Outcome report: Emerging technologies for telecommunications in disaster management

Session Date and Time: Tuesday, 6 July 2021 (11:00 – 12:00 Geneva time) - 60 minutes.

Opening Remarks and Session Moderation: **Vanessa Gray**, Head of Emergency Telecommunications and Environment Division, ITU Telecommunication Development Bureau (BDT), ITU

Speakers:

- **Hwirin Kim**, Head, Hydrological and Water Resources Services Division (HWR), World Meteorological Organization (WMO)
- **Elizabeth Bourke**, Drones Team Project Manager, World Food Programme (WFP)
- **Diego Meglar**, Department of Earth Sciences at the University of Oregon

Closing Remarks: **Bilel Jamoussi**, Chief of Study Groups, ITU Telecommunication Standardization Bureau (TSB), ITU

1. **Session summary:** This session discussed new applications of emerging technology, or novel use of existing technology, in the context of ICTs for disaster management. The event presented a number of initiatives from different sectors that use emerging technologies, including AI and ML, drones, satellites, big data, and 3D printing to help in disaster detection, preparedness and response, with particular focus on least developed countries (LDCs), landlocked developing countries (LLDCs), and small island developing states (SIDS). The session also introduced a new repository of case studies and subject matter experts that ITU would like to build to connect relevant stakeholders from industry, the public sector, and academia.

2. **Main outcomes highlighting the following:** This session discussed concrete examples of how disruptive or emerging technologies can help all stakeholders be better prepared for and respond more quickly and strategically when disasters strike. Situational awareness is improving with new tools, providing the crisis community with a clearer understanding of the extent of damage, connectivity gaps, and where to prioritize resources. A special focus was on how this can benefit in particular the most vulnerable communities in least developed countries (LDCs), landlocked developing countries (LLDCs), and small island developing states (SIDS).

   ITU introduced the idea to build a repository of emerging technology for disaster management. This repository of case studies and subject matter experts would inform and connect relevant stakeholders concerning new applications of emerging technology, or novel use of existing technology, to improve the application of ICTs for the disaster risk management cycle. Examples of the type of initiatives that would fit this concept were presented to the audience during this session:

   - Dr. Hwirin Kim, Head of the Hydrological and Water Resources Service Division of the World Meteorological Organization (WMO), provided an overview of WMO's early warning systems for flood forecasting and 3D printed automatic weather stations, which can be manufactured within a short time-frame and at low cost for implementation in developing countries.

- Dr. Diego Melgar, the Ann and Lew Williams Chair in Earth Sciences and an assistant professor of geophysics in the Department of Earth Sciences at the University of Oregon, presented a collaborative initiative with several partners, including IBM and NASA, to automate tsunami warning with advanced positioning data, data modelling, and machine learning technology that would notably better warn populations in SIDS.
- Ms. Elizabeth Bourke, the project manager of the Drones team within the IT Division of the United Nations World Food Programme, briefed the audience on WFP's innovative projects that use drones and machine learning to conduct post-disaster damage assessment of infrastructure in LDCs, LLDCs, and SIDS to better inform response and recovery efforts.

3. **Main conclusions reached during the discussion:** Disruptive technologies can spread critical information more quickly, improve understanding of the causes of disasters, enhance early warning systems, assess damage in new ways, and add to the knowledge-base of social behaviors and economic impacts after a crisis strikes. This is linked to connectivity and how technological advancement and innovation are creating new opportunities for enhancing disaster prediction, resiliency, reconnaissance, and risk reduction. Disruptive technologies – such as artificial intelligence (AI) and machine learning (ML), the Internet of things (IoT), and Big data – and innovations in such areas as robotics and drone technology are transforming many fields, including disaster risk management. These developments, supported by the rapid spread of supporting digital infrastructure, connectivity, and devices, especially wireless broadband networks, smartphones, and cloud computing, have created the foundation for the application of disruptive technologies for disaster management.

4. **Panellists contributions to the outcome reports:**

   - *What are the opportunities and challenges of emerging technology (specific to the session topic) for LDCs, LLDCs and SIDS*

     Tools for disaster management highlighted in this session are vital to LDCs, LLDCs, and SIDS, which are particularly vulnerable to disasters and often lack resilient ICT infrastructure and connectivity, sufficient early warning systems, public alerting capabilities, and the capacity to respond during and after events. Examples highlighted during this session:

     - WMO's 3D Printed Automatic Weather Stations can be produced rapidly and at low cost, making them viable for LDCs, LLDCs, and SIDS. These weather stations provide many benefits including improved mesoscale weather forecasts, strengthened early alert and regional decision support particularly for flash floods, agricultural monitoring and water resource managment, and health monitoring. The first pilot program for this initiative was in Afghanistan, and the initiative is designed to require very low infrastructure or back-end investment for widest availability.
     - WFP's Digital Engine for Emergency Photo-analysis (DEEP) program is built to be fully modular and deployable to LDCs, LLDCs, and SIDS. DEEP automates the learning analysis and processing of high resolution images from drones or satellites to detect all buildings and assess infrastructure damage after a disaster, significantly speeding up stakeholder response times during emergencies. WFP has developed and deployed this capability with LDCs, LLDCs, and SIDS in mind, with initial pilot deployment to respond to real-world events in Mozambique in 2019.
     - The University of Oregon, along with NASA and other partners, is leveraging geospatial information systems and satellite imagery to determine the spatial

extent of areas affected by tsunamais, including preliminary damage estimation to human and physical assets. Using data from worldwide terrestrial and satellite based data sources, along with advanced modelling and machine learning, this initiative can more accurately and rapidly forecast tsunamai effects, enabling effective public alerting that allows vulnerable populations to get to safety. This initiative is vital, particularly in the Asia/Pacific areas, where many vulnerable communities in LDCs and SIDS are at the greatest risk for tsunamais.

- ITU/WMO/UNEP Focus Group on AI for Natural Disaster Management (FG-AI4NDM), established in December 2020, explores the role of AI in the field of natural hazard and disaster management to underscore best practices for AI-based data collection and handling, improving modelling across spatiotemporal scales, and providing effective communication. In keeping with these objectives, FG-AI4NDM gathers various stakeholders from across the globe and has been fostering the participation of experts from low- and mid-income countries, and SIDS, which shown to be particularly impacted by these types of events.

- *What are the most important points/aspects of the emerging technology that should be considered in order to accelerate the digital transformation in LDCs, LLDCs and SIDS?*

  Advancements in the use of emerging technology for disaster response will have the greatest impact on developing countries, which lack resources and resiliency that compound their existing threat/risk calculus. Presenters consistently pointed out that new solutions must consider the following:

  - Evolving solutions for disaster risk management must be developed and provided that require little or no investment in infrastructure or back-end services like computing and server capacity, program/application development, and hardware (sensors, drones, communications, etc). International organizations realize that lifesaving technology must be made widely available to LDCs, LLDCs, and SIDS either with partner investment, or in a rapidly deployable model from centralized locations. In any case, common back-end support and infrastructure must be flexible and available at no cost.
  - Successful initiatives in this area can only be accomplished with close cooperation and support from national, regional, and local governments. Collaboration must be built-in from the beginning to ensure solutions adequately address local needs (a solution requiring LTE data is useless if only 2G connectivity is available), appropriate regulations are in place (e.g. permissions to fly drones), and by addressing proper services and integration with local systems (use of local languages, privacy considerations, etc).
  - Access to data is vital, and more progress must be made with private sector partners to provide data necessary to develop the best possible disaster management solutions. In certain situations, international investment is needed to incorporate new sensors, applications, or other partnerships to provide needed data.

- *Takeaway: please provide one key word and one sentence that most fit the session topic*

  Key word: Lifesaving

  Sentence: In disaster response management, disruptive technologies can spread critical information more quickly, improve understanding of the causes of hazards and disasters, enhance forecasting and early warning systems, assess damage in new

ways, and add to the knowledge-base of social behaviors and economic impacts after a crisis strikes.