IRDR
Integrated Research on Disaster Risk

FBAS DRR Session
17:00-18:30 (UTC+8), 6 September 2023

Summary

New data technologies for DRR early warning and early actions

1. IRDR organised the DRR Session entitled "New Data Technologies for DRR Early Warning and Early Actions" at the 3rd International Forum on Big Data for Sustainable Development Goals (FBAS), 6 September 2023 in Beijing. The session contributed to the Priority 5 and Priority 6 of the Global Research Framework. The concept note of this session is attached as the Appendix 2.
2. Prof. Dr. YANG Saini, Member of UNDRR APSTAG, served as the Chair of this session. she started the session by welcoming the participants and introducing the objectives, the agenda and the speakers of this session.
3. Dr. JIANG Long, Technical Coordinator of WMO-IOC in-situ Observations Programme Support Centre (Ocean-OPS), presented "WMO Activities for MHEWs":
   a) WMO together with UNDRR, IFRC and ITU are leading UNSG's, Early Warnings for All Initiative (EW4A). WMO developed the International Network for Multi-Hazard Early Warning Systems, which includes IRDR, UN Agencies, ISC, JRC and other international partners.
   b) The EW4A consists of four pillars, among which the 2nd one "Detection, Observation, Monitoring, Analysis and Forecasting of Hazards" requires the capacities of big data and advanced technologies.
   c) WMO Strategic Plan 2024-2027 emphasizes the application and development of new technologies. It provides global meteorological infrastructures and product and delivery of services benefiting from open data and new technologies such as AI. The Framework of WMO Information System version2.0 enables interoperability and unified data sharing.
   d) . The proposed actions next include feed data science and technology with sciences, and address the data management issues and digital divide etc.
4. Dr. Bapon Fakhruddin, Water Sector Lead of Division of Mitigation and Adaptation, Green Climate Fund (GCF), presented "Transforming Disaster Risk Reduction: Innovations in Risk Informed Action & Multi-Hazard Warning Systems":
   a) The systemic risk and complex impacts attributes propose challenges for early warning systems. EW4A requires the co-production and co-creation. However, the early warning systems are mostly grant based without private sector participation and there is a significant funding gap.
   b) GCF provides financial instruments and catalyses the impacts via building capacities and enabling the environment, accelerating innovation, de-risking and mobilising finance at scale and helping national financial institutions expand the green finance. The Priority of GCF Strategic Plan 2024-2027 "Addressing urgent and immediate resilience needs for particularly vulnerable countries, enhance early warning for all

and double to country access of finance" will enhance the access of climate resilience and disaster risk reduction. To navigate complex climate risks, we need integrated data systems to collect, analyse, and share information. Building human capacity through training and collaboration is key. Historical and disaggregated data provide insights to guide policy and risk reduction.

c) Mobilizing climate finance nationally and globally is vital for mitigation and adaptation. The nexus of climate action, disaster risk reduction, and sustainable development enables holistic resilience. Early warning systems can minimize disaster impacts. Resilience must be strengthened at all levels - individual, community, and national.

5. Prof. Dr. Amod Dixit, President of National Society for Earthquake Technology (NSET) of Nepal, presented "Report for Assessment NSET Use of Digital Technology for The Mountain Hazard Chain in Nepal":
   a) Intensive earthquakes, landslides and floods are major concern in daily life of Nepal. The risk landscape is impacted by climate change in the Third Pole and 2015 Gorkha Earthquake, for example, the numbers of landslides were observed to increase exponentially after 2015 Gorkha Earthquake. NSET launched international collaborative projects for awareness raising, community engagement, risk reduction and resilience building.
   b) The project "Sajag-Nepal: Preparedness and planning for the mountain hazard and risk chain in Nepal", which is one of the collaborative projects is anticipated to upscale the landslide monitoring and modelling to multi-hazards at national scale and enhance the capacity on forecast monsoon impacts on runoff and slope stability.
   c) New satellite data resources and advanced machine learning technologies are adopted in these projects. Benefitting from the popularization of communication technology, there are multiple channels, such as social media, radio, TV, face-to-face meetings, used for effectively reaching as many people as possible regarding hazard information and risk knowledge.
6. Prof. ZHANG Feng from Department of Atmospheric and Oceanic Sciences, Fudan University, China, presented "FuXi: the first machine learning forecasting system with comparable performance to ECMWF ensemble mean for 15-day global weather forecast":
   a) The Numerical Weather Prediction (NWP) Model has limitations in terms of computational requirements and scalability with increasing data, which can be addressed by utilizing machine learning-based models.
   b) Overall architecture of FuXi Model consists of three components: cube embedding, U-Transformer, and fully connected (FC) layer. By adopting Cascading Strategy, the result of 10-day forecasts by FuXi is better than ECWMF HERS, the result of 15-day forecasts by FuXi is comparable with the ECMWF EM.
7. Dr. WANG Tun, Director of Institute of Care-Life (ICL), China, presented "Some progress of EEW & MHEW system in China":
   a) With the underground earthquake sensors and mobile-phone-based sensors, ICL has established the world's biggest earthquake early warning network. The service

of earthquake early warning (EEW) system covers over 800 million users through television, mobile phones and supports the decision making of different sectors on emergency responses and risk assessment.

b) Multi-hazard early warning system was developed based on more than 40 data sources related to "sky, earth, and underground." The system integrated the models for earthquakes, landslides, floodings and debris flows and provided early warning services for multiple time scales. A network of multi-hazard monitoring and broadcasting has been established.

8. Dr. Nurfashareena Muhamad, Head of Southeast Asia Disaster Prevention Research Initiative (SEADPRI-UKM) of Malaysia, presented "A Multi-hazard Forecasting System for Cities":
   a) MHP is a multi-hazard platform forecasting system for cities (3-day ahead) led by SEADPRI-UKM and University of Cambridge, UK developed through a consortium project consist of 16 research and business organisations; 6 from the UK and 10 from Malaysia.
   b) The System is used for emergency response in the Parliamentary Areas of Kuala Lumpur and for land-use planning and development control in Kuala Lumpur. Operational Manual of Kuala Lumpur Multi-hazard Platform (KL MHP) and Geophysical Hazard Database are two major products of the System that used by City Planning Department (JPRB) and Civil Engineering & Drainage Department.
   c) Technical capacity for forecasting flood, landslides, haze, heatwaves, rainfall is low at the city and local authority levels in Malaysia. Hazard information and early warning is limited at a scale that is suitable for decision-makers in cities and local authorities. These main challenges in Malaysia requires the efforts from science-policy-society interface to achieve Sendai Targets and SDGs in particular the SDG11.
9. During the Q&A and discussion part, the following points were further addressed:
   a) For the weather forecast for large space and time scales, the service needs to capture the main features of changes. While for small space scale, the service should provide timely warning such as 2h forecasting, which is the key concern for the general public to do the early actions.
   b) Multiple resources and types of data will improve the accuracy of early warnings. The improvement of accuracy will enhance the trust of science.
   c) Though the early warning alerts can be issued by the authorities in most countries, the establishment and the service of early warning systems can be provided via "Public-Private-Partnership" model.
10. The Chair of the session Prof. Yang and the distinguished guest Prof. Dr. Gretchen Kalonji, the Dean of Institute for Disaster Management and Reconstruction of Sichuan University together summarized the session:
    a) The presentations delivered by the panellists answered all the questions proposed in the concept note, i.e., how to maximize the benefits of new data technologies, how to best contextualize the development of the early warning systems in different context, and what actions should be taken to improve the public trust.
    b) The effectiveness of early warning information is a key concern in the development

of MHEWs. Impact-based MHEWs have unique advantage in transforming information to behaviours.

c) The science stakeholders should continue to communicate between scientific network and to difference stakeholders. It is important to identify what people would like to listen to and what they won't. The efficiency of communication will be improved by using the different languages to different audiences.

11. This summary, some of the presentation materials, pictures from the venue of this session are available at IRDR website: https://irdrinternational.org/news/980. A policy brief on this session topic is foreseen.

Appendix1 Group Photo

Appendix2

Concept Note of FBAS DRR Session

New data technologies for DRR early warning and early actions

17:00-18:30, 6 September 2023, Room 201D

Rationale and Objectives:

The Report of the Midterm Review of the Implementation of the Sendai Framework for Disaster Risk Reduction 2015 – 2030 indicated that "new technology is helping overcome data gaps to enable better decisions". This has been reflected in the DRR efforts of Sendai Target G "Increase availability and access to early warning systems and risk information". The new and emerging technologies, including earth observation techniques, artificial intelligence and open science infrastructure, have the potential to provide more timely and reliable data for early warning. The progress in the development of multi-hazard early warning system (MHEWS) has been slow as one in three people globally is not adequately covered by any early warning systems. There is an increasing recognition on this global challenge and UN therefore has been calling for joint efforts in early warning and early actions.

The overall objective of this session is to provide a platform to share the innovations, insights, knowledge and experiences of new data technology for early warning and early actions. The participants will identify the challenges and opportunities for the intersectoral and interdisciplinary collaboration and practice required. The session will contribute to the Priority 5 "Harness technologies, data and knowledge for risk reduction" and Priority 6 "Support regional and national science and knowledge for policy and action" identified in the *A Framework for Global Science in support of Risk Informed Sustainable Development and Planetary Health* (ISC-UNDRR-IRDR, 2021, hereafter as "Research Framework") . The output of this session will be a concrete contribution to the follow-up actions for the Sendai Midterm Review, the implementation of the Research Framework and the inputs toward IRDR 2024 Conference.

Key questions to be addressed:

- How can DRR community maximize the benefits of new data technologies in forms of information service especially the early warning systems?
- How to best contextualize the development of the early warning systems in the national and regional levels?
- What actions should be taken to improve the public trust on the service of the early warning systems so that the better early actions can take place?

Expected outputs:

- Recommendations on the use of new data technology for the development of MHEWS.

- Suggestions and proposals on collaborative actions for future integrated research and policy supports.

Proposed Agenda:

Chair:

Yang Saini, Secretary-General of UNDRR APSTAG

Items:

- Brief opening by co-chair (5 min in total)
- Panel presentations (10 min each, 60 min in total)
  - **Long Jiang, Technical Coordinator, WMO-IOC in-situ Observations Programme Support Centre (Ocean-OPS)**
    WMO-IOC efforts in MHEWS (pre-record)
  - **Bapon Fakhruddin, Water Sector Lead, Division of Mitigation and Adaptation, Green Climate Fund**
    Transforming Disaster Risk Reduction: Innovations in Risk Informed Action & Multi-Hazard Warning Systems
  - **Amod Dixit, President, National Society for Earthquake Technology - Nepal (NSET), Nepal**
    The use of digital data and remote sensing for natural hazard and risk assessments and development planning in Nepal (tbc)
  - **Feng Zhang, Professor, Department of Atmospheric and Oceanic Sciences, Fudan University, China**
    FuXi (伏羲): the first machine learning forecasting system with comparable performance to ECMWF ensemble mean for 15-day global weather forecast
  - **Nurfashareena Muhamad, Head, Southeast Asia Disaster Prevention Research Initiative (SEADPRI-UKM), Malaysia**
    A Multi-hazard Forecasting System for Cities
  - **Tun Wang, Director, Institute of Care-life, China**
    Some progress of & MHEW system in China
- Q&A and discussion from the audience (20 min)
- Summary by co-chair (5 min)

Co-organized by:

Integrated Research on Disaster Risk (IRDR), CAST-UN Consultative Committee on Disaster Risk Reduction, Digital Belt and Road (DBAR) Programme DRR Working Group

Conference Link:

https://fbas2023.scimeeting.cn/en/web/index/17586