situation. Scientific Committee members have incentives such as the opportunity to form bonds with colleagues from across the world, gain visibility on global platforms, and use the ICSU and IRDR global brands for fundraising for institutional projects within nodes. But the effective execution of a complicated program such as IRDR can put too much pressure on volunteering SC members, and in particular on the Chair. Furthermore, the co-sponsors were marginally, not strategically involved during its formative years. This has led to lost opportunities to connect to their structures, and to play a more significant role from national to global level.

3.4 THE IPO IN BEIJING

The IRDR Interdisciplinary Body was the first to be based outside Europe, and then specifically in China. It presented an important opportunity for learning. Cultural differences between Western and Chinese societies were bound to challenge all involved. This would normally call for close and empathetic collaboration to smooth out problems as they emerge, orientation for international staff about the living and work conditions in China, and consideration among Chinese counterparts of the peculiarities of other ways of life.

The Review panel therefore learned with disappointment from a diverse set of persons interviewed that certain key stakeholders were from the beginning hesitant about locating the IPO in China. This lack of trust inspired the establishment of an office that not only insisted on independence, but on

keeping a significant distance from its host organization and country in nearly all aspects of its operations.

This approach contributed to very challenging circumstances during the first few years of IPO operations. For significant periods, the Chinese organizations involved experienced behaviour and processes that projected mistrust and lack of respect.[30] Strained relations and misunderstandings prevented productive relationships with the host organization, IRDR-China and other relevant bodies. This was further exacerbated by insufficient discussion about financial expenses and reasons for travel, as well as a failure to treat CAST and/or CAS as organizations that should be included in formal reporting and other relevant accountability and learning processes.

At the same time, some international staff members struggled to adapt to the working and living conditions in Beijing. Pollution, 'poor food' in the RADI cafeteria, expensive accommodation, the isolated location of RADI on the outskirts of Beijing, dependence on Chinese-speaking staff for interpretation of financial and administrative systems, restrictions on communication systems and, in early 2015, changes in tax regulations that had a significant impact on net salaries, were all mentioned as having been at times challenging for expatriates' work environment and quality of life.

It is a failure of management that all parties allowed the situation to fester, and that it was not evaluated with concerted remedial action early on. The situation was addressed (to the extent possible) only after a crisis meeting in 2015 between the co-sponsors, the IPO and the host organization, and with the appointment of an acting Executive Director who understood the need for relationship building among the IPO, SC and Chinese stakeholders.[31]

The Review panel found no reason to recommend that the IPO should move to another location. To the contrary, many solutions have been found and lessons learned. It continues to offer an opportunity to learn about operating an IPO in different contexts; how to establish and make best use of mutually beneficial relations with China's vibrant scientific community and in particular with RADI, which is regarded as the backbone of China's impressive remote sensing capabilities[32]; the Chinese Academy of Sciences[33]; and IRDR-China.

It is also advantageous that the IPO is located in a region where the very high incidence of hazards and disasters ensures continued interest in the advancement of science and technology in a search for solutions for prevention, risk reduction, adaptation and response.

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[30] The Review panel emphasizes that this information and findings were based on a significant number of interviews with a variety of persons involved from very different perspectives – from within and outside the program, and within and outside China. Convincing examples were given, and information was well triangulated for credibility.

[31] During this whole period RADI, and in particular the consistent and empathetic support of its previous Director, Prof Guo Huadong, garnered very significant appreciation from all stakeholders for the efforts to resolve administrative, communication and financial systems challenges.

[32] RADI houses nine laboratories or research centers at national or CAS level, two national key infrastructures for space-borne and airborne Earth observation, and four international S & T platforms supported by UNESCO, ICSU or TWAS. It has a team of 700 researchers and engineers, including more than 300 senior professionals. It has one postdoctoral program, six doctoral and master's programs, and more than 500 graduate students.

[33] CAS is a powerful scientific organization with 104 institutes, three associated universities, 63,000 scientists, abundant funding for research and many activities in disaster related work.

3.5 RESOURCING

The main source of funding for IRDR comes from a ten-year donation by the Chinese Association for Science and Technology (CAST)[34]. ICSU provides annual funding for one meeting of the Scientific Committee. IRDR has also received ad hoc funding for specific activities, including from UNISDR.

The secured IPO funding should have provided the program with the opportunity to concentrate on fundraising for research and other initiatives. The program has been operating in the midst of DRR as an increasingly well-recognized global priority for development, with aspects that should give it a competitive advantage such as the engagement of excellent scientists, a clear plan (in principle) to make a major difference in an important domain, and an extensive network of potential partners that include three powerful co-sponsors. The Review panel therefore found it unacceptable that there has been no strategic, concerted fundraising effort based on a well conceptualized business plan. Such an effort is imperative for the strategic evolution and sustainability of IRDR and its impacts.

Issues for consideration include:

- Centrally registered program income[35] has been very limited for a global program with the ambition of IRDR. All informed stakeholders agree that IRDR has been unable to raise sufficient funding to give its activities momentum. 'Lack of funding' is given as the primary reason for the limited scope and slow progress over the past six years, yet efforts appear to have been sporadic and ad hoc.

- Program income appears to have been significantly supplemented by funding that did not flow through the central account. There are no systematic records of all funding that has been available or used to support achievement of IRDR's objectives. The cost of the program is therefore unknown.

- The four IRDR Working Groups received some contributions from the program funds, but have tended to raise funds separately (and in some cases, unsuccessfully). Scientists' institutions have contributed costs for IRDR activities; in turn, IRDR's profile and partial funding of a project have, according to anecdote, helped some of the groups to secure grant funding for their own activities. Many partners have also provided ad hoc support for co-sponsorship of events.

- The situation is further complicated by the fact that formal program documentation tasks the co-sponsors, SC *and* ED with fundraising, yet it has never been made clear who should lead the effort.

- There has been lack of clarity about authority over the program budget, with either the ED or the SC Chair requested to approve, for example, travel expenses of the IPO or SC members. This has led to some tensions between RADI who administers the program budget, the ED

[34] CAST is a non-profit, non-governmental organization of Chinese scientists and engineers, comprising over 200 national professional associations and hundreds of local branches at various levels.

[35] IRDR had more than US$4 million in income for central operations and specific projects in 2011, and more than US$6 million in 2012. In both cases, around half was allocated for one project only, while the rest was made up of various relatively small amounts, primarily for events. ICoE-Taipei has consistently allocated a substantial annual amount for IRDR related activities, used primarily for capacity building among young scientists.

and/or the SC about the value for the program of approved travel plans in the absence of a strategy that can serve as a reference point for such decisions.

- RADI, the host organization, administers the program budget managed by the IPO. Financial reports in Chinese have presented problems, but such early challenges appear to have been resolved, and all financial procedures and administration found to be in order. However, it is of concern that until very recently, the donor and host organizations did not receive any formal reports from IRDR for purposes of learning or accountability.

3.6 IMPLICATIONS FOR ICSU

IRDR's governance system is said to have been conceptualised more or less in line with that of the work of other ICSU Interdisciplinary Bodies. Updates on activities are given rather than strategic reporting for measuring progress and for accountability, while co-sponsors as a group take a back seat in terms of program governance and management. The situation experienced in IRDR raises some questions about an approach where the Scientific Committee is the driver of the science, the manager of the IPO (e.g. defining the overall portfolio of activities, assessing ED performance), and allocator of funds - all while overseeing itself.

While it may have worked well for programs by other Interdisciplinary bodies, it appears to point to a fragile system that can easily derail or disappoint, especially when there is conflict, incompetence or insufficiently shared benefits; lack of management acumen, implementation capacity, or appropriate performance and impact monitoring and evaluation frameworks; or where it is particularly important to break out of scholarly or programmatic comfort zones.

This will become even more important in an era where the value proposition of science and technology and the role of evidence in policy and practice are increasingly questioned, and influenced by the demands of the Sustainable Development Goals and the various global and regional frameworks that relate to the DRR domain, such as the SFDRR.

Reconsideration of IRDR's governance and management set-up could therefore hold valuable lessons for ICSU and its co-sponsors – or at least draw concerted attention to issues for resolution in future.

4. PRECONDITIONS, CHALLENGES AND INFLUENCES ON SUCCESS

4.1. PRECONDITIONS FOR SUCCESS

IRDR has sufficient strengths to enable significant impact over the next few years, *if* such strengths are appropriately applied, trade-offs and tensions managed, and negative influences addressed. In this chapter, the Review panel returns to the change logic of IRDR sketched in section 1.2 to capture briefly the extent to which IRDR has met the preconditions initially envisaged as important for success, given the change logic of the Science Plan. The highlighted areas in figure 2 indicate some of the preconditions that were not met (and there are more). Some challenges in this regard could have been foreseen or highlighted by a monitoring system set up to give early warning signals.

The change logic of IRDR can now be revisited, detailed and adjusted to reflect the lessons learned during this Review. The key challenges and factors that influenced success should therefore be well understood, and considered in IRDR's adjusted plans and operations. This is the focus of this chapter.

4.2 KEY STRENGTHS OF IRDR

IRDR's initial conceptualization provided stakeholders with a strong value proposition.[36] Even in its pared down version IRDR continues to have a valuable niche and comparative advantage in the DRR space that should not be lost, but enhanced.

IRDR's niche and comparative advantage are based on the result of a *confluence o*f strengths and circumstances that include:

- Its strong focus on 'integration', which will be increasingly important, and its expertise and demonstration in this area of work which is likely to increase in demand around the world.
- The unique and ambitious vision in its Science Plan that continues to frame IRDR's foci.
- Its potential to make a real difference on the ground even though it is a global program - especially if the program re-captures the ambition in the Science Plan.
- The expertise and commitment of its highly respected scientists, who have been able to lead and guide IRDR's efforts on the international stage, give it profile as a voice for integration in the DRR domain, and continue to provide high quality scientific expertise pro bono.
- The link with its three high-profile co-sponsors - and in particular with ICSU as highly credible 'brand' in the scientific arena - that adds to its profile.
- Its global nature and (potential) footprint, through partnerships and the IRDR network that provide it with the potential to move from science to action and make a difference through knowledge synthesis based on comparative context-sensitive studies.
- Its IPO operating in a country and region where work on hazards and disasters, and scientific advancement in general, are very high, well-funded priorities.

[36] A value proposition is a promise of value to be delivered and acknowledged. It is also a belief from the customer – in the case of IRDR a variety of stakeholder groups within and outside the scientific arena - about how value or benefit will be delivered and experienced.

- Its potential to strengthen capacities through advocacy, awareness raising, education, engagement with early career scientists, and advocacy that things should be done differently in the DRR domain.

4.3 KEY CHALLENGES FOR IRDR

IRDR has a set of interrelated features that clearly **reflects the characteristics of an action network[37] that strives to achieve collective action and impac**t.

IRDR as action network working for collective impact has the following characteristics:

First, IRDR comprises a set of individuals and organizations that are intended to work together to realize transformation on a specific issue.

Second, it embraces diversity across sectoral, linguistic, disciplinary, Global South/North and other divides.

Third, it is intended to cross boundaries and silos, whether disciplinary, sectoral, geographic, jurisdictional, stakeholder or demographic.

Fourth, it has to mobilize and participate at organizational rather than individual level, ignoring hierarchies between organizations, in order to mobilize and scale resources and change the organizations themselves as part of larger transformational change.

Fifth, it strives to develop new processes, tools, relationships and actions within a decentralized decision-making structure that can support responsiveness in different contexts.

Sixth, it aims to produce common goods that benefit diverse stakeholders.

Seventh, its key participants often work on a voluntary basis, driven by their "passion and commitment to push the boundaries of enhancing environmental, social and economic outcomes". In this context, "individuals with legitimacy, accessibility, and passion for change" are seen as critical for success.

The experiences of organizations working with a **collective impact approach** have also shown that participants need (i) a common agenda for change based on a shared understanding of the problem and jointly agreed plans of action; (ii) data collection and consistent measurement of results across all participants to help ensure alignment and accountability; (iii) a plan of action that outlines and coordinates mutually reinforcing activities for each participant; (iv) open and continuous communication across the many stakeholders to build trust, assure mutual objectives and create common motivation; and (v) one or more backbone organizations (in IRDR's case, the IPO) with staff and specific sets of skills to serve the entire initiative and coordinate participating organisations and agencies.

Action networks that work towards **large systems change** also attend to generic success factors: It is important to learn from what works and continually integrate the knowledge into the way

[37] Steve Waddell (2016). Change for the Audacious: a doer's guide. Networking Action Publishing. 222 pp.

the effort is organized, and to organize action around specific issues such as a particular industry, a theme or a creative geographic space.

Rather than formal membership structures, attention should be paid to incentives for participation, and opportunities, activities and arenas provided that allow people to connect, solve problems, make decisions and be part of a community.

Learning processes and capacity development should be at the core rather than periphery of the effort, and networks cultivated that enable innovative ways of working.

Diversity and collaboration across boundaries should be encouraged, and also both formal and informal agreements to guide interactions.

IRDR also has other demands on its governance and management systems. Similar to many international scientific programs, it is heavily dependent on the volunteer time of highly skilled experts; this constrains productivity. Collective and catalytic action is crucial for achieving significant impact and mobilizing program resources. Yet IRDR has to draw together many different actors from diverse contexts, disciplines and sectors who do not necessarily know or trust one another; may not be inspired or motivated by the same actions and incentives; may not share values, expectations or capacities; or have a collective understanding of 'integration', 'integrated research' or 'catalytic action', relevance, quality, legitimacy and usefulness.

IRDR is also a first programme of this nature and scope in an evolving field of scholarship and work focused on policy, strategy and practice. It therefore cannot be conceived and executed with a rigid notion of what constitutes effective action and a trajectory towards 'success'. It has to adopt a learning approach while striving for accountability.

These considerations confirm that **IRDR needs a highly effective and accountable governance system as well as a strong, strategic management system that can propel the program towards its desired impacts.**

IRDR furthermore has to determine exactly what makes the whole more than the sum of the parts, and how this (potential) strength can be better used. It still shows signs of being a 'team of champions' rather than a 'champion team' (and still a relatively small one). It is often unclear whether SC members and other IRDR related experts speak or write as individuals, or as a representative that is fully engaged with, and acting on behalf of IRDR. This has blurred the boundaries of IRDR, and affected perceptions of its performance as well as its identity as entity and 'brand'.

Demonstrating and guiding 'integrated research'. IRDR has yet to demonstrate convincingly an integrated approach to DRR. Although FORIN has taken steps in this direction, even the four IRDR Research Projects do not convincingly demonstrate the implementation of 'integrated research' across hazards, disciplines and scales, and/or between the social, engineering, economic, natural and health sciences in a manner that can serve as inspiration and guidance to others[38].

Demonstrating and inspiring vibrant research in priority fields. Progress has been too slow to achieve a fraction of the intended impact in the Science Plan. This means that if IRDR is to produce meaningful

[38] Although FORIN is regarded as the best example and perceived to be moving in the right direction, many persons interviewed noted their disappointment with the lack of emphasis on this most fundamental aspect of IRDR.

research results that demonstrably make a difference to policy and practice towards more effective societal responses to risk, it urgently has to find ways to amplify and accelerate its research and dissemination processes.

Bringing results to decision- and policy-makers. Implementing IRDR effectively requires proactive, direct engagements between scientists and users, and/or innovative tactics in conjunction with 'boundary' organizations that can act successfully on the interface between science and the (policy-related) users of science. Overcoming the science-society and science-policy divides is notoriously difficult, and although SC members grapple with this matter, there is little indication of a systematic strategy for knowledge translation, or pressure on the IRDR network to support this goal at national level.

Mobilizing the IRDR network. Although National Committees' 'terms of reference' and ICoE Memoranda of Understanding indicate that their work is broadly aligned with, or supporting IRDR's objectives, they operate independently and are not held accountable for performance in this regard. The ICoEs and National Committees report at IRDR meetings, but while this stimulates exchange and interest in the program across disciplinary and geographic boundaries, it is not enough to result in a vibrant action network with alignment and coherence between the nodes, joint projects (including for fundraising) between some of the nodes, staff or student exchanges, or the exploitation of synergies between ongoing efforts in line with the principles of effective collective action. This gap has been recognized by ICoEs and National Committees, who have expressed a desire for more networking. This requires a special approach to management, with which IRDR has not engaged.

Establishing IRDR's boundaries. IRDR has not imposed any obligation on its network, nor required the 'nodes' to adhere to a set of values or principles. Even the branding of their projects and products has not been clarified. Since IRDR has not been able to incentivize support for its objectives and research priorities through project funding, it has been increasingly difficult to establish the boundaries of 'IRDR'.

4.4 INFLUENCES THAT IMPEDED SUCCESS

Some of the main reasons for underperformance in IRDR relate to decisions made during the inception phase, the challenging nature of the program and challenges that arose during implementation. Other reasons are inherent in how such ICSU Interdisciplinary Bodies are set up and their work organized. Quick resolution of these challenges is needed to accelerate IRDR's progress to impact.

4.4.1 Decisions during program inception

Decisions made during IRDR's inception phase profoundly influenced the course of its evolution by failing to reflect the ambition and special niche of the program in the Science Plan that was developed to guide program implementation:

Working Groups took on a different charge: The Science Plan proposed two Working Groups to scope out the research program and put elements in place that could lay a firm basis for further program development – focusing on forensic investigations of recent disaster events and the establishment of a long term hazards research network - two interrelated initiatives that would then lead to further working groups on specific aspects. Instead, four Working Groups went on to identify and drive research projects. Thus, instead of initiating the suggested coherent, cross-disciplinary and balanced approach to the in-depth forensic study of post-disaster investigations, informed by evidence-based assessments and in-depth case studies in different localities around the world, four parallel initiatives were launched. This does not mean that these initiatives are not useful, or justified. But the combination

of the divergence from the intent and the way implementation has proceeded has led to a program that is seen as fragmented and struggling to find the space to make a real impact on policy and practice.

A 'Long-term Hazards Research Network' was not established as intended: Although a network in support of IRDR work was initiated from inception, it was not connected to the central idea of 'penetrating' forensic studies described above. The way it has unfolded has also deviated significantly from the intent. According to the Science Plan[39], the network was intended to "*allow for enduring (decades long) place-based, longitudinal studies of natural hazard risk*" …. be "*a mechanism for reaching out to communities located in the most vulnerable areas and including them in the science agenda*", and "*provide a context for comparative analysis … of public policies and practices ….*". This would be crucial for understanding risk reduction practices in these sites and working towards "*increasingly effective future action*". The intended case studies were seen as instrumental in the selection of such sites, and this coherent, networked approach to research was intended to "*provide a framework for the full engagement into the IRDR program of the ICSU Unions and various other organizations ….*" The Long-Term Ecological Research (LTER) and National Ecological Observatory (NEON) programs were highlighted as potential models.

The Consultative Forum: The 'Consultative Forum', constituted of representatives of "*component and complementary programs and initiatives*" meeting regularly, was envisaged as an important mechanism for program guidance, but never formally constituted. Discussions at recent SC meetings proposed that several ad hoc meetings of stakeholders - mostly linked to conferences - could well be considered to have been the Forum. The Review panel does not agree. One of the key features of the intended roll-out of IRDR was the systematic filling of gaps and creation of synergies with existing international programs and projects. In order to fulfil its envisaged role, the engagement of Forum participants would have had to be structured around a strategic, synthesizing, evidence-informed reflective assessment of progress around collective action and impact, and IRDR's positioning in the current landscape - all within the context of IRDR's objectives (and milestones and targets, if any were articulated). Only then can coordinated plans be made and synergies cultivated. This was not done and with that, opportunities were lost to enhance coherence and synergy, and to amplify the impact of the IRDR projects through the co-design, co-production and/or co-delivery of knowledge.

4.4.2 Other critical impediments

In combination, the following had a very significant negative effect on IRDR's effectiveness. **The Review panel is of the opinion** that unless *all* these challenges are resolved to satisfaction, IRDR is unlikely to come near to achieving its potential in the next 4-5 years of operation:

1. **Funding.** Fundraising by the program to drive strategic action has been largely unsuccessful, primarily due to insufficient concerted focus on this imperative by the IPO, Scientific Committee and co-sponsors. As a consequence, research directions and activities were largely dictated by (often limited) funding available within the IRDR network nodes and the research units of the Working Groups.
2. **Strategic governance and leadership.** For reasons already discussed (chapter 4), in spite of their highly valued commitment and expertise, SC members struggled to meet the governance and leadership commitments required by IRDR.

[39] Science Plan page 49

3. **Strategic management and operational know-how.** One of the most serious reasons for IRDR's slow progress has been the frequent change in IRDR Executive Directors, with four EDs appointed in six years. This was accompanied by significant staff turnover in the IPO, unsuitable appointments and lack of clarity about authority and responsibilities. This was especially harmful given the challenges brought about by the location of the IPO in China as a first for ICSU, coupled with the ambitious scope of the program and the need for highly targeted, catalytic communication and engagement with multiple stakeholders around the world from national to global levels.
4. **Project selection and evolution.** Research project selection and related activities appear to have been driven, at least in part, by the interests and resources of available leading scientists serving in the Scientific Committee. This is not necessarily negative, but priorities might have been somewhat different if priorities were based on careful consideration of the landscape and scope of work needed to give life to IRDR's objectives. At the same time, funding constraints stymied the appropriately paced evolution of research priorities which, in turn, prevented sufficient focus on all the facets of integration espoused by IRDR
5. **Coordination and collective action.** As noted in section 2.2, in spite of IRDR's network – so useful in principle - the coordination, catalytic action and leveraging steps to realize the potential of collective action were not addressed in time to build the necessary momentum.
6. **Co-sponsor support and engagement.** The largely hands-off approach of the three co-sponsors meant that apart from the use of their 'brand' and the facilitation of some (admittedly important) collaborative efforts, their engagement with IRDR offered very little support towards the success of the program. The comparative advantage of having a set of powerful 'co-sponsors' was thus not appropriately used and displayed in the governance, positioning and resourcing of the program.

5. KEY LESSONS AND RECOMMENDATIONS

Key Review Question: What are the main lessons and recommendations from the Review that should inform the next five-year phase of IRDR?

5.1 KEY LESSONS

1. **Business model**. The 'business' (operational and funding) model of Interdisciplinary Bodies and the hands-off stance of program co-sponsors – as experienced by IRDR - impede the launch of an ambitious program that requires a paradigm shift in how science in that field is developed and applied for collective impact on policy and society. The lack of (non-project-based) fundraising[40], pro bono time commitment and the long timespan needed for fostering mindset changes may compel those responsible for implementation to narrow the scope of the program to 'more of the same'. This may prevent large-scale innovation on the science-policy-society interface.

2. **Nurturing ambition**. When an ambitious (even in global terms) scientific program - such as that foreseen in the IRDR Science Plan - requires very significant coordination in order to facilitate changes in society, it is not possible to proceed with 'business as usual'. It demands visionary planning coupled with strategic and adaptive yet accountable management; the pursuit of conventional and unconventional sources of funding; and robust efforts to connect effectively to policy communities and other key stakeholders outside the scientific domain.

3. **Scaling down ambition**. When the ambition of such a program is pared down, the framework and/or strategy that has been approved for implementation has to be adjusted, and the implications fully considered - in particular in terms of (i) the new niche and comparative advantage, as well as value proposition that the new initiative now offers, and (ii) performance expectations and accountability.

4. **Niche and value proposition**. Failing to clearly define and foster understanding of the niche and value proposition of a program for its different stakeholders, its boundary and its achievements, may impede its visibility. This will in turn lead to important stakeholder groups under-estimating the value of the program.

5. **Program boundaries**. It is difficult to distinguish the work done for IRDR by its associated scientists and ICoEs from that of their home institutions, and from what they would have done in their normal course of work. It is therefore essential to establish from the beginning exactly where the program boundary lies, so that it is clear which outputs, actions and achievements can and should be attributed to the program.

6. **Towards collective impact**. Collective action for collective impact is essential for a global science program that is set up to promote policy and societal change. Having expert individuals or a loose coalition of organizations is not enough. It requires (i) a 'champion team' rather than 'a team of champions', (ii) a concerted, systematic effort to cultivate a common vision, understand and use the value of each node, align and create synergies between the nodes (and/or projects) in the network, and promote incentives and mechanisms for collaboration, and (iii) strategic, focused long-term

[40] especially when the potential contributions of that field of science in society are not yet well understood

partnerships, instead of ad hoc relationships that are not sufficiently nurtured. And where 'integration' is essential, it also needs to be reflected in the actions of the network and not only in the science.

7. **Co-sponsorship**. Co-sponsorship requires full commitment, and strategic as well as active support and stimulus, for example through joint or contracted assignments, otherwise the role becomes meaningless.

8. **Governance.** It cannot be expected from a 'management committee' to steer all program actions, lead research projects, raise funds, conduct performance management and fulfil other management functions, *and* hold itself accountable for performance in these roles. A governance system has to ensure clearly assigned roles and responsibilities, prevent conflicts of interest and alleviate the burden on committed scientists, especially when they are operating pro bono. Some of the challenges experienced reside with the way in which ICSU Interdisciplinary Bodies are established.

9. **International Program Office**. Establishing an IPO in a foreign environment requires from both expatriates and hosts respectful and open engagement free from prejudice and cultural biases, eagerness to resolve challenges as soon as they arise, profound sensitivity to cultural differences, and keen efforts to establish and honour trust. Tensions arise when expectations are not clear or well aligned; when lines of authority and reporting are diffuse; and early challenges or warning signals are ignored. Empathetic yet decisive leadership on all sides is essential.

10. **Management**. For strong and effective management of a global program it is essential to have systems in place that can help those involved to be strategic, adaptive and accountable – in other words, useful monitoring, evaluation and knowledge management frameworks and systems that can support regular management reflection, give direction, pick up early warning signals, and facilitate learning about progress, challenges, success factors and impact.

11. Communicate, communicate, communicate. Even the most excellent, innovative, integrated program will be perceived as a failure if key stakeholders are unaware of the outputs and outcomes of the work. Not only do the key stakeholders and sponsors need to be targeted, but influential opinion-makers also need to be made aware of ongoing action and results.

5.2 RECOMMENDATIONS

The recommendations that follow are interconnected. They reflect the Review panel's view that in order for the next phase of IRDR to be successful, all the main challenges highlighted in the report have to be addressed with a sense of urgency, and with an integrated approach.

1. Rethink, reform or reshape IRDR's strategy

IRDR has to confirm its direction for the next phase of its development with a sense of urgency. It has several options. For example, IRDR can proceed incrementally from the current situation, with approximately the same scope and at the same pace. It can reposition itself as a program that exclusively mobilizes expertise and synthesizes knowledge for advocacy and advice in support of important initiatives (such as the Sendai framework, the IPCC and SDGs). Or it can be reformed to focus only on research rather than also on the translation of research to action - and thus promote only short-term research activities that explore new avenues for innovation.

However, the Review panel recommends that IRDR reshapes itself by building on, and robustly strengthening the foundation laid in the current program to achieve the objectives set out in the original framework in the Science Plan. Its results can be transformative, but will require a scaling-up and

scaling-out of FORIN, integration between RIA, DATA and FORIN, a very strong focus on catalytic action in order not to die under its own weight, and vigorously expanding and building its network into an effective and dynamic global community that can work together in line with the established principles of global action networks and collective impact.

Demonstrating and communicating the different dimensions of 'integration' and its application in research and policy should remain the core focus in all options.

It will require a single-minded effort to create the excitement, mindsets, resources and expertise that can make it work. It will be driven by a shift from 'science as research' towards 'science for policy and practice'. It will also need unconventional thinking and partners to work towards products that can reasonably be developed, yet excite interest among influential stakeholders. Success will depend on the vision and strength of the leadership, coupled to its ability to clearly identify and communicate the value proposition that IRDR offers, the niche it should have in the **'DRR for sustainable development'** landscape, and the capacity to develop working relationships with policy-makers and practitioners, including at national levels (e.g. national disaster management office, Met office, etc.) around demonstration projects.

It will also require an immediate undertaking to **expand the time horizon** of the program to another ten years. This will be justified, given the evolution of the field and IRDR's potential contribution to sustainable development.

It will be necessary to base the program strategy on careful positioning of IRDR on the intersection of (i) the IRDR Science Plan, (ii) the most important global conventions and initiatives, (iii) analyses of important gaps in current knowledge and activity, and (iv) different regional perspectives on, and priorities in DRR. Efforts also need to continue to align and mainstream IRDR in the global agendas that flow from the Sendai Framework, the 2030 Agenda, the UNFCCC and the IPCC, and related ICSU, UNISDR and other regional efforts.

In this process, it will be necessary to update the Science Plan, strategies and operational guidelines. It will be useful to develop a full-fledged change logic or 'theory of change' for IRDR, and clearly articulate its niche and comparative advantage in the DRR landscape, the value proposition it offers for important stakeholder groups, and the principles according to which it operates. This will help to steer its change logic, strategy and tactics.

The Review panel recommends that in order to chart the way forward, IRDR organizes as soon as possible a planning meeting with a few carefully selected, diverse and important stakeholders who understand the DRR landscape beyond scientific scholarship, and who can break out of convention, comfort zones and collegial 'clubs'. But the meeting has to be conducted with strong vision and leadership from within IRDR itself, and with representations from all regions.

2. Change IRDR's business model and fundraising approach

In collaboration with ICSU (who is also considering and working with new funding approaches) it is necessary to change IRDR's current 'ad hoc project' based business model and its fragmented and unaccountable approach to fundraising. The Review panel make the following suggestions for consideration.

- Once IRDR has made a firm decision on the way forward for the next phase, the immediate priority has to be the development and efficient implementation of an innovative business plan or fundraising strategy that also includes a focus on the sustainability of (i) the program and/or (ii) its impacts.

- The past practice of allowing small projects to be initiated without funding, with the IPO budget then used to try to fund them, has been problematic; projects should be started as independent initiatives with adequate funding and full-time, professional management. Substantial amounts of funding raised for IRDR projects have flowed to certain Working Group/SC members' host institutions, yet IPO funds are still used to subsidize their work[41]. Funds do not need to flow through the IPO, but records need to be kept of incomes that make the program work, and ensuring their alignment with program and fundraising strategies. This will help clarify the (currently very diffuse) program boundaries, and support accountability where appropriate.

- It will be essential to raise larger program grants that can enable steering of the program towards its desired outcomes. Such efforts can be proactive or opportunistic, but should facilitate major collaborative and strategic efforts that effectively use the potential of the IRDR network and 'family'. A plethora of grants can support localized action in regions or countries. The potential of charging for services and events should also be explored.

- Although led by the Executive Director, fundraising has to be a key priority and shared responsibility, with active support by the SC and the co-sponsors. It should be done according to a clear strategy and with an effective mechanism for oversight, accountability and learning.

- Form coalitions to tap unconventional sources of funding – *i.e.*, within and beyond the academic sector, including in the development space, where DRR has to build up a high profile through good advocacy and evidence. Opportunities are offered by scholar and student exchange programs, foundations, the private sector, the Belmont and similar forums, the many Grand/Global Challenges funds, multilateral agencies, national governments' international development divisions, major regional initiatives such as China's Belt and Road Initiative, the European Union research and development funds, and alignment between institutional funds for IRDR projects that can leverage further support. International development donors can also be approached for independent projects to foster national scientific advisory capacities on DRR in the three main regions in the Global South.

- A concerted focus on mobilizing financial resources from such sources will demand relationship building and the writing of innovatively conceptualized grant proposals that focus on the use of science for development and societal wellbeing, rather than for advancing knowledge per se.

3. Adjust the governance system

IRDR will benefit greatly from an effective oversight system that prevents conflict of interest and enable better use of the strengths of the various program components. The Review panel therefore proposes changes to the program governance system, to be implemented as soon as possible, with relevant documentation put in place, to ensure that program activities are not delayed during this important transition period in the lifetime of the program.

The main proposal of the Review panel is to separate the functions of (i) oversight, (ii) scientific leadership and guidance, and (iii) program leadership and management, and to enable adaptive

[41] This has not been the case for all projects. FORIN as a notable exception in view of its achievements.

governance (in other words, informed by a flow of targeted information that can provide for an early warning system and timely response).

Such an arrangement will also enable better use of the strengths of the Scientific Committee and clarify the distinct programme leadership and managerial role of the ED. IRDR has operated more like a scientific committee with a program than a program with a scientific committee. This has caused conflicts of interest, taken time away from strategic scientific guidance, and placed an untenable burden on SC members who have had to allocate valuable pro bono time to unnecessary management functions. The commitment that has been demonstrated by SC members over the years is highly appreciated and an essential asset for the program. The motivation and incentives that prompt highly respected and active professionals to commit time to IRDR should therefore be understood and safeguarded.

The changes we propose require the following actions, implemented in an integrated way to upgrade the institutional structures of IRDR:

- Establish an oversight body, the IRDR Governing Board, consisting of representatives of the program co-sponsors, the organization hosting the IPO, the Chair of the Scientific Committee, and one additional member from a key stakeholder organization or group. The governance committee is in charge of performance assessment, and will regularly receive relevant monitoring data and strategic updates on progress against plans. Formal reporting to the donor (CAST) and host organization (CAS and RADI) need to be in place as agreed upon, and line with the expectations of all parties involved.
- Adapt the functions of the IRDR Scientific Committee to reflect that of a body that provides scientific advice and strategic guidance to the program, and specifically to the International Program Office and Governing Board. It will execute assigned responsibilities such as technical advice on scientific priorities and merit, strategic advice on direction and strategy, building and activating networks and partnerships, and assisting with fundraising and the leveraging of in-kind support.
- Assess the scientific quality of IRDR research plans and products based on firm quality criteria and appropriate, useful reporting processes. This is especially important where the IRDR 'brand' will be reflected in processes and documentation, including when ICoEs, National/Regional Committees or universities and research centers solicit research funding. It will also assess scientific strategies, tactics and progress against the program strategy and evolving contexts.
- For the 15 SC members, ensure balanced representation from (carefully mapped) key stakeholder groups, and continue to consider geographical distribution, disciplinary background and gender balance. This will require rethinking and setting appropriate criteria for calls for nomination and final selection of members. Membership could include formal representation from the IRDR network constituent groups, ICSU Regional Committees, key stakeholder organizations (e.g. UNISDR STAG), and intended users of IRDR's outputs and expertise (for example from public policy, management sciences, e.g. schools of government, multilateral development organizations and/or private sector platforms or networks).
- Working Group leaders can be members of the SC unless there is a risk that this will stymie critical perspectives on their research. When persons are invited as observers or contributors to SC meetings, their role, status and the expectations of both sides should be clearly stipulated, and conceptualized in line with the SC responsibilities. The number of participants

in SC meetings, for example from ICoEs and Regional/National Committees, can be expanded by inviting those who have made major IRDR related progress, with travel support.

- In conjunction with the IPO, subgroups from among the 15 SC members can, during and between meetings, take on responsibility for moving specific parts of strategy or agendas forward. SC members can also be given formal responsibility for liaison with key stakeholders in their region, and for ensuring that IRDR (through the SC) is regularly and systematically updated on developments in the region in support of its strategy.

- Establish appropriate lines of reporting and accountability, among others ensuring that:
  - the SC Chair represents the SC on the Governing Board, leads SC meetings and supports and advises the Executive Director and Governing Board;
  - the ED, who should be a senior and well-respected person in the DRR or related domains, is accountable to the Governing Board, to whom he/she reports and who is thus also responsible for his/her appointment and performance appraisal;
  - the ED and SC Chair, together with two Vice-Chairs, form an executive committee that can collaborate closely on formulating and executing the IRDR strategy, and in particular also its fundraising approach and activities;
  - the ED has the final responsibility for the IRDR strategy and for the fundraising strategy, both to be developed in close consultation with the SC, co-sponsors and other key stakeholders;
  - the IPO and SC are accountable for the execution of the two strategies, in each case with carefully assigned responsibilities.

- Cultivate a culture of shared ownership and accountability for strategy, performance and informed decision-making among the Governing Board, the Scientific Committee and the IPO, while ensuring that lines of authority and accountability are clear. As part of the overall accountability system, the SC and IPO should provide systematic evidence of progress and relevant financial and administrative matters at regular intervals to the Governance Board, with implications and challenges analysed and changes justified. Budget reporting and review processes should also be applied to ensure financial oversight of both the IPO and SC.

4. Refine and strengthen leadership, management and communication

The findings of the Review have shown that the ambition and character of IRDR requires strong leadership, professional management, and extensive communication. It will therefore be very important to ensure that the IPO, and the Executive Director in particular, have the authority, capacities and support to lead the program.

It will also be crucial to focus on enabling the following:

- Focus on ensuring good relations between the IPO and host organization RADI, and on establishing an 'early warning system' to prevent any tensions from arising. Informal meetings between could be organized once a month between the two organizations to exchange information and handle any management issues. Both should be commended for the efforts made in this regard over the past year. It will be helpful now to determine how to best orientate new staff to the culture and working conditions in China. Possibilities to do so can be explored in conjunction with other international programs based in CAS institutes. Rules of operation of the IPO should be clear, and wherever necessary discussed and negotiated with CAS, RADI and other involved actors. It is also a good time to review the past and present experiences of IPO and RADI staff to determine together how to ensure in

future appropriate expectations among current and new staff in both organizations with respect to issues such as accommodation, transport, tax, medical insurance, salaries, communication infrastructure and financial management, and address remaining challenges.

- Put performance management, learning and accountability systems in place that are relevant for the whole IRDR 'family'. This requires interlinked monitoring, evaluation and knowledge management systems that can facilitate adaptive as well as strategic management, and evidence-informed reports tailored for different purposes. Care should be taken to have informative as well as nuanced monitoring and evaluation (especially when tracking and assessing progress and impact in both scientific and user environments) – in other words, beyond simple measures of outputs and implementation progress.[42]
- Launch a communications strategy that is integrated with knowledge management and monitoring and evaluation (M&E) systems, with sufficient resources for success. Different forms of publication and communication (including social media such as blogs, vlogs, twitter accounts and others), should serve different stakeholders groups in the research, policy and practice domains. Communication on professional forums can help improve low citation counts and downloads. The website, already improved, can be further developed and positioned to become the most visited resource for DRR science and scholarship related news. It should also better reflect the work of the 'IRDR family', for example by including URL links to the websites of all IRDR ICoEs and IRDR National/Regional Committees.
- Constitute a Consultative Forum to support strategic planning and collective action, either as initially envisaged in the Science Plan, or in a well-justified modified form.
- While some have suggested that the IPO could have a one-person adjunct office to enable more effective communication – based either in Paris at ICSU/ISSC or in Geneva at UNISDR - the Review panel is not convinced that this will be effective, efficient and desirable from a management perspective, and therefore does not recommend that this be done.

5. Operate as 'action network' towards collective impact

The network established by IRDR has to be activated in order to accelerate progress and amplify the scope. We propose that this is done by learning from the experiences of action networks that work towards large systems change.[43] Success factors have shown that IRDR should emphasize the following:

- A common vision and agenda for change based on a shared understanding of the objectives and problem(s), jointly agreed plans of action that outline mutually reinforcing activities for each node and partner involved, and both formal and informal agreements.

[42] For example, among many others, to help gain insights on potential unintended negative consequences of research-based initiatives (for example, when DRR interventions might have a detrimental effect on societal development), the application of principles according to which IRDR operates (for example, whether projects are sufficiently culture and context-sensitive, or encourage vulnerable communities to be self-reliant in applying research results) and so on.

[43] Both action networks and a collective impact approach are premised on the belief that no single policy, government department, organisation or program can tackle or solve the increasingly complex social problems that societies face. They call for multiple organisations or entities from different sectors to abandon their own agenda in favour of a common agenda, shared measurement and alignment of effort.

- Diversity in thinking and expertise, and collaboration across boundaries, for example around a thematic or geographic area, or a particular site or series of sites for comparative work and longitudinal studies.
- Common motivation and incentives for collaboration, and activities and arenas that allow people to connect, solve problems, make decisions and be part of a 'community' that work together on issues of importance.
- Open and continuous communication across nodes and partnerships to build trust, as well as data collection and consistent measurement of results across initiatives where appropriate. This helps to ensure alignment, accountability and learning, with continual integration of knowledge into what is being done.

IRDR's global focus also positions it well to strengthen capacities in the Global South among early career scientists. The IRDR International Centers of Excellence could play a role in this regard, for example, by hosting fellowships or internships. The regional structures and platforms of ICSU, ISSC, UNISDR and other international programs such as START and Future Earth can be used to facilitate such efforts.

The IRDR ICoEs and Regional/National Committees can be engaged by, for example, (i) organizing DRR science forums for the network; (ii) maintaining a web-based platform to facilitate their exchange; and (iii) inviting young scientists from selected ICoEs and RC/NCs to join IRDR Working Groups to enhance case studies and scaling.

There has to be a stronger focus on nurturing productive and formal rather than ad hoc partnerships that are based on occasional interactions between individuals. Such partnerships have to be selected for their potential for mutual benefit in the long run. The UNISDR Regional Offices, and the three Regional Offices of ICSU are seen as crucial in this regard. Programs of key UN organizations, the World Bank, UNISDR STAG and Future Earth are other examples. Platforms and sustainable development initiatives led or strongly supported by the private sector, such as Global Compact, Measure What Matters, the B Team and the Global Impact Investing Network provide additional opportunities for understanding the interests of the private sector, and for potential collaboration.

Lessons should be learned from the experiences of global environmental change programmes under ICSU over the past 30 years. These programmes were successful among others because they relied on international networks with scientists working pro bono to develop useful and valuable knowledge needed to advance society's understanding of global environmental change. In line with the intent in the Science Plan, creation of such networks through collaboration between IRDR, the co-sponsors and other partner organizations should be encouraged and supported. Another mechanism for collaboration can be the development of a set of national-focused projects that are coordinated to enable knowledge synthesis towards an important regional or global goal.

As the first ICSU IPO located in Asia and in the Global South, IRDR also has a unique opportunity to facilitate the sharing and integration of different approaches, knowledge systems and wisdoms among Western, Oriental and other societies across the world, and to encourage greater contributions from the Global South. IRDR linked initiatives with a regional footprint, such as the programs of ICoE-REaL's Periperi U consortium, the Regional Committee in Latin America and the Caribbean, and the Belt and Road Initiative in which IRDR-China and other stakeholders in the region are active, can serve as valuable opportunities for the promotion of what IRDR has to achieve.

ANNEXES

ANNEX 1. LIST OF ACRONYMS

AIRDR	Assessment of Integrated Research on Disaster Risk
CAS	Chinese Academy of Sciences
CAST	China Association for Science and Technology
DATA	Disaster Loss Data
DBAR	Digital Belt and Road
DRR	Disaster risk reduction
ED	Executive Director
FORIN	Forensic Investigation of Disasters
GFDRR	Global Facility for Disaster Reduction and Recovery
ICoE	International Center of Excellence
ICoE-REaL	ICoE for Risk Education and Learning
ICSU	International Council for Science
ICSU-ROA	ICSU Regional Office for Africa
ICSU-ROAP	ICSU Regional Office for Asia-Pacific
ICSU-ROLAC	ICSU Regional Office for Latin America and the Caribbean
IGU	International Geographical Union
IPCC	Intergovernmental Panel on Climate Change
IPO	International Program Office
IRDR	Integrated Research on Disaster Risk
ISSC	International Social Science Council
IUGG	International Union of Geodesy and Geophysics
GAR	Global Assessment Report on Disaster Risk Reduction
LTER	Long-Term Ecological Research
NEON	National Ecological Observatory
RADI	Institute of Remote Sensing and Digital Earth
RIA	Risk Interpretation and Action
SC	Scientific Committee
SDGs	Sustainable Development Goals
SFDRR	Sendai Framework for Disaster Risk Reduction
STAG	Scientific and Technical Advisory Group
START	Global Change System for Analysis, Research and Training
TWAS	Third World Academy of Sciences
UNAM	National Autonomous University of Mexico
UNESCO	UN Educational, Scientific and Cultural Organization
UNFCCC	UN Framework Convention on Climate Change
UNISDR	UN Office for Disaster Risk Reduction
WCDRR	3rd World Congress on Disaster Risk Reduction

ANNEX 2. TERMS OF REFERENCE FOR THE REVIEW

Background

The Integrated Research on Disaster Risk (IRDR) is a 10-year, interdisciplinary research programme sponsored by ICSU, the International Social Science Council (ISSC), and the United Nations International Strategy for Disaster Reduction (UN-ISDR). It is a global initiative seeking to address the challenges brought by natural hazard events, mitigate their impacts, and improve related policy-making mechanisms.

Disasters related to natural events continue to grow in number, intensity and impact. In many regions, their impacts are amplified by rapid growth and unsustainable development practices, both of which increase exposure and vulnerabilities of communities and capital assets. Disasters, many of which are exacerbated by climate change and increasing in frequency and intensity, significantly impede progress towards sustainable development. Addressing this problem requires an approach that integrates research and policy-making across all hazards, disciplines and geographic regions. The IRDR Programme endeavours to bring together the natural, socio-economic, health and engineering sciences in a coordinated effort to reduce the risks associated with natural hazards.

The Sendai Framework on disaster risk reduction 2015-2030 was adopted by UN member states in March 2015. It promotes a shift in focus from managing disasters to managing risks, thus putting more emphasis on preventing risks, better understanding and mainstreaming disaster risk reduction in development policies. This calls for a better understanding of risks in all their dimensions, exposure and hazards to enhance risk-informed decision-making at all scales.

Origins

The ICSU Priority Area Assessment on Environment and its Relation to Sustainable Development (2003) and the ICSU Foresight Analysis (2004) both identified "natural and human-induced hazards" as an important emerging issue. A specially convened ICSU Planning Group on Natural and Human-induced Environmental Hazards set up in 2006 concluded on the need for an integrated research programme addressing the challenge of natural and human-induced environmental hazards, sustained for a decade or more, and that would rest on the close coupling of the natural, socio-economic, health and engineering sciences applied to the whole range of hazard types around the world. The Group's recommendations, led to the elaboration of the IRDR Science Plan, endorsed by ICSU and its co-sponsors – ISSC and UN-ISDR – and IRDR was duly established in 2009. IRDR is expected 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.

Since mid-2010, the IPO is hosted by the Institute of Remote Sensing and Digital Earth (RADI) of the Chinese Academy of Sciences thanks to a grant from the Ministry of Science and Technology obtained through CAST (China Association for Science and Technology).

Objectives

The aim of the IRDR Programme is to generate new research and alliances on the following three research areas.

1. *Characterization of hazards, vulnerability and risk.* 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 is, of necessity, interdisciplinary. Understanding of the natural processes and human activities that contribute to vulnerability and community resilience need to be integrated in order to reduce risk. This objective addresses the gaps in knowledge, methodologies and types of information that are impeding the effective application of science to averting disasters and reducing risk.
2. *Understanding decision-making in complex and changing risk contexts*. Understanding effective decision-making as part of risk management - what is it and how it can be improved - calls for an emphasis on how human decisions and the pragmatic factors that constrain or facilitate such decisions contribute to hazards becoming disasters and/or may mitigate their effects.

3. *Reducing risk and curbing losses through knowledge-based actions*. It requires integration of outputs from the first two objectives and can only be achieved through implementing and monitoring informed risk reduction decisions, and through reductions in vulnerability or exposure. Processes of human adjustment or adaptation can be used to reduce vulnerability and increase resilience.

Three cross-cutting themes were identified to support the implementation of these objectives: capacity building, including mapping capacity for disaster reduction; the development of case studies and demonstration projects; and assessment, data management and monitoring of hazards, risks and disasters.

A fuller explanation of IRDR's research objectives can be found on the IRDR website.

International Centres of Excellence

A number of IRDR International Centres of Excellence (ICoE) have been established, through the IRDR Scientific Committee and the relevant National Committees, to provide regional and research foci for IRDR. ICoE and IRDR projects collaborate to provide global contributions towards achieving the IRDR legacy. The International Centres of Excellence seek to facilitate regional scientific activities through geographically-focused contributions based on more localized inputs and by being visible centres of research serving to motivate participation in the IRDR programme.

National and Regional Committees

IRDR actively encourages the creation of National and Regional Committees to 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. National and Regional Committees 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.

Organization and methodology of the Review

A Review Panel will be established by the three co-sponsors of IRDR, namely ICSU, ISSC and UNISDR, to carry out a review of the performance and future strategic remit of the IRDR Programme. The Review Panel will consist of six to eight members, one of whom will be a serving member of the ICSU's Committee on Scientific Planning and Review (CSPR). The composition and the chair of the Review Panel will be reviewed and approved by the ICSU's Committee on Scientific Planning and Review (CSPR).

To initiate the review process, the Panel will be provided with background information by the IRDR International Programme Office and IRDR ICOEs, ICSU, ISSC, UNISDR, and the IPO's host organization (RADI). The IPO, in close consultation with the three co-sponsors, will ensure access to the IRDR archives, including copies of all reports and volumes published since the establishment of the Programme. ICSU will provide secretariat support to the Panel to carry out the activities necessary to the review (consultation, organization meetings, etc.).

The Panel will mainly work electronically, and meet in person as needed.

Purpose and objective of the Review

The Panel is expected to carry a mid-term review of the IRDR programme covering the following areas:

1. *Strategic planning and implementation*

Assess the achievements and impacts of IRDR against its initial objectives (including research, engagement in policy-processes, capacity development, etc.)

2. *Governance*

Assess appropriateness and effectiveness of IRDR's organization and governance mechanisms, committees e.g. the science committee, working groups, international centres of excellences, etc.

3. *Secretariat, funding and operations*

Assess adequacy of IPO structure, relationship with the host organisation, level and sources of funding and prospects. Identify barriers to effective and efficient running of the programme and recommend ways forward.

4. *Stakeholders and partnerships*

Identify IRDR linkages and relationships within the DRR science community (including with members and other programmes run by the sponsors e.g. Future Earth), and also with non-academic stakeholders.

5. *Communication, visibility and influence*

Assess IRDR's positioning in the overall DRR space (including policy fora e.g. the Sendai Framework for Disaster Risk Reduction).

6. *Future development*

Identify the inherent challenges and make recommendations on the future evolution of IRDR.

ANNEX 3. REVIEW PANEL MEMBERS

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ANNEX 4. COMPONENTS OF THE IMPLEMENTED PROGRAM

Figure 1. Program components and the envisaged connections between them.

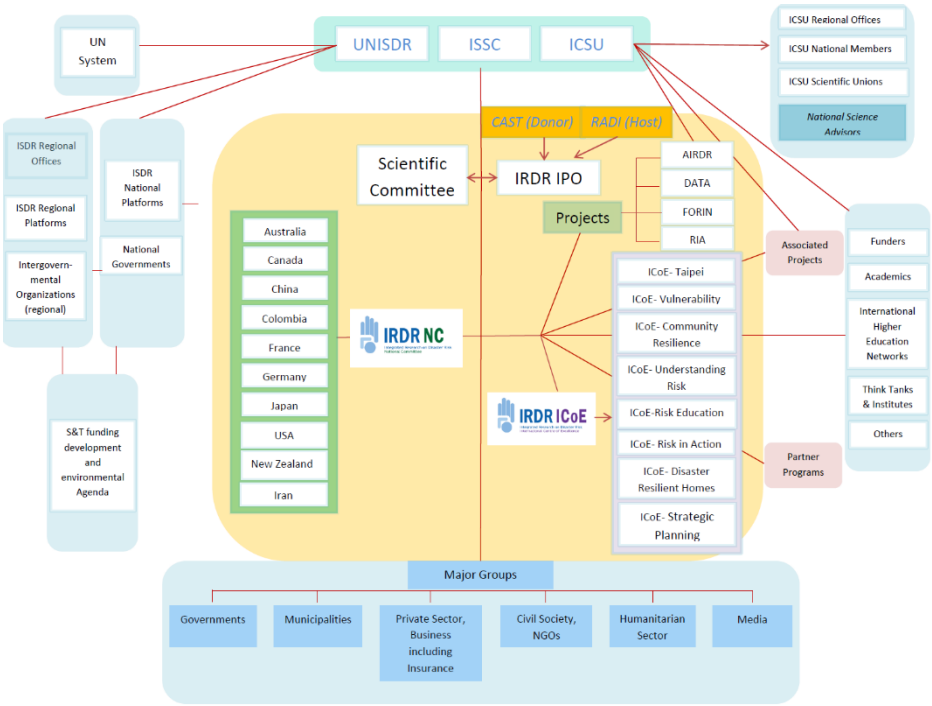
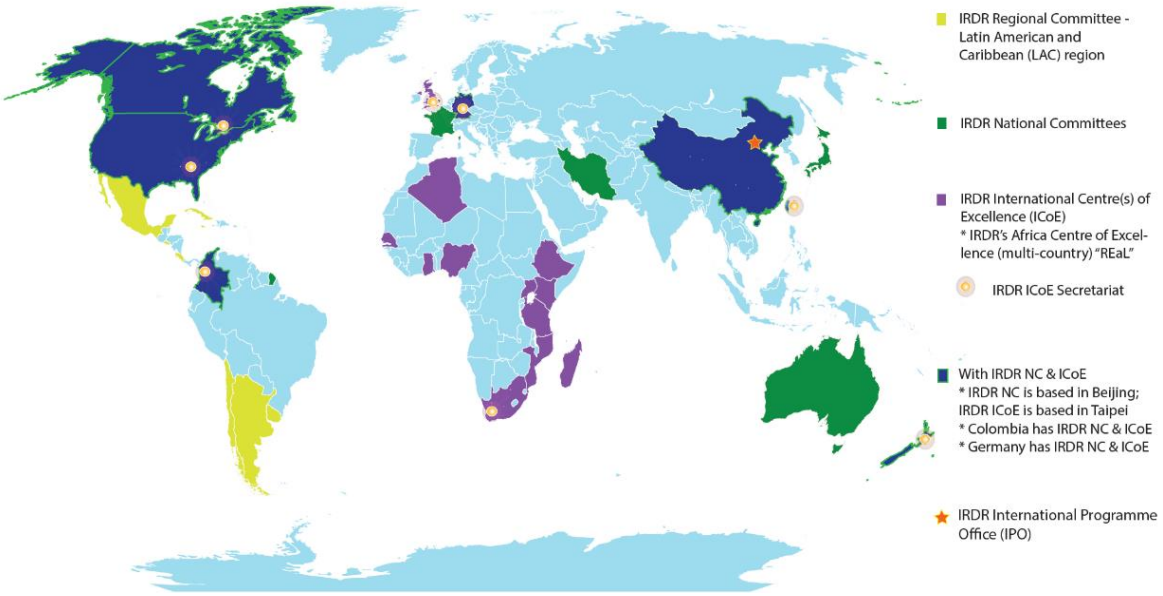


Figure 2: Map showing IRDR's presence in 30 countries around the world (by mid-2016).



IRDR International Centres of Excellence

1. IRDR ICoE-Taipei
Home Institution: Academy of Sciences located in Taipei, China

2. IRDR ICoE in Vulnerability and Resilience Metrics (IRDR ICoE-VaRM)
Home Institution: Hazards and Vulnerability Research Institute (HVRI), Department of Geography, College of Arts and Sciences, University of South Carolina, Columbia, South Carolina, USA

3. IRDR ICoE in Community Resilience (IRDR ICoE-CR)
Home Institution: Joint Centre for Disaster Research (JCDR), Massey University, Wellington, New Zealand

4. IRDR ICoE in Understanding Risk & Safety (IRDR ICoE-UR&S)
Home Institution: Disaster Risk Management Task Force, Institute of Environmental Studies (Instituto de Estudios Ambientales – IDEA), National University of Colombia (Universidad Nacional de Colombia), Manizales City, Colombia

5. IRDR ICoE for Risk Education and Learning (IRDR ICoE-REaL)
Home Institution: Periperi U (Partners Enhancing Resilience for People Exposed to Risks) Consortium, Research Alliance for Disaster and Risk Reduction (RADAR), Department of Geography and Environmental Studies, Stellenbosch University, South Africa

6. IRDR ICoE in Risk Interpretation and Action (IRDR ICoE-RIA)
Home institution: Centre for Integrated Research on Risk and Resilience (CIRRR), Department of Geography, King's College London (KCL), London, UK

7. IRDR ICoE for Disaster Resilient Homes, Buildings and Public Infrastructure (IRDR ICoE-DRHBPI)
Home Institution: Institute for Catastrophic Loss Reduction (ICLR), Western University, London, Canada

8. IRDR ICoE on Critical Infrastructures and Strategic Planning (IRDR ICoE-CI&SP)
Home Institution: Institute for Spatial and Regional Planning (IREUS), Department of Civil Engineering and Environmental Management, University of Stuttgart, Germany

IRDR National Committees

1. IRDR Australia
Home Institution: Bushfire & Natural Hazards Cooperative Research Centre (BNH CRC)

2. IRDR Canada
Home Institution: Science and Technology Working Group, Canada's Platform for Disaster Risk Reduction

3. IRDR China
Home Institution: China Association for Science and Technology (CAST)

4. IRDR Colombia
Home Institution: National Committee of Disaster Risk Knowledge, National Unit for Disaster Risk Management of the Presidency of the Republic of Colombia (Unidad Nacional de Gestión del Riesgo de Desastres, UNGRD)

5. IRDR France
Home Institution: Scientific Council, Association Française Pour la Prevention des Catastrophes Naturelles (AFPCN)

6. IRDR Germany
Home Institution: German Committee for Disaster Reduction (Deutsches Komitee Katastrophenvorsorge e.V. – DKKV)

7. IRDR Iran
Home Institution: International Institute of Earthquake Engineering and Seismology (IIEES)

8. IRDR Japan
Home Institution: Science Council of Japan (SCJ)

9. IRDR New Zealand
Home Institution: Natural Hazards Research Platform (NHRP)

10. IRDR USA
Home Institution: Natural Hazards Center (NHC), Institute of Behavioral Science, University of Colorado at Boulder

IRDR Regional Committee

IRDR welcomed its first RC in 2013, in the Latin American and Caribbean (LAC) region, through the newly formed ICSU Regional Office for Latin America and Caribbean (ICSU-ROLAC) Scientific Steering Committee for Integrated Research on Disaster Risk in LAC.

IRDR's global network

As noted in section 2.1, the Science Plan proposed that a 'long-term hazards network' be established in order to lay a firm foundation for further program development[44] and, more specifically, to provide a global network of sites that can reach vulnerable communities and conduct longitudinal studies and comparative analyses towards the progressive building of resilience across the network. Although it has as yet not been managed in line with this objective, the network has such potential. Its institutional nodes are from different disciplines and geographical contexts that offer good potential for joint research and collective input into international processes.

[44] Science Plan page 46.

By June 2016 the network consisted of ten National Committees[45] and eight International Centers of Excellence[46], including the Periperi U consortium that spans universities in 11 countries in Africa[47]. An IRDR Regional Committee with representation from eight countries[48] was also established in the region of Latin America and the Caribbean (LAC). IRDR therefore now has a footprint in more than 30 countries around the world (figure 2), with plans for rapid expansion. Linkages with the regional bodies of co-sponsors add in principle – if not yet in practice - to the network.

In spite of the absence of efforts to rally them around IRDR's vision and mandate, IRDR has put a useful architecture in place for rolling out relevant plans and actions around the world – even though this has not yet happened. It is unfortunate that IRDR has only a loose arrangement with each of its nodes. They undertake to support IRDR's objectives in a Memorandum of Understanding, but even where there are requirements to be met, reporting is ad hoc and unsystematic, without clear performance expectations or an operating accountability system.

Advocacy and advice - global platforms and events

The Scientific Committee and Working Group members worked as individuals and as a group to raise awareness of the potential role of science and technology in DRR, and of the need to focus on causes and risk rather than the consequences of disasters. This appears to be the work for which they are most widely known. Together with ICSU and its Regional Committees[49], they have been active in the preparatory processes for the 3RD WCDRR[50], and in spite of some criticism, are widely credited among survey and interview respondents with helping to bring science and technology as well as an integrated approach to DRR into the SFDRR[51]. Scientific Committee members also informed processes for the development of the 2030 Agenda for Sustainable Development, and regional DRR efforts.

In January 2015, 14 of 25 IRDR representatives at the Science and Technology Conference organized by UNISDR Scientific and Technical Advisory Group (STAG) in Geneva played an active role in the organization and proceedings of the conference. IRDR was notably encouraged to continue to set up 'national scientific advisory authorities' on disaster risk, and to organize through FORIN a STAG working group on root causes.

Advocacy and partnerships for research impact: Representatives of the IPO and Scientific Committee attended and contributed to a remarkable number of conferences and meetings, in 2011-2012 alone participating in 54 events from national to global level. These activities brought them in contact with a

[45] Australia, Canada, China, Colombia, France, Germany, Iran (new), Japan, New Zealand and the USA.

[46] Located in Canada, Germany, New Zealand, South Africa, Taipei-China, the United Kingdom and the USA.

[47] Algeria, Ethiopia, Ghana, Kenya, Madagascar, Mozambique, Nigeria, Senegal, South Africa, Tanzania and Uganda.

[48] Argentina, Cuba, Chile, Colombia, Costa Rica, Jamaica, Mexico and Venezuela.

[49] This points to opportunities for more integration between IRDR and ICSU bodies

[50] They helped to lead the Science and Technology Major Group delegation at both preparatory committee meetings in 2014, and participated in all Major Group discussions with the co-chairs of the World Conference preparatory committee concerning the pre- and zero drafts of the proposed framework. They attended expert open meetings and produced a number of statements, for example on the integration of disaster risk reduction and development policies.

[51] The S&T process under ECOSOC led to agreement across all science parties around the need for the so-called '4+2', consisting of analysis, synthesis, scientific advice, review and monitoring, with two cross-cutting pillars, communication and engagement, and capacity development.

vast array of important initiatives and organizations, prompting and facilitating discussions about collaboration or alignment with IRDR initiatives.

IRDR also made use of a variety of partnerships to organize meetings in support of its objectives. Two international conferences organized in China attracted notable partners and several hundred participants from around the world[52]. Several regional workshops and were organized to advocate for disaster risk reduction and management in line with IRDR objectives, and to improve alignment with partners or parallel efforts[53]. Relationships with its three co-sponsors led to some joint actions with UNISDR and ICSU, although the potential inherent in these relationships still has to be fully exploited.

Cross-cutting Theme 1. Capacity building

Here capacity building refers to the development of human skills and societal infrastructures within a community, nation or region in order to reduce the level of risk[54]. One of the sub-themes stipulate that global capacity for DRR would be mapped with the help of a supportive network to highlight strengths and gaps in available capacities to cope with different risks, and to understand the sources of vulnerability in terms of capacity. Some of the work done in ICoEs and even in National Committees might be useful in this regard, but if so, has not been integrated into the work of IRDR in a manner explicit and strategic enough to reflect the intent of this theme.

In terms of addressing the sub-theme of building self-sustaining capacity, IRDR has made a good start at national level by establishing the IRDR network. Universities (through the ICoEs) are a crucial element in scientific capacities that can sustain in a country and region, while national platforms enable science, policy and practice to meet. IoCE-REaL is an excellent example, even though IRDR cannot take credit for many of its achievements as the Periperi U Consortium was established long before IRDR. It has developed very significant national capacities in 11 countries, based on and promoting an integrated approach to DRR by focusing on engaged, boundary-spanning scholarship that reaches communities and engages with policy-makers.

IRDR therefore has a very good comparative advantage in its ability to build self-sustaining capacities at different levels and across different sectors – if this advantage is appropriately used by supporting work in the other two subthemes – mapping global capacities for DRR, and enabling internal capacities that will allow communities and nations to engage with DRR on their own terms and in their own ways.

[52] For example, the second IRDR conference held in 2014 had more than 300 participants from 54 countries, and was organized in partnership with the China Association for Science and Technology, the China International Conference Center for Science and Technology, IRDR China, ICSU, ISSC and UNISDR, with sponsorship from the International Journal of Disaster Risk Science and the Chinese Academy of Sciences (through RADI).

[53] Examples: In 2011 IRDR co-sponsored several workshops and symposia of the Extreme Natural Hazards and Societal Implications (ENHANS) project of the International Union of Geodesy and Geophysics (IUGG). A symposium on integrated disaster risk research was held in Malaysia in collaboration with the ICSU Regional Office for Asia and Pacific (ROAP) with the aim to bring together IRDR National Committees, regional partners, young scientists and other initiatives with an interest in disaster risk reduction. In 2012 a workshop on DRR was held in collaboration with multiple partners in Latin America and the Caribbean. Delegations from seven countries as well as the ICSU Regional Office for Africa (ICSU-ROA) attended a first consultative meeting between IRDR National Committees in November 2014 in London, organized by the UK Collaborative on Development Sciences (UKCDS). IRDR also sponsored, through ICSU, the First Asia Science and Technology Conference on Disaster Risk Reduction (ASTCDRR) organized by UNISDR in Bangkok in August 2016

[54] Science Plan page 28

As a result of its embeddedness in the higher education sector, IRDR has also from the beginning had an explicit focus on the next generation of scientists, starting in 2011 with the organization of a workshop for young scientists in Beijing to introduce IRDR and allow them to share their research.[55] In 2013, the RIA Working Group brought together 25 World Social Science Fellows to explore how the RIA framework could be integrated across scientific disciplines and cultural contexts, and to identify research projects in which they could engage.[56] Young scientists from diverse contexts have also been engaged in processes to review the FORIN methodology.[57]

The ICoE-Taipei has been a strong force in efforts to engage young scientists. An example is its organization in 2013 of the International Young Scientists Conference on IRDR, Future Earth and Sustainability, which brought together 42 young scientists from 11 countries to interact with leading experts in the field. Sponsored by ICoE-Taipei and organized by the International START Secretariat, the conference was intended to stimulate competition, encourage excellence, reward outstanding performance, and foster the development of personal and institutional networks. Such initiatives continue.

Cross-cutting Theme 2. Case studies and demonstration projects

The Science Plan envisaged that in order to make launch sufficiently robust actions in the first few years of its existence, the Scientific Committee would establish and encourage a series of case studies to identify major research needs and gaps at the interface of the sciences. AIRDR and consultations within the DRR community (primarily among scientists) can be seen as having contributed to this identified need, but case studies, as envisaged[58], were not conducted for this purpose. However, the Research Projects progressed to the extent that they are using, or intending to use case studies and demonstration projects, with FORIN having been the most active in this regard – even if not in the manner and to the extent envisaged in the Science Plan.

Cross-cutting Theme 3. Assessment, data management and monitoring: This cross-cutting theme addresses the need at country and regional level for baseline and episodic monitoring (including ground-based and remote sensing) to determine the impacts of disasters, and the establishment of mechanisms that enable the timely production and dissemination of easy-to-use, accurate and credible information to appropriate authorities. Relevant guidelines were to be developed, and 'local assessments globally and global assessments locally' applied[59]. As described earlier in this chapter, DATA has been active in this space – to date the only effort of IRDR beyond what might be done in ICoEs and National Committees. Again, DATA's efforts do not reflect the ambition displayed in the description of this theme in the Science Plan.

[55] The ICSU Annual Grant Program was used to bring young researchers to the 22nd Pacific Science Congress and to the IRDR conference in 2011.

[56] IRDR's focus on partnerships was also demonstrated here with the collaboration between ISSC; IRDR ICoE-Taipei; the Global Change System for Analysis, Research and Training (START) International Secretariat; the United Nations International Short Term Advisory Resources (UNISTAR); and the Royal Society of New Zealand

[57] This was done in partnerships with the International Geographical Union (IGU), the ICSU Regional Office for Latin America and the Caribbean (ICSU ROLAC), the Mexican Academy of Sciences, the International Consortium on Landslides, the National Autonomous University of Mexico (UNAM), the University of Sciences and Art of Chiapas, and the National Centre for Disaster Prevention (CENAPRED)

[58] Science Plan page 30

[59] Science Plan page 31

IRDR RESEARCH PROJECTS

1. *Assessment of Integrated Research on Disaster Risk (AIRDR)*. Established to undertake the first systematic and critical global assessment of integrated research on disaster risk.
2. *Disaster Loss Data (DATA)*. Established to put in place an overall framework for disaster loss data for all providers, nodes and networks for databases, and to conduct sensitivity testing among databases to ensure some level of comparability
3. *Forensic Investigations of Disasters (FORIN).* Established to uncover the root causes of disaster through in-depth investigations that go beyond the usual reports and case studies conducted after disaster events.
4. *Risk Interpretation and Action (RIA).* Established to determine how people – both decision-makers and ordinary citizens – make decisions, individually and collectively, in the face of risk.

In order to support IRDR Objective 1, the Assessment of Integrated Research on Disaster Risk Working Group established AIRDR as a three-year research project to undertake the first effort to establish a "systematic and critical global assessment" of integrated research on disaster risk that could serve as a baseline of the state of the art, and inform research and funding agendas. It can therefore also (perhaps more appropriately) be seen as part of the intent with IRDR's cross-cutting theme on capacity building and in support of the case studies that were aimed at identifying gaps that IRDR's research efforts could fill.

Led by four leading university-based researchers from the Global North, the baseline study mapped part of the 'researchscape' based on publications in English language journals over a limited period[60]. Four outputs were produced. Three were publications for UNISDR's 2015 Global Assessment Report on Disaster Risk Reduction (GAR15), providing baseline data on three topics[61] yet surprisingly, without acknowledging IRDR[62]. Its useful guideline document, Guide to Assessing Integrated Research on Disaster Risk, allows application of a common method that permits upward integration of local, regional and global reviews, and provides a method for systematic reviews of scientific literature in countries not familiar with such methods.

By their own admission, this working group did not fully fulfil their charge – said to have been the result of lack of funding to do so. The outputs were not comprehensive enough to serve as baseline or to inform a longer-term science agenda. IRDR-China has indicated some interest in such an exercise at national level, but has some concerns about copyright when downloading for this purpose 'a hundred thousand' articles, most of it in Mandarin. AIRDR has set the scene for expanding the scope of work at national and regional levels, but encouraging take-up of the guidance to establish a more comprehensive and useful baseline that can be repeated over time will require much more effort than has been applied to date. IRDR itself has not indicated how AIRDR's work will influence its own research agenda, or how it intends to pursue the effort in future.

[60] The study appears to have covered only risks of 'natural origin' while ignoring technological, anthropogenic and cascading risks.

[61] Incentives for Disaster Risk Management; Governance in Disaster Risk Management; Transformative Development and Disaster Risk Management

[62] Only one author was formally engaged in IRDR.

In order to support IRDR Objective 1 and the 'monitoring' cross-cutting area, the Disaster Loss Data Working Group launched DATA in 2011 with the aim to put in place an "overall framework for disaster loss data for all database providers, nodes and networks, and to conduct sensitivity testing to ensure some level of comparability". It can be seen as supporting Objective 1 but more saliently, addresses the Science Plan's proposal for a cross-cutting theme on assessment, data management and monitoring, as well as collaboration with the ICSU Committee on Data for Science and Technology (CODATA).

Fittingly, its first 'kick-off' meeting was held in November 2012 at the 23rd conference of CODATA[63], while it is also noted as having interactions with the CODATA Task Group. It develops regular work plans said to be based on stakeholder demand, and has produced five outputs to date[64]. The 'peril' classification system has reached important potential users, likely the result of their engagement in the impressive Working Group with representation from at least 16 organizations that include universities, the private sector, multilateral and government agencies, and an international non-government organization. Its 'peril classification' has been implemented by EM-DAT and DesInventar, and has informed GAR15, UNSTAT and the SFDRR. MunichRe and SwissRe have indicated their interest (and were part of the Working Group). DATA has been requested to work on 'big data' and has recently been approached by the World Meteorological Organization for further collaboration.

DATA has turned its attention to supporting the GLIDE project and, with a longer term perspective, to supporting the consistent assessment of the human impacts and better understanding the state of the art in measuring the economic impact of disasters. DATA outputs may eventually facilitate data collection and use around the world, even though it has to date addressed only a small part of the challenge to improve the infrastructure of disaster loss data globally and locally. It is an important initiative.

In order to support IRDR Objectives 2 and 3, the Risk Interpretation and Action Working Group established RIA as an important project with a demanding scope of work focusing on "*how people, both decision makers and ordinary citizens, make decisions individually and collectively in the face of risk*". It is led by the intriguing quest to determine what appropriate decisions do not follow compelling risk analysis results. Risk perception and related decision-making are heavily influenced by local contexts, and are highly culture-specific. Thus while RIA addresses a core and very integrative question of IRDR, the usefulness of the answers can only be proven in specific real-world cases involving decision-makers and the affected public. This dilemma was discussed in depth during the 14th Science Committee meeting in 2015, and has implications for the scope of work that RIA can deliver without much more extensive networks that reach into communities around the world.

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[63] Funding for DATA to the tune of around US$155,000 was obtained from IRDR and ICoE-VaRM (and its host University of South Carolina), an integral part of the project. According to a leading figure in DATA, it was conceived as an 'infrastructure' rather than 'research' project as it reconciles and improves databases for research, policy and practice. This is said to have made fundraising 'difficult'; the Review panel does not agree that this necessarily has to be the case.

[64] The IRDR Peril Classification and Hazard Glossary; Guidelines on Measuring Losses from Disasters: Human and Economic Impact Indicators; and Who needs loss data? - a paper prepared for GAR15. Two publications, one in Nature Climate Change 5:707-709, are listed by the authors as IRDR outputs yet without IRDR given as an author affiliation. Results have been presented at three workshops and eight presentations at national and international conferences, while several of those involved acted as expert advisors in important international efforts.

RIA has been frequently presented in disaster risk related conferences and workshops, although its real impact will only be felt outside the academic domain. As with the other IRDR research efforts, it will be critical to engage decision-makers at different levels and in different contexts in its work and results. According to survey and interview results, RIA is at present the least known of the IRDR Research Projects. Out of the 28 listed IRDR publications only three are attributed to RIA, but it has been building its own expert community and engaging in capacity development. It has been involving younger researchers from a variety of contexts in the Global South, and several ISSC sponsored fellowships and training events were delivered in 2013 and 2014 in partnership with, among others, ICoE-Taipei. These efforts tend to yield intangible and long-term results.

Since 2015 there is a London based ICoE dedicated to RIA. This focused approach, in particular within the context of the post-Sendai efforts and the SFDRR, can help to advance the research and bring tangible improvement in translating risk perception into sensible decisions and sustainable actions. It is likely that the demand for the type of knowledge produced by RIA, and hence its visibility, will grow with time. RIA expects to conduct work tailored to regions, and hope in time to lay the foundation for developing indicators for the Sendai framework relating to hazard demographics. This is an excellent opportunity to engage the National Committees in each country. Opportunities to integrate the work of RIA and FORIN should also be explored.

In order to support primarily IRDR Objective 3, the Forensic Investigations of Disasters Working Group established FORIN to uncover the root causes of disaster through in-depth investigations that go beyond the usual reports and case studies conducted after disaster events. FORIN is one of the best known projects of IRDR. With its investigative concept, it comes probably closest to the 'integrated research' ideal of IRDR. It subscribes to the principle that risk is socially constructed. It develops along a temporal axis the evolutionary chain from the social construction of risk (analysis of root causes, risk drivers and unsafe conditions) through exposure, vulnerability and hazard(s) to the social production of disaster upon the possible onset of a hazard event. With these concepts FORIN contributes to IRDR's first objective, and provides a guide (though not a manual) to employ the concept in addressing objective 3[65].

FORIN has mobilized a sizable part of the leading IRDR associated scientists to contribute either as members of the Working Group, or as participants, co-authors or other contributors to FORIN events. The list of 28 IRDR publications has five FORIN related entries[66]. While being 'integrative', FORIN has so far been developed exclusively by researchers with a social science background. FORIN has been able to achieve a certain level of institutional integration within IRDR, as displayed in the case study with ICoE-Taipei on typhoon Morakot, a case study on seasonal drought in Southwestern China (Yunnan province) with IRDR-China, and five case studies (among them from Philippines and Japan) reviewed by King's College (yet another ICoE) within the framework of an EU funded project.

FORIN was also active in capacity building. Its workshops attracted young colleagues, and an advanced institute was initiated already in 2012, carried out in collaboration with ICoE-Taipei. FORIN

[65] FORIN appears to address both objectives 1 and 3, while the annual reports of IRDR in 2013 and 2014 dealt with FORIN exclusively under objective 3 (or under the then newly introduced Goal 4)

[66] The FORIN 1 Report was published in 2011, a case study report (by ICoE-Taipei) in 2014, two publications in 2015, and the revised Conceptual Framework and Guide to Research in 2016.

organized several workshops[67]. After extensive feedback on case studies, the FORIN methodology was further developed and published in 2016.

The practical viability of FORIN has been tested in several case studies with the involvement of IRDR linked scientists. The first phase of the development of FORIN has come to an end, and it is now set to be tested in real world conditions by authorities responsible for disaster risk management. It will also require a significant effort to get it into wider circulation and application.

Description of IRDR's governance system[68]

The Constitution of IRDR designates the Scientific Committee as the "principal governing body of IRDR, set up by, and acting for, the Sponsors of the program". It is responsible for formulating policy on IRDR program development and implementation[69], program planning, project approval, liaison and the facilitation of cooperation, budgeting, implementation, establishing an oversight mechanism, disseminating and publicizing program results, and fundraising for the program as a whole, and for the work of the Scientific Committee and its Working Groups. Its terms of reference also stipulate that it will report annually to the Executive Board of ICSU and to the Executive Committee of ISSC, as well as to the executive heads of each organization following Committee meetings.

The Chair is appointed by the Co-sponsors (*i.e.*, ICSU, ISSC and UN-ISDR) upon submission of three names by the Scientific Committee after a nomination process by the wider scientific community. The additional fourteen members of the Scientific Committee are appointed by the co-sponsors upon consultation with the Chair. Designated representatives from each of the Co-sponsors and the Director-General of RADI (as host institution) are *ex officio* members of the Scientific Committee. The Officers of the Scientific Committee, designated as the Chair and three Vice-Chairs elected by the Scientific Committee itself, are responsible for the implementation of decisions and policies, assisted by the ED.

The IPO is seen as a supporting function for the Scientific Committee, and the Executive Director (ED) acts as its Secretary. The ED is appointed by the Co-sponsors[70], employed by RADI (as are all IPO staff), and reports to the Chair of the Scientific Committee who also assesses his/her performance[71]. The Scientific Committee approves the annual budgets and financial and audit reports of the IPO and prepares annual reports for 'communication' to the Co-sponsors.

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[67] In 2013 in connection with landslides, held in Chiapas, Mexico, together with national and regional partners, among them ICSU ROLAC. A second workshop was held in 2014 at UNAM, Mexico City. In November 2014 a workshop was co-funded with UNISDR.

[68] As conceptualized in the IRDR Constitution.

[69] This was made explicit in the MoU between ICSU and RADI.

[70] In the Letter of Cooperation between all involved parties, signed on 22 October 2010, it is noted that the ED will be selected "in close consultation by the Parties and the Chair of the Scientific Committee.

[71] In the terms of reference for the ED in 2013, it is stipulated that the annual performance review for the ED would be done by the Scientific Committee Chair, acting on behalf of the Co-sponsors, in consultation with RADI.

The ED and IPO are therefore on paper completely under the authority of the Scientific Committee[72]. The Co-sponsors are only engaged in key appointments and the receipt of reports. They devolved all other responsibilities to the Scientific Committee Chair, who "acts on their behalf".

The accountability of the ED to RADI as host institution was not clarified in the Constitution. The MoU between ICSU and RADI noted the responsibilities of the host organization as providing input into the appointments of the ED and IPO staff as well as facilitating the formal documentation for international staff, employing IPO staff in line with standard procedures in CAS and China, providing input into the performance assessment and contract renewal of the ED and IPO staff. Although the IPO was responsible for the financial management of the IPO's budget and the Director-General was to approve expense claims, RADI had no authority over its planning, budgeting and funding allocations, which were under the authority of the Scientific Committee[73].

The Co-sponsors provides 'scientific' rather than 'financial' sponsorship, which is largely aimed at giving profile and weight to global initiatives. However, their role in the governance and management of IRDR has been minimal.

[72] This was confirmed in the meeting held by the co-sponsors in RADI on 31 July 2015. "Leadership of the program resides with the Science Committee and the IPO carries out science initiatives. The IPO is fundamental in putting in place the program activities."

[73] In 2013, the terms of reference for the ED stipulated that RADI would give input into the annual work plan upon consultation by the Scientific Committee. In the 2016 terms of reference it was stipulated that RADI would approve the work plan together with the Co-sponsors.

ANNEX 5. REVIEW APPROACH AND METHODOLOGY

In line with the practice in scientific contexts, the Review was designed to be based on expert opinion informed by the use of evidence collected and analysed within a fairly short timeframe.

In order to enable systematic and credible work, a 'theory based assessment' approach was used. IRDR's change logic was therefore retrospectively developed as guidance, and triangulation[74] done to the extent possible. This meant combining (wherever possible within given constraints) qualitative, quantitative, perceptual and factual data; and using several methods, multiple sources of information (Box 2), and at least two panel members as analysts for each of the key Review questions.

Box 2. Data collection methods

1. Reconstruction of the change logic of IRDR, based on the Science Plan, other documents and interviews during the inception phase.
2. Study of documentation (plans, progress and annual reports, meeting minutes, newsletters, reviews and evaluations, website content, IRDR publications).
3. Review of relevant monitoring, bibliometric and altmetrics data.
4. Observation of the Scientific Committee (SC) meeting, an anonymous survey and a critical reflection session with 13 SC members and 14 other participants in Paris, France.
5. Field visit to the International Program Office in Beijing, China.
6. Stakeholder analysis.
7. Anonymous survey among stratified groups.
8. Semi-structured key informant interviews using a purposefully selected sample.

The IPO field visit included observing working conditions and interviews with the Acting Director, IPO staff, senior representatives from RADI, CAS and CAST, and the director of one other international program hosted by RADI. Key informant interviews were conducted with 50 purposefully (rather than randomly) selected persons based on (i) their knowledge of IRDR; (ii) their knowledge of the disaster risk reduction domain; (iii) stakeholder group representation; and (iv) balanced geographic distribution between the Global North and Global South.

An anonymous survey with open and closed questions elicited 639 responses from 3,500 recipients of the on-line questionnaire sent to the IPO's contact list (18 percent response rate). Of these, 354 indicated that they knew IRDR somewhat to very well, thus ensuring that their responses were used for analyses.

Quality assurance and constraints

The Review was largely independent, commissioned by the program co-sponsors and conducted by panel members external to the program. Due to the nature of an expert opinion rapid review, the panel

[74] Triangulation facilitates the validation of data and findings through cross-checking, using three or more methods, analysts and /or data sources and types.

had to balance significant time and resource constraints with the need for sufficient and appropriate evidence to provide for a credible assessment. Panel members had very limited windows of opportunity for collaboration to get the Review done, and was heavily dependent on secondary data sources.

Formal evaluation standards could not be fully applied. Efforts were made to mitigate the biases that risk influencing the credibility of this type of review by (i) encouraging systematic data collection and analysis based on detailed questions, an understanding of the program logic, and the use of semi-structured interview guides, (ii) appropriate sampling using stratification of stakeholder groups, including soliciting perspectives from stakeholder groups or representatives known to hold differing views on matters; and (iii) triangulation between panel members (analysts), methods, data types and data sources.

The Science Plan that set out the strategic direction and expectations for the program was complemented by the Strategic Plan 2013-2017 developed in 2012. However, the two documents were not sufficiently aligned and neither appears to have been used consistently to inform program strategies and tactics. The panel therefore elected to use as its guiding document the Science Plan, which was the original founding document that laid the foundation and expectations for the program.

It was challenging to reach stakeholders who had sufficient knowledge of IRDR, yet were distant enough to bring fresh perspectives. This was especially problematic with respect to policy- and decision-makers outside the academic or research environment. The survey provided such an opportunity[75]. Analyses showed surprisingly few marked differences in perspectives between various stakeholder groups.

The Review panel worked in three groups to compare evidence and findings. There were significant consistency and sufficient patterns in the data - enough to give the panel confidence in the veracity of their findings. It was however essential to verify the findings with the Co-sponsors, IPO, RADI, and Scientific Committee members before finalisation of the report.

The Review report follows the structure of the key questions the panel had to answer. It discusses the findings and conclusions in three chapters dealing with strategy and programming, implementation and impact, governance and management, and IRDR's positioning before concluding by revisiting the change logic of IRDR and highlighting key lessons and recommendations. The seven annexes contain the terms of reference and other information about the program and methodology.

[75] Thirty percent of the respondents were from outside the academic sector.

ANNEX 6. REVIEW MATRIX

Performance Area / Subgroup Focus	Key Review Questions	Sub-questions	Sources of Evidence *(refer to methods and stakeholder map)*
I. Strategy & Programming *(planning & implementation)*	1. To what extent has IRDR fulfilled its objectives? (Has IRDR met the need for, and filled gaps in integrated disaster risk research?)	1.1 To what extent are the **scope and foci of IRDR** realistic and desirable within the emerging global context? Are there redundant or important gaps or missing elements? Are its "boundaries" (*i.e.*, scope reflected in its mandate and operations) clear enough?	▪ IRDR Constitution & Science Plan ▪ Trends and context analyses in literature ▪ Sendai and other relevant conventions ▪ Interviews with purposefully selected Level 1-5 stakeholders
		1.2 Does IRDR have **explicit values and principles** that underpin and guide its work (e.g. with respect to cultural responsiveness, the creation of dependency, or the extent of participation of disaster prone communities in research processes)? Is this important?	▪ IRDR Constitution ▪ TORs Working Groups ▪ Interviews with Level 1 stakeholders
		1.3 To what extent has the **implementation** of the IRDR proceeded in line with its objectives and in a holistic manner, *i.e.,* balancing the various objectives and cross-cutting themes, and maximising synergies between components? If not, what were the reasons?	▪ Annual reports ▪ Science Committee meeting reports & interaction ▪ ED reports ▪ Interviews with Level 1 and 2 stakeholders
		1.4 How appropriate and effective are the prevailing **mechanisms and modes of implementation** of IRDR research (*i.e.,* networks, joint projects, ICoEs, etc.)? How far could and should implementation oriented (rescue, humanitarian, insurance, etc. entities and individuals) participate in the IRDR?	▪ IRDR Constitution & Science Plan ▪ Science Committee meeting reports & interaction ▪ ED reports ▪ Interviews with purposefully selected Level 1-5 stakeholders
		1.5 Has sufficient attention been given during implementation to the intended **multi-dimensional, integrated and inclusive nature** of the IRDR, including in terms of disciplines, fields of science, hazards, scale, and geographical regions? Are systems *(i.e.,* coherent and coordinated processes and mechanisms) in place to help ensure this?	▪ IRDR Constitution ▪ IRDR publications ▪ TORs of SC & Working Groups ▪ Composition of SC, Working Groups & partners ▪ Interviews with Level 1 & influential Levels 2 & 5 stakeholders (those pro and opposed)
		1.6 To what extent are the IRDR activities and products **opportunity based** rather than the result of the systematic implementation of the programme of work?	▪ TORs/MoUs with IRDR components ▪ ED reports ▪ Science Committee meeting reports & interaction ▪ Interviews with Level 1 stakeholders
		1.7 How is **"quality"** defined and encouraged in the IRDR? Are effective systems in place for this purpose? Are IRDR outputs considered to be of sufficient/high quality?	▪ Science Plan (Strategic Plan) ▪ IRDR publications ▪ Interviews with Level 1 & 2 stakeholders ▪ Survey among stratified groups

		1.8 What is known at this stage about the (i) **relevance, (ii) accessibility, (iii) visibility, (iv) utility and (v) timeliness** of IRDR's research outputs? And of its other main contributions?	▪ Bibliometrics ▪ Website statistics / Altmetrics / Google search ▪ Survey among stratified groups
		1.9 What are the **main scientific achievements** of IRDR (*i.e.* i.t.o. integrated disaster risk research and related activities)? To what extent are they in line with the initial expectations? Make specific reference to i. the characterisation of hazards, vulnerability and risk (primarily FORIN, AIRDR) ii. understanding decision-making in complex and changing risk contexts (primarily RIA) iii. assessment, data management and the monitoring of hazards, risks and disasters (primarily DATA) iv. reducing risk and curbing losses through knowledge-based actions v. developing case studies and demonstration projects vi. developing capacities in this domain.	▪ IRDR publications (and those of its members?) ▪ IRDR annual reports ▪ Any available evaluations ▪ Science Committee meeting reports & interaction ▪ Working Group (and NC and ICoE) reports ▪ Interviews with purposefully selected Level 1-5 stakeholders ▪ Survey among stratified groups
		1.10 To what extent has IRDR been successful in (i) **sharing knowledge** among researchers, and (ii) **engaging and communicating** with influential users?	▪ Bibliometrics ▪ Website statistics / Altmetrics ▪ Science Committee meeting reports & interaction ▪ Working Group (and NC & ICoE) reports ▪ Interviews with key Level 1 & 2 stakeholders ▪ Survey among stratified groups
		1.11 What difference has the IRDR made **within** the scientific arena, from global to regional and national levels – *i.e.,* has its work been **used, or had influence or impact** among scientists?	▪ IRDR annual reports ▪ Any available evaluation reports ▪ Science Committee interaction ▪ Interviews with purposefully selected key stakeholders from Levels 1-5, tracing "impact stories" ▪ Survey among stratified groups
		1.12 What difference has the IRDR made **outside** the scientific arena, from global to regional and national levels – *i.e*., has its work been **used, or had influence or impact**, especially among influential stakeholders? ("Influential" to be self-defined i.t.o. individuals or organisations. Stakeholders may include policy-makers, budget-makers, decision-makers, practitioners, business sector and/or social organisations directly managing disaster risk).	▪ IRDR annual reports ▪ Any available evaluation reports ▪ Science Committee interaction ▪ Interviews with purposefully selected key stakeholders from Levels 1-5, tracing "impact stories" ▪ Survey among stratified groups
		1.13 To what extent are the differences made in line with the **expectations** expressed in key IRDR documents? Were these expectations realistic, given what has transpired?	▪ IRDR Constitution ▪ Science Plan ▪ Science Committee interaction ▪ Synthesis of analyses in answering questions above

		1.14 Were there any **unexpected positive or negative consequences or impacts** as a result of the design and/or implementation of the IRDR? Do any of the negatives have the potential to neutralise positive outcomes?	▪ ED reports ▪ Science Committee meeting reports ▪ Interviews with purposefully selected key stakeholders from Levels 1-5
		1.15 What **internal and external influencing factors** have (i) enabled and (ii) inhibited IRDR progress and performance? What is emerging as possible **success factors?**	▪ IRDR annual reports ▪ ED reports ▪ Science Committee meeting reports ▪ Interviews with purposefully selected key stakeholders from Levels 1-4 ▪ Synthesis of analyses in answering questions above
II. Governance & Organisation *(Governance systems, secretariat, funding & operations)*	2. To what extent are the governance structures and processes appropriate for the effective positioning and management of the IRDR?	2.1 Are effective **governance frameworks** - including institutional structures and operational systems - in place, with evidence that they appropriately and sufficiently guide programme strategy and operations?	▪ IRDR Constitution & Science Plan (Strategic Plan) ▪ IRDR annual reports ▪ ED reports ▪ Science Committee TORs, meeting reports & interaction ▪ IPO site visit ▪ Interviews with key stakeholders from Levels 1 & 2
		2.2 Is the **Scientific Committee** an effective, efficient and appropriate governance mechanism, including in terms of its composition, oversight functions and programme positioning?	▪ IRDR Constitution & Science Plan (Strategic Plan) ▪ IRDR annual reports ▪ ED reports ▪ Science Committee TORs, meeting reports & interaction ▪ IPO site visit ▪ Interviews with key stakeholders from Levels 1 & 2
		2.3 Are the **governance processes** sufficiently transparent and accountable?	▪ IRDR Constitution & Science Plan (Strategic Plan) ▪ IRDR annual reports ▪ ED & Science Committee meeting reports & interaction ▪ IPO site visit ▪ Interviews with key stakeholders from Levels 1 & 2
		2.4 To what extent are the **(i) Scientific Committee, (ii) Working Groups (Projects) and (iii) Consultative Forum (or relevant conferences)** perceived to be effective, legitimate and credible structures and mechanisms in support of programme execution?	▪ ED & Science Committee meeting reports & interaction ▪ Working Group TORs & reports ▪ IPO site visit ▪ Interviews with key stakeholders from Levels 1-5
		2.5 How well is the potential of the (i) **National and Regional Offices and Committees**, and **(ii) the ICoEs** being used in support of program execution?	▪ IRDR Constitution & Science Plan (Strategic Plan) ▪ IRDR annual reports ▪ ED & Science Committee meeting reports & interaction ▪ Working Group TORs & reports ▪ IPO site visit ▪ Interviews with key stakeholders from Levels 1-5

	3. To what extent are the management structures, mechanisms and resources appropriate and adequate for the effective and efficient management of the IRDR?	3.1 How well is the **International Program Office** performing in terms of efficiency and effectiveness? How has high leadership and staff turnover affected capacities and performance?	▪ IRDR Constitution & Science Plan (Strategic Plan) ▪ IPO site visit, ED/team TORs & reports ▪ Science Committee meeting reports & interaction ▪ Working Group TORs & reports ▪ Interviews with key stakeholders from Levels 1, 2 & 4
		3.2 To what extent is there effective **collaboration and synergy** between the different program structures, including between the IPO and host organisations, and the IPO and the Scientific Committee?	▪ IRDR Constitution & Science Plan (Strategic Plan) ▪ IPO site visit & ED reports ▪ Science Committee TORs, meeting reports & interaction ▪ Working Group TORs & reports ▪ Interviews with key stakeholders from Levels 1-3
		3.3 Have **resources** been sufficient, and financial flows adequate, to enable program objectives to be met? Has IRDR (centrally and jointly) **adequately contributed** to the resources supporting the programme?	▪ IRDR Constitution & Science Plan (Strategic Plan) ▪ IRDR budget and financial flow summaries ▪ IPO site visit & ED reports ▪ Science Committee TORs, meeting reports & interaction ▪ Working Group reports ▪ Interviews with key stakeholders from Levels 1-4
		3.4 How are **priorities** determined and positions advanced, **progress and potential risks** monitored, and **results** evaluated? Have **knowledge management systems**, including M&E and communication, been effective in supporting programme objectives?	▪ IRDR Constitution & Science Plan (Strategic Plan) ▪ IPO site visit & ED reports ▪ Science Committee TORs, meeting reports & interaction ▪ Working Group TORs & reports ▪ Interviews with key stakeholders from Levels 1-2
		3.5 To what extent has **programme management been adaptive**? In other words, were opportunities used, and important challenges timeously identified and effectively addressed, informed by evidence? Are systems in place to support an adaptive management approach?	▪ IPO site visit & ED reports ▪ Science Committee TORs, meeting reports & interaction ▪ Working Group TORs & reports ▪ Interviews with key stakeholders from Levels 1-2
		3.6 Is the **organisational culture** of the IRDR conducive to collaboration and high performance?	▪ IPO site visit & ED reports ▪ Science Committee TORs, meeting reports & interaction ▪ Working Group TORs & reports ▪ Interviews with key stakeholders from Levels 1-3
		3.7 What **internal and external influencing factors** have (i) enabled and (ii) inhibited the governance & management performance of the IRDR? What is emerging as possible **success factor**s?	▪ ED reports ▪ Science Committee meeting reports & interaction ▪ Interviews with purposefully selected key stakeholders from Levels 1-4 ▪ Synthesis of analyses in answering questions above

III. Landscape & Positioning *(Stakeholders & partnerships; communication, visibility & influence)*	4. How well is IRDR positioned in the disaster risk reduction space? To what extent is IRDR relevant and significant in the broader efforts of the global community to address major challenges in the DRR domain?	4.1 How effective has the programme design and implementation been in **positioning** the IRDR as a unique, special and/or significant actor in the international DRR domain? Does IRDR have a **clear role, niche and comparative advantage**?	▪ Trends and context analyses in literature ▪ Sendai, UNFCC, SDGs & other international conventions ▪ Scoping documents of all DRR programs ▪ IRDR Constitution & Science Plan (Strategic Plan) ▪ IPO site visit ▪ Science Committee interaction ▪ Interviews with purposefully selected stakeholders from Levels 1-5
		4.2 How well have the IRDR objectives and results been **aligned with expectations** in key global and international agreements and agendas?	▪ Trends and context analyses in literature ▪ Sendai, UNFCC, SDGs & other international conventions ▪ Link with Working Group I findings
		4.3 To what extent have the IRDR objectives **remained relevant** within new and evolving global and international initiatives and contexts such as the 2030 Agenda and Sendai Framework for DRR 2015-2030? What frameworks and trends should be considered in future?	▪ Trends and context analyses in literature ▪ Sendai, UNFCC, SDGs & other international conventions ▪ IRDR Constitution & Science Plan (Strategic Plan) ▪ Science Committee interaction ▪ Interviews with purposefully selected stakeholders from Levels 1-5
		4.4 To what extent do influential stakeholders credit the IRDR with **significant and original** innovations and contributions to the international DRR domain?	▪ Interviews with purposefully selected stakeholders from Levels 1-5 ▪ Survey among stratified groups ▪ Google search ▪ DRR media reports
		4.5 To what extent has IRDR been **successful and timely** in engaging with important and influential international stakeholders? What is its **level of influence** at important international events, or within important initiatives?	▪ Annual reports ▪ Science Committee reports & interaction ▪ Interviews with purposefully selected stakeholders from Levels 1-5 ▪ Survey among stratified groups
		4.6 How successful has IRDR been in getting **influential** international stakeholders to **engage with its initiatives?**	▪ IRDR annual reports ▪ Science Committee reports & interaction ▪ Interviews with purposefully selected stakeholders from Levels 1-5 ▪ Survey among stratified groups ▪ Link with Working Group I findings
	5. Given the IRDR objectives, to what extent are the linkages and relationships of IRDR with the DRR	5.1 Have sufficient and appropriate **partnerships, coalitions, alliances and/or other collaborative or coordinating mechanisms** been used or established to (i) build (self-sustaining) capacity, (ii)	▪ IRDR MoUs / agreements ▪ IRDR annual reports ▪ Science Committee reports & interaction ▪ Interviews with purposefully selected stakeholders from Levels 1-5

	science community and non-academic stakeholders appropriate and effective?	enable integration and reduce duplication, and/or (iii) maximise the effectiveness of generated knowledge and expertise?	▪ Survey among stratified groups ▪ Link with Working Group I findings
		5.2 Does IRDR have sufficient and appropriate working **linkages with other important programs/initiatives**, including with other ICSU Interdisciplinary Bodies such as Future Earth, Urban Health and Wellbeing Programme, Global Climate Observing System) supported by the co-sponsors of IRDR? And with **national risk reduction** efforts?	▪ IRDR MoUs / agreements ▪ IRDR annual reports ▪ Reports of relevant initiatives ▪ Science Committee reports & interaction ▪ Interviews with purposefully selected stakeholders from Levels 1-5 ▪ Survey among stratified groups
		5.3 To what extent have these **linkages and relationships contributed** to actions and results, both within and outside the scientific community, that otherwise would not have been possible?	▪ IRDR annual reports ▪ Science Committee reports & interaction ▪ Interviews with purposefully selected stakeholders from Levels 1-5 ▪ Survey among stratified groups ▪ Link with Working Group I findings ▪ (DRR media?)
		5.4 Are **disaster prone communities** sufficiently and appropriately engaged in IRDR research and communication processes? Is this encouraged and documented, and can examples readily be found?	▪ IRDR annual reports ▪ Science Committee reports & interaction ▪ Interviews with purposefully selected key stakeholders from Levels 1-5 ▪ Survey among stratified groups ▪ Link with Working Group I findings
		5.5 Have there been **unintended negative consequences or impacts** as a result of positioning efforts by IRDR? If so, to what extent can this neutralise positive gains?	▪ IRDR annual reports ▪ Google search ▪ Science Committee meeting reports & interaction ▪ Interviews with purposefully selected key stakeholders from Levels 1-5 ▪ Survey among stratified groups
		5.6 What **internal and external influencing factors** have (i) enabled and (ii) inhibited the international positioning of IRDR? What is emerging as possible **success factors?**	▪ IRDR annual reports ▪ Science Committee meeting reports & interaction ▪ Interviews with purposefully selected key stakeholders from Levels 1-5 ▪ Synthesis of analyses in answering questions above
Future Development (*Challenges,*	6. What are the main lessons and recommendations from the Review that should	6.1 To what extent can IRDR be regarded as a **success** at this stage of its lifetime and performance trajectory? What were the **main drivers for, or impediments** to success? What are the implications for a next phase?	▪ Synthesis across all findings & conclusions

opportunities, lessons & recommendations)	inform the next five-year phase of IRDR?	6.2 Is the IRDR **change logic** or "theory of change" of the IRDR holding up? If not, where has it broken down and why? What are the implications for the next phase?	▪ Synthesis across all findings & conclusions
		6.3 Is any **major change in direction or strategy** needed over the next five year phase in response to the changing global landscape and demand? What are the reasons? If so, what changes are needed in the governance, management and operational arrangements?	▪ Synthesis across all findings & conclusions
		6.4 What are the main forward-looking strategic and, if appropriate, operational **lessons** that can be learned from an integration of the Review findings - cognizant of evolving contexts and potential future challenges and opportunities?	▪ Synthesis across all findings & conclusions
		6.5 What are the main strategic and, if appropriate, operational **recommendations** most likely to help IRDR achieve its objectives (or new objectives) over the next five years? Why are these considered the most significant and useful for long-term success?	▪ Synthesis across all findings & conclusions

ANNEX 7. PERSONS INTERVIEWED

Surname	Name	Position	Organisation	Country
Abdelhakim	Ayadi	Member	Algerian Hazards Network	Algeria
Alcantara	Irasema	Professor / Co-Chair	UNAM / FORIN	Mexico
Ammann	Walter	President	Global Risk Forum GRF Davos	Switzerland
Assia	Harbi	Research Director	Centre de Recherche en Astronomie Astrophysique et Géophysique	Algeria
Birkmann	Jörn	Professor / Director	University of Stuttgart / ICoE-CR	Germany
Bostrom	Ann	Professor	University of Washington	USA
Briceño	Sálvano	Former Director / Former Chair	UNISDR / IRDR	Venezuela
Castleton	Anne	Former Science Officer	IRDR	USA
Cardona	Omar	Professor / Director	National University of Colombia / ICoE-UR&S	Colombia
Chen	Fang	Secretary-General	China National Committee	China
Cui	Peng	SC member	Institute of Mountain Hazards and Environment/CAS	China
Deves	Maud	Secretary, Scientific Board	Association Française pour la Prévention des Catastrophes Naturelles (AFPCN)	France
Estrella	Marisol	Coordinator	UNEP Disaster Risk Reduction Programme	Switzerland
Fakhruddin	Bapon (SHM)	Co-Chair	IRDR DATA	New Zealand
Gatzweiler	Franz	Executive Director	IPO, ICSU Urban Health and Wellbeing	China
Guo	Huadong	Former Director	RADI / CAS	China
Hackmann	Heide	Executive Director	ICSU	France
Holloway	Ailsa	Director	IRDR ICoE REaL	South Africa
Hong	Tianhua	Director	UNESCO World Heritage Site Remote Sensing Project	China
Hooke	William	Associate ED / Member	American Meteorological Society / IRDR Planning Committee	USA
Johnston	David	Director ICoE-CR/Fmr SC Chair	Massey University / Former SC Chair	New Zealand
Kasuga	Fumiko	Global Hub Director	Future Earth Secretariat – Japan Hub	Japan
Koltermann	Peter	Professor	Lomonosov University / IOC UNESCO	Russia / Germany
Klein	Rüdiger	Former IRDR ED	IRDR IPO	China
Lang	Lang	Administrative Officer	IRDR IPO	China

Surname	Name	Position	Organisation	Country
Liu	Jie	Director	International Cooperation Office, RADI/CAS	China
Lwasa	Shuaib	Associate Professor / Chair	Makerere University / IRDR Scientific Committee	Uganda
Maskrey	Andrew	Fmr IRDR Focal Point	UNISDR	Switzerland (UN)
McBean	Gordon	Fmr Chair / President	IRDR / ICSU	Canada
Moore	Howard	Member	ICSU IRDR Planning and Scoping Group	Canada
Morris	Kerry-Ann	Former Jr Comms Officer	IRDR	Jamaica
Murray	Virginia	Vice-Chair	UNISDR STAG	UK (UN)
Oliver-Smith	Anthony	Professor Emeritus / Co-Chair	FORIN	USA
Paton	William	Former Acting ED	IRDR IPO	China
Pelling	Mark	Professor / Director	King's College / IRDR ICoE-RIA	UK
Pujiono	Puji	Regional Adviser on DRR	UN Economic and Social Commissions for Asia and the Pacific (UNESCAP)	Thailand
Qin	Jiuyi	Director	CAST Center for International Exchange	China
Raimundo	Inês	Member	ICSU Regional Committee for Africa	Mozambique
Rovins	Jane	Fmr Executive Director	IRDR	New Zealand
Shaw	Rajib	Professor / Chair	Kyoto University / ASTAAG	Japan
Shrivastava	Paul	Executive Director	Future Earth	Canada
Sparks	Steve	Member	ICSU IRDR Planning and Scoping Group	UK
Stavrou	Vivi	Executive Officer	ISSC	France
Spini	Lucilla	Head of Programs	ICSU	France
Terry	James	Professor / Group Chair	Zayed University / ICSU ROAP DRR group	UAE
Villagran	Juan Carlos	Head of Unit	UN SPIDER	Germany (UN)
Vogel	Colleen	Professor	University of the Witwatersrand	South Africa
Wahlström	Margareta	Former SRSG on DRR	United Nations	Sweden
Warner	Koko	Project Coordinator	UNFCCC	Germany
Wu	Guoxiong	Director	Future Earth China	China
Zhang	Jiansheng	Director General	Department of International Affairs, CAST	China
Zhuang	Yan	Deputy Division Chief	Bureau of International Cooperation, CAS	China

ANNEX 8. LIST OF DOCUMENTS READ

Documents related to IRDR

Documentation on IRDR website.

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A Science Plan for Integrated Research on Disaster Risk.

IRDR Strategic Plan 2013-2017.

IRDR Annual Report 2015, July 5, 2016.

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