

9. CHAPTER NINE: REGIONAL COOPERATION IN METEOROLOGY, HYDROLOGY AND CLIMATE TO SUPPORT MULTI-HAZARD EARLY WARNING SYSTEMS AND RISK ASSESSMENT IN SOUTH EAST EUROPE

Even though the South East Europe (SEE) region is highly diverse in terms of geography and climate, countries of Western Balkans and Turkey are exposed to a range of similar disasters caused by the impacts of hydro-meteorological hazards. Development of Risk Assessment, Multi-Hazard Early Warning Systems (MHEWS) and other capacities to support disaster risk management and reduction could significantly benefit from regional coordination and cooperation, leveraging expertise, capacities, resources and information across the region among SEE countries and with various regional centers in Europe.

Within the European Commission (EC) Directorate General for Enlargement funded “Regional Programme on Disaster Risk Reduction in South East Europe” implemented jointly by WMO and UNDP, Activity 1.4 on “Regional Cooperation Roadmap” aimed to identify areas and opportunities for the strengthening of regional collaboration in hydrometeorology to strengthen Disaster Risk Reduction (DRR) in SEE. In this regard, this chapter which was developed through extensive consultations with the SEE countries and regional stakeholders, identifies the common challenges faced by SEE countries to strengthen their DRR capacities and specifically faced by the NMHSs to support DRR through risk assessment and early warning systems. It also provides a mapping of the existing cooperation mechanisms in South East Europe and the greater European Union, and identifies opportunities and challenges to strengthen SEE regional cooperation mechanisms to support risk assessment and Multi Hazard Early Warning Systems, as well as the specific areas requiring further regional cooperation in Disaster Risk Reduction.

9.1. Benefits of regional cooperation in meteorology, hydrology and climate to support DRR

As mentioned in Chapter One, availability of meteorological, hydrological and climate products and services is critical for an effective implementation of a comprehensive disaster risk management founded on HFA, encompassing risk assessment and the development of risk reduction and risk transfer mechanisms. NMHS have vital contributions to make to support informed decision-making within a comprehensive strategy for reducing the impacts of disasters caused by natural hazards. Development of Risk Assessment, Multi-Hazard Early Warning Systems (MHEWS) and other capacities to support disaster risk management and reduction could significantly benefit from improved regional coordination and cooperation in meteorology, hydrology and climate, leveraging expertise, capacities, resources and information across the region among SEE countries and with various regional centers in Europe, particularly in the following areas:

- **Operational regional and international cooperation in weather forecasting and hazard prediction:** Successful operation of NMHS is based on international cooperation. Weather forecasts and forecasting of natural hazards are based on products from global and regional scale numerical weather prediction models, use of satellite data and sharing of data. The European NMHSs have globally an unique opportunity to benefit from the state-of-the-art weather forecast modelling, medium-range weather forecast products and the super computer resources. Regional cooperation among all providers of hydrometeorological services and improved data production and data sharing will significantly benefit the quality of weather forecasting and production of early warning services at European and regional levels and in each SEE country.
- **Sharing of methodologies and good practices, leveraging expertise for the development/strengthening of risk assessment and MHEWS:** Development of risk assessment, MHEWS and other capacities could benefit from regional cooperation through the development and sharing of common methodologies and good practices that are adapted to the specificities and capacities of the SEE countries.

- **Addressing cross-border hazards:** Hazards that constitute the most significant risk to the SEE region, such as flood, forest fires or droughts, are often trans-boundary. Addressing these risks efficiently would require regional cooperation for the harmonization of methodologies, the adoption of common standards and the exchange of data and information related to hazard monitoring, forecasting and warning among the countries sharing the same river basin, forest or agriculture plain.
- **Developing regional climate products and services:** Climate change and its potential impacts have boosted social demands for tailored climate services. Climate research and operation requires huge amounts of resources in terms of computer power, model research and know-how, IT expertise as well as interpretation capabilities. Therefore, regional cooperation offers excellent opportunities for networking by pooling certain capacities of the NMHSs and other institutes in a region to develop products such as regional climate analyses as well as seasonal and climate forecasting. Over the years WMO has facilitated the establishment of the Regional Climate Outlook Forums (RCOF) as multi-stakeholder mechanisms engaging national, regional and international climate experts, sectoral practitioners and policy makers. Through an interactive process, RCOFs and associated Regional Climate User Forums (i) develop consensus regional climate outlooks, (ii) identify the requirements for regional climate information products and services, and (iii) foster multi-disciplinary sectoral cooperation to improve the quality of climate information products and services.
- **Cost-saving through regional cooperation:** Finally, regional cooperation to strengthen NMHSs capacities will also bring significant financial savings. As an outcome of the SEEDRMAP initial studies conducted in 2007, it was revealed that the strengthening of SEE NMHSs capacities through regional cooperation and coordination would cost 30% less compared to a stand-alone solution (the modernization plan was estimated at 63.2 million € with regional cooperation and 90.3 million € without).

9.2. Methodological approach to develop a regional cooperation roadmap in MHEWS and risk assessment for South East Europe

One of the key outputs of this “Regional Programme on Disaster Risk Reduction in South East Europe” is the development of a regional cooperation roadmap laying out the areas in disaster risk reduction and hydro-meteorological issues that require regional cooperation (Activity 1.4). Building on the outcomes of the National Policy Dialogues (Activity 1.1), MHEWS Training Workshop (Activity 1.3) and Flood and Drought Risk Assessment National Capacities assessments (Activity 2), the regional cooperation roadmap for strengthening Meteorology, Hydrology and Climate Services for Disaster Risk Management has been developed through the following process (Figure 47):

1. Areas in DRR and Meteorological, Hydrological and Climate-related issues that require regional cooperation have been identified based on outcomes of consultations with IPA beneficiaries during the national assessments and the National Policy Dialogues;
2. A workshop on “Regional cooperation in MHEWS and risk assessment in SEE” was held with (sub-)regional agencies and technical centres supporting DRR in Europe and South East Europe to identify opportunities for further strengthening regional cooperation projects and activities (16-17 February 2011, WMO Geneva);
3. A Regional Meeting for Strengthening Regional Cooperation in Meteorology, Hydrology and Climate Services for Disaster Risk Management, with Directors of NMHSs and DRM agencies (28-29 March 2011, Sarajevo, Bosnia and Herzegovina) to finalise the draft regional cooperation roadmap; and
4. A Regional Conference on Coordination and Cooperation in the field of disaster risk reduction in the region organised by UNDP on 11-13 September 2011 to endorse the regional road-map proposal prepared by UNDP and WMO in consultation with beneficiaries and regional partners.

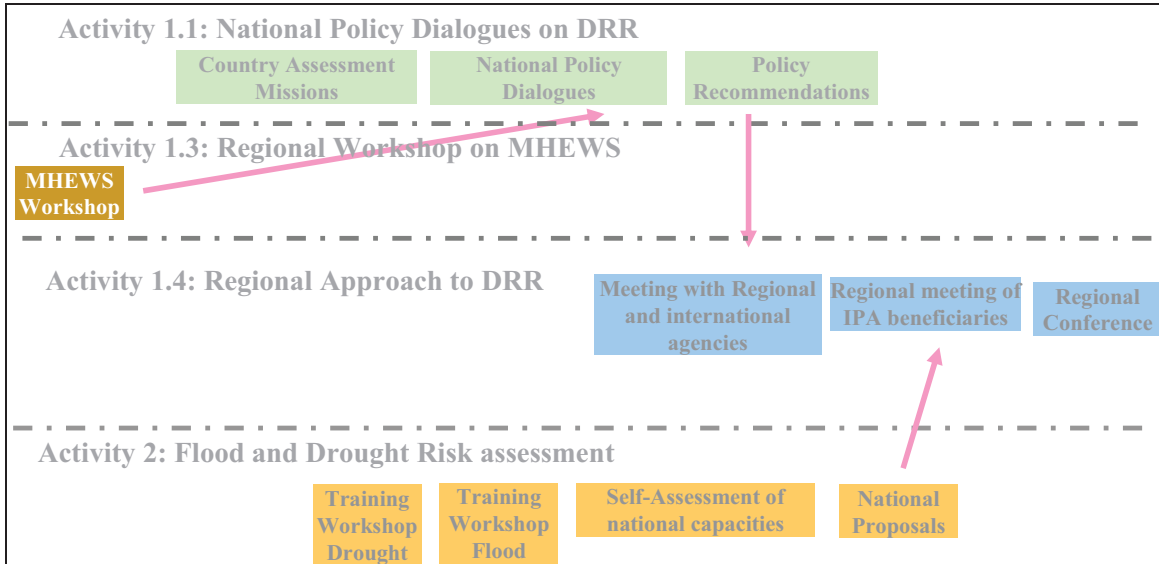


Figure 46. Methodological approach to develop a regional cooperation roadmap in MHEWS and risk assessment in SEE

9.3. Common needs and challenges of SEE countries to strengthen their DRR capacities

9.3.1. Outcomes of the National Policy Dialogues

As mentioned in Chapters 2-9, National Policy Dialogues on DRR have been organized in each IPA beneficiary, where policy recommendations were discussed and endorsed at national level. A detailed analysis of these recommendations is provided in Annex 4, which demonstrates that SEE countries are sharing common needs and challenges to strengthen their DRR capacities, particularly with respect to meteorological, hydrological and climate related issues. These common challenges and needs are highlighted in the following table 57.

9.3.2. Outcomes of the assessment of the capacities of the NMHSs to support DRR in SEE

The detailed assessments of the DRR framework and institutional and technical capacities of the NMHSs of the SEE countries to support DRR presented in Chapter 2-9 have led to the development of technical recommendations to strengthen the NMHSs capacities. A detailed analysis of these technical recommendations is provided in Annex 5, which demonstrates that SEE countries are sharing common needs and challenges to strengthen these capacities to support DRR. These common challenges and needs are highlighted in table 58.

Table 57: Common needs and challenges of the NMHSs of SEE to support DRR emerging from the NPDs

COMMON NEEDS AND CHALLENGES OF THE NMHSs OF SEE TO SUPPORT DRR EMERGING FROM THE NATIONAL POLICY DIALOGUES	No. of IPA beneficiaries concerned
HFA Priority 1: Ensure that disaster risk reduction (DRR) is a national and a local priority with a strong institutional basis for implementation	
<ul style="list-style-type: none"> All countries in SEE are aware of the new DRR paradigm that followed the adoption of HFA. The legislation related to disaster risk management has been recently or is currently being updated in many countries; however, an appropriate legal and institutional DRR framework has not been established in many countries yet. 	All
<ul style="list-style-type: none"> There is a common need to mainstream DRR and to move to real implementation of the HFA by: <ul style="list-style-type: none"> - integrating DRR within other development plans and sectoral policies; - developing DRR Action plans; establishing DRR institutional mechanisms at the local level; - establishing clear financial mechanisms to support DRR. 	All
<ul style="list-style-type: none"> Most countries of SEE have established or are in the process of establishing a National Platform for DRR. 	Most
<ul style="list-style-type: none"> There is a need to clarify the DRR institutional framework where there are overlapping and redundancies among the national agencies including technical agencies such as the NMHSs. 	3
HFA Priority 2: HFA priority 2: Identify, assess and monitor disaster risks and enhance early warning	
<ul style="list-style-type: none"> There is a need for strengthened institutional coordination and cooperation among technical agencies and with the DRM agencies, including data exchanges, for the development of risk assessment and early warning systems. 	All
<ul style="list-style-type: none"> There is a need to strengthen the technical and human capacities of the NMHSs to support DRR and specifically risk assessment and early warning systems. 	All
<ul style="list-style-type: none"> There is a need to enhance coordination between several agencies in charge of hydrometeorology 	3
<ul style="list-style-type: none"> There is a need to invest in fully operational 24/7 hydrometeorological services. 	2
<ul style="list-style-type: none"> Trainings and methodologies for the development of risk assessments and early warning systems are required. 	All
<ul style="list-style-type: none"> Many countries have established a 112 system, and there is a need to clarify the differences and potential synergies between 112 system and EWS . 	4
<ul style="list-style-type: none"> There is a need to strengthen linkages between DRR and adaptation to climate change policies and strategies. 	All
HFA Priority 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels	
<ul style="list-style-type: none"> There is a need to develop appropriate programmes and curricula to integrate DRR at all levels of education. 	All
<ul style="list-style-type: none"> There is a need to promote citizen awareness of the risks as well as of the existing mechanisms and systems set up to reduce risks such as EWS. 	All
HFA Priority 4 Reduce the underlying risk factors	
<ul style="list-style-type: none"> There is a need to mainstream DRR into development and sectoral strategies and plans 	All
<ul style="list-style-type: none"> There is a need to develop long-term DRR strategies and to strengthen partnerships with international and development partners and promote their increase involvement in DRR. 	All
<ul style="list-style-type: none"> There is a need to develop capacities for climate services to support medium to long term sectoral planning with respect to climate change in all SEE countries. 	All
HFA Priority 5 : Strengthen disaster preparedness for effective response at all levels	
<ul style="list-style-type: none"> SOPs need to be well defined, regularly tested and continuously improved. 	All
<ul style="list-style-type: none"> There is a need to increase the use of simulation exercises. 	All
<ul style="list-style-type: none"> There is a need to strengthen preparedness for cross border hazards through regional and international cooperation. 	All

Table 58: Common technical needs and challenges of the NMHSs of SEE to support DRR emerging from the capacity assessment

COMMON TECHNICAL NEEDS AND CHALLENGES OF THE NMHSs OF SEE SUPPORT DISASTER RISK REDUCTION	No. of beneficiaries concerned
Legal framework and institutional arrangements related to the role of NMHS in DRR	
<ul style="list-style-type: none"> There is a need to prescribe a new law for hydrometeorological services. There is a need to reorganise the NMHS and better integrate it in the DRR institutional framework and planning. In this regard, the specific roles and responsibilities of the NMHSs in DRR should be clarified in most countries, particularly with respect to their mandate to issue early warnings, as well as the cooperation and coordination with other technical agencies. 	4
	5
	Most
Operational relationships with other agencies	
<ul style="list-style-type: none"> There is an urgent need to clearly define roles and responsibilities of the various agencies within the DRR framework, and to improve the cooperation among the NMHS, other technical agencies and the DRM agencies, particularly for data exchange, risk assessment and early warning systems. In this respect appropriate SOPs should be defined within a Quality Management System. 	Most
	Most
Monitoring and observations networks and data exchange	
<ul style="list-style-type: none"> There is an urgent need to upgrade and modernize the meteorological and hydrological networks by: <ul style="list-style-type: none"> - upgrading the calibration and maintenance systems per WMO standards - developing the network of Automated Weather and Hydrological Stations (all countries) - increasing the number of remote sensing systems, including upper air sounding stations, weather radars, lightning detection systems - developing or improving real time communication system for observation and data (i) at the national level and (ii) at the regional levels There is also a need to strengthen the marine observation networks in the coastal countries. 	5
	All
	All
	2-4
	4
Forecasting	
<ul style="list-style-type: none"> There is an urgent need to develop an operational forecasting system. There is a need to develop or strengthen nowcasting capacities to support DRR, including by developing the production of regional weather radar composite. There is a need to improve the capacities to use Numerical Weather Prediction (NWP) products and to join European or international NWP model consortium. There is an urgent need to develop hydrological modelling and to link these models to NWP and weather radar data for flood forecasting. There is a need to improve the automatic analysing and editing tools. There is a need to improve the technical capacities to develop monthly and seasonal climate outlooks. 	1
	5
	All
	6
	All
	5
Hydrometeorological data management systems	
<ul style="list-style-type: none"> There is an urgent need to initiate a data rescue programme to digitise and quality ensure the historical data. There is a need to develop the technical capacities for data management and to adopt automatic quality control systems of hydrometeorological data. There is also a need to develop national hydrological or agrometeorological databases that would link all existing databases in one unified at the national level. There is a need to strengthen data management capacities for real time. 	6
	5
	4
	2
Hazard analysis and mapping to support risk assessment	
<ul style="list-style-type: none"> There is a need to clearly define the institutional framework related to risk assessment and to specifically define the role of the NMHSs. There is a need to define standard methodologies for hazard characterization and mapping, and for hazard risk assessment. There is the need to strengthen the collection of hazard data including impacts and hazard extent and to develop and maintain corresponding hazard databases. There is a need to develop hazard analysis and mapping (through GIS tools) based on historical data and climate change projections to support risk assessment. There is the need to develop capacities in the use of GIS, spatial analysis and management of geographic data; remote sensing. 	Most
	All
	5
	All
	All
	4

<ul style="list-style-type: none"> There is a need to develop hydrological modelling for flood risk assessment. There is the need to develop a shared methodological framework for the integration of climate change products in hazard risk assessment. 	Most
Information technology and telecommunication issues	
<ul style="list-style-type: none"> There is an urgent need to reinstall the connection to the WMO GTS. 	2
<ul style="list-style-type: none"> There is a need to modernize the telecommunication system for automatization and dissemination of forecasts and warnings. 	All
<ul style="list-style-type: none"> There is an urgent need to develop or improve websites for a better public weather service. 	3
Warning products and services	
<ul style="list-style-type: none"> There is an urgent need to establish a 24/7 science based analysing, forecasting and warning system. 	4
<ul style="list-style-type: none"> There is a need to further improve existing warning products and to develop new warning products and services in close cooperation with the Disaster Risk Management stakeholders as well as users from various sectors. 	5
<ul style="list-style-type: none"> There is a need to clarify the mandate roles and responsibilities of NMHS to produce / issue / disseminate official warnings for hydromet hazards through appropriate SOPs under a QMS framework. 	4
<ul style="list-style-type: none"> There is a need to improve the warning dissemination mechanisms by improving the communication systems, partnerships with the media, as well as enhancing the awareness of the population. 	4
<ul style="list-style-type: none"> There is a specific need to develop early warning systems for (i) flash flooding and (ii) drought. 	4 - 3
Climate change analysis	
<ul style="list-style-type: none"> There is a need to develop a climate data management system. 	Most
<ul style="list-style-type: none"> There is a need to develop the technical capacities for climate change projections downscaling to local scales. 	Most
<ul style="list-style-type: none"> There is a need to develop climate change impact studies in cooperation with DRR and other sectors. 	Most
Human Resources	
<ul style="list-style-type: none"> There is an urgent need to increase the number of data management, computing and IT experts. 	All
<ul style="list-style-type: none"> There is a need to increase the number of staff with academic MSc and PhD degrees in meteorology and hydrology. 	All
<ul style="list-style-type: none"> There is a need to promote training of the mid-management in leadership, project management, cooperation with industry, participation in EU R&D projects and English level. 	All
<ul style="list-style-type: none"> There is a need to establish a systematic training programme for NMHSs staff by adapting the trainings systems in use in some of the advanced EUMETNET NHMSs. 	All
Regional cooperation	
<ul style="list-style-type: none"> There is an urgent need to promote cooperation among SEE NHMSs. 	All
<ul style="list-style-type: none"> Methodologies and tools for production of flood and drought risk assessment and mapping at the national/regional level should be developed and harmonized in the region, based on good practices, particularly for flood risk assessment in transboundary river basins (Sava river). 	All
<ul style="list-style-type: none"> Modernization and interoperability of the meteorological and hydrological networks should be implemented at the sub-regional level including automatic on-line stations, a sub-regional radar network as well as a lightning detection network. 	All
<ul style="list-style-type: none"> To improve their forecasting capacities SEE countries should increase their cooperation with global, regional and specialized Centres producing NWP. 	All
<ul style="list-style-type: none"> Cross-border exchanges of real-time data, forecasts and warnings should be increased. 	All
<ul style="list-style-type: none"> A regional Multi-hazard Early Warning System composed of inter-operable national Early Warning Systems should be designed through a regional cooperation process. 	All
<ul style="list-style-type: none"> A regional harmonisation of watch and warning systems should be promoted. 	All

9.3.3. Opportunities and challenges to strengthen DRR through regional cooperation in meteorology, hydrology and climate

These thorough analyses provide a good basis for the strengthening of regional cooperation in meteorology, hydrology and climate in South East Europe to strengthen DRR. Indeed, it revealed that:

- **Strengthening DRM policies and strategies toward more preparedness and prevention is underway in the SEE region:** Most of the countries in the region are currently restructuring their DRM processes, coordination, policies and strategies moving forward from post disaster response to preventive and preparedness strategies. This is an opportunity to foster institutional coordination and collaboration among NMHS and various partners in this area.
- **The roles and responsibilities of NMHSs in DRR is increasingly recognised in South East Europe.** Most of the countries in the region highlighted the need for strengthened institutional coordination and cooperation between the NMHSs, the DRM agencies, and other sectors, particularly for the development of risk assessment and early warning systems.
- **All countries in SEE realised that the technical and human capacities of their NMHSs need to be strengthened** to support DRR and specifically risk assessment and early warning systems.
- **Although capacities of NMHS in producing meteorological, hydrological and climate products and services varies across the region, SEE countries are confronted to common challenges** related to their monitoring and observation networks, their forecasting capacities, their hydrometeorological data management systems, their hazard analysis and mapping capacities, their warning products and services development, their IT infrastructure or their climate change analysis capacities.
- **SEE countries urged the need to promote regional cooperation in meteorology, hydrology and climate** as a critical step toward improving DRR and EWS capacities. A number of areas requiring regional cooperation have been identified including:
 - Harmonisation of risk assessment methodologies, tools and capacities;
 - Coordination and harmonization of EWS for cross border hazards;
 - Sharing of good practices in DRR;
 - Regional Trainings and workshops;
 - Development of regional project proposals and coordination with donors and funding agencies;
 - Establishment and/or utilization of Centres of excellence and cooperation mechanisms.

9.4. Existing Cooperation Mechanisms in SEE and greater European Union

A comprehensive regional cooperation should be based on the existing cooperation mechanisms that are presented in this section.

9.4.1. Regional mechanisms and initiatives supporting DRR in South East Europe

9.4.1.1. The Regional Cooperation Council (RCC)

The RCC was officially launched on 27 February 2008, as the successor of the Stability Pact for SEE¹⁴, with the goal to promote mutual cooperation and European and Euro-Atlantic integration of SEE in order to inspire development in the region for the benefit of its people. The RCC functions as a focal point for regional cooperation in SEE. The RCC provides the SEE Cooperation Process (SEECPP) with operational capacities and acts as a forum for the continued involvement of those members of the international donor community engaged in the region. The work of the RCC

¹⁴ The Stability Pact for SEE was launched in 1999 as the first comprehensive conflict prevention strategy of the international community, aimed at strengthening the efforts of the countries of SEE.

focuses on six priority areas: economic and social development, energy and infrastructure, justice and home affairs, security cooperation, building human capital, and parliamentary cooperation as an overarching theme (See Annex 6).

9.4.1.2. The Disaster Prevention and Preparedness Initiative (DPPI)

DPPI was launched in November 2000 under the framework of the Stability Pact for SEE in an effort to contribute to the development of a cohesive regional strategy for disaster preparedness and prevention for its 12 member States (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, FYR Macedonia, Greece, Hungary, Moldova, Romania, Serbia and Montenegro, Slovenia and Turkey). The overarching goal of the DPPI is to foster regional cooperation and coordination in disaster preparedness and prevention for natural and man-made disasters in SEE and its objectives are to: (i) strengthen good neighbourly relations and stability through the exchange of information, lessons learnt and best practices in the field of disaster management; (ii) Enhance cooperation between DPPI partners in view of EU enlargement and the process of Euro-Atlantic; (iii) Support and encourage countries to develop, adopt and/or enforce state-of-the-art disaster emergency legislation, regulations and codes designed to prevent and mitigate disasters in line with guidelines and common practices accepted in the international community; and (iv) Assist and encourage countries in the region to implement HFA (See Annex 6).

9.4.1.3. The United Nations Strategy for Disaster Risk Reduction in Europe (UN-ISDR-Europe)

The UN-ISDR Europe core mandate includes awareness-raising activities in disaster risk reduction, including the promotion of the World Disaster Reduction Campaign, advocacy through policy formulation, the dissemination of guidelines to assist in the implementation of the Hyogo Framework for Action (HFA), promote the establishment of national platforms for disaster risk reduction, enhance networking and partnership-building to contribute to an effective culture of safety and protection of all communities in Europe. In SEE UN-ISDR is one of the key agencies involved in the SEE Disaster Risk Mitigation and Adaptation Programme (SEEDRMAP) which was initiated in 2007 with the World Bank and the WMO.

9.4.1.4. Other UN and international initiatives supporting regional cooperation in DRR

Through Component 1 of the EC DG Enlargement Project (See Chapter 1), **UNDP** is developing a regional cooperation roadmap for Disaster Risk Management that would focus on: (i) harmonization of policy and strategic planning and overall institution building for DRR; (ii) Support across the sub-region for the establishment of National Platforms for DRR; (iii) Capacity development for DRR involving joint training, the promotion of study tours, joint simulations and the establishment of common curricula for education purposes; (iv) Developing common practice in mainstreaming DRR in development; (v) Public awareness; (vi) The assessment of gender issues in DRR and the formation of common approaches to mainstreaming gender into DRR programmes within the sub-region; and (vii) Establishing a sub-regional approach to a coordinated approach to DRR and climate change adaptation (CCA).

Under the cooperation Programme SEEDERMAP, **the World Bank** supports mitigation of the adverse financial effects of natural hazards on the economies of SEE. The World Bank has contributed to the design of the South-Eastern Europe and Caucasus Catastrophe Risk Insurance Facility (SEEC-CRIF), which is contributing to the development of catastrophe insurance markets providing access to affordably priced insurance. In addition, the World Bank is providing loans to the governments of Croatia (14 million \$USD), Albania (4 million \$USD) and Moldova (4 million \$USD) for the strengthening of Hydrometeorological Services, including support for the installation of automatic weather stations. A strong cooperation with WMO could be beneficial in ensuring that the infrastructure and systems developed with the World Bank financing are interoperable and are designed with consideration for regional cooperation issues.

9.4.2. Regional cooperation in meteorology in Europe

There are considerable capacities in Europe, through technical (sub-)regional and specialized centres and the European meteorological infrastructure that can be leveraged in support of capacity development for enhanced disaster risk management in SEE. Concerted efforts for collaboration at the European level were marked with the establishment of organizations such as European Centre for Medium-Range Weather Forecasts (ECMWF), European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) and the Conference of National Meteorological Services in Europe (EUMETNET). Through this cooperation European countries have joined forces to collectively develop capabilities in observations, monitoring, forecasting, modelling, research and the corresponding sharing of data, information products and services that underpin the current work of NMHSs not only in Europe, but the world over. The availability of these capacities offers opportunities for enhanced regional cooperation to support development and application of meteorological, hydrological and climate products and services for DRR in SEE. Membership of SEE countries to these organizations would, therefore, provide them with technical and operational support to improve meteorological, hydrological and climate services. These Centres could support interoperability, data harmonization and standardization, development of guidelines, training, development of products and services for different DRR applications.

9.4.2.1. European Centre for Medium-Range Weather Forecasts (ECMWF)

In 1967 the Council of Ministers of the European Communities meeting in Luxembourg decided to promote and encourage scientific and technical research in meteorology. As a result, the setting up of the “European Meteorological Computer Centre for Research and Operations” was agreed. This became the core of the activities of ECMWF, which was established on 1 November 1975. The main objective of ECMWF is to advance medium-range weather forecasting to fill the gap in the working programmes of National Weather Services of Member States in their efforts to contribute with products and services to their national economies. Today ECMWF has 19 Members States and 15 co-operation States (See Annex 6).

9.4.2.2. European Organization for the Exploitation of Meteorological Satellites (EUMETSAT)

With the advent of satellite technology, European countries decided to establish EUMETSAT, in 1986, to deliver weather and climate-related satellite data, images and products – 24 hours a day, 365 days a year. It has a membership of 26 countries and co-operation agreements with 5 countries. Data from EUMETSAT, which is accessible to SEE countries, is critical for monitoring of meteorological and environmental phenomena and for improving forecasting (See Annex 6).

Table 59: Status of SEE Membership in the European Meteorological network

Beneficiary	ECMWF	EUMETNET	EUMETSAT
Albania	Membership underway (through the project)	Membership underway (through the project)	
Bosnia and Herzegovina	Membership underway (through the project)	Membership underway (through the project)	
Croatia	Cooperating State	Member	Member
The former Yugoslav Republic of Macedonia	Cooperating State (through the project)	Member (through the project)	
Montenegro	Cooperating State	Member (through the project)	
Serbia	Cooperating State	Member	Cooperating State
Kosovo (as defined by UNSCR 1244/99)			
Turkey	Member		Member

9.4.2.3. EUMETNET – Conference of National Meteorological Services in Europe

Motivated by the success of EUMETSAT, 17 countries in Europe¹⁵ created the EUMETNET to facilitate co-operation of its Members as a network to help them in providing: (i) leading expertise on weather, climate, environment and related activities; (ii) technical support to the corresponding scientific community; and (iii) high quality basic data and products. In 2010 EUMETNET acquired a legal personality under the form of an Economic Interest Grouping (under the Belgian law). Today, the network comprises 29 members. EUMETNET runs a number of different programmes between its members (See Annex 6) in various fields such as observing systems, data processing, basic forecasting products, research and development and training. Its METEOALARM Programme has created a European-wide public and multi-lingual portal for the provision of alerts to the public and authorities about severe weather 48 hours in advance. The EUMETCAL Programme, which is a computer-aided learning project, facilitates training of staff of NMHS through provision of various training modules.

9.4.2.4. Other institution or initiative supporting regional cooperation linked to meteorology

In the late 1990s and early 2000s, the Joint Research Centre (JRC) of the European Commission started the development of initiatives which, among others, provide valuable contributions to the work of NMHS in Europe. These include the European Forest Fire Information System – EFFIS (operational since 2003), the European Drought Observatory and the European Flood Alert System – EFAS (operational in 2003). While these initiatives provide valuable information on forest fires, drought and floods, they do not replace the role played at national level by the NMHS in these areas (See Annex 6).

The European Union legislation and guidelines can also be utilized as a driver to enhance regional cooperation supporting DRR. The EU Water Framework Directive requests EU Member countries to develop flood risk assessment (hazard maps and flood risk maps) and flood risk management plans, as well as to coordinate in transboundary river basins. Regarding droughts, although there is no directive, a guidance to EU members recommends to develop hydrological drought impact assessment, drought management plans, as well as an European Drought Observatory and early warning system by 2012.

9.4.3. Sub-regional hydrometeorological cooperation mechanisms in South-East Europe

9.4.3.1. The Drought Management Center for SEE (DMCSEE)

The DMCSEE was established in 2006 in Ljubljana, Slovenia, with the aim to promote the application of drought risk management tools and provide training on tools and methodologies for drought assessment, monitoring and early warning to the 13 Member countries of the SEE region.

9.4.3.2. The SEE Virtual Climate Change Center (SEEVCC)

The SEEVCC was established in 2008 in Belgrade, Serbia, with objectives to (i) fulfil the needs of SEE countries for information on sub-regional climate change; (ii) support the development of capacities of NMHS in the area of climate change in the SEE region; (iii) strengthen linkages between science and adaptation planning, policy planning, as well as management of climate risks, and (iv) promote a model of partnership between NMHS and other sectors dealing with climate change, as well as with relevant international organizations, regional climate centers, donors, etc.

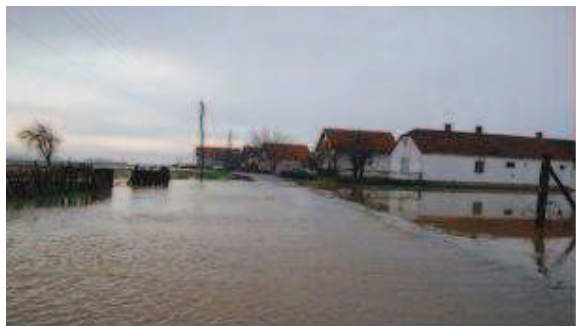
9.4.3.3. The International Sava River Basin Commission (ISRBC)

The ISRBC is in charge of implementing the Framework Agreement on the Sava River Basin which was signed in 2002 by four riparian countries of the Sava river basin (Bosnia and Herzegovina,

¹⁵ Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom

Croatia, Serbia and Slovenia) to promote transboundary cooperation for the sustainable development of the region by focusing on navigation, water management and flood and drought risk reduction.

Two examples of cross-border disasters: a need for more regional cooperation



- December 2010 transboundary flooding in the Drina basin

At the end of November to the beginning of December 2010, heavy rains on the territory of Montenegro and Bosnia and Herzegovina simultaneously caused a high rise in the water level over the whole Drina River Basin. The high level wave in the Drina Basin caused floods on the territories of Montenegro, Bosnia and Herzegovina and Serbia with consequential significant material damage. Based on the available data, including ECMWF products, the Hydrometeorological Service of Serbia promptly provided forecasts and warnings for all participants in the flood defence system. Owing to this and measures taken by the Sector for Emergency Management the loss of human life was avoided and damage to property was mitigated, especially in the lower part of the Sava River. However, the lack of a common regional hydrometeorological information system for the Drina Basin among its riparian countries did not allow the hydrometeorological early warning system to perform at its best. From the aspect of the functioning of the flood risk management system on the Drina River as a water course cut by state borders or is the state border and whose regime is crucially influenced by the management of constructed accumulations, a need exists for inter-governmentally coordinated management of the waters within this Basin. In the case of the Drina River, this is possible to realize through regional projects that would also be supported by relevant international institutions.¹⁶

- August 2007 cross-border forest fires in Dubrovnik area

From 4 to 9 August 2007, an intense forest fire burned more than 3,400 hectares of vegetation between Croatia and Bosnia and Herzegovina in the Dubrovnik area. According to the Standard Operating Procedures for the transboundary actions in wild fire protection between Croatia and Bosnia and Herzegovina, fire brigades of both countries were authorised to operate in the cross-border area. During the fire, strong Bora wind complicated fire protection operations and precluded helicopter and airplane intervention. Therefore, it was very important to have reliable wind forecast. Croatia Hydrometeorological Service forecasted the Bora wind to last until the 6 August occupying the lowest 2 km level of the atmosphere with wind velocities exceeding 10 m/s. ALADIN/HR model and its application by HRID (High Resolution Isentropic Diagnosis) was utilised to predict the essential features of this local phenomena with high reliability. All information was available on a daily basis to the fire-fighters as a part of Standard Operator's Procedure on weather forecast information¹⁷.

¹⁶ More information is available in ANNEX 7

¹⁷ More information is available in ANNEX 8

9.5. Roadmap for the development of the hydrometeorological component of a regional DRR strategy

9.5.1. A DRR regional strategy for South East Europe

During the consultations, the need for a clear regional strategy in DRR highlighting the long-term priorities for capacity development and cooperation with corresponding regional action plan for implementation was highlighted. It was recommended that this strategy should include the following:

- The regional DRR strategy should be founded on a comprehensive framework for disaster risk management within a multi-stakeholder and multi-hazard approach and identify and prioritize concrete areas of regional cooperation;
- The regional DRR strategy should ensure that gaps, needs and priorities are addressed in a coordinated fashion and with a long-term capacity development perspective;
- The regional strategy would be underpinned with phased project proposals targeted at capacity development. Various projects in the region supported through bi-lateral and multi-lateral cooperation should be better integrated and aligned to avoid redundancies and address gaps;
- The strategic priorities for the development of meteorological, hydrological and climate services should be developed in context of the SEE regional strategy for DRR;
- The regional DRR strategy must be complemented with corresponding regional agreements and trans-boundary agreements and regional operational plan (who, what, when, how and with whom). Specifically the Regional DRR Strategy and Regional Operational plans should consider the hazards posing risks across borders in the region, e.g., forest fires, floods, droughts, heat waves;
- There is need for multi-stakeholder regional mechanisms to develop regional strategy, identify areas of cooperation and develop, monitor and evaluate the regional implementation plan.

9.5.2. Areas requiring regional cooperation in meteorology, hydrology and climate

9.5.2.1. Risk analysis, data management and exchange to support DRR and MHEWS

Floods, droughts, forest fires are among highest priority hazards in the region, with severe impacts on safety of lives and economic losses across the whole region. As risk assessment at regional, national and local levels is the foundation for the development and implementation of any DRR strategy, the following priorities have been identified in this area:

- Methodologies and tools for production of risk assessment and mapping at the national/regional level should be developed and harmonized in the region for the priority hazards, based on common standards. This would be particularly crucial for flood risk assessment in trans-boundary river basins, and forest fires;
- There is a need of integrated risk assessment and early warning decision tools (GIS platform based) that integrate hazard information (statistical and real-time) with exposure and vulnerability information from different sectors;
- Common meteorological, hydrological and climate databases, metadata, common GIS platforms need to be developed and adopted based on standards, as well as integrated, and quality controlled;
- There is a need for data exchange mechanisms and protocols at national, (sub-) regional and international levels (EUMETNET) to facilitate exchange of data, and formalized agreements across agencies;
- The existing sub-regional technical cooperation centers such as the SEE Drought Management Center and SEE Virtual Climate Change Center should be strengthened, as well as their cooperation with the global and European centers of excellence to develop their capacity to deliver regional products and services to support risk assessment;

- SEE Climate Outlook Forum (SEECOF) should be utilized in a multi-stakeholder mode as a mechanism to identify user needs and requirements for provision of regional climate products and services to be provided through the Regional Climate Centers;
- There is a need of methodologies and capacities to produce regional-scale projections of climate change, including hazard trends analysis and capacity development and training for the beneficiaries for downscaling for the national needs.

9.5.2.2. Operational cooperation of the NMHS and DRM Agency and service delivery

As operational cooperation between the DRM agencies and the hydrometeorological services is fundamental for the development of an effective early warning system, the following priorities have been identified in this area:

- National and regional development of early warning systems should be carried out on the basis of a number of principles that have emerged from the documentation and synthesis of good practices in developed and developing countries around the world;
- Ongoing MHEWS stakeholders workshops and trainings at national or/and regional level should be enhanced for a better understanding of roles and capacities among Meteorological Services, DRM agencies and key EWS stakeholders with regards to MHEWS;
- There is a need to develop Quality Management Systems in the hydrometeorological services and Standard Operating Procedures (SOPs) with their stakeholders as well as cooperation in the development of hydro-met products in support of 112;
- For flood warnings in transboundary basins (eg Drina, Sava) cooperation should be enhanced at the river basin level;
- Regional case-studies on multi-stakeholder, multi-country cooperation in EWS (2007 Dubrovnik fire, 2010 Serbia floods) supported by ECMWF products should be documented and published;
- A harmonized regional Multi-Hazard Early Warning System composed of coordinated national Early Warning Systems could be designed through the regional DRR strategy. The various operational aspects (trans-boundary, sub-regional, and regional) need to be identified and reflected in formalized agreements and SOPs. In this regard, the interoperability of observing network, regional coverage and data exchange and policies need to be considered, for consistency of hydrometeorological information.

9.5.2.3. Harmonization, exchange and real time coordination of hydrometeorological networks, forecasting expertise and watch and warning systems

With respects to monitoring, forecasting and watch and warning systems, regional coordination and cooperation is a must. In these areas, the following priorities have been identified:

- Regional cooperation and harmonization of the hydro-meteorological capacities need to be implemented in alignment with the regional DRR strategy to ensure alignment with regional priorities and operating plans in DRR;
- Modernization and interoperability of the meteorological and hydrological networks should be planned at the sub-regional level to benefit from economies of scale and financing opportunities. The planning should include automation and optimization of monitoring networks as well as integration of radars and remote sensing capacities into a sub-regional network;
- To improve their forecasting capacities SEE countries should increase their cooperation with global, regional and specialized Centres (e.g. ECMWF) producing NWP, develop their NWP capacities and become members of NWP model consortiums. Linkages between NWP models and hydrological models should also be developed for a better flood forecasting;
- Strengthening of technical capacities of DMC SEE and the SEE Virtual Climate Change Center and their institutional capacities to support Members needs for products and training;
- A regional harmonisation of watch and warning systems should be promoted;

- Cross-border exchanges of real-time data, forecasts and warnings should be increased; in this regard the standards and data exchanges should be developed.

9.5.3. Priorities and next steps

In this overall context, the following areas have been identified as priorities for the development of future regional cooperation project or programmes aimed to strengthen the capacities of the hydrometeorological services to support Disaster Risk Reduction in South East Europe:

- Enhance the regional hazard assessment and mapping capacities;
- Enhance capacity to forecast hazardous meteorological and hydrological phenomena and deliver timely warnings to support DRR;
- Develop the capacity needed to support climate risk management and climate change adaptation into national and regional DRR agenda;
- Design a regional Multi-Hazard Early Warning System composed of harmonized national Early Warning Systems within a regional cooperation framework.