Synthesis of present situation and further Institutional and Technical recommendations to strengthen NMHS capacities in DRR support

Beneficiary	Recommendations						
	Legal framework/ enabling environment	*Observational networks*	*Telecommunications and Computing*	*Data management*	*Forecasting system*	*Risk assessment/EWS/ Preparedness&Response*	*Regional/International cooperation*
THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA	In accordance with the Law on Crisis Management ("Official Gazette of the Republic of Macedonia" No. 29/05), the Government of the Republic of Macedonia adopted a Decree **on the Methodology for drafting the Security threat assessment of the Republic of Macedonia in regard to all risks and hazards, its content and structure, its keeping and updating, as well as establishing the crisis management system entities** that get a complete version or an excerpt from the Assessment (Official Gazette of the Republic of Macedonia No. 13/11). **DRM:** National Platform for Disasters Risks Reduction (NP for DRR), here considered as a legal act, has its **Third revised edition, and was adopted by the Government of Republic of Macedonia in May 2012**. With this release overall **responsibility for its implementation is again returned to the CMC, which means coordination at national and international level**.	**METEOROLOGY:** In recent years due to lack of funding the number of meteorological stations has been drastically reduced (e.g. 50% reduction in number of precipitation stations). Number of employees at the main meteorological stations is reduced (retirement and ban on new employment as an austerity measure). High priority should be given to the maintenance of the observing systems, especially regarding the stations of the regional basic synoptic network (RBSN) and the regional basic climatological network (RBCN), adequate to meet the requirements of WWW. There are difficulties in maintenance of the AWS: - calibration and supply of spare sensors and other parts; - different communication software for AWS; - lack of staff; - insufficient training of existing staff to work with AWSs; - lack of off-road vehicles to reach the stations for maintenance. Calibration of Instruments is irregular and inadequate. There is an urgent need to	Telecommunication capabilities of NMHS are based on Internet (wired and wireless connection) supported by public commercial providers. AWOSs are connected with NMHS HQ in Skopje by public internet connection and mobile network using GPRS/GSM protocol. Meteorological reports from synoptic weather stations are transmitted via public Internet. RMDCN was replaced with Internet ftp connection. NMHS has its own radio communication network, which is still in use for data exchange. Public internet connection is not reliable and stable communication, particularly under severe weather conditions. There are numerous interruptions in the mobile and internet network. NMHS and the Government of Macedonia have to build its own information, and data dissemination. The internal Ethernet network is in a very bed condition. There is a need to modernize the technology for meteorological, hydrological and related real time data exchange in the country, in order to better serve the needs of end users.	There is evident progress in digitalization of historical climatological data which are not yet applied for hazard analyses, and DRR purposes (data records in paper form are well sorted and stored). Meteorological department has a CLIDATA software (old version). It is expected by NMHS that the new version of CLIDATA will be made available through IPA Project for further improvement of climatological database. At the same time hydrological department is still missing a solid data base designed for hydrological purposes. There is a need to speed-up the digitization of observations in paper form. It is recommended to investigate the possibility of using the database software MCH-BD, and its potential to serve as unified data base for climatology and hydrology [consider also the issue of migration from one data base to another?]. Quality analysis and quality control of	Data processing is on a low level, particularly in operational forecasting services. ECMWF MetView software is still not in use. There is no archive of data exchange. NMHS runs operationally the NCEP WRF-NMM numerical non-hydrostatic forecasting model. It uses the NCEP initial and boundary conditions. The NWP has been implemented with external support (consulting company). There is no in-house NWP development expertise. There is an urgent need to utilize better the products available from ECMWF. There is a need to promote NWP modeling through collaboration with one of the European NWP consortia (requires stronger collaboration with the University of Skopje). NMHS is a member of EUMETNET/EMMA meteoalarm system. Communication with key DRR institutions is satisfactory, but could be improved. Shortage	**Methodology**: Based on Article 45, Paragraph 3, of the Law on Crisis Management ("Official Gazette of the Republic of Macedonia" No. 29/05), the Government of the Republic of Macedonia adopted a Decree on the Methodology for drafting the Security threat assessment of the Republic of Macedonia in regard to all risks and hazards, its content and structure, its keeping and updating, as well as establishing the crisis management system entities that get a complete version or an excerpt from the Assessment (Official Gazette of the Republic of Macedonia No. 13/11). There is a need to train different experts in application of the above methodology, strengthen GIS capabilities, develop hazard analysis and mapping based on historical data, spatial analyses and remote sensing data, and climate change projections, in order to support risk assessment. There is a need to strengthen the systematic collection of drought/floods impact information. The HMS is mandated by	Continue or improve the level of cooperation with sub-regional drought management and climate change centers in SEE (DMCSEE and SEEVCCC). There are urgent needs to enhance data exchange, warning and watch coordination and cross border training activities. **The potential role of EMMA Hydrology should be explored.** Bilateral cooperation of HMS with NMHSs in the neighboring countries (Albania, Bulgaria, and Serbia) should be further developed (cooperation in NWP, radar meteorology, exchange of additional data, Hydrology, environmental monitoring, exchange of expert visits, exchange of literature, etc.). To improve their forecasting capacities SEE countries should increase their cooperation with global, regional and specialized centers producing NWP, by developing their NWP capacities and become

	CMC is appointed UNISDR Focal Point. In the framework of the implementation of the NP for DRR several activities were undertaken among which are: - Set up thematic working group for development a Strategy for DRR of Republic of Macedonia - On the occasion of October 13th International Day of reducing disaster risks in the context of the global campaign for inclusion of people with disabilities are implemented activities for DRR inclusion of visually impaired and blind people under the slogan "Disability is not inability"; **Nevertheless, there are still needs to further improve the legal and institutional DRR framework, including to avoid overlapping of responsibilities, in particular with those of CMC and Protection and Rescue Directorate** FYR Macedonia, in transition to a market economy, needs to reconsider the legal background for operation of the National Hydrometeorological Service (NMHS) and adapt	build capacity of the existing staff of NMHS to work with AWS. There is a need to adopt a unified software which runs the diverse vendors AWSs. There is a need to establish Laboratory for control, maintenance and calibration of AWS sensors. **CMC:** The project for establishing an Integrated system of prevention and early warning of forest fires, which are realized in cooperation with JICA, provide 15 modern Automatic weather stations (AWS). These AWS now are part of regular meteorological network of NMHS, which significantly strengthened the technical capacity of the National Hydro-Meteorological Service. This is a rare example where through DRR project reinforces Hydro- meteorological service of Republic of Macedonia. There is an urgent need to utilize the observations obtained from the JICA project AWSs, and to make these data available for all experts at NMHS. Upper-air observations have not been performed for last **five** years due to the lack of finances for dislocation of the station which was removed from its old location. NMHS has a	NMHS has very limited computing capacity. It procures personal computers for its staff's use, and some servers for computationally less demanding applications. There is a need for both, regular telecommunication and data base servers, and high performance computing capacities, in order to accommodate for seasonal forecasting, regional climate modeling, and hydrological and flood forecasting.	observed data are applied. Data rescue methodologies are applied partially. Training is missing for this activity. There is a need for training to improve data rescue and data management capacities of NMHS following established WMO standards and best practices. There is a need to integrate data rescue and data management components into specific climate research or climate services related projects and activities [presumably jointly on sub-regional scale]. There is a progress in providing meteorological metadata. Locations of meteorological, climatological and hydrological stations are GPS fixed. GIS technology as an essential tool is applied on basic level. There is no development and application in data and risk analyses. There is a need for a capacity building in GIS technology. CMC and NMHS signed a Memorandum of Cooperation, which in principle provides bases for exchange of data and information.	of IT personal in NMHS is the main cause for deterioration of data processing and weather forecast. Lack of finances hampers the improvement of technical capacities for data processing and operative public weather forecast, including tailored forecasts for different users. There is an urgent need to develop capacities for operational round a clock weather forecasting, based, inter alia, on ECMWF products. Forecast Department is inadequately staffed, and their working environment should be substantially improved. Existing human and technical capacities of NMHS are not utilized in full. There is a need for more training in the following fields: satellite meteorology, application of NWP products, hydrological forecasting. The capacity for operational hydrological forecasting at NMHS is rather limited. At the moment manual graph model for predicting floods is applied. Slight progress was made	the law to support CMC and PRD in the Early Warning Systems for meteorological and climate related hazards (flood, fire, drought, …). This competence is enshrined also in the bylaw, and is included as an Institutional framework in signed Memorandum of collaboration between HMS and CMC**. In case of forest fires HMS provide necessary meteorological information through Integrated Geographical System which CMC established in cooperation with JICA.** This GIS system can be expanded for flood and drought. **There is a need to work further on broadening the scope of the GIS system established by CMC for other hazards (floods, droughts, cold spells, heat waves, …).** The "integrated 112 system" in FYR Macedonia is not operational yet, but the CMC operates an emergency phone number 195, parallel of which there are three phone numbers, 192 for police, 193 for fire services and 194 for **ambulance. Activities are underway to establish an integrated telecommunications system for emergencies - 112.** HMS is using the products from ECMWF (e.g. Extreme	members of NWP model consortiums. Linkages between NWP models and hydrological models should also be developed for a better flood forecasting. **The EUMETNET Forecasting Programme potential could be explored.** Bilateral cooperation with Switzerland in operational hydrology, which has been already established, should be continued, if possible. Modernization and interoperability of the meteorological and hydrological networks should be implemented at the sub-regional level, and should include automatic on-line stations, a sub-regional radar network as well as a lightning detection network; A regional Multi-Hazard Early Warning System composed of inter-operable national Early Warning Systems should be designed through a regional cooperation process.

	to the new economic situation (e.g. further development of services for the end users). NMHS has a potential to serve the needs of several ministries covering agriculture, environment, transportation, defense, economy etc. Strategic Plan for Development of NMHS should be prepared. The position of NMHS among the governmental offices may be reassessed, with a view of possible reorganization of the NMHS structure to better implement the obligations and mandates given by the law, an potentially seek for better finances. Quality Management System (QMS) came to the attention of NMHSs and the top management initiated its implementation. **There is an urgent need to support HMS of FYROM in their adoption of the QMS [e.g. NMHSs with ISO 9001 Quality Management Systems could provide examples of their documentation].** The New National Strategy for Protection and Rescue was adopted recently by the Assembly of the Republic of Macedonia, covering the	plan to renew upper-air measurements and to establish a new station with new equipment. Previous station was located at the Airport "Alexander the Great" near Skopje City. New location for the station is envisaged at the NMHS headquarters in Skopje. This project needs financial support, and employment of additional qualified personnel. There is an urgent need to set-up operational upper-air observations in the Republic of Macedonia. NMHS of FYR Macedonia has 9 AWS installed. Produced Data are for climatological purposes; Two weather radar are in use for now-casting and weather modification. These old technology radars were upgraded and digitalized. Nevertheless, they are often out of function, as their hardware maintenance is complicated [MRL 5 S/X produced 1985, and WSR 74 S/X produced 1984, both upgraded in 2005]. At least one new radar system is necessary for early warnings and research purposes. There is a strong need for employment of young staff, especially with technical engineering background. Special attention should be			through participation at a few training seminars for flood forecasting, which was not sufficient to implement the knowledge in practice. There is an urgent need to develop capacities to use hydrological models, to advance operational hydrological forecasting, and to establish a warning system for floods and flash floods.	Forecast Index, EPS and deterministic Forecast, etc.) in its preparation of EWS information. It also uses the EUMETSAT products, as it was granted a satellite receiver. According to established methodology and conceptual design of Integrated GIS (Macedonian Forest Fires Information System – MKFFIS), Hot Spot map have two channels, one of them is EUMETSAT MSG-SEVIRI (http://mkffis.cuk.gov.mk/index.php/pocetna_strana/pocetna?lang=en). In cooperation with NMHS, CMC received a license to use the data by EUMETSAT for the purpose of creation of Hot Spot map. FYR Macedonia has a co-operating state status at ECMWF, and is not a member of EUMETSAT due to lack of financial resources. The EUMETNET Programmes contribution to the preparation of EWS (OPERA composite, EMMA cross-border information) is very useful in the system of EWS. Unfortunately, OPERA composite is not implemented in most of the Balkan countries. Implementing OPERA should be essential for EWS and now-casting. There is a need for further training in utilization of ECMWF, EUMETSAT, and EUMETNET products in order to	

	period 2014 to 2019. **NMHS: SOP for Warnings and preparedness of weather and other natural hazards in state of emergency** is defined, which regulates the flow of information within and from the NMHS towards Crisis Management Center, Protection and Rescue Directorate, competent institutions, and Public and Media. Consistent to this SOP the NMHS adopted a **Protocol for Early Warning of hazardous weather, water, and environment phenomena in regular condition**. NMHS has a well-established collaboration with the Ministry of Health in the prevention and early warning on cold spells in winter, and heat waves in summer (http://zdravstvo.gov.mk/kako-protiv-studenoto-vreme/); NMHS and CMC signed a Memorandum of cooperation, which defines also the instruction on the way the NMHS is involved in Crisis Management System for protection and rescue of Republic of Macedonia. NMHS and the Institute for Public Health signed an Agreement for collaboration.	given to trainings of observers and technicians in order to contribute to a higher quality of observations and measurements in the observing systems of NMHS. **HYDROLOGY:** Hydrological observational network was set-up following the methodology taken from ex-Yugoslavia (dated 1956). The network has not been renovated for almost 20 years. Some stations need dislocation due to newly build hydro-technical facilities, which alter the measured data. There is a lack of professional hydrologists and staff to run and maintain the hydrological network. There is a need to revise and modernize the hydrological network (dislocate inadequate stations), and consider hiring new hydrologists at NMHS.				improve the warning products. The potential of the EUMETNET Programme Eumetcal could be explored. HMS is participating in a study of drought monitoring in Macedonia in the frame of collaboration with the Drought Management Centre for SEE (DMCSEE). Under this collaboration focus is placed on monitoring and assessing drought and assessing risks and vulnerability connected to drought. In the frame of the project for establishing an integrated system of prevention and early warning on forest fires (Macedonian Forest Fires Information System, MKFFIS) web based GIS system was introduced. One of the products of this system is a Vegetation dryness map. There is a further need to strengthen the agrometeorology capacities of HMS to support drought risk assessment. Integrated database on disaster-related information is being established. CMC was granted with a software package by UNDP to build an present and historical disaster data base for FYR Macedonia. At the moment this data base is not accessible for other	

	The Regulation for collaboration of HMS for Macedonian Army purposes is also in place; There are also other instructions and procedures concerning meteorological and hydrological services. There is an urgent need to adopt the above SOP, the Protocol, and different Instructions and/or technical memoranda in form of an ISO 9001 Standard documentation. Under the CMC HQ a national operational and information center is established, together with other 8 regional operational information centers which cover the whole territory of the Republic of Macedonia with 24/7 duty. CMC is the only civil institution which has a duty operational center with characteristic telephone number for emergency calls 195 (in near future transformed to E-112). HR of the NMHS: there is no significant change. The number of the qualified professional staff is inadequate, whereas the number of administrative staff is sufficient. There is a need to employ young professional staff, at least on a contractual basis [e.g. through their					institutions. The local self-governments are responsible, de-jure, to provide CMS, CMC and PRD with the data about damages incurred in the aftermath of natural disasters. Nevertheless, a number o problems arouse which are related to the clear procedure, methodology nomenclature, financial indicators etc.	

	engagement on international projects].						