

Weather Forecasting & Early Warning System Implemented by IES & HYDS

A complete solution for weather-related Disaster Management at the continental, National, Regional and Municipal Scales



1. INTRODUCTION

Climate change, driven largely by global warming, is expected to increase the frequency and severity of natural hazards and disasters worldwide. Although international efforts are underway to reduce greenhouse gas (GHG) emissions through various governmental agreements and climate initiatives, the impacts of climate change are likely to intensify before any long-term stabilization can be achieved. Views on the causes and extent of climate change continue to differ among governments and stakeholders. Regardless of these differences, it is essential to develop and implement strategies that reduce the impacts of disasters on communities and infrastructure.

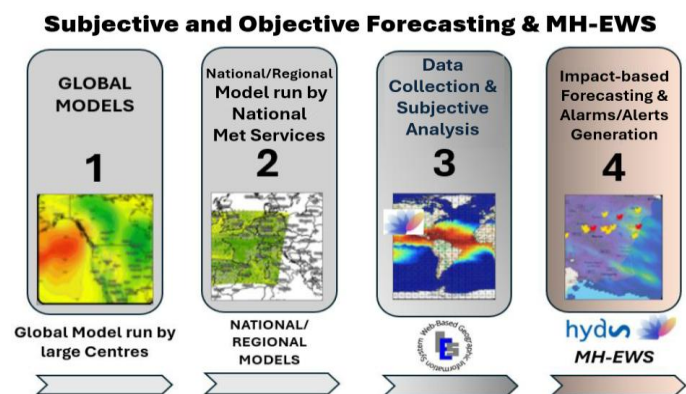
Two of the most effective measures are accurate **Weather Forecasting (WF)** and the implementation of **Multi-Hazard Early Warning Systems (MH-EWS)**. When properly designed and operated, these systems can significantly reduce the loss of life, economic damage, and disruption caused by hazardous events. Recognizing their importance, United Nations Secretary-General António Guterres announced in 2022 the goal of ensuring that every person on Earth is protected by effective early warning system by the end of 2027.

Given the demonstrated benefits of MH-EWS, Europe launched an initiative known as **ANYWHERE for Europe (A4EU)**, often referred to simply as "**ANYWHERE**." Building on advanced weather forecasting capabilities, many European countries have implemented impact-based forecasting and warning services using the commercial version of the A4EU platform, **Argos**, or comparable software solutions.

The implementation of the system includes both a central European platform and national-level systems, with an increasing number of countries establishing their own **National Nodes**. In many cases, these have been complemented by regional and municipal nodes to provide localized forecasting and warning services. The European experience demonstrates the value of integrated forecasting and early warning systems and offers a useful model that can be adapted by other continents and countries to meet their specific environmental, social, and operational requirements.

2. Multi-Hazard Early Warning System (MH-EWS) also known as EW4All

Our Early Warning for All (EW4All) is designed to implement the following model.



- Large Centers operate Global Models, while National Centers run National or Regional Models.
- IES Met-WebGIS ingests data from both Global and National weather models.
- HYDS ARGOS provides Impact-Based Forecasting (IBF) and Early Warning System (EWS) capabilities.
- IBF represents a technical and operational shift from traditional forecasting - "what the weather will be" - to impact forecasting - "what the weather can do."
- Together, these two systems work seamlessly to combine high-quality weather forecasting with early warning system components, enabling more effective decision-making and risk management.

3. IES Weather Forecasting Package (Met-WebGIS)

- IES provides a very flexible **Weather Forecasting package**, which accepts data from the Global and National/Regional models.
- The forecasting package developed by IES, Met-WebGIS, provides a flexible data ingestion framework capable of integrating meteorological and environmental data from a wide range of national, regional, and global sources. It can ingest various types of observational and forecast data, such as numerical weather prediction (NWP) model outputs, surface and upper-air observations, weather radar, satellite imagery, lightning detection data, hydrological data, and other meteorological datasets. In addition, it supports the ingestion of data in multiple formats, including GRIB, BUFR, NetCDF, HDF, XML/IWXXM, and traditional alphanumeric formats (e.g., TAC). Met-WebGIS also supports the integration of data from the country's national observing network and special

monitoring systems of weather-related parameters such as Radiometer profilers and Lidars. These diverse datasets are processed and combined to generate the forecasting and decision-support products described above.

- c) The system can also be upgraded for 3-D viewing of Weather.

4. Multi-Hazard Early Warning System

The MH-EWS part using **Argos** was developed by our partner **HYDS**, and it is the Commercial version of **A4EU** in which HYDS played an important development role. **Argos** is an advanced system that combines an Impact-based Forecasting, an Early Warning System (EWS) and a Decision Support System (DSS). Its purpose is to optimize the management of emergencies caused by meteorological phenomena such as floods, blizzards, heat and cold waves, snowfall, coastal phenomena, and air pollution. Together the two systems (**Forecasting of IES and MH-EWS of HYDS**) work seamlessly.

5. Implementation of a Combined System

The integrated system was successfully implemented and deployed operationally in **Tonga** under a **World Bank-funded project** in December 2025. The **Forecasting component** was also successfully implemented and completed in **Burkina Faso** under a **WMO-funded project** in June 2025 by **IES**.

6. Our Overall Proposal

With the European concept in mind, while **each Gulf country may choose to implement its own system**, a cooperative framework like that of the European model is worth considering. Under such a model, the Gulf Cooperation Council (GCC) - comprising **Saudi Arabia, the United Arab Emirates, Kuwait, Oman, Bahrain, and Qatar** - could establish a centralized regional node serving as a powerful hub for data integration, analysis, and coordination. This central node could be hosted by one of the GCC member states, while each country would operate its own national and local nodes extending down to the municipal level.

The same approach could be applied across Africa and, ultimately, the entire continent. The proposed system would integrate regional frameworks, such as those of Southern African Development Community (**SADC**) and Economic Community of West African States (**ECOWAS**) with national and community-based early warning systems tailored to the specific needs of African populations. Successful implementation of such an initiative would require close coordination among private-sector companies or consortia, multilateral organizations, and National Meteorological Services (NMSs).

Although individual countries may prefer to develop and operate their own systems, a shared centralized platform would offer significant advantages, including enhanced regional collaboration, improved data sharing, reduced duplication of effort, and lower development, operational, and maintenance costs across the overall system.

7. Our offer to handle complete system

Our group, **IES (Canada)** and **HYDS (Spain)**, brings extensive expertise in meteorological and hydrological projects. IES has successfully delivered numerous forecasting and hydrometeorological infrastructure projects, including the installation of hydromet station networks, while HYDS has implemented multiple Multi-Hazard Early Warning Systems (MH-EWS).

Both organizations have played key roles in the implementation of **A4EU** and the development of a web-based **Impact-Based Forecasting Workstation**. Their proven track record in designing, deploying, and operating such comprehensive systems across diverse international environments demonstrates significant technical and operational capability.

While we are proposing a **centralized system** because it offers the most cost-effective and operationally efficient solution, we are fully prepared and pleased to implement **standalone systems for each country**, should that be the preferred approach.

8. CONCLUSIONS

We have presented a highly effective solution for Disaster Management Early Warning Systems, combining the strengths of two industry-leading organizations: IES's advanced weather forecasting capabilities and HYDS's Multi-Hazard Early Warning System (MH-EWS).

This partnership brings together the expertise and experience of two proven companies that successfully implemented a powerful Weather Forecasting and early warning solution in the Kingdom of Tonga through a World Bank-funded project.

While many assume that such systems require significant investment, their true value becomes evident when compared to the potential loss of life, infrastructure, and property resulting from a single major weather-related disaster.

In this context, the cost of implementation is modest relative to the immense benefits and long-term resilience these systems provide. We would be honored to support your country in strengthening its disaster preparedness and safeguarding the lives, property, and livelihoods of its citizens.



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