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Building Capacity around the world by strengthening National Meteorological Societies & Regional Meteorological Societies and creating Collaborations

IFMS GLOBAL MEETING/CONFERENCE #7 - 2021

SESSION 5: December 15, 2021

MULTI-HAZARD EARLY WARNING SYSTEM

SAVING SOCIETY AT LARGE FROM EFFECTS OF GW&CC

Building Institutional and Societal Capacity

Introduction

The effects of Global Warming and Climate Change (**GW&CC**) are causing more and more severe weather events causing a lot of damage both to life and property creating a lot of news around the world. It is a topic which not only interests the professionals in the field of meteorology but also general public, bureaucrats and politicians. Therefore, IFMS decided to include 2 full sessions on the issue of GW&CC in its IGM/C-07 being held in November and December 2021.

Session 4: Public Lecture on Causes of Global Warming & Climate Change (**GW&CC**), its Remedies and how to cope with the effects of GW&CC. (40 to 45 minutes), followed by a Panel discussion with expert Moderator and Panelists.

Session 5: This Session is on Early Warning Systems. Two speakers from Spain who have in depth experience in developing such systems will make presentations. The first presentation will be on A4EU – the Multi-Hazard Early Warning System – Anywhere for Europe. The second presentation will be on MH-EWS implemented in Spain. This will be followed by a very strong panel to discuss the all issues related to MH-EWSs and how they can be developed in developing and least developed countries.

Presentation on the Anywhere Multi-Hazard Impact-Based Early Warning System: A Change of Paradigm of Climate Risk Management.

Prof. (Dr.) Daniel Sempere-Torres is a Professor of Hydrometeorology at the Civil and Environmental Engineering Department of the [Universitat Politècnica de Catalunya \(UPC\)](#), and Director of the [Center of Applied Research in Hydrometeorology \(CRAHI\)](#). He has more than 25 years of experience on hydrometeorological modelling, hydrological applications of weather radars, flood Early Warning Systems, Decision Support Systems and climate emergencies risk management. He has been EU coordinator of the H2020 Innovation Action [ANYWHERE](#), of the FP7 project [IMPRINTS](#), and of the UCPM projects [ERICHA](#), EDHIT and HAREN. He is member of the advisory board of the Meteorological Service of the Catalonia region (Spain).



Presentation Abstract

Prof. Daniel Sempere-Torres (SEMPERE@CRAHI.UPC.EDU) and **Marc Berenguer** - Centre de Recerca Aplicada en Hidrometeorologia. Universitat Politècnica de Catalunya (CRAHI-UPC). Barcelona. Spain.

It is widely accepted that during the last decades sustained increase of the frequency and intensity of the climate-induced emergencies such as floods, storms, wildfires, heatwaves and droughts is related to global warming. The extreme events registered worldwide during 2021 exemplify how the combined effect of the increase in the frequency of climate-induced emergencies and the resulting increase of human exposure make entire communities unprecedentedly exposed to events to which they are not prepared to react. Moreover, these climate-induced emergencies should not be seen as an anomaly, but as precursors of the “new normality” we will experience in the next decades. It is believed that the present disaster risk management strategies are not well adapted to new realities.

Therefore, it is time to lead a **change of paradigm in climate-induced risk management**, consistent with the new urgency imposed by the climate change adaptation. In other words, we need to adopt new technologies we have at hand (but still not commonly used) to the new societal needs.

In this context, the **ANYWHERE EU H2020 innovation action** (www.anywhere-h2020.eu) proposes an operational **Multi Hazard Early Warning System (MH-EWS)** for climate emergencies able to translate the most advanced meteorological forecasts into **Impact forecasting products** (see <http://anywhere-h2020.eu/our-vision/catalogue-products>) to allow pro-active management of climate emergencies by **Civil Protection Authorities and Emergency Management Centres (EMCs)**.

ANYWHERE uses AI to integrate **forecasts with high resolution local impact models** (like PROPAGATOR in the case of wildfire propagation, the FF-EWS flash-flood impact indicator or the snow affectation impact on roads model for instance) automatically combining them with the **regional layers of exposure and vulnerability** to support **pro-active decision making at EMCs**. All this information, usually available but not interconnected, is now processed in the **multi-risk decision support platform A4EU (ANYWHERE for EU**, see <http://anywhere-h2020.eu/services/multi-hazard-early-warning-platforms/a4eu>), to **automatically identify the affected critical points**. Including their characteristics and location, and other advanced services designed to allow emergency response specialists to **focus on local IMPACTS**, without the necessity to look into the details of the meteorological forecasts and triggers, **selecting the most vulnerable locations** (i.e., Schools, Train stations, Hospitals, Seveso facilities, etc.) instead of vast regions, operationally supporting them to enhance their response capabilities.

These systems have been verified, tested and operationally demonstrated in **7 EMCs covering all the climatic range in EU** (see <http://anywhere-h2020.eu/services/multi-hazard-early-warning-platforms/a4eu/pilot-sites>), showing excellent results in a number of events, some over 50-year return period. The collected experiences have been presented as success stories by the project showing the **huge innovative potential of the ANYWHERE real-time implementations** (see <https://www.youtube.com/watch?v=ugaJZRJzxxQ>).

The presentation will introduce the **ANYWHERE project** as well as the main characteristics of the **MH-EWS** and **A4EU** platforms. Preparing the floor for a second presentation about the operational services based on the **ANYWHERE** solutions offered by the SME [HYDS](#).



IMPLEMENTATION OF THE ANYWHERE MULTI-HAZARD IMPACT-BASED EARLY WARNING SYSTEM AT MUNICIPAL, REGIONAL AND NATIONAL LEVEL

Dr. Xavier Llord Pavon

M.Sc. degree in Maths from the Universitat de Barcelona in 2002 and Ph.D. degree in Civil Engineering from the [Universitat Politècnica de Catalunya](#) in 2010. He joined the the [Center of Applied Research in Hydrometeorology \(CRAHI\)](#) in 2002, where he did his dissertation on the error structure of radar rainfall and its errors, working on both ground- and space-borne radars. Until May 2011, he worked as the Development Head of CRAHI-UPC.



Since June 2011, he has been enrolled as **Head of R&D at HYDS**. He has participated in several EU R&D projects as well as public and private projects. His interests include precipitation estimation with focus on applied solutions: Early Warning Systems and Decision Support Systems for hydrometeorological risks.

Presentation Abstract

Dr. Xavier Llord and Rafael Sanchez Diezma - Innovative Solutions (HYDS). Barcelona. Spain.

ANYWHERE H2020 innovation action (www.anywhere-h2020.eu) created an operational **Multi Hazard Early Warning System (MH-EWS)** focused on translating the meteorological forecasts into Impact forecasting products, and a set of tools (**A4EU platform**) tailored for different stakeholders to foster pro-active management of hydrometeorological emergencies.

Those ANYWHERE solutions have been implemented as **operational services** for Civil Protection Authorities and Emergency Management Centres at different levels: municipal, regional and national level.

The presentation will introduce the case study of Spain, showing the multilevel implementation:

- **Municipal:** Implementation in 34 municipalities of Alicante region (~600k inhabitants in total) for flood early warning and emergency management. Where Early Warning based on a multi-source of impact products has been linked with municipal auto-protection plans to help municipal civil protection authorities to trigger impact mitigation actions and improve emergency management.
- **Regional:** Implementation in Catalunya area (~8M inhabitants) for multi-risk management: flash-floods and riverine floods, snow, forest fires, heat and cold waves, wind, air pollution, etc. The implementation is focused on providing early warning on different elements (both administrative units and critical elements) to help focus the civil protection authorities in the most potential affected areas to disseminate local warnings and distribute assets accordingly.
- **National:** The ANYWHERE solution is the backbone of the Spanish national alert network (RAN: Red de Alerta Nacional). This implementation connects and collects data and warnings in real time from the different national agencies (National Weather Agency, National Geological Institute, National Water Directorate, National Transit Authority, National Ports Authority, etc.) in order to provide a single access point to all national warnings and associated information for civil protection authorities.

Explanation of the systems as well as a real-time demonstration will be done.



Moderators

A. Dr. Harinder P. S. Ahluwalia – Since 2015, he has been the President of the International Forum of



Meteorological Societies (**IFMS**) which aims at creating collaboration between the National Meteorological Societies of the world to leverage each other's strengths. Previously he was the President of the Canadian Meteorological and Oceanographic Society (**CMOS**). He is also the President and CEO of Info-Electronics Systems Inc. (**IES**) based in Montreal with an office in New Delhi. Incorporated in 1981, IES is a systems engineering, development and implementation company in Hydrometeorology, Remote Sensing and environment monitoring. Dr. Ahluwalia has been a member of the National Round Table on

Environment and Economy advising the Government of Canada on Sustainable Development issues. He is a strong proponent of PPP model for weather business as well as cooperation between nations to achieve optimum results in this border-less issue - weather. He has won many awards for his outstanding contribution to Canada and hi-tech industry. He is a member of many societies and is a Fellow of CMOS. He has published a number of papers/articles in Meteorology and Electromagnetics.

Opening Remarks – Dr. Harinder Ahluwalia

There is a big effort to cutdown on the usage of fossil fuels and plant a lot of trees to keep the temperature rise below 1.5^o C over the pre-industrial era. It is also important to note that despite taking all these measures, we will still face a lot of weather-related disasters which need to be forecasted accurately to warn the citizens about impending disasters. In other words, all countries will need MH-EWS to safe-guard their population. All countries (including least developed ones) will require at least a basic infrastructure for measuring weather parameters and make them available on GTS of WMO. As a part of Education and Training Value Proposition of IFMS, we would like to assist WMO and WB to educate our member societies and their professionals about the implementation of MH-EWSs.

In mid to late 1980s, I was involved in the implementation of a project for the distribution of weather information through Satellite for the Meteorological Service of Canada. Knowing how important weather information for aviation is and also knowing that quality weather information for aviation is not available in many developing and least developed countries, I decided to make a proposal to the UKMet Office to promote a centralized system to do aviation forecasting for entire world and distribute it through satellite. Eventually, ICAO decided to develop such a system with WMO assistance. The UK Met Office and the National Weather Service of USA were selected to develop a system for worldwide aviation weather forecasting products and distribute them through satellite. Three satellites were used to cover the entire globe and aviation products produced by UKMet Office and NWS were distributed. As the Internet coverage has improved, this system now distributes aviation weather information through Internet.

One of the topics I would like to discuss is whether implementation of such a system for MH-EWS covering entire world is possible and if yes, what it will take to implement it.

Since **Institutional and Societal capacity building** is a very important part of such a system, how we can achieve that.

B. Prof. Oscar Frumento – Professor of Climate System, Faculty of Natural and Health Sciences, National



University of Patagonia San Juan Bosco, Puerto Madryn, Argentina.

Principal Professional Officer and Head of the Climatology Laboratory at the Centre for Studies of Maritime Systems (CESIMAR), CCT-CENPAT, National Council of Science in Puerto Madryn, Argentina. Experience in regional climate modelling and dust transport; design of local and regional surface observing networks.

Member of the CESIMAR CD by the professional and technical staff (2016-present)



Climatology advisor for the early warning system for bushfire (in association with INTA, National Institute of Agricultural Technology, Trelew, Argentina).

Contributor to the Argentine Third National Communication to the UNFCCC. *Climate of Patagonia* (2013-2014).

Opening Remarks – Prof. Oscar Frumento

With the current scenario of climate change and global warming, society is very vulnerable to the occurrence of extreme weather events. The spatial scale of these events is very wide and impacts differently according to the capacity to manage the situation.

In arid lands, for example, extreme weather events can cause flash floods (precipitation), create the appropriate conditions for the occurrence of wildfires (heat waves) causing huge impact on people's life and infrastructures.

Early warning systems are not only a task of meteorologists: other areas and public services have to be part of it. It is therefore important that the development of early warning systems is done in a joint manner with actors from the public, the academic and the private sectors.

PANELISTS

- 1. Shri Ramesh Bhatia** served India Meteorological Department for more than 36 years and retired as Additional Director General in December, 2008. He was Permanent Representative of India with WMO and was elected as a member of the Executive Council during 15th session of WMO congress in 2007.

After undergoing training in Satellite Meteorology in CEMS, Lannion, France during 1977, he has been very actively involved in the INSAT Meteorological Applications Program of Government of India. He played a leading role in planning for all INSAT series of satellites and establishment of ground segment facilities for the meteorological applications program of these satellites right from the early stages of inception. Participated in many International and national meetings and Conferences related to satellite activities. He has published more than 50 research papers in various journals/proceedings of conferences.



As in-charge of Instrumentation and telecommunications activities for a few years, he has made significant contributions in establishment of Doppler Weather Radar Network in the Department. His contributions were also important for improving the quality of Radiosonde observations, automatic weather stations and establishing new type of instruments at airport meteorological offices.

He has played a leading role in planning for overall modernization program of IMD and its implementation in a strict time bound schedule during the period 2006-2008. This program has proved to be a game changer for IMD. A large positive impact of this program has been observed on various services being provided by IMD for all sectors of National Economy, particularly on the Cyclone warning services.

After retirement from active service, he served as a Consultant in IMD for a short period. At present he is engaged in review of some of the research papers sent by the editorial Board of journal Mausam and delivering lectures on Satellite Meteorology in some of the training courses of IMD and ISRO.

He was also President of the Indian Meteorological Society during 2007-2009 and participated in the first two meetings of IFMS.

Opening Remarks – Mr. Ramesh Bhatia

An efficient and effective Early Warning System for weather and climate is very essential for Socio-economic developments in all parts of the world. WMO is now encouraging all Member countries to take adequate steps for its development and to make appropriate improvements from time-to-time based on new developments and experiences. Focus all over the world is now on impact - based forecasts which eventually lead to specific actionable items of work in order to minimize the impact of adverse weather. While National Meteorological and Hydrological Services (NMHSs) have the mandate of providing accurate and timely forecasts / warnings for weather and climate, it is equally important to have effective coordination with all other agencies who take subsequent actions to minimize the adverse impact. This is where all Meteorological Societies in the world can play a vital role by increasing public awareness. Only proper actions at appropriate times will ensure minimum adverse impact. Key components of EWS are:

1. NWP models running on Very fast computers and generating NWP products, followed by expert's intervention for interpretation of products and their real-time use after proper value addition.
2. Generating forecasts and warnings
3. Dissemination to different users (Strong and efficient IT based systems)
4. Infrastructure availability for timely actions by different agencies.

By making timely Capital investments in developments of all these systems, the quality of overall service can be improved considerably. Significant economic benefits from such investments generally continue for a long time during subsequent years. In India, lot of capital investments were made during 2007-2009 for modernization of different components of weather/ climate services. All these investments have proved to be the major game changer. In particular, death tolls from cyclonic storms have reduced drastically from 2013 onwards. Death tolls due to heat waves have also reduced drastically as a result of improvements in EWS. Further reductions in death tolls from some of the weather-related events like Lightning strikes, severe thunderstorms, cloud bursts, land- slides and floods is a major challenge. These are the areas of very high priority for focus by the government agencies.

Long term Socio-economic gains of making capital investments for improving infrastructure of weather/climate services are much more than the original investments. IFMS, through the meteorological societies, can make useful contributions in this regard.

- 2. Dr. Agnes Kijazi** is the 3rd Vice President of WMO. She is also the Director General of Tanzania Meteorological Agency (TMA) and Permanent Representative (PR) of Tanzania with the World Meteorological Organization (WMO).



She has more than 30 years of working experience in the field of Meteorology at national and international levels, a career she started in 1988. During this period, Dr. Kijazi has been mostly engaged in meteorological operations and management at various positions.

She has vast experience in meteorological infrastructure and technology; research, modeling and prediction; data management and information sharing; and quality assurance and risk management. Dr. Kijazi has also served in various positions at regional and global level. To date, she is the member of WMO Executive Council, member and Co-Chair of UN-10 Member Group to support the Technology Facilitation Mechanism (TFM), and Vice Chair of the SADC-Meteorological Association of Southern Africa (MASA). She has extensively contributed in the development and implementation of various WMO program at national, regional and global level. With this vast experience, it demonstrates that Dr. Kijazi is a suitable candidate to steer the implementation

of the WMO Reforms and strategic Plan in addressing the emerging meteorological challenges facing the global community.

She holds BSc, MSc, PhD (Meteorology) degrees.

Opening Remarks of Dr. Agnes Kijazi

3. Jim Abraham, President of CMOS is well known meteorologist - nationally and internationally - and is



frequently invited as an expert by a variety of organizations and the media.

Jim managed a wide variety weather, water, and environmental operational and research programs over a 36-year career with the Meteorological Service of Canada.

His most proud accomplishment was starting the Canadian hurricane forecast and research program,

Jim was awarded the Patterson Medal for Meteorology in 2003, the Queens Jubilee Medal in 2013, and a Fellow of the Canadian Meteorological and Oceanographic Society in 2017.

Opening Remarks of Mr. Jim Abraham

With the federal government's priority on enabling resilience to climate change, emerging work in Canada is focused on understanding risks. The new Cabinet appointed by the Prime Minister has created a separate Minister for Emergency Management, in addition to the existing Public Safety Minister.

The Emergency Management Strategy for Canada is undertaking a major work to develop a national risk profile. A few of these initiatives will be highlighted.

The Meteorological Service of Canada is leading much of the hazard detection and forecasting for weather related hazards, in particular to improve lead times at least out to the seasonal time frame.

Dissemination and communications include an Alert Ready System.

Much of the Early Warning System is challenged by the need to be well coordinated between federal, provincial/territorial and municipal agencies.

*Education is simply the soul of a society as it passes from one generation to another.
 Education is a commitment to excellence in Teaching and Learning.
 "Education is the most powerful weapon which you can use to change the world"Nelson Mandela*

Organizations involved in creating a "Weather Ready Globe"

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| National Meteorological Services | National Meteorological Societies | HydroMet Equipment Industry | World's Least Developed & Developing Nations |
| Financed by United Nations | Financing being Sought | Financed by World's Richest Nations | Industry |

