# AI for Good Global Summit 2024 Workshop Summary Report


**Workshop:** Forecasting the Future: AI in Early Warning Systems (session recording) organized as part of the AI Sub-Group of Early Warnings for All Initiative.
**Date and Time:** 31 May 2024, 14:00 – 18:00 CEST
**Attendance:** The workshop was at capacity and attended by ~160 participants. The AI for Good Global Summit was attended by 4,500+ participants from 147 countries over the 3 days.
**Social media promotion:** WMO promotes Early Warnings for All at AI For Good Global Summit blog.

**Moderators:** Ms. Loretta Hieber-Girardet, Chief, Risk, Knowledge and Capacity-Development Branch, United Nations Office for Disaster Risk Reduction (UNDRR) and Ms. Vanessa Gray, Head, Environment and Emergency Telecommunications Division, International Telecommunication Union (ITU)

## Introduction: Leveraging AI for Early Warning Systems (14:00 – 14:30 CEST)

Ms. Loretta Hieber-Girardet, Chief, Risk, Knowledge and Capacity-Development Branch, United Nations Office for Disaster Risk Reduction (UNDRR), opened the workshop by sharing excitement about new AI application developed for disaster analysis. Traditionally, the task of analysing disaster impacts, including affected populations and infrastructure damage, could take several days to a week. However, with new AI tools, the same analysis can now be performed in just a few hours. This application, recently used for Indonesia's common country analysis, signifies a significant advancement, enabling countries with limited resources to process large datasets quickly and efficiently.

Highlighted how the workshop will focus on the transformative potential of AI in humanitarian and disaster risk reduction efforts and emphasizing AI's role in enhancing early warning systems globally. This is crucial in achieving the goal of protecting all people on Earth through effective early warning systems.

The workshop featured opening remarks from:

- **Ms. Ko Barrett - Deputy Secretary-General, World Meteorological Organization (WMO)**

Ms. Barrett, Deputy Secretary-General, World Meteorological Organization, highlighted the palpable enthusiasm surrounding the event, and emphasised the ambitious goal of the World Meteorological Organization (WMO) to protect everyone on Earth with early warning systems by 2027. She provided a brief overview of WMO's history, noting its long-standing role in innovation since the 1950s, particularly in sharing data and information to support weather forecasting and climate outlooks. Acknowledged that AI is already revolutionising WMO work, although its full potential in early warning systems is yet to be explored. Pointed out the importance of leveraging AI for more effective and speedy life-saving services. Ms. Barrett highlighted the MedEWSa project as an example of WMO's collaboration with research institutions, the private sector, and international bodies to refine early warning systems using AI.

- **Dr. Cosmas Luckyson Zavazava - Director, Telecommunication Development Bureau (BDT), International Telecommunication Union (ITU)**

Dr. Zavazava, Director of the Telecommunication Development Bureau at ITU, began by echoing the excitement shared at the workshop regarding technological advancements. He highlighted the longstanding partnership between ITU and WMO, emphasizing their joint efforts in utilizing radio spectrum for meteorology and early warnings. ITU, established in 1865, continues to innovate and adapt to modern times, focusing heavily on standards setting and global spectrum allocation. Dr. Zavazava commended the recent initiatives of WMO and welcomed attendees to the AI Summit for Good, noting its importance as a global dialogue platform on AI.

His remarks underscored the critical role of AI in enhancing early warning systems, aiming to ensure that every person on Earth is within reach of early warning signals by 2027. He discussed the AI for Early Warning for All subgroup, which explores AI use cases to strengthen early warning capabilities and disaster management. Highlighting the devastating impact of disasters worldwide, Dr. Zavazava emphasized ITU's commitment to leveraging AI responsibly. He noted ITU's extensive work in developing standards related to AI and disaster risk reduction, engaging regulators and industry stakeholders to manage AI effectively without stifling innovation.

Following these remarks, the session continued with presentations from key partners who have been collaborating in the AI and disaster risk reduction space:

- **Mr. Juan Lavista Ferres – Corporate Vice President & Chief Data Scientist, Microsoft AI for Good Lab**

Mr. Juan Lavista Ferres, Corporate Vice President & Chief Data Scientist, Microsoft AI for Good Lab emphasised the disparity in addressing critical global challenges like child mortality, climate impact, and disabilities compared to commercial interests. Highlighting the role of AI, Mr. Lavista Ferres explained how his team leverages AI to tackle humanitarian issues inaccessible to many governments and NGOs due to resource constraints. He illustrated this with examples such as updating census maps using AI models, crucial for targeting aid effectively.

Underscored the necessity of simplicity in solutions, contrasting the allure of complexity with the practicality of straightforward AI models. These models help predict and mitigate risks during natural disasters, demonstrating the impact of accessible AI solutions. Emphasized the transformative power of satellite data in disaster response, citing projects in Afghanistan and Libya where rapid mapping enabled swift humanitarian action. Also highlighted collaborations using large language models to facilitate data queries, simplifying complex coding tasks for non-specialists across languages. Stressed the imperative to harness AI's processing power for solving global challenges, asserting that modern

technology eliminates excuses for inaction. His presentation showcased how AI, coupled with satellite data and accessible tools, can revolutionize disaster management and humanitarian aid, making complex technologies accessible for humanitarian purposes.

- **Ms. Inbal Becker-Reshef - Director, NASA Harvest**

Ms. Inbal Becker-Reshef, Director of NASA Harvest, presented on the organization's role within NASA Harvest which is their Global Food Security and Agriculture Program and also within the Group on Earth Observations Global Agricultural Monitoring Initiative (GEOGLAM). NASA Harvest aims to maximize the utilization of satellite data in agriculture globally, collaborating extensively with public, private, and academic partners. The program emphasizes co-development and user-centric approaches to convert vast satellite data into actionable agricultural insights.

Ms. Becker-Reshef highlighted the foundational role of essential agricultural variables, such as crop mapping, field boundaries, planting and harvesting times, and yield forecasting, derived from diverse satellite data sources. These serve as building blocks for generating crucial agricultural information used in early warning systems and decision-making processes. Showcased various applications of satellite data, including global crop land monitoring and change detection, yield forecasting, and risk assessment due to climate change or conflict. Examples from Somalia, Ukraine, and Sudan illustrated how satellite data facilitated timely responses to crises, such as droughts and conflicts, enabling targeted interventions and policy decisions.

The presentation emphasised the importance of multi-disciplinary collaboration and advances in machine learning to enhance the accuracy and accessibility of satellite-derived information. Advocated for greater integration of scientific advancements with practical applications, ensuring that data-driven insights lead to tangible impacts in food security and beyond. The presentation highlighted NASA Harvest's pivotal role in leveraging satellite data to transform global agriculture, emphasizing its critical applications in monitoring, forecasting, and responding to agricultural challenges worldwide.

Overall, these presentations highlighted ongoing collaborations and successful implementations of AI in enhancing disaster preparedness and response.

## Applications of AI for EW4All (14:30 – 16:25 CEST)

**Application 1: How Google is using AI for early warning at a global scale**

- **Ms. Ayelet Benjamini – Engineering Director, Google**
- **Mr. Grey Nearing - Senior Research Scientist, Google**

Google explored several AI use cases at the country level, focusing on applications like flood forecasting and other climate-related challenges. Google, represented by Ayelet Benjamini and Gray Nearing, presented AI-driven projects aimed at enhancing community resilience to climate change. Google's AI initiatives in climate resilience are diverse, ranging from reducing emissions and managing heat to real-time disaster response and recovery. Their efforts demonstrate the potential of AI to address some of the most pressing environmental challenges globally. Key points discussed, included:

- Climate change, no longer a distant threat, requires comprehensive strategies across all time scales, from mitigation to disaster response.

- AI can be used in pre-disaster mitigation, examples were given from a variety of use cases. AI optimizes traffic lights to reduce emissions from stop-and-go traffic, with early trials showing up to 30% reduction in stops and 10% in emissions. Implemented in 12 cities, reducing traffic stops and emissions significantly. AI has also been used to help reduce the climate impact of contrails by adjusting flight paths, cutting contrail formation by more than half in test flights with American Airlines. AI is being used to identify urban heat islands which can be used to suggest where tree planting should occur to mitigate heat effects - data provided to 350 cities through the Environmental Insights Explorer.
- During disasters, Google is also using AI and presented a variety of use cases. For example, in wildfire tracking, AI provides real-time wildfire boundaries on Google Maps, aiding in immediate decision-making. Initiated in 2017, Google's flood forecasting uses a global AI model trained on extensive data, outperforming traditional models. The system covers 250,000 locations globally, offering accurate and timely flood predictions. Google is working with the World Meteorological Organization on a pilot study to adapt their global AI model to the needs of specific countries, enhancing local flood forecasting capabilities.
- A damage assessment use case for post-disaster response was also highlighted, where AI compares pre- and post-disaster imagery to identify damaged buildings, helping humanitarian agencies allocate resources efficiently.
- Google emphasised the importance of open data and collaboration with academic institutions, governments, and other partners to build trust and improve AI models. All data and methods are published in scientific journals to ensure transparency and reproducibility.

**Application 2: AI-powered mapping tool by Microsoft, IHME and Planet**

- **Ms. Amy Michaels – Principal Product Manager, Microsoft AI for Good Lab**
- **Dr. Bobby Reiner - Associate Professor, Institute of Health Metrics and Evaluation, University of Washington**
- **Mr. Andrew Zolli - Chief Impact Officer, Planet**
- **Mr. Solomon Kassa – Tech Consultant & Strategist, Ethiopia**
- **Mr. Kevin White – Senior Director of Data Science, Microsoft AI for Good Lab**

- **Ms. Amy Michaels – Principal Product Manager, Microsoft AI for Good Lab**

Ms. Amy Michaels, Principal Product Manager at the Microsoft AI for Good Lab, discussed ongoing collaborations with UNDRR and ITU focused on disaster response, resilience, and food security. The presentation highlighted Microsoft's efforts in developing early warning systems under pillars one and three of the EW4All initiative. The importance of a collaborative approach was emphasised, seeking input from various stakeholders to tailor solutions effectively. Also underscored the importance of understanding specific use cases and encouraged participation to shape future developments.

Introduced a pilot project in Ethiopia as a case study, aiming to demonstrate the effectiveness of integrating technology with local expertise to enhance early warning capabilities. Ms. Michaels emphasized the need for multidisciplinary teams, combining technological innovation with subject matter expertise to create impactful solutions. The presentation also highlighted the early stages of development, inviting feedback and collaboration to refine and expand the roadmap for global early warning systems.

- **Dr. Bobby Reiner - Associate Professor, Institute of Health Metrics and Evaluation, University of Washington**

Dr. Bobby Reiner from the University of Washington's Institute of Health Metrics and Evaluation discussed advancements in population estimation using AI and geospatial data. The presentation highlighted collaboration with Planet and Microsoft AI for Good Lab to improve global health insights by refining population estimates. The presentation emphasized the challenges of outdated census data and sparse surveys, which limit accurate population estimates, crucial for understanding disease burden and health trends. Partnering with technology companies, they utilized high-resolution satellite imagery to identify and quantify building density across small geographic areas. This approach allows for precise localization of population distribution, enhancing their ability to forecast demographic changes, disease outbreaks, and environmental impacts at a granular level. Also illustrated how these advancements enable predictions of population movements and changes in response to climate shifts, infrastructure development, and educational trends. Highlighted the transformative impact of real-time population data in improving public health strategies and disaster response planning, emphasizing the role of continuous updates in providing timely insights into societal dynamics.

- **Mr. Kevin White – Senior Director of Data Science, Microsoft AI for Good Lab**

Mr. Kevin White, Senior Director of Data Science, Microsoft AI for Good Lab, discussed the application of AI models for mapping flood risks and population changes, emphasizing the integration of temporal data and geographic overlays to enhance understanding and mitigation strategies.

The presentation highlighted the use of AI models developed based on population density insights, as discussed by earlier speakers. By leveraging satellite imagery and advanced modeling techniques, Microsoft demonstrated how they tracked population growth over time, pinpointing areas where growth encroaches upon flood-prone zones. Using Ethiopia as a case study, illustrated how recent satellite data revealed population expansions into flood-prone areas, identified through historical flood mapping. This approach not only quantified the population at risk but also assessed the impact on agricultural lands, crucial for food security and disaster resilience planning. Stressed the practical applications of this data for policy-making and infrastructure planning. By identifying vulnerable areas and potential impacts on critical infrastructure like railways and crop lands, the AI-driven insights enable proactive disaster management and sustainable development.

The presentation emphasized the scalability of these AI tools beyond Ethiopia, highlighting their potential to serve as a model for other economies in Sub-Saharan Africa and beyond. Highlighted the importance of international collaboration, including partnerships with organizations like the UN and the World Bank, to scale and refine these innovative solutions.

- **Mr. Andrew Zolli - Chief Impact Officer, Planet**

The presentation underscored the vision for leveraging space technology and artificial intelligence (AI) to enhance early warning systems globally, thereby improving collective resilience in the face of environmental and societal challenges. Through this presentation, Mr. Andrew Zolli, Chief Impact Officer at Planet, proposes a strategy that integrates satellite data, real-time planetary indicators, and analysis-ready data to address the modern resilience challenge: how to help societies persist, recover, and thrive amid disruptions.

The approach involves four key components:

- Building regenerative capacity: This involves strengthening the ability of systems to recover and grow stronger from disruptions, focusing on sustainability and renewal.
- Sensing emerging risks: By utilizing advanced sensors and data analysis, the initiative aims to detect potential risks and threats at the earliest possible stage.
- Responding to disruption: The strategy includes developing mechanisms to respond swiftly and effectively to disruptions, minimizing their impact and facilitating a return to stability.
- Learning and transformation: Finally, the approach emphasizes the importance of continuous learning and adaptation, ensuring that lessons from past disruptions inform future resilience efforts.

The presentation highlighted the potential of technology to provide real-time data and analysis, which is crucial for proactive risk management and resilience building. By integrating these capabilities, societies can be better prepared to face the inevitable shocks and surprises of the future.

- **Mr. Solomon Kassa – Technology Consultant & Strategist, Ethiopia**

Mr. Kassa focussed on leveraging AI to understand and plan for risks in Ethiopia. The presentation underscore the challenges Ethiopia faces regarding climate risk and community resilience. It highlights the use of AI and machine learning, satellite and remote sensing, IoT, real-time monitoring, big data analytics, and community-based monitoring to mitigate risks such as flooding. These technologies enable the generation of AI-based images and analysis-ready data, which are crucial for planetary indicators and solutions.

AI is shown to be instrumental in solving challenges by providing real-time data and insights for effective decision-making. For instance, satellite data helps in assessing flood risks and infrastructure impacts, which is critical for risk-based land use planning and infrastructure protection.

Initial AI models reveal specific risks to Ethiopian communities, such as the increased risk of flooding near railways and the extent of cropland and population affected by flooding in areas like Dolo Ado and Afambo. The country aims to become a model for other nations by expanding technical assistance and executing a nationwide rollout of strategic planning.

**Application 3: Deployment of hydroinformatics platforms supported by the AI**

- **Mr. Bolívar Erazo, Executive Director of the National Institute of Meteorology and Hydrology (INAMHI), Ecuador**

The presentation highlights the integration AI in early warning systems, specifically focusing on Ecuador's hydrometeorological context and the development of the GEOGLOWS hydrological forecasting tool. Ecuador, located in the tropical region, experiences complex hydrometeorological conditions influenced by the Intertropical Convergence Zone (ITCZ) and El Niño-Southern Oscillation (ENSO). The Andes mountains create diverse climatic zones and a vast drainage network, making the country susceptible to extreme events exacerbated by climate change.

The National Institute of Meteorology and Hydrology (INAMHI) in Ecuador has been enhancing early warning systems to adapt to these changing conditions. They have implemented meteorological warning bulletins and alerts through the Common Alerting Protocol (CAP), coordinating with the Secretary of Risk Management to disseminate alerts via text messages with links to access maps.

GEOGLOWS, developed by the Group on Earth Observations (GEO) for global water sustainability, is a key tool in Ecuador's early warning system. It uses the ECMWF meteorological forecast system and HTESSEL hydrological model to predict streamflow, which is then routed through river networks using the RAPID model. The Hydroviewer application visualizes these forecasts and activates alerts when discharge levels reach thresholds. Adaptations include integrating satellite-based rainfall estimation products, the Flash Flood Guidance System (FFGS), and drought alerts.

GEOGLOWS also incorporates artificial intelligence through the Stream Analysis for Bias Estimation and Reduction (SABER) method, which applies machine learning to correct bias in ungauged basins by comparing them to gauged basins. This method utilizes data from approximately 13,000 in-situ stations worldwide.

The presentation also covered the use of AI algorithms in hydrology and meteorology, such as testing various channels of the GOES 16 satellite to detect heavy precipitation onset and using machine learning models like Random Forest, XGBoost, and neural networks to analyze meteorological data.

**Application 4: AI capabilities of the Disaster Connectivity Map**

- **Mr. Chris Emberson – GIS Expert, ITU**
- **Mr. Paul Hamilton – GIS Expert, ITU**

The Disaster Connectivity Map (DCM) aims at improving disaster response through advanced telecommunications analysis. The DCM, led by GIS experts Paul Hamilton and Chris Emberson, focuses on detecting network outages in disaster-affected areas by comparing real-time connectivity data against historical baselines. The system uses data from various sources, including mobile and fixed devices, to create dynamic maps that show the extent of telecom network disruptions.

The DCM is particularly concerned with identifying the offline individuals who cannot receive emergency notifications due to a lack of fixed broadband, 2G, and 3G network coverage. For instance, in Fiji, it was found that 96% of the population could be reached through fixed and 3G+ mobile networks under normal circumstances, leaving 4% (41,298 people) potentially vulnerable to natural hazards without access to early warnings.

The presentation also elaborated on the impact of network outages following disasters, noting that the offline population can significantly increase, as seen in Vanuatu after Tropical Cyclones Judy and Kevin and a 4.9M earthquake. The cellular coverage decreased from 100% to 36%, and the population beyond network reach increased from 19% to 36%. Similar patterns were observed in Tonga after the Hunga Tonga-Hunga Ha'apai volcano eruption and tsunami, where the population without network access rose from 2% to 19% but gradually decreased as connectivity was restored.

The DCM also highlights the importance of early warning systems for all populations, especially in the context of multi-hazard environments. It aims to work with various partners, including Microsoft AI for Good lab, Planet, and the University of Washington, to use AI for rapid assessment of change from satellite imagery to generate high-resolution population density maps. The initiative seeks to pilot this technology in Fiji, Tonga, and Vanuatu before scaling it to over 30 countries.

**Application 5: Development of a AI supported DSDS (Decision Support and Dissemination System) - HEU-MedEWSa project**

- **Mr. Jon Cox, Scientific Officer, Science and Innovation, WMO**

The MedEWSa project is a sophisticated early warning system designed to combat natural hazards and extreme weather events in the Mediterranean and pan-European regions. Funded by the EU Horizon Programme, this €5 million, three-year initiative aims to develop a multi-hazard Early Warning System (EWS) that integrates Artificial Intelligence (AI) tools to enhance decision-making for first responders. The project, which began in November 2023, involves eight pilot studies across various countries, from Spain to Georgia and Sweden to Ethiopia, with a particular emphasis on the Mediterranean basin.

MedEWSa is a consortium of 29 partners, including National Meteorological and Hydrological Services (NMHSs), the European Centre for Medium-Range Weather Forecasts (ECMWF), Red Cross, small and medium-sized enterprises (SMEs), academia, research institutions, first responders, civil protection organizations, NGOs, local and regional governments, and the private sector. The MedEWSa platform architecture is centered around AI tools and decision support systems, aiming to enhance rapid action from first responders and support the tailoring of MHEWS products to local contexts through co-design with users.

**Application 6: Everbridge - Enhancing 24/7 Public Warning Alerts with chatbot technology**

- **Ms. Kirsty Grant, Marketing Director for Public Safety Solutions, Everbridge**
- **Mr. Robin Binkworth, Senior Product Manager, Everbridge**
- **Ms. Lisa Aldera, Software Engineer Intern, Everbridge**

The presentation outlines a project by Everbridge aimed at enhancing 24/7 public warning alerts using chatbot technology. The project, funded by the European Union's Horizon 2020 Research and Innovation Programme, focuses on improving the efficiency and accessibility of emergency communications. The chatbot is designed to provide extensive information efficiently, support multiple languages, and reduce traffic overload during emergencies, while also offering a feedback loop for improved service.

The chatbot, which does not collect or store any user identifiable information, is intended to be easily accessible via a URL link, without the need for downloads or opt-ins. It is expected to deliver personalized and location-based information both inside and outside emergency areas, using cell broadcast or SMS technology. The chatbot leverages AI systems like OpenAI's ChatGPT to enable one-to-many and many-to-one communication, improving situational awareness and predictive modeling before and during events.

Challenges include ensuring the chatbot's reliability, efficiency, and accessibility, as well as addressing language barriers and population coverage. Goals for the chatbot include easy accessibility, extensive information delivery, support for multiple languages, and reduced traffic. The chatbot is also designed to enhance societal resilience by supporting early warnings and improving impact assessments.

Risks associated with the high-risk AI use-case include legal, assurance, and liability issues, as well as data accessibility and usability challenges. The presentation emphasized the need for maturity in understanding, significant testing, and considerations of latency, cost, maintenance, scaling, and availability.

**Application 7: The Rise of Artificial Intelligence (AI) for Space Applications**

- **Mr. Pierre-Philippe Mathieu, Civil Security from Space (CSS) implementation manager, European Space Agency (ESA)**

The presentation covered the integration of AI in space and rapid resilient crisis response, focusing on Earth Observation (EO) and the role of AI as a co-pilot in managing and analyzing vast amounts of geospatial data.

The presentation introduced Gaia, a digital assistant, who provides real-time insights using data from various satellites like Sentinel-2 and Copernicus. Gaia assists in disaster management by quantifying flood risks and impacts, and in environmental monitoring by tracking the effects of events like El Niño.

The presentation also emphasized the importance of AI in improving weather forecasting, data augmentation, and the automation of programming through machine learning. The text discusses the concept of Foundation Models for EO, which involve transfer learning and the use of large language models for tasks such as flood reporting, as exemplified by FloodBrain. It highlights the potential of generative AI in creating synthetic data and the challenges associated with deepfakes.

Through his presentation, Pierre Philippe also delved into the use of AI in enhancing satellite imagery resolution and in creating digital twins for coastal flooding prediction. It introduced CoastalTwin, which uses machine learning and physics-informed neural networks to predict sea surface height more efficiently than traditional methods. The Rapid and Resilient Crisis Response Accelerator was also mentioned as an initiative to support stakeholders in crisis management, leveraging multiple space-enabled systems for effective decision-making. The presentation further described the deployment of AI onboard satellites for tasks like change detection and methane plume monitoring, reducing response times significantly.

**Demonstration of Seeed Hazard Response Mission Pack**

- **Ms. Violet Su, Business Development Manager, Seeed Studio**

Seeed Studio demonstrated their Hazard Response Mission Pack which explores how the combination of AI and IoT in a portable suitcase can help contribute to effective disaster response. Ms. Su explained that that the Mission Pack is compact to carry around, with the following products from sensor networks to edge computing for remote sensing, data transmission, data processing, inference and analysis:

- LoRaWAN gateway to provide data coverage
- LoRaWAN sensors to gather environmental data
- LoRaWAN trackers to get location data for assets and personnels
- SenseCAP Watcher as the physical AI agent to sense the surrounding environment
- reComputer Jetson device to run large language models on premise for quick inference and analysis
- BYOS - combination of Wio Tracker 1110 Dev Board and Grove Sensors to build your own sensors according to the needs of different scenarios

The Hazard Response Mission Pack is a collaboration of Seeed with their community partner Seeed Ranger Davide Gomba. Since its debut in July 2023, it's evolved into different versions by incorporating new products with emerging technologies as well as demands for different applications. They welcomed participants to contact them and explore how they can work together to make the Mission Pack meet different needs, especially in disaster preparedness, response, mitigation, and recovery.

## Unlocking the Potential of AI and Future Opportunities (16:45 – 18:00 CEST)

The workshop emphasised the need for AI to focus on community benefits, collaboration with private sector partners, and addressing specific implementation and operational gaps within the Early Warning for All initiative. The presentations and interactive sessions aimed to explore how AI can be leveraged to fill these gaps effectively, and the need to transition from AI models to piloting in countries.

**Discussion 1: Unlocking the Potential of AI: Funding**

- **Mr. Bapon Fakhruddin, Water and Climate Leadership, Green Climate Fund**

The Green Climate Fund (GCF) focuses on integrating artificial intelligence (AI) into early warning systems for climate change. The GCF operates with a systematic approach to risk management, considering interconnected and cascading risks, and emphasizes the importance of partnerships (Fakhruddin et al., 2022). The fund provides financial support to countries, with a significant investment in Country Readiness and National Adaptation Plans, particularly for Least Developed Countries (LDCs) and Small Island Developing States (SIDS).

The GCF works through country-driven readiness programs that align with national priorities and is an open partnership organization with over 200 accredited entities. It offers a variety of financing instruments, including blended finance and new financial structures. The fund is willing to take risks and provide patient capital for early-stage project development, aiming to stimulate climate finance. It seeks a balanced allocation of funding between mitigation and adaptation efforts.

The GCF is strategically positioned to scale up investments and create markets, leveraging its unique combination of scale and risk appetite. The fund has a '50 by 30' Vision, which includes targeting vulnerable communities, maximizing private sector investments, reinventing partnership models, streamlining project approval processes, and shifting from one-off projects to programmatic and systemic responses.

The GCF has set ambitious goals, such as protecting 50+ countries with new or improved early warning systems by 2027 and approving 40+ proposals for adaptation, including locally-led actions. The fund also prioritizes climate science and risk evaluation for a foreseeable future, ensuring investments have a significant impact potential and contribute to a paradigm shift in sustainable development.

The GCF's investment criteria are guided by the potential for impact, the needs of recipients, promotion of country ownership, efficiency, and effectiveness. The fund advocates for systems thinking by integrating sub-systems. Access to funding is a key priority, with simplification measures being implemented to facilitate this.

Lastly, the GCF is exploring the application of AI and satellite technology, which could enhance its ability to monitor and respond to climate-related risks and support early warning systems.

**Discussion 2: Unlocking the Potential of AI Applications**

EW4All pillar representatives from ITU, WMO, UNDRR and IFRC presented gaps within each Pillar.

**UNDRR** discussed potential AI solutions within Pillar 1, which focused on gathering risk information before the occurrence of events. Key points discussed, include:

- Challenges in quickly calculating the impacts of events, such as the effects of a heatwave on food systems or the stress on health systems during a drought-induced cholera outbreak. There is potential for AI models to expedite these calculations.
- The need to address gaps in disaster impact data, which can be hampered by language barriers. AI could help bridge these gaps by complementing existing data.
- There is difficulty in modeling certain hazards like heatwaves, storms, and wildfires compared to more straightforward hazards like floods and seismic events. AI has significant potential in improving scenario modeling for these complex hazards.
- There's opportunity to improve socio-economic impact-based climate projections using AI. For example, understanding future dynamics, such as changes in urban infrastructure or sewage systems, in relation to increased flood risks and other climate impacts.
- Current proficiency in identifying buildings and land but lacking integration of seasonal crop calendars, building materials, and infrastructure age. These elements are crucial for predicting hazard impacts but are not yet incorporated into models.
- Opportunity to use AI to support stress testing of critical infrastructure. For example, assessing the effects of different wind speeds on cell towers or prolonged water exposure on gravel roads. Modeling the capacity of evacuation routes or the functionality of sewage plants under stress. Evaluating the capacity of evacuation routes and the impact of infrastructure failures on critical services like sewage pumping.
- AI can be used to assist in the development of impact and mitigation plans across different languages. Opportunity to facilitating knowledge sharing between countries with similar challenges but different languages.
- The opportunity to digitize millions of hand-drawn or handwritten risk maps and records to make them more accessible and usable.
- AI can enhance the ability to understand and use risk information from various countries and communities, particularly when the information is in different languages.

**WMO** highlighted Pillar 2 gaps focused on the challenges and considerations related to the detection, monitoring, analysis, and forecasting of hazards. Key points discussed were:

- The substantial cost involved in training AI models, highlighting the importance of partnerships with the private sector. The energy consumption and carbon emissions associated with processing large amounts of data should not go unnoticed.
- A people-centered approach is important when involving AI, there is need for a better understanding of local dynamics to effectively reach and communicate with people. Need to ensure that the information provided is actionable and that there are means for people to act on the alerts.
- Highlighted the importance of AI-based nowcasting and addressing data gaps for accurate short-term weather predictions. There are opportunities to partnering with various organisations to enhance nowcasting capabilities.
- There is opportunities to use AI tools for downscaling and processing numerical weather prediction (NWP) products to provide meaningful information at a local scale. However, there is also need for robust verification to assess model performance and identify outliers or data gaps.
- Opportunities to enhance visualisation tools to better communicate forecasts and warnings, AI can be used to improve the clarity and effectiveness of visual information.
- Important to further collaborate with different agencies, not just the private sector, to advance AI applications in hazard forecasting.

- A key challenge of impact-based forecasting is due to the variable quality of impact data sets. There is a need to improve the quality and consistency of these data sets.

**ITU** discussed Pillar 3, which centered on effective communication to people at risk during emergencies. The main gaps discussed included:

- Identifying the best communication channels to reach people at risk is crucial. Understanding who is covered by digital networks using available data. AI plays an important role in integrating this information to determine the reach of mobile phones and other digital channels.
- Reaching hard-to-reach communities is a key challenge when not covered by digital channels. Need to consider investments in digital infrastructure or alternative communication methods like sirens, radio, and television.
- Need to focus more on people in at-risk areas rather than just general digital coverage and ensure that those who are most vulnerable receive the necessary alerts.
- There is a need to improve how to assess the resilience of communication infrastructure. This includes understanding the risks of relying on certain communication channels and having measures for infrastructure resilience and backups.
- Opportunities for AI to improve tracking response to alerts, for example, evaluating how people responded to previous alerts. Track the actions of people in at-risk areas after receiving alerts, such as their evacuation behavior.
- Consistency and clarity of messages can be improved to ensure that warning messages are consistent and understandable. There is also a need to assess whether people understood and found the messages useful. AI could be leveraged for translating alerts into multiple languages and improving message clarity.
- AI could be utilised for user profiling and sentiment analysis to better understand the needs and responses of the target audience.

**IFRC** discussed the critical role of people in End-to-End Early Warning Systems under Pillar 4, emphasising the need to understand human behavior in response to messages and signals. This understanding can be enhanced by AI, which can help optimise communication strategies and ensure effective action during emergencies. Key points covered included:

- AI has potential to improve understanding of human behavior within the system. AI can be used to determine the most effective messages and signals for prompt and appropriate human response.
- AI can be used for reviewing and refining checklists used by governments to implement early warning systems. These checklists help identify which aspects of the systems are suitable for AI integration.
- AI can assist in the development and optimization of government policies and standard operating procedures, SOPs. AI can identify gaps in policies and ensure they address the right needs, enhancing preparedness and response.
- The workshop revealed additional opportunities for AI that are not currently included in the government checklists. This includes leveraging large language models to improve policy development and implementation strategies.
- It's possible incorporate AI in ways that are not yet fully explored or documented in existing guidelines. It's important to continuously review and collaborate to enhance EWS.

This was then followed by an **interactive question and discussion session** with workshop attendees. Key points covered, included:

- A participant asked about funding models for moving AI innovations from concept to real-world use. It was explained that the GCF can provide various funding avenues depending on the project's scale and government support. Projects can also benefit from readiness funds and project preparation funds. The flexibility of GCF financing, which can extend up to 10 years, was highlighted.
- The importance of considering behavioral aspects in technology implementation was emphasised. This includes understanding how people use technology, their resistance to certain tools like chatbots, and their actions during emergencies.
- Effective community engagement and trust-building are crucial. The discussion underscored the need for incorporating local behaviors and preferences into technology solutions and ensuring they are beneficial to communities.
- Evaluating the environmental impact of AI, such as energy and water usage, against its benefits is essential. This helps in making informed decisions about investments in technology.
- Examples were shared about the challenges of implementing technology at scale and the need for continued funding beyond initial development stages.
- Participants discussed the integration of technology solutions with existing systems and the importance of interdisciplinary collaboration to address gaps and maximise impact.

## Conclusions: Looking to the future (17:45 – 18:00)

The workshop concluded with expressions of gratitude to co-leads, presenters, and participants for their engagement and contributions.

**The key takeaways from the workshop are:**

- With the goal to protect everyone on earth with an early warning system by 2027, leveraging AI can improve the speed, quality, and comprehensiveness of risk information gathering, crucial for effective disaster preparedness and response. The workshop recognized existing gaps in applications and services within the Early Warnings for All initiative, and emphasized the need to address some of these gaps with AI solutions.
- AI integration into early warning systems can be used to better understand and influence human behavior, improve policy development, and improve overall preparedness and response strategies. AI can be used to optimise the reach and clarity of emergency alerts.
- The use of chatbot technology can enhance public warning alerts, improving accessibility and efficiency in emergency communications.
- The workshop illustrated the role of AI in flood forecasting, wildfire tracking, and real-time disaster response. AI was also being used in Ecuador’s hydrometeorological early warning systems, enhancing flood prediction and bias correction using AI algorithms.
- Advancements in population estimation using AI and geospatial data are being used to improve public health strategies and disaster response planning.
- AI integration in space applications for disaster management, emphasizing real-time data analysis and prediction using Earth Observation satellites.
- Important not to forget simple AI solutions for addressing humanitarian issues, such as through satellite data and accessible tools. For example, the integration of satellite data in agriculture, can be used in early warning systems for timely responses to crises and improving global food security. The integration of satellite data can also enhance societal resilience to environmental and societal challenges.

- Collaborative and multidisciplinary efforts in developing early warning systems are needed.
- Important to balance the benefits and costs of AI, focusing on people-centered approaches, and enhancing collaboration to improve hazard detection and forecasting.
- Donors show interest in AI applications, presenting additional opportunities for funding and support.
- There is a lot of opportunity to strengthening existing and grow new partnerships in relation to AI applications in EWS. New partners are welcome to join the AI Sub-Group of Early Warnings for All Initiative. There will be opportunities to further highlight the role of AI in EW4All at UNGA and COP29.

**The proposed next steps from the workshop to help strengthening the goal of protecting everyone on Earth with an early warning system by 2027, include:**

- Continue to leverage AI for Early Warning Systems by expanding AI use case applications and piloting in countries. Continue to develop and implement AI solutions to address gaps in early warning systems. Focus on applications that enhance the speed, quality, and comprehensiveness of risk information gathering. Transition AI models from theoretical frameworks to practical pilot projects in various countries. Utilize existing collaborations to refine and expand these pilots.
- Continue to strengthen existing partnerships and engage new collaborators under the AI Sub-Group of Early Warnings for All Initiative. This can include organizations such as NASA, GSMA, REACH, and NetHope. Build on current collaborations with Microsoft, Planet, IHME, Google, and others to scale and improve AI applications in disaster preparedness and response. Continue to strengthen and pilot in other countries the ongoing AI-powered mapping tools for population estimation and disaster risk assessment, and the AI application in the Disaster Connectivity Map.
- Focus on people-centered approaches for example, by ensuring that AI solutions are designed with a focus on community benefits, enhancing local resilience and preparedness. Develop and implement strategies to optimise the reach and clarity of emergency alerts using AI.
- There is opportunity to further explore the use AI to assess and improve infrastructure resilience against natural hazards.
- Leverage interest from donors in AI applications to secure additional funding and support for early warning system projects.
- Host a follow up event at the upcoming United Nations General Assembly (UNGA) and COP29 to share progress of country pilots, gather feedback and get onboard more partners and country buy-in to further pilot.
- Explore capacity building and training opportunities, especially to national stakeholders on the use of AI tools and data in EWS and disaster management.



There are many problems where AI and technology can help


GSMA


Risks and Exigencies


Risks and Exigencies


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