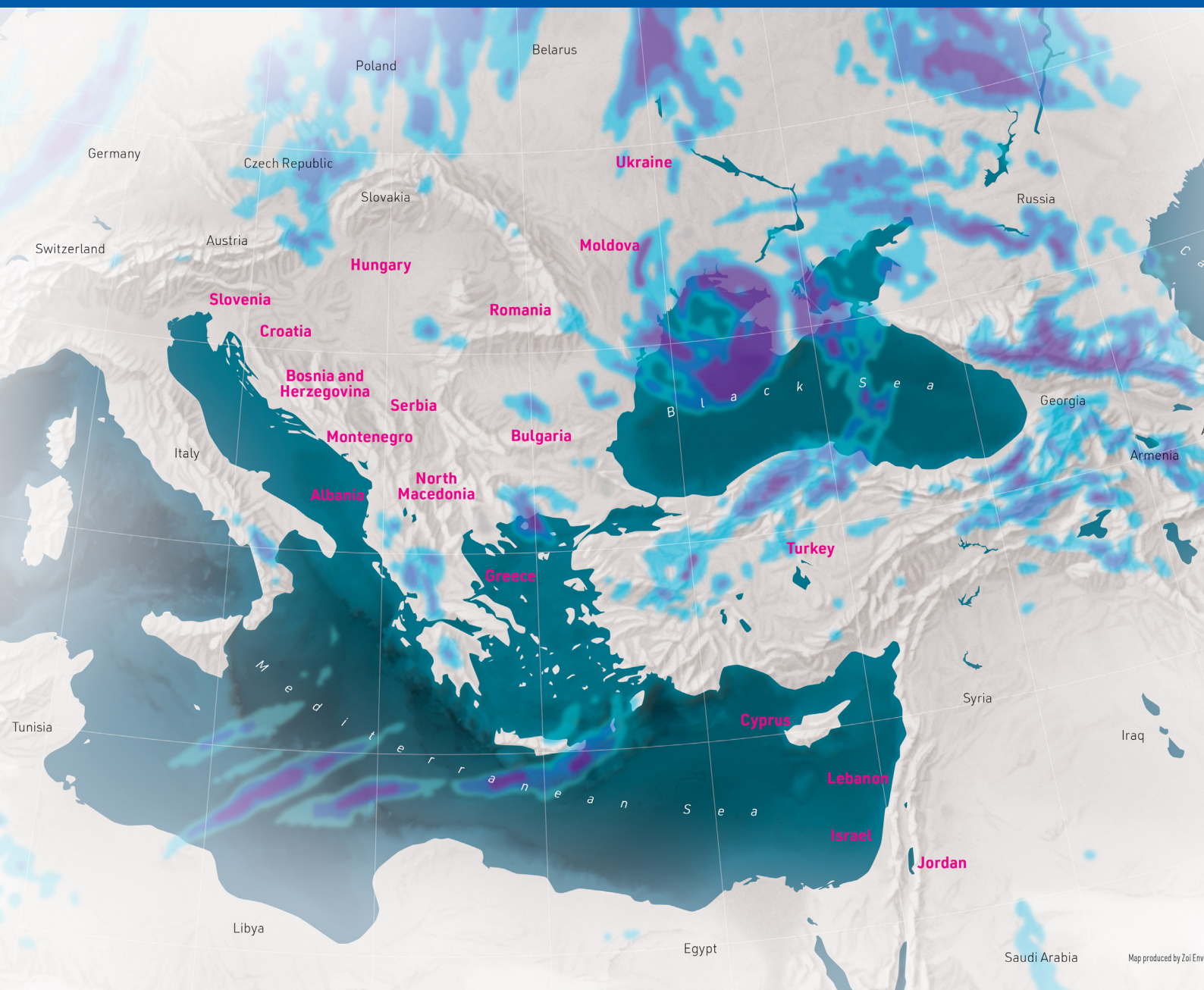




WORLD
METEOROLOGICAL
ORGANIZATION

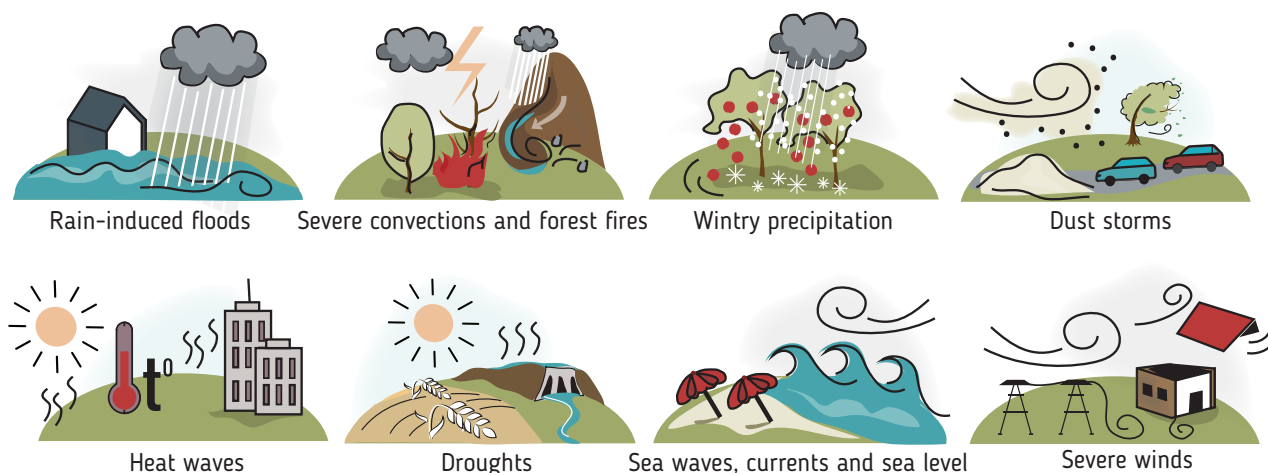
SOUTH-EAST EUROPEAN MULTI-HAZARD EARLY WARNING ADVISORY SYSTEM (SEE-MHEWS-A)



1 THE NEED FOR EARLY WARNING

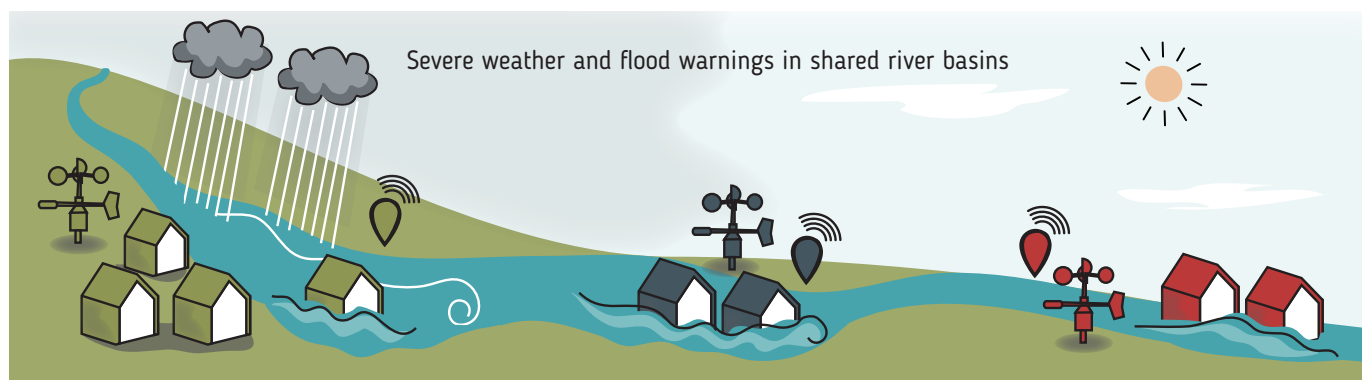
In May 2014, devastating floods and landslides caused by unprecedented rainfall swept through the Western Balkans, particularly Bosnia and Herzegovina, Serbia, and Croatia. The damages caused by this disaster were appraised at over 2 billion Euros (€), according to the World Bank. Every year, the impacts of weather, climate and water-related hazards cause severe damages in South-East Europe. Scientist predict that the intensity and frequency of these hazards — and thus their devastating impacts — will increase due to climate change. Many natural hazards affect South-East Europe — including severe storms, floods, droughts, heat- and cold waves, and wildfires. All have the potential to impact human life and well-being and to damage property and assets and interrupt trade and transport connections, resulting in economic losses across many sectors.

Major hazards and impacts



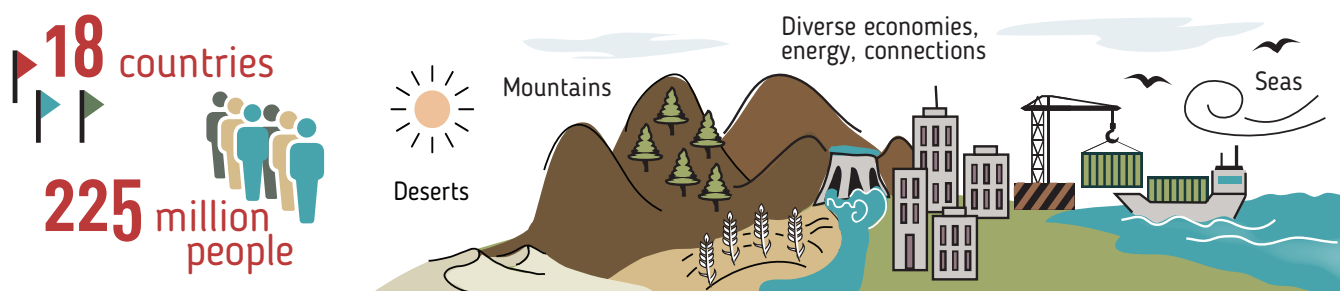
However, many of the losses and damages that relate to severe weather are preventable or can be mitigated by forecasts and warnings that are more specific and timely, and rapidly and clearly communicated nationally and across borders to relevant national stakeholders and those at risk. While South-East European countries have diverse geographies, economies and cultures, they are united by common weather patterns, shared rivers and seas, and cross-border disaster risks. To prepare for and respond to natural hazards effectively, the countries of the region need to work together. The countries in the region also recognize the need for regional cooperation in view of the limited national resources available for the hydrometeorological sector.

Importance of cross-border cooperation



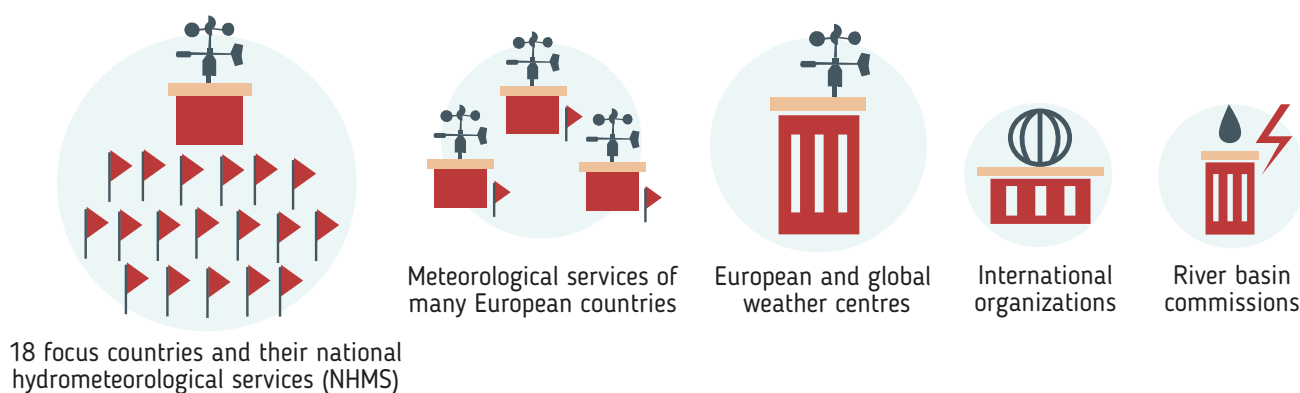
In response to these challenges, 18 countries of South East Europe have agreed to cooperate in the South-East European Multi-Hazard Early Warning Advisory System (SEE-MHEWS-A) initiative for improving forecasting and warning provisions related to meteorological and hydrological hazards. The countries are Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Greece, Hungary, Israel, Jordan, Lebanon, Montenegro, Moldova, Romania, Serbia, Slovenia, North Macedonia, Turkey, and Ukraine. In this effort, they have the support of the World Meteorological Organization (WMO) and international development partners, including the [World Bank](#), [European Union \(EU\)](#), [Global Facility for Disaster Reduction and Recovery \(GFDRR\)](#), and [United States Agency for International Development \(USAID\)](#).

Diverse countries, people, and geography



The development of the SEE-MHEWS-A initiative is a joint effort between the National Meteorological and Hydrological Services (NMHSs) of the participating countries working in collaboration with WMO Regional Specialized Meteorological Centres, European meteorological infrastructure organizations (ECMWF¹, EUMETSAT² and EUMETNET³), research institutions, European numerical weather prediction consortia, and the WMO Secretariat.

Project participants and contributors



1 European Centre for Medium-Range Weather Forecasts (ECMWF) — ecmwf.int

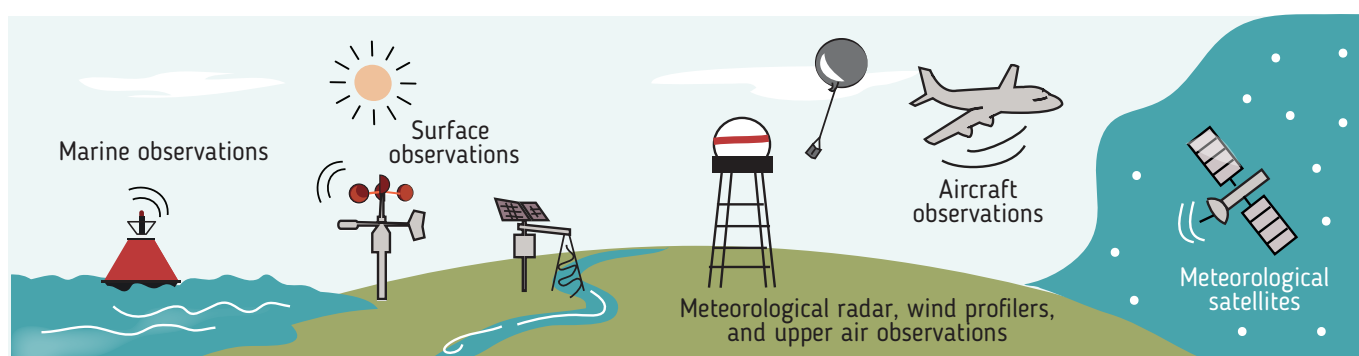
2 European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) — eumetsat.int

3 European Meteorological Services Network (EUMETNET) — eumetnet.eu

2 EXCHANGE OF DATA, INFORMATION, AND FORECASTS

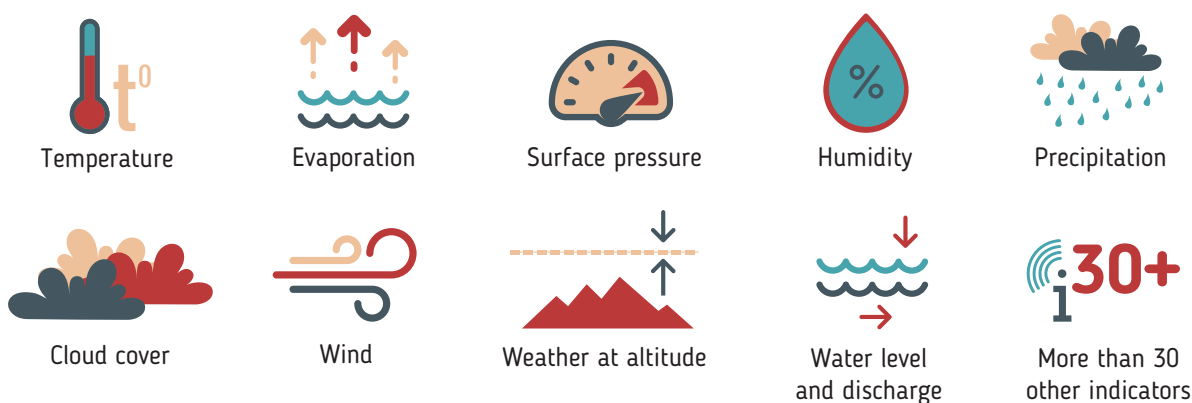
The countries have already committed to exchange data, information, forecasts and warnings and to achieve interoperability within the SEE region. This will allow all the countries to access a large quantity of observations that are not currently shared and which can be used to improve meteorological and hydrological forecasting in the region. The data sources include surface and marine meteorological stations, hydrological stations and weather radars, which observe essential weather parameters such as surface pressure, temperature, precipitation, wind, and many others.

Diverse sources of hydrometeorological data



The increase in meteorological and hydrological data will improve the accuracy of the prediction of hydrometeorological hazards. Since the launch of the SEE-MHEWS-A initiative, there has been a 50% increase in regional data exchange and further improvement is expected, including incorporating of other types of data, such as hydrological observations and radar data. To facilitate data exchange, the countries agreed on a [Policy on the Exchange of Hydrological and Meteorological Data, Information, Forecasts and Advisories](#) under the South-East European Multi-Hazard Early Warning Advisory System. The Policy articulates the technical and conceptual principles for the exchange of data, information, forecasts and warnings, and it sets the way how the interoperability within the SEE region will be achieved following WMO standards and practices.

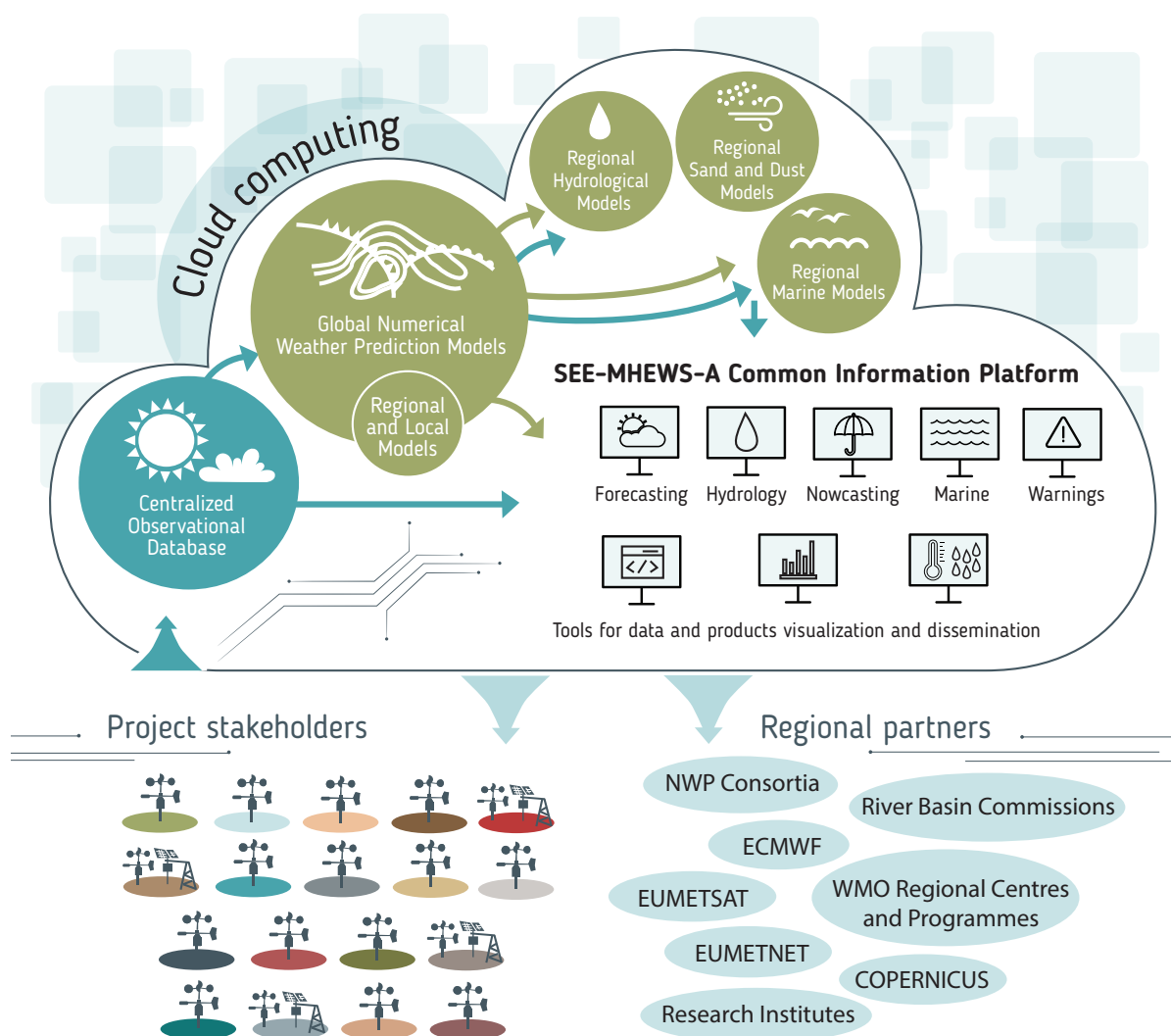
Hydrometeorological parameters observed



3 HAZARD FORECASTING

The development of regional early warning systems requires better predictions for hazardous events, which demands the setting up of sophisticated numerical prediction models on high-performance computer systems. The SEE-MHEWS-A initiative brought together national, European and global weather forecasting centres to develop, operate, and continuously improve the modelling framework of the regional multi-hazard early warning system, which comprises numerical weather prediction models, hydrological models, oceanographic and wave models, sand and dust storm models, and nowcasting systems.

Cooperation on Numerical Weather Prediction (NWP) is one of the most important aspects in the development of the regional advisory system. The high-resolution NWP models being deployed under the SEE-MHEWS-A initiative aims to provide accurate and timely forecasts for severe weather in an extended area around South-East Europe, including parts of the Middle East. Furthermore, the outputs of these models will be used for other system components, particularly hydrological modelling to improve flood forecasting for critical river catchments in the region.

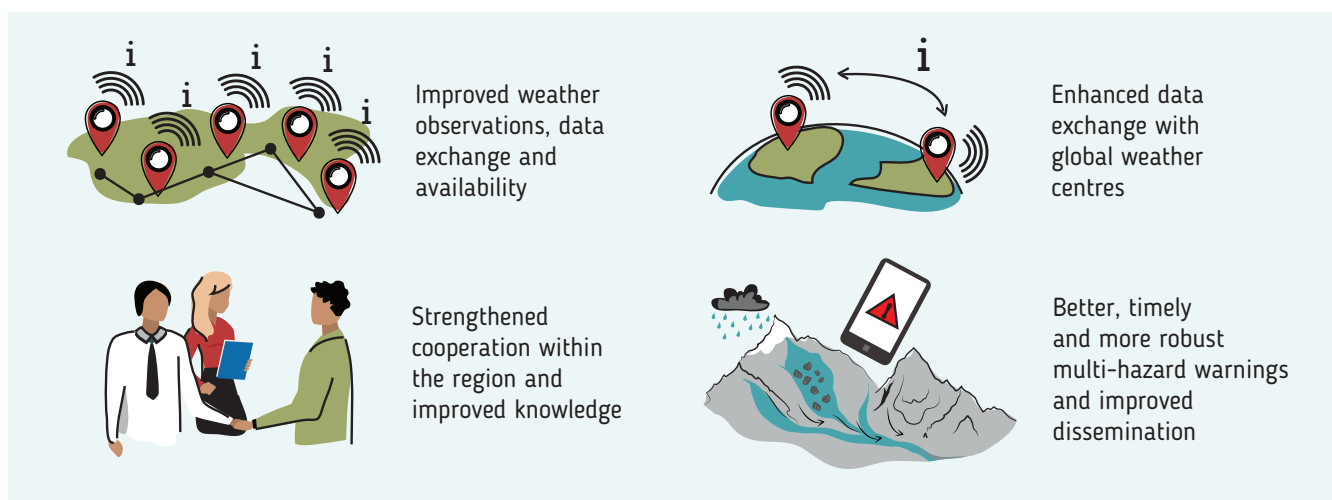


All products created under the system will be made available to forecasters from the region on a platform where they can be visualized and disseminated to all the participating NMHSs. The platform currently allows forecasters from different countries to work collaboratively to identify potential hazards and impacts, especially when impending weather events may affect multiple countries.

5 BENEFITS OF A REGIONAL APPROACH TO EARLY WARNING SYSTEMS

The SEE-MHEWS-A initiative is driven by the need for closer collaboration in the participating countries in order to respond to the increasing frequency and intensity of hazards. Furthermore, the initiative permits the participating countries to overcome the national resource issues in the hydrometeorological sector.

Main benefits and areas of work



Expanded and improved regional weather and water forecasting capabilities



Weather and water modelling requires cutting-edge technology, adequate and timely data, advanced knowledge, and experience. SEE-MHEWS-A supports National Meteorological and Hydrological Services by facilitating regional collaboration, by improving the delivery of better severe weather forecasts and warnings, and by improving local skills. Furthermore, the SEE-MHEWS-A provides a framework for efficient use of regional expertise and resources for the common good. Disaster risk management authorities, weather dependent sectors — from transportation, energy and water management to urban planning and agriculture — and the general public will be the ultimate beneficiaries.

The cost-benefit ratio for investments to strengthen hydrometeorological services, in terms of reduced economic losses, is often estimated at about 1 to 4, varying from 1:2 to 1:25, depending on the country, various other factors and timeframes considered. The potential economic effect from more specific and timely, rapidly and clearly communicated forecast and early warnings is substantial for the whole South-East European region. According to the World Bank, in the Western Balkans alone it is conservatively estimated for the agriculture, transport, construction, and energy sectors to be in the range of US\$ 50–100 million per year.

With support from:



SEE-MHEWS-A is being implemented by WMO in partnership and with financial support from USAID, the World Bank Group, the Global Facility for Disaster Reduction and Recovery (GFDRR), and the European Union (EU), the latter in the frame of the Western Balkans Disaster Risk Management Program.