UNDRR STAG Data Working Group (DWG)

Report on Concept, Activity and Implication

December 2019 (updated April 2020)
Prepared by UNDRR Global Science and Technology Advisory Group (G-STAG) Data Working Group (DWG)

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G-STAG Global Science & Technology Group
SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION 2015-2030

UNDRR UN Office for Disaster Risk Reduction

Northumbria University NEWCASTLE

Summary

The United Nations Office for Disaster Risk Reduction (UNDRR) through its Science and Technology Advisory Group (STAG) established a working group on 'Data' that has been active during 2018 and 2019. This is a part of the UNDRR drive to enhance implementation of the Sendai Framework for Disaster Risk Reduction (SFDRR) and achieve risk-informed development through science-based decision making at local, national and regional level. The Data Working Group (DWG) has been coordinated with a selection of people working with approaches to disasters and who are active in making data work for DRR. This DWG report completed in draft at the end of 2019 and now finalised presents concept, activities and the implications derived from networking, interviews and sharing of policy, practice and ideas in international forums that contributed to the outlook presented here. Whilst the emphases added to aspects of this work are inevitably a product of the author's interpretation, there are a wide range of people and secondary sources that have indirectly contributed. The report has been updated in the light of the 2020 outbreak of COVID-19 which it is felt further reinforces the need for action on data.

An overriding driver of discussions facilitated by the DWG has been the need to understand data that is appropriate and active in contributing to the process of achieving SFDRR targets. This necessitated a demand driven and back to basics initiative to question what data works in progressing DRR. This agenda will continue to require the consideration of all sectors that produce data related to disasters in terms of the way in which progress is being and can be made for decades to come. The work initiated an ongoing review of the production and use of data in everyday risk reduction for any part of society in relation to slow or rapid onset threats. The data agenda includes the need to continue to invest in better collection, reporting and use of reliable loss and damage, risk, and capacity related data.

The DWG found that an action-oriented approach to data is needed to implement the ambitious outcomes proposed by the Science and Technology Road Map. The implications of 'action data' and 'data as a voice' are examined. If the agenda for data would only concern production of larger amounts of data as outcome, this would be very unlikely to produce sufficient change in political will, behaviour or knowledge and education required at this critical juncture of the Anthropocene, being the period during which human activity is the dominant influence on climate and the environment. It is however clear that in the context of the current COVID-19 crisis lack of data in many countries has impeded effective responses. In these circumstances the challenge is revealed as the need for data that is more effectively collected earlier in a crisis. Improved quality of data is desired, though if limited to improvements in reporting of data but without requisite understanding and action in response to it there will be insufficient transitioning to disaster risk reduction and sustainable development post crises. An action orientated agenda that emphasizes

implementation and impact is therefore the most imperative aspect of the data agenda and is therefore established foremost during this stage of DWG work.

This phase of reporting concludes that what is required foremost is the adoption and integration of action data collection, transmission and uptake as part of more effective disaster risk management systems at all levels and to drive significant change. There is a need for long term working examples that can be drawn upon to show how emergent networks of agencies and local groups progress this proposed emphasis, orientated by the Sendai Framework approach. Action data is a key area for expansion and investment going forward.

Whilst the concepts and their implications touched upon in this report are potentially many, and will be worked upon further, a brief summary of core conclusions arrived at are that:

- Good data is a basis for improved decision making towards achieving Global Targets for Disaster Risk Reduction and Sustainability
- Actions for Disaster Risk Reduction are currently not proportionate to the data available
- There is a need to rethink how data reduces disaster risk for more resilient and well-being enhanced futures and to use this to guide the quantity, quality and timing of data collection
- Action orientated framings of data, that also serves as a voice, can enable disaster risk reduction and resilience and is relevant at all levels and to all sectors

The report should be used to identify actions for investment. Some initial items for the list are included in the concluding section.

Contents

1. Introduction

The UNDRR STAG identified the need for orientation in the use of data in achieving the expected outcomes of the Sendai Framework for Disaster Risk Reduction (SFDRR). The Data Working Group (DWG) has been a loosely defined mix of contributors to DRR approaches that met sporadically during 2018 and 2019 to identify key points of departure that would progress this agenda.

The Co-Chairs' Summary of the Global Platform for Disaster Risk Reduction (2019) on 'Resilience Dividend: towards sustainable and inclusive societies' made significant references to data reflecting the UNDRR DWG concern, including through the following statement:

> *"Comprehensive and disaggregated data harnessed across time and space is crucial to effectively define exposure and vulnerability, particularly for those most at risk. We need to make better use of existing data for information and action."* (GP 2018, Section C, para 15)

The accompanying work of the DWG has been based on principles of open debate and drawing from existing practices and observations. The role of data in progressing the Sendai Framework references to initiatives that include existing links to UNDRR and beyond. The phase of engagement leading to this report primarily addressed 'what data works' to bring recognisable progress towards achieving both the intended outcomes of the SFDRR and associated SDGs.

The DWG initial work has been broadly guided by the UNDRR STAG Science and Technology Road Map drafted in 2016, which was updated early 2019 and which includes multiple references to data needs. This included under Sendai Framework Priority for Action 1 *Understanding Risk*, the Expected Outcome to;

> *"assess and update the current state of data"* (1.1) and *'ensure that scientific data and information support are used in monitoring and reviewing progress towards disaster risk reduction and resilience building"* (1.3).

Under Priority for Action 4 Build Back Better, the Expected Outcome is also data based being to:

> *"identify and respond to the needs of policy- and decision-makers at all levels for scientific data and information to strengthen preparedness, response and to "Build Back Better" in Recovery, Rehabilitation and Reconstruction to reduce losses and impact on the most vulnerable communities and locations"* (4.1).

The work of the DWG is complementary to the aims and objectives of the Sendai Framework Monitoring System which is collating online data from member states. The 'UN Sendai

Framework Data Readiness Review' (2017) was released earlier and forms a further part of the backdrop to the rationale of the DWG. Subsequently, the launch of the Global Risk Assessment Framework (GRAF) in 2019, which includes a Mapping and Gap Analysis Working Group has further emphasised the need to better understanding what exists and is needed to advance an active systems orientated risk assessment that is data rich. The GRAF focus on risk assessment builds from Global Assessment Reports (GAR) wishing to better understand global and local risk and to mainstream risk assessment. Other complimentary initiatives have included the International Science Council Committee on Data (CODATA) and associated IRDR Data Project. Further the European STAG engaged a regional working group focussed on data interoperability that has accompanied the discussions of the DWG. There are many existing data orientated initiatives that already complemented some of the core orientations of the DWG, such as for example the Risk Data Hub of the Disaster Risk Management Knowledge Centre (DRMKC) of the European Commission Joint Research Centre (JRC). Outputs from each of these and other initiatives are listed as bibliographic sources at the end of this report. A common understanding across all initiatives to date is that improved data is fundamental to implementing the SFDRR. Since the onset of COVID-19 during 2020 much of the key findings of the DWG draft are reinforced by the problems faced in rapid onset emergencies where the importance of good data had been underestimated as crucial to decision making systems. The World Health Organization (WHO) had relatively early in the crisis called for local level testing that would provide data on who was infected and transmission patterns to enable more effective interventions.

1.1 Concept development

Whilst an impetus of better informed DRR is to draw on data stemming from research, project monitoring and wider observation, it is unclear as to how varied data types and systems are helping progress towards SFDRR targets. Early discussions of the DWG amongst representatives suggested a need to address issues of data availability, accessibility and use (including data quality, interoperability and barriers to data sharing). This expanded to include all challenges there are in getting data to successfully facilitate impact on disaster risk; by applying more extensive data science, applications of big data, improved cross-sectoral stakeholder relations and utilising private sector interests in disaster data, particularly insurance companies that have been one of the underutilised resources.

An overriding priority focus of the DWG to identify data that actively helps reduce disaster risk is however based on the rationale that processes of data accumulation in the domains of science, technology, media, programming and project level activity has grown extensively without clear orientation as to what works best in achieving an impact. Whilst DWG related discussions acknowledged that there are fundamental problems where data is missing, inaccurate or not reaching those who need it, a further as yet under-emphasised issue is related to inactive data. This is where existing data is not contributing sufficiently to progress demanded by SFDRR. There is in the view of this phase of DWG therefore a priority need to understand and facilitate processes of 'action data'; It is posited also that a wider recognition of the roles of varying data types, be these numeric, visual or narrative and

examples of evidence based links between data and risk reduction are key to the expanded implementation of DRR for decades to come.

The concept outlined in this report therefore developed around an everyday reality that data to effect change, otherwise here referred to as 'Action Data', will need to be considered as that which is a voice in the implementation of DRR; honest, informed, communicable, understandable and acted upon. 'Actions' have intended outcomes but may lead to consequences distant from the original reasoning. Emphasis on action also illuminates the consequences of a failure to act. Actions may have cascading and cumulative effects - analysing what data works emphasises identifying outcomes for DRR where there is evidence of data playing and active role in processes of intended progress.

In promoting data as voice there becomes recognisable overlap between what may be considered as data and that which is considered information. The distinction is not sufficiently great to confuse the rationale of action data. Information in this context is considered either the same as data, or as the knowledge acquired through experience or study. "Information is the meaning given to data by the way in which it is interpreted" (Collins English Dictionary, various dates). The role of data can therefore be considered in terms of the voice promoted by the data and operational at all levels of human engagement with disaster prevention and response. Examples of steps towards the objectives of Sendai are in existence and therefore it is time to identify how data and action data processes are speaking to and enabling disaster risk reduction at all levels.

2. Activities

This 2018-19 phase of the DWG involved expert meetings of STAG and its partners, including the International Science Council (ISC). Additional activities included; events as sub-sections of international conferences, interviews with a small sample of key informants using structured inquiry, and examination of documented case studies of DRR related projects from various parts of the world. The process adopted has been iterative and non-invasive; it was overall to listen and to draw observations in response to a need identified in the early meetings of the group to engage a collective discussion on data. This included a clear need to interact with neighbouring initiatives that are also engaged in looking at the role of data in DRR.

Table 1 lists the principle events where approaches were discussed with DRR scholars, practitioners and policy influencing groups in the interest of being informed and with a desire to co-create perspectives. Engagements included interviews and discussion groups within international events, orientated by a cross-sectional guide that allows for consideration of disaster loss, risk and capacity related data; numeric, visual or narrative (Figure 1). The four questions guiding this information collection are included so as to stimulate thought about; what data contributes, what data is not and how it is an active voice for those exposed to disaster risk and for facilitators of action on Sendai Framework Priorities. A final question approaches the issue of cooperative actions that actively contribute to risk reduction. Whilst

there are these questions to address, the approach however remains open to wider comment, these questions providing a basic level of orientation.

There is the option of scale-up through recognising which approaches have been proven to be useful in reinforcing the potential for data that enables strategies for impact relevant to Sendai Priorities for Action.

The data domains considered in this process were considered in terms of loss and damage, risk and capacity related data. It is noted that loss and damage data is currently collected with the primary aim of monitoring change. It is for example a way of assessing the impact of the Sendai related policy drivers at national level, such as being provided by Desinventar, an inventory system of the effects of disasters (desinventar.net) Examples include mortality, morbidity and economic assets-based compilations of data. Meanwhile, exposure and vulnerability data, which can be considered primarily, risk orientated may include the loss and damage data with future uncertainty and consequent varying perceptions of significance. The Risk Data Hub of DRMKC provides a Geographical Information Systems (GIS) webplatform of Europe wide risk data. Risk related data, which includes change in exposure to hazard and conditions of vulnerability, is crucial to prediction and assessing levels of precaution that must be applied. Its application is common to studies of disaster risk, and a predominant investment has remained in the application of financially based insurance approaches.

A third range of data is framed here as capacity related, being that which measures capacity for mitigation, response and adaptation. It is in effect information about steps taken for emergency preparedness and response and can be particularly relevant to measuring Target E of the Sendai Framework, 'the numbers of countries with national and local DRR strategies' (SFDRR, 2015). This forms part of the Sendai Monitor process of intended reporting by nation states.

Table 1: Principle Events where Action Data approaches were discussed with DRR scholars, practitioners and policy makers to inform and co-design.

Date	Organisation / Contact	Event	Activity/Outputs
Dec 2017 – July 2018	STAG initiating meetings and online discussions	Formulation of initial DWG concept note	Concept Note
20.07.2018	Science and Technology Advisory Group (STAG); Data Working Group (DWG) – International Science Council (ISC)	ISC Meeting in Paris	Report
08.2018	Science and Technology Advisory Group (STAG); Data Working Group (DWG)	Main STAG Meeting, Geneva	Revised Concept and Action Note-Draft
17.09.2018	Inter-Agency Task Team (IATT)		Issues Brief on Science, Technology and Innovation for the SDGs Roadmaps
08.11.2018 – 09.11.2018	Global Risk Assessment Framework (GRAF)	2nd GRAF Expert Group meeting in Geneva	Establishment of link to Mapping and Gap Analysis Working Group – Also meeting with E-STAG
27.11.2018 – 29.11.2018	Science and Technology Advisory Group (STAG)	3rd Expert Group Meeting on Science, Technology and Innovation Road maps for the SDGs, Brussels, Belgium	

14.12.2018 – 22.01.2019	·Virginia Murray ·Helen Hinds ·Maitland Hyslop ·John Walsh ·Matt Steel ·Shuaib Lwasa ·Michael Szoenyi ·Sanjaya Bhatia ·Aris Popadopoulos	1-1 Key informant interviews	9 Interview transcriptions
02.2019	STAG	Circulation by STAG of Revised Science and Technology Road Map originally drafted 2016	Revised: Science and Technology Roadmap to Support the Implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030 references to Data
13.03.2019 – 15.03.2019	Global Alliance for Disaster Research Institutes (GADRI)	4th Global Summit of Research Institutes for Disaster Risk Reduction. "Increasing the Effectiveness and Relevance of our Institutes; and GADRI General Assembly, DPRI, Kyoto University, Uji Campus, Obaku Plaza, Kyoto, Japan".	Action Data working group discussion session. Presentation of GRAF to conference including references to partnerships and Data.
13.05.2019 – 17.05.2019	Global Platform for DRR. Geneva, Switzerland	Science and Policy Forum, Palais de Nations Plenary Session: Science and Policy dialogue: The case for better data. Formal release of Global Assessment Report (2019) including section on Data	Action Data working group discussions and Science and Policy Forum Session brief.

17.07.2019 – 19.07.2019	United Kingdom Alliance for Disaster Research (UKADR) Disasters Research Group (DRG) United Kingdom Collaborative for Development Research (UKCDR), Global Challenges Research Fund (GCRF)	Northumbria University Conference: "Dealing with Disasters: New Points of Departure in Transitioning Disaster Reduction and Sustainability Challenges". Session on Action Data.	Action Data working group discussion notes.
Aug 2019 – Dec 2019	Consolidation of DWG initial concept and implications.	DWG within STAG. Contributions to GRAF Mapping and Gap Analysis survey process.	Report on Concept, Activity and Implications

3. Findings

3.1 Breadth of data types

One of the experiences of this phase of the DWG engagement with stakeholders of DRR data has been an acceptance in participant responses and event discussions that varying types of data and their impact must be broadly classified; a source, or particular type of data contribution, is likely to be effective when it is part systematised. No resistance was detected to the proposal that data for progress towards the Sendai Priorities for Action must be comprised of numeric, narrative and visual forms (Figure 1). For example, the following indicative comments were received during interviews:

> *"I think in certain areas, from the social science areas and anthropology that you get more of a narrative type of the data. … In the geographical area, the use of GPS and data systems, they use mapping. Certain disciplines, say geography, natural science, use more mapping. We can combine qualitative and numerical [data]. Most of us use numerical but can depend on the different disciplines. All of the data is ready to feed into the Sendai Framework. I think all those three [numeric, visual and narrative data] are beneficial today."*

John Walsh, Vanderbilt University Medical Center (own perspective)

> *"Our data is evidence informed, it can be narrative, visual and pure numeric data. We cover the whole lot … we focus on everything that is in the Sendai Framework."*

Virginia Murray, Public Health England

This sentiment was reflected across the sector and was felt by facilitators of the DWG engagement process to be a confirmation that through definitive acknowledgement of all data types, the door could be opened to multiple contexts and actions at all levels, localised through to 'remote' or 'big' data initiatives.

The recognition of broadly defined types of data means greater data availability, be this numeric, narrative or visual, though often still untapped, that could assist in implementing actions on targets. Varying research traditions tend to cling to particular forms of knowledge creation based on particular types of data formats; the challenge therefore is in relation to actual integration and to generate or use data that varying sectors and disciplinary orientations consider outside of their scope of delivery if working alone.

3.2 Availability of appropriate data

There is a distinction to be made between data that has not been gathered because it comprised unknown ingredients of hitherto uncertain phenomena; both that which is known about but ignored and that which is underreported due to a lack of resource capacity to do so. In discussions at meetings participants accepted that much potentially good data remains hidden. This may be either because of a lack of its visibility or due to it not being communicated or shared, depending on context and due to a lack of data collection. The STAG meeting of all working groups had brought to the fore the issue of a lack of capacity to be able to engage data collection, particularly in low income countries where DRR education may be limited. However, during the lifetime of this phase of the DWG this issue become considered to be more universal, though more acute in low income countries. Unreported or non-existent data is a greater issue for exposure to hazards and vulnerability experienced by groups of people in poorer areas who are more at risk and without active data or the voice that data provides; they are consequently ignored. Some indicative comments from interviews included:

> *"I don't think it's a problem with the data, what is being collected or not collected, I think it's how the data is being used. Where we fall short in the global goals is how the data is being used. Data usage and data collection. Unless you get into local community data, or a population that doesn't have data. I think we have way more data than we can use effectively. The data is being collected and I am comfortable it's* there; but *specific types of data may not point to a particular issue, but we have it from a lot of different events that could be used."*

John Walsh, Vanderbilt University Medical Center (own perspective)

> *"The economic analysis of the data that is collected is usually at the government level, or the insurance company level, but is really never collected at the individual level and at the small business level. So, for the average person in that location during that storm, we don't know what that event cost them. We have never researched that, and we never collect their information."*

Aris Popadopoulos, Non-Profit Resilience Action Fund

Indicative Scope of the Interview

Name of Participant:
Role of Participant:
Date:

1. What data do you consider to be already contributing to the progress of the Sendai Framework Priorities for Action?

Types of Data	Numeric	Narrative	Visual	Comment:
Loss				
Risk				
Capacity				
Comment:				

2. What other existing data is there that could contribute to the progress of the Sendai Framework Priorities for Action?

Types of Data	Numeric	Narrative	Visual	Comment:
Loss				
Risk				
Capacity				
Comment:				

3. Which cooperative actions enable data to progress the Sendai Framework Priorities for Action?

Types of Data	Numeric	Narrative	Visual	Comment:
Loss				
Risk				
Capacity				
Comment:				

4. How is data a *voice* for those exposed to disaster risks and for facilitators of the Sendai Framework Priorities for Action?

Types of Data	Numeric	Narrative	Visual	Comment:
Loss				
Risk				
Capacity				
Comment:				

5. Comment on any aspect of the data you have referred to that can also apply to achieving SDGs or other parts of the 2030 agenda.

Types of Data	Numeric	Narrative	Visual	Comment:
Loss				
Risk				
Capacity				
Comment:				

Figure 1 Scope of overall action data questioning across key disaster risk data domains

Further, in the context of COVID-19 the additional issues of delays in reporting data has been flagged in the initial analyses of what went wrong in terms of early mitigation and response to the spread of the virus. The mix of issues of not enough early detection of the virus in people combined with allegations of a lack of responsiveness by heads of state to scientifically known risks has then led to mistrust in some of the information disseminated.

3.3 Data access

Data across a range of well-known hazards and accompanying risks exists within larger corporations and in particular within the insurance sector but is not readily accessible. Member states cooperate over data reporting relative to the benefits that may be gained or otherwise hold it back. For example, health data that might impact on exports of produce, or a loss of confidence in producer and consumer economies, is more reluctantly provided whereby the resultant delays in data release may cost lives. Also, in relation to slow onset events, data that assists the comparative advantage of one private sector investment in risk reduction over the other is less likely to be shared as open data. Existing data compilation at global scale facilitated through UN organisations and the IFRC demonstrates that there is macro-scale capacity to log data at the level of nation states, as is also becoming prevalent with the Sendai Framework Monitor. Other accessible data had for many years included, for example, that compiled by CRED of the University of Louvain, which has provided basic parameters of what types of disasters have occurred where and monitors this over time (CRED EMDAT, 2019). A particularly detailed development is provided by the WHO through the Global Health Observatory (WHO, 2019) which lists extensive criteria. Though not focussing on disasters as either cause or effect for this type of health orientated data there is much convergence between health monitoring and data needed to orient towards the SDGs and DRR. The following comments are indicative of where interviewees would refer to overcoming the challenges of data access in their institution:

> *"I used to work in regional government, the Regional Development Agencies had a lot of information on economic loss and impact, but I think that has got lost. They have lots of data, looking at Brexit. The data is out there, I don't know where it is. There is a disconnect between accessing the data to supporting assumptions. There are routes to get it, it's not been tested. I don't have it."*
>
> Helen Hinds, Head of Resilience at Newcastle City Council

> *"I think being in the LRF (Local Resilience Forums) really helps; being in the national risk assessment helps, the willingness for partners to talk together and share data. We share information; whether or not we share data is a different question. Amongst partners there is a willingness to share data and information; we understand the importance of it. The introduction of GDPR has helped, in the organization of the way we share data; we can get data from different bits of the organisation. What's really important in my team is the ability to build relationships with people who have data that you will need at a different time. I don't need it all, all the time, but I need to know who to ring to ask. We have arrangements in place to share information between different parts. This is, for example, on vulnerable people. I need to know parts of this information; it's very sensitive data but we are comfortable in sharing this data with us and other partners. We have to work in partnership. I have a team of five; I have no chance of doing my job unless I work in partnership both internally and externally. We have a huge public expectation because if we get it wrong, as we've not shared data, we have no excuse.*

Somebody could die or the recovery could be worse. In terms of impact, it makes it real. Data contributes to decision making. You need to be able to use partial data and make decisions based on the data you have at that moment. It can be hard."

Helen Hinds, Head of Resilience at Newcastle City Council

3.3.1 Sharing more detailed data (open data)

The higher education research sector has for some decades been making steps towards making data collected through publicly funded research more open. For example, in the United Kingdom it is common practice of major national funding councils to make a condition of funding to be that data collected in the process of research is stored in a repository that can be accessed by other researchers. The practice of publishing data laden research into open access journals is also now widely encouraged across this sector.

Further examples of approaches to overcoming data sharing barriers are reflected in some areas of data science and a good example is set by BioMed Central Ltd. via the BMC industry standards for data sharing based on FAIR. The rationale is that publishing research data in a repository to accompany a research article or on its own helps make the data more: Findable, Accessible, Interoperable and Reusable. (BMC, 2019)

Whilst the culture of 'open data' is expanding there is not as yet any clear expression of open data sharing between all sectors. For example, there is no evidence available for this report that the insurance industry is actively involved in sharing data. Further, whilst people who have engaged with the DWG have made reference to much of the closed world of data control, it is also reasonable to consider that some data cannot be shared openly for ethical reasons, should the identity of individuals or groups compromise their security.

The use of 'The Cloud' for data storage has been questioned as a potential security risk for national level data and information sharing. The query regards the benefits of more open data may be as such side-tracked by real or perceived issues of security.

Some of those of the DWG and some of the people interviewed commented on sharing more detailed data, referring to the lack of sharing (particularly in the insurance sector) and contrasting this with good examples of open data:

"Unfortunately, the insurance industry is not sharing that data … One reason they claim is privacy … second reason is that they don't want their competitors to have their data. A lot of data is held close to the chest and not shared and could be better used. I consider that a huge missed opportunity and one that we need help by government, to free up some of that data. I think the most important thing here is transparency and data democracy. If you have to go through a long elaborate process to get information from agency X or insurance provider Y, it's not going to happen. We need to establish through Sendai, more open transparent information

processes, have data that is available to anyone to access and to use to develop and to do their research from. To me that is critical. People say they want to collaborate, but the systems they set up are very closed. We have to get those barriers and obstacles out of the way, we need to work on that. To me the best example and practice is in Japan. Japan collects and reports publicly in both Japanese and English, on the statistical numbers, on the different types of buildings destroyed by different hazards and categorised by different categories of construction."

Aris Popadopoulos, Non-Profit Resilience Action Fund

"There is another initiative, the African open source platform, from the committee of data and a programme of the International Science Council in Paris, that is really the future. When you create this type of platform that enables this sharing of scientific data it can be integrated in risk assessments and implementations of different risk reducing measures and can support in a different way to now. So there are those that exist that have limits and those that are coming up with a potential wide programming and capability of catalysing the acceleration of the implementation of Sendai."

Shuaib Lwasa, Associate Professor in Geography, Makerere University, Uganda

3.3.2 Social media

Social media sources of data are often free for all (though can be blocked in some countries). For example, one of the case studies included in Table 1 exemplifies a process of anyone sharing immediate disaster risk data in the almost entirely open environment of social media. In the example in Table 2 Case Study 5 (Indonesia), there was an increase of 30 percent in people taking actions due to social media messaging. The power of social media in getting data to work for disaster risk reduction cannot be underestimated. However, online sources via the Internet can represent an array of good and bad data sources and claims to authenticity; the issue here is that there is little systemic distinction between that which is uncorroborated and non-peer reviewed and that which is.

3.3.3 Bad data

Discussions during this DWG in relation to bad data suggested the prime reasons for bad data to be variously due to lack of capacity, deliberate faking of data and intentional or non-intentional corruptions of data.

Where there is data availability, it is clear from commentaries below that some data arrives into the wider sector and news contexts through a poor quality of verification and may be either completely incorrect or based on partially presented or uncorroborated information. This can relate to poorly verified science and to data that is interfered with or used for the purpose of misinforming. This finding has resonance with and is spotlighted where there are wider issues of media communication and 'fake news'. The effects are not least reflected in

the ongoing impasse in global climate and risk policy where climate change denial and through the selective use the data to try to make a point. The danger of an ability to "lie with statistics" is well-known. However, issues of poor data and data availability can relate to capacity issues, where countries lack skills training to be able to manage disaster related phenomena with good data. Given an imperative to provide disaster related data, capacity issues lead to inappropriate data being applied to satisfy a need to deliver information. A comment on this is as follows:

> *"One of the challenges with the Sendai framework is a lot of the reporting is aggregated at the national level, which loses a bit of the ability to dig into the variations and where this has come from at the more local level. There's a lot of information and knowledge available at the local level, but it's probably not integrated or picked up, or gets lost across the aggregation process and that could very much help. So the grading of the information helps you to interpret whether the resilience capacity is there or not. I think that is what is currently missing in terms of turning information into useful data."*
>
> Michael Szoenyi, Zurich Flood Resilience Alliance.

3.4 Data collection approaches

The DWG has engaged with a wide range of data producers who use a diverse range of data collection techniques. The review of a range of case studies carried out for this report found evidence of varied types of project for which impact has been achieved through the collection and application of ground level data. The search included looking at ground level examples where data collection feeds into immediate impacts as represented by the examples presented in Table 2.

3.4.1 Remotely sensed

It was clear that there remains a critical role for remotely sensed data collection techniques and that producers of this type of data are developing their range of observation methods in ways that assist risk assessments and post disaster monitoring. Much of this work is being gathered and documented in the context of initiatives that have come forth in the UN Global Assessment Report (GAR) and more recently are being revisited and integration sought in the context of the Global Risk Assessment Framework (GRAF), which is assisted by the GRAF Mapping and Gap Analysis working group. The GRAF seeks to "improve understanding of complex risk behaviour where relevant and applicable, to transform behaviours and catalyse a proactive decision-making culture by democratising everyone's understanding of the systemic nature of risk through time". (GRAF, 2019).

Other initiatives found to exemplify the extension of data collection techniques to an operational and integrated process that link objectives to Sendai Framework outcomes are exemplified by the Group on Earth Observations (GEO); GEO refers to a data cube that

orientates a mix of data and associated data collection approaches. A further example, GNS Science, focusses in part on the societal benefits of earth systems processes and resources. It is not the intention of this report to attempt to list all the examples that demonstrate integration of remotely and otherwise sensed data. The wider industry uses remote sensing techniques with relational databases, as referred to earlier for the case of the DRMKC Risk Data Hub – the approach is a well-networked part of the industry that is also closely traced through the UN Space-based Information for Disaster Management and Emergency Response (UN-Spider, 2019).

High tech approaches that include the application of artificial intelligence (AI) to early warning systems, for example the German Research Centre for Geosciences, uses AI to monitor volcanic activity through analyses of satellite imagery. The Internet of Things is combining social media and real time sharing of images and related information to address any disasters as they are happening (Table 1 Case Study 5 Thomson Reuters Foundation Trust, and the I-React EU Horizon project serve as examples). Additionally, the propensity for 'big data' to be applied to complex models is progressively emergent, though has been so ever since the expansion of supercomputer applications to weather forecasting.

A comment below illustrates how remotely sensed data is being applied to ground level scenarios in a number of ways:

> *"The other set of data being used, not necessarily by government, is the remotely sensed data which is becoming enormous, the use of satellites and open sources, data from satellite imagery that is medium to high resolution. We use that in my department and lab, use it to assess the temporal availability of forest regeneration and to climate in the pastoral area to try and understand what happens when you have a drought period to the forage and whether that is enough or how many livestock would then be supported under different scenarios with interruptions of available pasture and under the climate conditions. Satellite imagery is useful, if it is available and downloadable."*
>
> Shuaib Lawsa, Associate Professor in Geography, Makerere University Uganda

> *"I call disasters a goldmine of information. Unfortunately, we are not mining them. We have technologies today that can help us do that, with drones and aerial surveys. There are instruments that can actually pick up the quality of the materials in a building, they can send signals about whether it was metal, was it strong enough on the windows. We have a lot of technology today that we did not have a decade or so ago."*
>
> Aris Popadopoulos, Non-Profit Resilience Action Fund

3.4.2 Closely sensed

Those who engage in remotely sensed approaches to monitor disaster risk and impact are aware of the need to 'ground truth' data. At its most basic level this involves checking the

remotely sensed pixel that represents a surveyed item, as apparent from afar, to check that this is interpreted with a correct representation. However, closely sensed information stretches far into human environments and behaviour, and beyond what is spatially representable. The role of participatory approaches in DRR is now also common place, featured as the basis on which local groups of people can engage in communicating about risk. The use of the focus group and its adaptation variously as participatory action research is key to deriving qualitative data for understanding; it provides one of the key origins of action data. The techniques used to engage people in participating in data gathering in the DRR sector has been foremost in Vulnerability and Capacity Assessments (IFRC 2019) and has been used by NGOs and local governments aiming to understand local level risk. The action research aspect is where learning is gained through actions that are part of ongoing research and implementation processes. Where this involves the application of techniques to gain scientific information and apply it locally in a community cooperative manner, it is comparatively a form of citizen science (Fast and Haworth, 2019). For example, Case study 1 in Table 2 shows how citizens are reporting local information, relating to dengue disease, to a specific helpline set-up by the scientific community as part of ongoing action research to reduce the rate of dengue cases in Pakistan. The following interviewee response expresses how citizen science and action research is being used in country to further data collection and monitoring at the local level:

> *"There is data that is often not in the mainstream, and it's not widespread. You wouldn't find it in the whole country. That is data in respect to everyday risk, continuous monitoring of what happens. I know of this from working with the school of public health, at my university. They have a strong programme on health complexities in emergency situations. Think of, for example, a heatwave and drought and residual heatwave with that. If the disaster is anticipated, there are systems built in the community, where they start collecting the everyday data in respect to the number of cases of illnesses related to the extreme weather event, fatalities, hospital records. The school of public health uses this to inform the ministry of health and put this into the curriculum on how to manage these emergencies."*

> *"We cannot underestimate the local level initiatives that are monitoring different risk and events. It's not widespread and it's based on cooperative actions between academics etc and other interested parties and I have seen this now, not in Uganda, but other countries, where ongoing work I have been involved in with the community members have established protocols for continuous monitoring of particular events related to the risks they face."*

> Shuaib Lawsa, Associate Professor in Geography, Makerere University Uganda

Similar accounts had been reported or experienced by other local level disaster risk and resilience building case studies encountered by the authors of this report, particularly those in lower income countries where government departments and NGOs have sought to engage grass-roots level engagement with risk reduction that is reliant on local level data.

Table 2: Case Study Examples

#	Case Study Title, Location, Overall impact	Set of actions to reduce disaster risk	Type of data which helped to achieve the aims/a change	Published
1	"Pakistan predicts dengue cases with helpline data". Pakistan. Overall impact: Significant decline in dengue cases	- Citizens report information relating to dengue disease to a specific helpline - Health workers report confirmed cases and deploy containment efforts - Front-end workers access predictions in real-time	- Numeric, narrative and visual data reported by locals into a database - Forecast data - Geo-tag cases onto an app, which correlates information into useful practical data	12th July 2016 Science and Development Network (SciDevNet) Gent, E.
2	"CPP Early Warning: Saving Thousands in Cyclone Mora". Bangladesh. Overall impact: Saved 1000's of lives from cyclones, reduced damage to property, crops, livestock etc.	- Volunteers disseminate warning signals through radio networks, signal flags, announcements with megaphones in local language - Assists in evacuation - Mobile phones used to communicate with volunteers - Raises community awareness on preparedness activities - Mock drills and simulation exercises	- Narrative data – information for early warning - Visual – use of signal flags	June 2018, IFRC 'DRR in Action'. Hossain, M.B.

3	"Developing urban and community disaster risk reduction plans using collaborative mapping techniques". Dar es Salaam, United Republic of Tanzania. Overall Impact: Community level resilience to disasters (largely flooding) is strengthened.	- Formed 'Ramani Hurai' in 2015, a community risk mapping project. - Generated substantial amounts of geospatial data and maps for landuse, infrastructure and exposure. - Data directly informs development of DRM and DRR plans - Mapped neighbourhoods covering ~ 3.5 million residents over 228 communities. - At community level, results led to actions such as: drain cleaning programmes, evacuation planning, emergency flood response teams. - At city level, results led to creation of a multi-agency response team.	- Mapping - Geospatial information - Historical records of flood	"Building Climate Resilience in Tanzania Water Sector" Project funded by the ACP-EU NDRR Program.

4	"Winter shelters for rural herder communities". Mongolia. 21 Provinces. Overall Impact: Decrease in livestock loss. Protection of their livelihoods and reduce vulnerability.	- Supported herder community groups to construct winter shelters for their livestock in order to provide protection from the harsh temperatures. - Constructed sub-shelters for smaller and younger livestock. - Participatory community-based approach.	- Verbal communications from Vulnerability and Capacity Assessment drawing from local knowledge	IFRC 'DRR in Action'. P.20 Sharavnyambuu, M.
5	'Facebook for disasters' app helped Indonesian neighbours save lives - researchers". Indonesia. Overall Impact: Saved lives. Reduced financial losses. 30% who received flood warning took preventative actions.	- Users post information on a social media app as disasters unfold, allowing community members to take immediate action. - Used by 1 million people in 78 locations - Users share photos of flooded streets, locations of shelters, warnings of water-borne diseases.	- Photos - Videos - Social media - Internet of Things	Thomson Reuters Foundation, trust.org (TRF) 24.10.2018 Michael Taylor

3.5 Interoperability

An identified demand for minimum standards in data collection, formatting and capacity to exchange information between different user groups not only raised the importance of having good quality data but also the interoperability of data between different user groups. If for technical or other reasons data does not transmit in a consistent manner to enable cross-sectional (spatial and sectoral) and longitudinal (temporal) comparisons, its benefits in making disaster risk reduction systems actionable will be compromised. However, the dependence on interoperability will depend on the context and purpose of disaster data. For example, where systemic responses requiring coordination of multiple agencies is paramount, such as in preparing fire and rescue, ambulance and police services for a mass disruption to urban residents, data that is transferrable between systems is critical to the means to effective intervention and response. Where there are complex systemic risks, data about people surviving in unique environments can be induced, such as in identifying local level reaction to unquantified environmental hazards; here interoperable standardised data may be less of an imperative.

The issue of interoperability, standardisation and associated barriers was raised in the first DWG meetings and have since been picked up by the European STAG who have produced a report on "the role of data interoperability in disaster risk reduction: barriers, challenges and regional initiatives" (Migliorini et al. 2019). The findings of this work highlight that a barrier to realisation and exploitation of the potential that interdisciplinarity can offer to disaster risk reduction is presented by 'incompatible data standards and nomenclature used in different disciplines' (p.1). This group proceed to list barriers and also outline some ways forward for 'Data-ESTAG' as a 'European initiative to enhancing data interoperability for disaster risk reduction'. An emphasis is applied to online monitoring data enabling some significant overlap to the objectives of the Sendai Framework Monitor. The coordinators of the ESTAG have maintained a good working relationship with GSTAG Data Working Group. It is hoped that other regional STAG groups will engage around related challenges in due course.

3.6 Data communication

Strategic data communication advances the understanding, processes and techniques and impact of disaster risk, resilience and response. Though communication was frequently referred to as central to the usefulness of data in the process of the Sendai Framework, it was clear that more work in understanding communications in depth would be required. There is a need for ongoing critical analytical studies of risk communication within and between science and technology partners and related policy and practice contexts. Whilst on the one hand communication of data can be dependent on online systems for collecting, manipulating and sharing information, communication is essentially a social process. Participatory communication exercises for disaster risk reduction can hear the 'voices' of intended beneficiaries. Hence, cross-analytical transdisciplinary communication and engagement within and beyond science and technology partners also requires data that is disaggregated by gender, age, physical and mental ability as a minimum standard.

Communication barriers would be better addressed by understanding how hazards and risks are transmitted and translated from a multi-hazard knowledge base into risk reduction. Risk across multiple contexts can be difficult to communicate beyond more quantifiable classification of statistical probability. Linking communication to accompanying SDGs, such as short term tangible strategic poverty, health and wellbeing actions, makes systematisation more feasible. The DWG had not done this sufficiently yet, but findings there are advocate for a greater inventory of experiences with accompanying toolbox of adaptations appropriate for improved *processes and techniques* of multi-hazard communication. This will need an evidence base of specific voices enhanced through communication media in action; including visualisation, sound and re-representations from varied social and technical positions. The range of examples for further development include film, participatory photography/radio, theatre, puppetry, participatory GIS, community mapping and appraisal, social media, mobile phone technologies and education materials for schools as applied to either real or perceived hazards and risks.

Data communication addressed in this way relates to the phenomenological and technical attributes of lived experiences of hazard and risk relative to communication technologies, scientific orientations and information sources in different cultural contexts. It can serve across the loss and damage, risk and capacity related data domains outlined in section 2 of this report, to bring voice and action to *impact* monitoring and evaluation and provide routes to linking local, national and related global networks in overcoming barriers to disaster risk reduction. Several comments below reflect on data communication and inclusivity of all voices, at all levels and their impact:

> *"The UK has taken a stand in what it hopes to be, the international leader in inclusive data. This has come through by the initiative in the SDGs to leave no one behind. We as an office have signed up to the inclusive data charter, which essentially stresses we won't stop until our data can shine a light on everyone. We recognise data is limited in not being able to highlight those people who are most vulnerable in society. If we couple that with the fact that in a DRR setting, its often those individuals, as an example, women and children, who are most at risk of suffering at those hazards. So data can help this and maximise differences and allow policy makers to see where the priority areas are for initial focus. … Countries around the world are quickly realising that without alternative data the challenge becomes immense."*
>
> Matt Steel, Office for National Statistics, UK

> *"[The voice] is active in parliament and government, it's there now but wasn't there three months ago [before the flooding event]. There is an upgrade going on of the emergency services…there is a review of the census. There's been a rapid turnaround in terms of the voice. The voice has come from local shop keepers, companies, parliamentarians and the king has realised the problem and stepped in himself. The voices have been heard and not ignored."*

Maitland Hyslop, Consultant in Aviation and Health, Kuwait Government

"You can speak more credibly if you have data to back you up. Data is an important part of being a credible voice, whether at the local level or at the regional level or international level. To me it is essential to have the data, the data is the source of the analysis. So, you can do the analysis to develop the recommendations and then the conclusions that will be the voice to either the global press, the global community, at national forums and international forums. Up until now I think a lot of the voices are weakened there. There is a lot of hand waving and big numbers thrown out. There is very little voicing of analysis of data. We need more of those voices, because that is what is going to move us towards practical solutions and actions."

Aris Popadopoulos, Non-Profit Resilience Action Fund

"We did a debrief in 2012 following severe flooding, that included talking to citizens and reflecting their views and reporting back to the organization. I think it's really powerful. I think a recent way it's been used which is really powerful is the bishop's report into Hillsborough. We listen to people after, Grenfell demonstrates we don't listen to people before, it's tragic. We are getting better, but we need to develop that skill. Listening to the quiet voices as well."

Helen Hinds, Head of Resilience at Newcastle City Council

Table 3: Barriers to Communication examples

Barriers to Communication	Examples
Technological	• Infrastructure failure • Non-acceptance of the technology by user • New or different technology not understood • Social media barriers to communication
Organisational	• Employee cultures, rules and norms not shared • Different languages or terms used within organisations • Specific policies, structures, goals in an organisation not shared
Social	• Diversity of people in language, nationality, politics, religion • Filtering of messages and information inaccurate and inadequate • Information overload, lack of quality, unreliable data

No matter how good the data that is available and being communicated, there remains the further barrier of data denial. The most obvious example, which cropped up in discussions during this DWG phase, was that of the well-publicised issue of climate change denial, whereby overriding evidence provided by science is either ignored or weakened by those

hoping to avoid taking greater actions to mitigate it. The current position of countries wishing to reduce the significance of climate change communication through data denial includes the USA, through its decision to withdraw from the Paris Agreement. Dangerously, the previous two years have seen the advance of data denial in Brazil with political complacency in the destruction of Amazonia and in Australia with the lack of contrition from political leaders regards escalation of climate induce wildfire. An emergent sub-theme coming from the DWG was around the need to better live with uncertainty, implying less reliance on data to is unrealistically comprehensive. Unfortunately, uncertainty has tended to not be positively engaged through a more precautionary approach by nation states, who instead interpret the uncertainty aspects of risk as a means to avoiding major preventative decisions.

The context of COVID-19 during 2020 has then highlighted the issue of the need to acquire, communicate, interpret and react to data in a timely manner, highlighting how fragility across any of these steps costs lives and can allow an escalation of crises.

3.7 Data *receivability,* internalisation and reaction

Once, data may have transitioned initial barriers in its communication, at the level of nation state or more locally, actions will depend on reactions to risk as internalised behavioural changes. If information to those receiving communicated data, such as for example weather and disease incidence data, is not provided, its interpretation and the appropriate reactions will not be forthcoming. This is a well-known challenge highlighted in the study of early warning systems. Data active as a voice that is heard, misheard or not understood is not only a political matter but depends on different cultures of dealing with risky conditions and how data is internalised with individuals and groups. Some of the issues of culture are starting to be discussed and realised more widely in the sector, as demonstrated by the focus of World Disasters Report (2014) on Culture and Disasters. The focus had been developed following work on this topic lead by the Communicating Disasters research group hosted by the Centre for Interdisciplinary Research, Bielefeld Germany in 2010. The first comment provided below illustrates an example of those highlighting little information being representing more marginalised groups in society, with there being a greater focus on broad level data. The second comment refers to examples of difficulties in communicating with citizens during and after disasters:

> *"I work with the deaf and hard of hearing for disaster preparedness, and there is very little information in support of this group or in research. I think the research needs to be more localised to specific populations or geographical issues dealing with disasters … I think all this broad big data we collect and use is difficult to extrapolate to be useful for focused research. When you look at emergency management policies and products for dealing with this community, you need to be creative to come up with data on what exists out there and to how it applies to specific issues".*
>
> John Walsh, Vanderbilt University Medical Center (own perspective)

"How is data an active voice and resource? I think we struggle with that, you can communicate in numbers but not everyone understands them. If you use narrative, there is a balance between educating and scaring people. All the information people were accessing around cladding, people feared living in high rise blocks and the fear they created within themselves. They weren't trusting the voices that were trying to reassure them. We have tower blocks in the city and the cladding wasn't like Grenfell but they didn't believe us. We are bad at communicating it".

Helen Hinds, Head of Resilience at Newcastle City Council

3.8 Action data implementation, its potential impact and replicability

This report primarily flags the need for action data in achieving the intended outcomes of the SFDRR as a cross cutting finding of the DWG. This is backed up by piecing together the experience-based comments of people who work with disaster risk. However, ongoing systematic evidence will need to be grown around this topic to expand the case for improving action data effectiveness across all sectors; one of the tests for data that works will be in its scientifically based validity based on a proven knowledge of what works in bringing about change. This will rely not only on identifying data impacts where the process of change is understood, but also where it can be systematised so that it can be replicated. The impact of data in achieving SFDRR and SGDs would be multiplied if all aspects of the above DWG findings are taken into account in devising replicable processes and outcomes were feasible. The comment below illustrates the desire for a global system with global standards in order to replicate good practices around the world:

"We need to establish more global standards and best practices that countries around the world can use. We need to break the boundaries that today exist, in terms of the codes, standards between the countries. Really expose information that says 'there are certain universal resilient standards and best practices that all countries categorised by clusters of hazards.' A country like the Philippines, that faces floods, typhoons, fires, is a cluster of hazards. We need a few good, best local standards and practices that can apply to the Philippines and Japan, say California with fires and earthquakes. If we had the data in a usable database, we could see the patterns a lot easier and be able to demonstrate that these practices are the ones that should be adopted globally, instead of trying to reinvent the wheel in every country and city over and over again, which fragments the problem. … What we need is a database that is agreed on that we can populate with information post disaster. Not just the buildings that were destroyed, but also the ones that survived. You can learn as much from the ones that survived, as you can from the ones that were destroyed, because they faced and resisted the hazards".

Aris Popadopoulos, Non-Profit Resilience Action Fund

4. Implications and Applications

The overall findings of the DWG to date provide a measure of progress and prospect for the concept development and derived implications for disaster data requirements going forward. Overall the process has been one of listening to different types of user groups as they have interacted in international meetings, focused study groups, presentations and specific interviews. Secondary sources have been reviewed and a sense of what needs to be done in terms of effective progress is derived.

The DWG was not comprehensive in its reviewing, neither has it sought to or been able to, identify what would be a representative sample of respondents and participants beyond the resources it had to operate with for this period of analysis. However, it has used the working environment of experts and practitioners to identify a realistic reflection on where the sector has reached and where it can advance by picking up and evolving a concept of action data and data as a voice for achieving disaster risk reduction, as most effectively as possible. Much of the earlier stages of the DWG reflected on barriers to advancing disaster risk reduction and these were found to be where there was a lack of an inclusive and effective process to the acquiring and use of data. The barriers can be conceptual, methodological or due to the human condition, each preventing more optimal policy and practice to come to the fore.

As the ideas developed through the DWG and beyond progress further, the recognition of the need to come up with a conceptual emphasis to addressing boundaries, transitions and outcomes through action partnerships has already suggested that this would facilitate a form of data driven (or evidence based) disaster risk reduction. This would require not only the tidying up of global level data on loss and damage, which is being addressed through a number of other initiatives, but also the generation of local and national level action data as part of a process of bringing sufficiently radical change to offset disaster risk that is otherwise currently 'out of control'. Some insights for this more progressive agenda from the reviewing reported here points to the following ways of shifting investment to:

- A whole of society approach to data, rather than for example looking for vulnerable groups and 'ignorant' people; the implication is to promote short and long-term people centred engagement with actionable data.
- An understanding of grounded everyday adaptation to risk and people's other reactions to risk, both of which can be less predictable; this requires avoiding uniplanar thinking in data management. This can for example be progressed through greater 'listening' to the voices (i.e. data) and co-observing the practices of at risk people, particularly young people who will represent the next generation.
- Embedding principles of well-being achievable with the support of data that works by showing how everyday harm is being offset by risk and sustainability actions. This is to work with aspiration and motivation, rather than with coping and resilience as if they were more isolated conditions. There is evidence from local level case studies

that this breads a culture of prevention, whereby people engage in risk reduction to preserve environmental, economic and social assets with which they have invested.

The potential there is for success through the above emphases comes with requirements in the way work is performed in the sector and for which financial investments will be needed. COVID-19 has shown us that investments to build up strengths sufficiently early and anticipatory of major impacts remains lacking in most parts of the world. It is also clear from analysis of reactions to risk that there is also a need to work with both real and perceived risk, to find ways of enforcing the application of precautionary principles, better understanding of open and closed systems for disaster prediction and response calculations, improved communication and interpretation of disaster, risk and risk informed development cross-culturally. It is argued that a contribution to this process lies in improved attention to principles of active voices in disaster risk, otherwise referred to in this report as Action Data.

The transition from (uni)linear supply driven inputs, to the sustained induction of discovery for unique solutions for unique times, places and people implies the need for adaptable disaster risk reduction applications. There is a role for all sectors in this agenda. The DWG was at this point yet to engage the wider private sector including insurance brokers to seek further variants of the action data and data as voice agenda being proposed. However, it is predicted that the strategy can be developed relative to the predicament of each sector it involves. The full benefits of more co-operative working around data for evidenced based working between otherwise competitively driven agendas are further implications to be examined on an ongoing basis.

5. Conclusions

This report does not conclude there are simply remedies in the challenge of delivering more impactful data processes in DRR. However, to address greater effectiveness there are conceptual emphases and observations provided here that should be of note to practice and policy discussions going forward. The people centred approach advocated for the data agenda has been prevalent in the emergence of DRR related engagements worldwide, including for example in the development of more comprehensive approaches to early warning systems. However, a major new challenge is presented in responding to the need to apply good data to all actions pertaining to DRR in a timely way. This needs to be grounded in local realities where impacts on DRR are inseparable from making progress with sustainability challenges (SDGs). An opportunity for an increase in awareness of this interlinkage of varied hazards, exposures and actions that mitigate disaster outcomes is in effect both brought into stark focus, and aided, by the 2020 COVID-19 crisis. This is also demonstrating how new ways of living are essential and major human adaptations possible. A common agenda of all types of crises that currently headline, related to climate, pandemic and the fragility of global and local systems is a demand for the right action related data, available at the right time, with whom and where it is needed.

Most UN and partner investments into registering data focus on loss or incidence on the one hand and capacity (or availability of services) on the other. Risk data has however been much less represented. Risk is addressed by national risk registers at the nation state level, but these are not fully developed, such as for example to include measures of exposure and vulnerability. This is perhaps not surprising since a greater level of inductive and qualitative interpretation and representation would be necessary to get beyond this stage. Indicators of uneven wealth and well-being, where applied into data monitoring and assessment procedures at national level, could close some of this gap.

The application of big data and artificial intelligence to running data collection, processing and dissemination systems is a burgeoning opportunity to better update on disaster risk creation and impacts of DRR in real time. The technical details of this expanding technological benefit to the sector has not being evaluated in depth in this reporting period – however, there are clear opportunities to make use of the latest techniques and tools that science and technology can provide. This period of the DWG sought to lay down some basic principles regards optimal progress points in DRR, namely that all data, regardless of how is it managed within and beyond data science, needs to be interpretable as action data, that which contributes to or effects change for future generations to be healthy, secure and free.

Given cultural complexity and specificity of contrasting locations considered in this work, systematisation of data collection, processing and its use will need to be implemented relative to its source and its purpose. No one solution will fit all. Standardisation of data is however important to a point and should be applied in all situations where it is proven to be beneficial to the aims of SFDRR and related sustainability agendas.

Whilst there are many aspects to the concepts and their implications touched upon in this report, that will be worked upon further, a brief of summary of core conclusions are that:

- Good data is a basis for improved decision making towards achieving Global Targets for Disaster Risk Reduction and Sustainability
- Actions for Disaster Risk Reduction are currently not proportionate to the data available
- There is a need to rethink how data reduces disaster risk for more resilient and well-being enhanced futures and to use this to guide the quantity, quality and timing of data collection
- Action orientated framings of data, that also serves as a voice, can enable disaster risk reduction and resilience and is relevant at all levels and to all sectors

The report should be used to identify actions for investment. Some initial examples already being suggested include:

- Identification of ongoing case studies that trace the effectiveness of action data processes.
- Establishment of a network of ‘data champions’ to oversee this process, either managed by UNDRR or outsourced to other networks.

- Maintain a continuation of DWG type reference meetings and monitoring through international conference events including in particular GP of UNDRR. This is to enhance sense making at all levels of governance to improve data driven decision-making for DRR and sustainability.
- Maintain an integrative approach to data using all relevant global initiatives working under multi-disciplinary terms of engagement, in particular through the GRAF, Sendai Framework Monitor, UNDRR partnerships, and non-UN bodies such as for example the Global Alliance of Disaster Research Institutes (GADRI) and the International Science Council (ISC) group of initiatives including IRDR.
- Fully publish the findings of any updated version of this current report.

Though the rationale for action data and the comments of individuals contributing to this report all occurred before COVID-19 was on the radar, it has been possible to also consider many of the perspectives as informative in the context of such pandemics.

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