WORLD METEOROLOGICAL DAY – 2023

THE FUTURE OF WEATHER, CLIMATE AND WATER ACROSS GENERATIONS

This year's World Meteorological Day (WMD) celebrates 150th anniversary of World Meteorological Organization (WMO) since its foundation as International Meteorological Organization (IMO), in 1873. For this event, the achievements, progress and potential of WMO community are about to be remembered/presented through a special theme: *The future of weather, climate and water across generations.*

The main challenges of the humanity in the past 150 years, present and future are: a rise in average global temperature of more than 1 °C, extreme manifestations of weather, warmer and more acidic ocean water, the rise of sea levels and the melting of glaciers and ice. On the other hand, in the latest decades, the fast development of science and technology improved the weather forecasts and early warning life-savings, as well as new tools like machine learning and Artificial Intelligence are expected to.

Let's have a short journey through the last 150 years of weather and climate service in order to point out the main achievements and challenges!

• In the **19th century**, the standardization of maritime data and meteorological observations at sea is considered to be the milestone of weather forecasting, due to lieutenant Matthew Fontaine Maury (US Navy). Beginning with 1860, Admiral FitzRoy started to issue storm warnings for sailors of the coast of UK, and one year later, general weather forecasts. The first use of electric telegraph for transmitting weather reports was made in 1849, but the Morse Code was not a proper system for exchanging meteorological observation data from large areas.

In the opening of IMO (1873), Prof. Buys Ballot stated: "It is elementary to have a worldwide network of meteorological observations, free exchange of observations between nations and international agreement on standardized observation methods and units in order to be able to compare these observations". In its early years, IMO achieved improvements in meteorological instrumentation – and efforts to develop a worldwide network of meteorological stations.

At the end of the 19th century, the *First International Polar Year* (1882-1883) set up observing stations around the North Pole, while, at the *Second International Polar Year* (1932-1933) the importance of these observations for weather forecasting around the world was demonstrated.

• The **20th century**, marked by The First and Second World War, has recorded, in the late 1950's, major steps for the meteorological programme, by solar radiation and atmospheric ozone measurements and set a new era for the atmosphere observations: the first Earth-orbiting satellites SPUTNIK-1 and SPUTNIK-2 were launched (1957), as well as the first world's weather satellite (on the April 1st, 1960)-TIROS-1. As a result of these actions, in 1963, WMO launched *World Weather Watch Programme*, which celebrates its 60th anniversary this year. It was meant to

realize meteorological observations over land, on sea and from space; prepare weather forecasts and warnings; exchange information globally and in real time.

Another important feature of the late 20th century was the development of *Numerical Weather Prediction* (NWP) program which significally improved the accuracy of weather forecasts.

Extreme weather phenomena, like storms, floods, droughts and others were present in the Earth's history, but 1970's brought new *Challenges,* as the terrible drought in Africa or the world's deadliest known tropical cyclone in today's Bangladesh (it killed up to half millions of people). The latter tragedy set the foundation of *WMO Tropical Cyclone Programme*, that covers all oceans affected by tropical cyclones and its purpose is to observe and research for improving monitoring, forecasts and warnings.

The Water Decade (*International Drinking Water Supply and Sanitation Decade*) and *Climate change* were among the two main concerns in the 1970's and 1980's. The Water Decade showed the high pressure on freshwater resources and the importance of oceanographic and hydrological services for climate prediction, water resource management and security. The first statement on climate changes was issued in 1976 and *World Climate Research Programme* was established in 1979, while in 1988, the *Intergovernmental Panel on Climate Change* came into being.

• Into the **21st century**, the development of weather observations and modelling technologies led to the following results: more reliable five-days forecast; real time access to observations; a growing number of observations; seasonal and long-term forecast, used in agriculture, health system, water, transport etc.; an increase in data exchange in areas like hydrology, atmospheric composition etc., which will help monitoring and prediction of all Earth-system components.

Regarding the ***challenges***, *Global Climate reports* show that climate change indicators (greenhouse gas concentrations, surface temperature, ocean heat etc.) are at record observed highs, generating more extreme weather and climate events: longer/more intense heatwaves, heavier rainfall, and more severe droughts. For this, it is necessary to improve monitoring, prediction and communication regarding the evolution and effects of weather ("what the weather will be and what the weather will do"). This will help communities to understand and adapt to the weather conditions in the future.

Early Warnings for All it's the initiative of WMO to be sure that everyone is protected by early warning systems in the next five years. It is considered to be a cheap and effective way to protect people and goods of extreme weather. For example, an investment of US$800 million on such systems in developing countries would avoid losses of $3 to 16 billion per year (Global Commission on Adaptation).

• **The future** is considered to *raise the demand for weather, climate and water forecast information in support of decision-making*. All these services are influenced by technology evolution (supercomputers, satellite technology, smart mobile devices etc.), as a result of investments mostly from the private sector.

Researches are very important to understand the scale and peace of changes in weather, climate and water circle and help us to adapt to these changes.

Climate changes is not only about changes in temperature, but into a lot more elements: wetness and dryness, winds, snow and ice, coastal areas and oceans. “Without urgent and deep reduction of emissions, limiting global warming to 1.5°C is beyond reach”, the IPCC latest report states.

Our action today will shape the future of the planet!

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