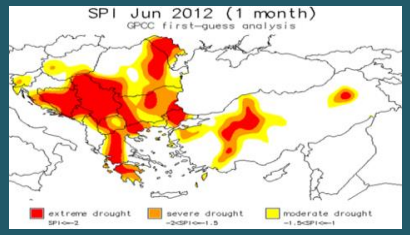
Building Resilience to Disasters in Western Balkans and Turkey

IPA PROJECT
BUILDING RESILIENCE TO DISASTERS IN WESTERN BALKANS AND TURKEY

TASK 6: National Early Warning Systems – assessment of current capacities, identified gaps and recommendations (reports for each beneficiary)

Sergio Pasquini and Milan Dacic, WMO

REGIONAL FORUM ON MULTI-HAZARD EARLY WARNING SYSTEM
15 OCTOBER 2014, ANKARA, TURKEY



Outline

A – TASK 6: TERMS OF REFERENCE AND METHODOLOGY

B – SUMMARY OF EIGHT PROJECT BENEFICIARIES EWSs:

1. Albania
2. Bosnia and Herzegovina
3. Croatia
4. Kosovo (UNSCR 1244-99)
5. FYR Macedonia
6. Montenegro
7. Serbia
8. Turkey

Task 6 "Design a Regional Multi-Hazard Early Warning System composed of harmonized National Early Warning Systems within the regional cooperation frameworks"

- Assessment and gap analysis of the existing national Early Warning Systems
- Preparation of a Technical design document describing a **seamless** regional Multi-Hazard EWS, composed of harmonized and inter-operable national MHEWS.

Terms of Reference and Methodology of work

- ***A Concept and Design Document* will be developed utilizing regional collaboration** in engaging the national Disaster Risk Management (DRM)/ Civil Protection Agencies and the National Meteorological and Hydrological Services (NMHSs) of the project beneficiaries. The document will describe and specify the necessary technological, operational and institutional arrangements for building the business case for a regional MHEWS composed of harmonized and inter-operable national EWSs.
- The above **system design involves close cooperation and consultation with the main DRM stakeholders**. A thorough study of user requirements is the basis of all system specifications, product definition and procedure design. Therefore, the *Task 6 Design Team*, which was established, engages both DRM and NMHS expertise.
- The work of the **Design Team**, supported by a team of experts from WMO, will build upon the capacity assessments that have been conducted for each beneficiary during the preceding DRR/SEE IPA Project (2010/2011), complemented **with visits to the beneficiaries by two project consultants**. Since the objective of the system design phase requires detailed analysis and specifications of the national needs, face-to-face consultations with the beneficiaries' stakeholders are of vital importance. Therefore, a coordinated action plan for the design was developed, followed by visits to each of the agencies for more in-depth discussions at expert level.

ToR

- Desktop review of available assessments of meteorological, hydrological, and climate-related hazards, and related institutional capacities for MHEWS.
- Comprehensive analysis of capacities, gaps and requirements related to the four components of EWS in the SEE beneficiaries for meteorological, hydrological and climate-related hazards, including
- Review existing regional agreements and arrangements of the SEE beneficiaries
- Field visits by consultants to beneficiaries
- Preparation of the Design Document for the regional MHEWS – Institutional and Technical Parts
- Organization of meetings and a final dissemination workshop

Structure of the Reports

Background

PRESENT STATUS OF ENABLING ENVIRONMENT FOR EWS IN PROJECT BENEFICIARY

- *Introduction*
- *Progress since 2007-2011*
- *Recommendations*
- *Conclusion*

KEY STAKEHOLDERS AND DECISION MAKERS AND THEIR RELATIONSHIP IN MHEWS

- *Introduction*
- *Progress since 2007-2011*
- *Recommendations*
- *Conclusion*

OPERATIONAL COOPERATION BETWEEN THE DRM AGENCY AND NMHS

- *Introduction*
- *Progress since 2007-2011*
- *Recommendations*
- *Conclusion*

TECHNICAL CAPACITIES OF NMHS IN SUPPORT TO MHEWS

- *Introduction*
- *Progress since 2007-2011*
- *Recommendations*
- *Conclusion*

Focus

- Present Status of Enabling Environment for the national EWS
- Key Stakeholders and Decision Makers and their Relationship within the Multi-Hazard Early Warning System
- Operational Cooperation between the DRM Agency and the NMHSs
- **Technical Capacities of NMHS in Support to MHEWS**

Albania

Present Status of Enabling Environment for the national EWS

Conclusion

- The enabling environment for DRR is under a comprehensive updating process for improving the coordination mechanism as well as the definition of roles and responsibilities of the DRR entities. There is an urgent need to finalise the aforementioned process. In order to further consolidate the institutional framework, it is highly recommended to strengthen the capacities of the entities in the direction of a comprehensive DRR that includes prevention and mitigation and to **finalize the ongoing work for establishing a National Platform and a Strategy for DRR.**

Albania

KEY STAKEHOLDERS AND DECISION MAKERS AND THEIR RELATIONSHIP WITHIN THE MULTI-HAZARD EARLY WARNING SYSTEM

Conclusion

DGCE has the clear mandate for national coordination, at central and local level, in relation to DRR issues. Notwithstanding there is a need to clarify the role of other institutional bodies in relation to floods.

IGEWE has further improved the support to DGCE and to the other DRR related institutional entities and the progress should be consolidated developing the relevant SOPs.

At the same time it is also highly recommended:

- to further improve the operational cooperation between the IGEWE and the MMS particularly for the real time exchange of observational data;
- to involve the IGEWE through its Seismology Department in the Eurocode adoption process, …..

Albania

OPERATIONAL COOPERATION BETWEEN THE DGCE AND THE IGEWE

Conclusion

- The clarification of the mandates of the DRR institutional bodies in relation to the hydro-meteorological warnings is the highest priority.
- There is a need to further expand the potential of automatic dissemination of warnings (sms, web site, TV, etc…) in line with expected requirements of the new law on Civil Protection";
- There is a need to improve, in collaborative efforts with MSNATA and regional partners, the forecasting model to better predict and localize the aviation hazard.

Albania

TECHNICAL CAPACITIES OF IGEWE IN SUPPORT TO MHEWS

Recommendations

- There is a need to modernize and rehabilitate the meteorological and climatological observation network to finalise the implementation of new 50 AWSs.
- There is a need to finalise the AdriaRadNet Project
- There is a need to establish a lightning detection network
- There is a need to provide the national budget resources for maintenance of equipment.
- There is a need for data rescue and digitization of the historical records that still exist only in paper format.
- There is a need to further improve the collection, transfer and processing of hydrological data.
- There is a need to strengthen the IT sector (equipment and personnel) in order to make sustainable the good progress achieved.
- There is need to restart the contacts with ECMWF for Co-operating State membership e to initiate the procedures for qualified staff to attend the ECMWF training courses.
- There is a need to restart the contacts with EUMETNET in order to join the EMMA and EMMA-H Projects and in perspective OPERA.
- There is a need for further capacity building in using the EUMETSAT products for EWS.
- There is an urgent need for new qualified staff including meteorologists, hydrologists, and IT-personnel.
- There is a need for additional training to be provided for the existing staff in:
  - flood forecasting;
  - specialized training in satellite and radar applied meteorology, and nowcasting;
  - forecasting and nowcasting products generation;
  - calibration and maintenance (with support of RIC);
  - seasonal forecasting (with a support SEEVCCC).

Albania

TECHNICAL CAPACITIES OF IGEWE IN SUPPORT TO MHEWS

Conclusion

- IGEWE has, particularly after the recent and on-going improvements, an organizational and technical capacity to base its further development for providing a high quality service to DRM authorities in line with the requirements of the new law on Civil Protection. Future capacity building and development is to be firmly associated with enhanced regional and international collaboration involving the hydro-meteorological and DRM communities.
- The increase of skilled personnel is the highest priority.
- In order to further improve the service to DRM associated to flood hazards at national scale, it is recommended to enhance the hydrological and the weather radar networks as well as to establish a lightning detection system capability covering the whole country.
- As far as the meteorological forecasting is concerned, it is considered of fundamental importance to benefit of the full range of ECMWF products from Medium Range to seasonal forecasting as well as of the European Centre's meteorological software. Of great importance is also the potential increase of upper air observation at sub-regional level.

Bosnia and Herzegovina

PRESENT STATUS OF ENABLING ENVIRONMENT FOR THE NATIONAL EWS

Recommendations

- There is need to consolidate and further strengthen the opportunities offered by the launches of the DRR Platforms at Bosnia and Herzegovina, and at Republic of Srpska entity level;

Conclusion

- The enabling environment for DRR has been recently updated with the launch of the Bosnia and Herzegovina Platform for DRR as well as at entity level with the launch of the RS DRR Platform. In order to fully benefit of the above mentioned improvements it is recommended to strengthen the cooperation between FHMZ and RHMZ along the lines of the successful initiative related to the EUMETNET/EMMA Project.

Bosnia and Herzegovina

KEY STAKEHOLDERS AND DECISION MAKERS AND THEIR RELATIONSHIP WITHIN THE MULTI-HAZARD EARLY WARNING SYSTEM

Recommendations

- There is a need to further strengthen the cooperation and real time data and products exchange at entity level – the FHMZ FBiH and RHMZ RS and Civil Protection, and Water Agencies – by developing MoUs and related SOPs according to the WMO No. 1099 document ("Guidelines for Creating a Memorandum of Understanding and a Standard Operating Procedure between a National Meteorological or Hydrometeorological Service and a Partner Agency");
- There is a need to consolidate and further strengthen the cooperation which is already in place for the Meteoalarm Project between FHMZ FBiH and RHMZ RS, and to consider further joining additional EUMETNET Projects like OPERA, EMMA Hydrology and Climate Programme activities on climatological and phenological databases (ECA&D and PEP725 respectively).

Conclusion

The cooperation between the MHEWS stakeholders is in place and effective as the EMMA Meteoalarm Project is confirming. Notwithstanding there is a need to improve the cooperation and the real time data exchange between the FHMZ and RHMZ with Civil Protection and Water Agencies at entity level. In particular MoUs and SOPs should be developed.

Bosnia and Herzegovina

OPERATIONAL COOPERATION BETWEEN THE DRM AND THE HMSS IN BIH

Recommendations

1st Priority:

- There is an urgent need to establish a flood and flash flood warning system;
- There is an urgent need to improve the weather radar network;
- There is a need to improve the meteorological forecasting models to better predict the localization and the intensity of the high impact weather on short time scales;
- There is a need to improve, in collaborative efforts with the Directorate of Civil Aviation , and regional partners, the forecasting model to better predict and localize the aviation hazard.

2nd Priority:

- There is a need to enhance agro-meteorological observation network to better predict mid- to long-range drought conditions;
- There is a need to establish a lightning detection network to cover entire territory of BiH;
- There is a need to strengthen the RHMZ and FHMZ computing and telecommunications facilities, (hardware and software) for the warnings dissemination.

Conclusion

- Current technical capabilities of RHMZ and FHMZ constitute a good starting point on which further enhancements are to be made in order to provide adequate support to the disaster risk management in Bosnia and Herzegovina for the main hydrometeorological hazards.
- In order to further improve this support, it is recommended to enhance, in a perspective of MHEWS, the agro-meteorological, the weather radar and lightning observation networks as well as to develop an operational hydrological forecasting model capacity.
- It is essential to further enhance cooperation and data exchange between the entity hydrometeorological services, FHMZ and RHMZ can better fulfill their mandates. Excellent example of such enhanced collaboration is RHMZ and FHMZ joint work on issuing operational Meteoalarm for Bosnia and Herzegovina). It is also necessary to strive to establish a 24/7 round the clock operational meteorological and hydrological forecasting.

Bosnia and Herzegovina

TECHNICAL CAPACITIES OF FHMZ AND RHMZ IN SUPPORT TO MHEWS

Conclusion

- Two hydrometeorological services in Bosnia and Herzegovina, the Republic Hydrometeorological Service of Republic of Srpska (RHMZ-RS) and the Federal Hydrometeorological Service of Federation of Bosnia and Herzegovina (FHMZ-FBiH) have promising organizational and technical capacity to base its further development aiming ultimately at providing a high quality service to DRM authorities. Future capacity building and development is to be firmly associated with enhanced regional and international collaboration involving hydrometeorological and DRM communities.
- There is a good starting position to act towards the implementation of **QMS system at FBIH** as there are several important pieces of regulation which already serve as operative documentation for the daily work of the service. Further work on these and **establishment of a team in RHMZ** which will be dedicated to draft all necessary procedures is required together with enhanced sub-regional cooperation with the MHSs which are further along the way, or already have introduced the QMS.
- One of the prerequisites for the above goals is the existence of improved observational and forecasting systems, which are run and maintained by well trained professional staff who undertake continuing education.
- In order to further improve the service to DRM associated to flood hazards at the scale of BiH, it is recommended to **enhance the hydrometeorological observation networks**, including establishing the **weather radar systems** which will cover the entire territory of Bosnia and Herzegovina. Improved forecasting capabilities, in particular those focused on the identified small river catchments within the BiH, but also to the cross border river catchments is also highly recommended.
- As far as the meteorological forecasting is concerned, a list of technical requirements is given in this chapter, which takes into account different components of the forecasting system, but also stresses the need **for further improvements in IT sector**. As an example, in order to better serve the needs of numerical weather prediction, it is recommended to **improve upper air observations**, **upgrade the existing forecasting system**, and **seek for new and additional expertise in NWP** for meteorological department which could be either project-based or conceivably permanently hired by the MHSs. Striving to **become a member of ECMWF**, and utilize other opportunities under the **EUMETNET (OPERA, C-SRNWP, etc.**) will contribute to developing capacities in NWP and other areas of MHS mandate.

Croatia

PRESENT STATUS OF ENABLING ENVIRONMENT FOR THE NATIONAL EWS

Conclusion

- There is a system of well-established institutions for protection and rescue at national and local level, as well as a legal framework that governs disaster preparedness and response. However, DRR is not systematically addressed in either overarching or sector specific strategies.
- The roles and responsibilities in DRR and EWS are well defined, and the coordinating mechanism is implemented through central and local governing structures. In order to further improve the enabling environment, **it is recommended to strengthen the coordination between the DRR stakeholders**, to reduce the underlying risk factors through the integration of DRR in developments policies and **finalize the ongoing work in aligning the enabling environment to the European framework**.

Croatia

KEY STAKEHOLDERS AND DECISION MAKERS AND THEIR RELATIONSHIP WITHIN THE MULTI-HAZARD EARLY WARNING SYSTEM

Recommendations

1st Priority:

- Finalization of the Strategy for adaptation on climate changes under development by the Ministry of Environmental and Nature Protection;
- Strengthening of the efforts, in the framework of the National Platform for DRR, for the Mapping of meteorological and hydrological hazards together with NPRD and Croatian Waters.

2nd Priority:

- Further development of a single database on disaster financial losses for the whole Republic of Croatia building on the existing specific databases, i.e. at the Ministry of Finance, the Meteorological and Hydrological Service, and the local self-governments;
- The finalization of the document "National Platform for DRR", under joint development by NPRD, CSS and DHMZ.

Recommendations

According to the law, NPRD has the lead in DRM in Croatia. The **DHMZ plays a central technical role in MHEWS**, and is a **member of the Protection and Rescue Headquarters** of the Republic of Croatia. DHMZ actively cooperates with other key stakeholders and decision makers in the country. In order to further improve this cooperation, it is **recommended to finalize the existing joint efforts and to strengthen the technical and scientific support to the Ministry of Environmental and Nature Protection on the development of the Strategy for adaptation on climate change.**

Croatia

OPERATIONAL COOPERATION BETWEEN THE NPRD AND THE DHMZ

Conclusion

DHMZ current technical capability allows to provide full support to NPRD for the main hydrometeorological hazards in Croatia. In order to further improve this support, it is recommended to **enhance** the meteorological and hydrological **observing networks** and the efforts for the development of the **hydrological forecasting model**. Moreover, the strengthening of the computer resources and the encouraging results of the new operational forecasting system could be further optimized and tailored, in perspective of MHEWS.

Croatia

TECHNICAL CAPACITIES OF DHMZ IN SUPPORT TO MHEWS

Recommendations

- There is a need to implement hydrological numerical forecasting model on large and small river catchments;
- There is a need to install 6 new weather radars;
- There is a need to implement higher resolution deterministic meteorological forecasting model, and to introduce regional ensemble forecasting system;
- There is a need to integrate the Climate Watch System advisories into the MHEWS;
- There is a need to establish joint working groups between DHMZ and DUZS to tailor the products for different end-users (agriculture, electric power company, etc.);
- There is a need to further exploit the benefits of the hydrological warning exchanges through EUMETNET EMMA-Hydrology;

Conclusion

- DHMZ has the organizational and technical capacities for providing a high quality service for all MHEWS components, and it is actively linked to regional and international hydrometeorological community. Collaboration is implemented through SOPs with MHEWS partners like DUZS, Croatian Waters, Mountain Rescue Service, Red Cross, Ministry of Interior, Ministry of Defence, Croatian Seismological Survey, and others.
- In order to further improve the service to DRM related to flood hazards at national scale, it is recommended to enhance the meteorological and hydrological observing networks, including weather radar systems, and the forecasting capabilities.
- Completing the collaboration with the relevant partners on extreme weather and climate hazards, and in support to the Ministry of Agriculture and NPRD – which are responsible for drought hazard and risk assessments – it is **recommended to further improve the Climate Watch System**.
- A list of technical requirements for DHMZ to support the MHEWS is given in Chapter 5, which takes into account different components of the forecasting system **(data assimilation, NWP model, operational data base, telecommunications, high performance computational resources,** etc.). If realized, these technical requirements may improve the operational work of the DHMZ and deliver better services to MHEWS.

Kosovo*

PRESENT STATUS OF ENABLING ENVIRONMENT FOR THE NATIONAL EWS

Recommendations

- there is an urgent need to finalize the approval of the **KHMI new structure** expanding the sectors from 3 to 4 with the aim to improve the capacity of laboratory, but also to strengthen the existing meteorological department;
- there is an urgent **need to improve the coordination with the Water Department of the Ministry of Environment and Spatial Planning particularly in area like floods and droughts monitoring and forecasting;**
- to further strengthen the efforts for the **establishment of the National Platform on DRR**;
- to accelerate the actions for the finalization of the DRR Strategy.

Conclusion

- The institutional framework is well defined and the cooperation is well regulated and in place. In order to further consolidate the institutional framework it is highly recommended and urgent to strengthen the capacities of the KHMI with the approval of the new structure with the increase of resources mainly aimed at strengthening the meteorological component. The coordination with the Water Department of the Ministry of Environment and Spatial Planning should be reinforced in areas like floods and droughts.
- The ongoing work on the National Platform and the Strategy on DRR should be accelerated.

*) This designation is without prejudice to position on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

Kosovo*

KEY STAKEHOLDERS AND DECISION MAKERS AND THEIR RELATIONSHIP WITHIN THE MULTI-HAZARD EARLY WARNING SYSTEM

Recommendations

- There is an urgent need to strengthen the efforts for the finalization of the EMA ongoing work on Risk Assessment review and update in particular for socio-economic vulnerability;
- There is an urgent need to explicitly include **compliance with WMO** and internationally agreed standards (for example ISO QM) **in the Law** for Hydro-meteorological activities;
- There is a need to improve the synergies **between KHMI and the Meteorological Division at Pristina International Airport**;
- There is a need for progress in the adoption of constructions "Eurocodes" and in monitoring their enforcement for earthquake damage mitigation.

*) This designation is without prejudice to position on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

Kosovo*

OPERATIONAL COOPERATION BETWEEN THE EMA AND THE KHMI

Conclusion

- The increase of KHMI technically skilled human resources is the highest priority. The ongoing KHMI support to EMA should be formalized with an MoU and related SOP. In order to improve this support in a perspective of MHEWS, it is **recommended to enhance the hydrological, the agro-meteorological, the weather radar and lightning observation networks**. At the same time it is **recommended that KHMI is granted access to the outputs of operational hydrological and meteorological forecasting systems through a regional cooperative effort.**

*) This designation is without prejudice to position on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

Kosovo*

TECHNICAL CAPACITIES OF KHMI IN SUPPORT TO MHEWS

Recommendations

- The increase of KHMI technically skilled human resources is the highest priority;
- There is a need to enhance the hydrological observation network, including the automatic hydrological stations and automatic rain gauges in order to enable KHMI to support EMA (initially through international cooperation) in their decision making with regard to the potential hazards on the following highly critical river catchments:
  - River Sitnica – 4 Automatic Hydrological Station (AHS), and 4 Automatic Rain Gauge station (ARG) (rehabilitation of the old stations)
  - River Drin – 7 AHS, 7 ARG (rehabilitation of the old stations)
  - River Morava – 3 AHS, 3 ARG (rehabilitation of the 2 old stations, 1 new station)
- - There is a need to install the GPRS connectivity to the observation networks and data loggers and computers in the stations for real-time data delivery;
- There is a need to work jointly within the sub-region on implementation of hydrological forecasting;
- There is a need to strengthen the sub-regional cooperation in exchange of radar data;
- There is an urgent need to develop a website for the KHMI for provision of weather related information to stakeholders and public;
- There is a need to implement, through international collaboration, a hydrological numerical forecasting model on river catchments (e.g. river Drin);
- There is a need to grant access to the outputs of hydrological and meteorological systems through a cooperative effort at regional level;
- There is a need to improve the operational data and products exchange with the Meteorological Department of Pristina International Airport for resource optimization and better prediction of aeronautical hazards.
- There is a need to strengthen the KHMI computing and telecommunications facilities, under both aspects of hardware and software, for the warnings dissemination in real time;
- There is a need for further capacity building in using the EUMETSAT products for EWS;

*) This designation is without prejudice to position on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

Kosovo*

TECHNICAL CAPACITIES OF KHMI IN SUPPORT TO MHEWS

Conclusion

- The general conclusion from the Phase I of the IPA project is that the situation in Kosovo is not favorable for efficient and effective DRR activities. There are some improvements in the technical capacities of KHMI to deal with DRR issues, nevertheless there are still considerable broad technical areas which require urgent capacity building and development.
- To alleviate this problem and to improve the provision of hydrometeorological services in support of DRR in Kosovo, there is a need to establish working arrangements between the provider of hydrometeorological data and services (KHMI) and the Emergency Management Agency (EMA), ensuring the provision of early warnings and advices on meteorological and hydrological hazards.
- To fulfill this mandate there is a need for **KHMI to provide and maintain the minimum necessary physical infrastructure based on automatic meteorological and hydrological stations with real-time transmission of data**. Complementing to this is a trained expert staff is required which will operate this network, and for which continuing long-term education and training has to be secured.
- The situation with personnel and infrastructure in meteorology and hydrology is less convenient than in the chemical laboratories. Partial rebuilding of the meteorological and hydrological networks took place in 2001. Nevertheless, at present in addition to requirement for enhancing the meteorological and hydrological observation networks, there is a need to implement twinning projects in order to make better use of the investment done previously and in the future.
- With adoption of new organizational structure of KHMI, possible better organizational and technical capacities for providing a higher quality service will exist at KHMI for MHEWS components.
- In order to further improve the service to EMA related to flood hazards, it is recommended to **enhance the hydrometeorological observation networks, including utilization of weather radar observations obtained through sub-regional cooperation,** and the **forecasting capabilities on the identified small river catchments** within Kosovo, but also in the neighboring areas (in connection to cross-boundary hazards).
- Regarding the drought hazard, it is recommended to further improve the climate watch system, and the agro-meteorological observation network and practice.

*) This designation is without prejudice to position on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

FYR Macedonia

PRESENT STATUS OF ENABLING ENVIRONMENT FOR THE NATIONAL EWS

Conclusion

- The enabling environment for DRR has been recently updated improving the coordination mechanism as well as the definition of roles and responsibilities of the DRR entities. In order to further consolidate the institutional framework, it is **recommended to strengthen the capacities of the entities in the direction of a comprehensive DRR that includes prevention and mitigation** and to finalize the ongoing work in the context of the NP on DRR. An Action Plan should be developed for the implementation of the Strategy for Protection and Rescue 2014–2019 which was recently approved.

FYR Macedonia

KEY STAKEHOLDERS AND DECISION MAKERS AND THEIR RELATIONSHIP WITHIN THE MULTI-HAZARD EARLY WARNING SYSTEM

Conclusion

- CMC has the overall responsibility for the implementation of the NP on DRR which means coordination at national and international levels. Cooperation with the HMS is excellent and the HMS observation network has benefited from it. It is highly recommended to strengthen the efforts for the implementation of the 112 Integrated System as well as **to expand the GIS-MKFFIS to floods and droughts on the basis of an extended hydro-meteorological support**.

FYR Macedonia

OPERATIONAL COOPERATION BETWEEN THE CRISIS MANAGEMENT CENTRE AND THE HYDROMETEOROLOGIAL SERVICE

Conclusion

- HMS current technical capability provides a very good support to CMC for the main hydrometeorological hazards. Ongoing cooperative effort between CMC and HMS and the potential expansion of the GIS-MKFFIS to floods and droughts could lead to a broadening of the list of hazards covered. **In order to further improve this support, it is recommended to enhance, in a perspective of MHEWS, the agro-meteorological, the weather radar and lightning observation networks as well as to develop an operational hydrological forecasting model capacity.**

FYR Macedonia

TECHNICAL CAPACITIES OF HMS IN SUPPORT TO MHEWS

Recommendations

- There is a need to enhance the hydrological observation network with automatic hydrological stations and automatic rain gauges in order to support DRM decision making and HMS hydrological numerical forecast model on the following large and **small river catchments: Vardar, Lepenec, Treska, Pcinja, Bregalnica, Crna, Strumica**.
- There is a need to improve the discharge measurements.
- There is a need to develop a hydrological numerical forecast model and to establish a flood and flash flood warning system on large and small river catchments (e.g. above)
- There is a need to modernize and rehabilitate the meteorological and climatological observation network.
- There is a need to relocate the upper air station close to the yard of HMS and upgrade the equipment.
- There is a need to modernize the weather radar network to cover whole country (outdated radars need to be replaced).
- There is a need to establish a lightning detection network to cover full territory of the country.
- There is a need for data rescue and digitization of the historical records that still exist only in paper format.
- There is a need to strengthen the informatics sector (equipment and personnel).
- There is need to safeguard the national budget resources for annual ECMWF Co-operating State membership fee, and to strengthen the utilization of available information and products.
- There is a need to further exploit data/products generated by EUMETNET programmes, especially OPERA programme.
- There is a need for further capacity building in using the EUMETSAT products for EWS.
- There is an urgent need for new qualified staff including meteorologists, hydrologists, and IT-personnel.
- There is a need to improve the forecasting facilities including:
- Operational hydrological forecasting.
- There is a need to establish a calibration laboratory and improve the use of the calibration services of RIC.

FYR Macedonia

TECHNICAL CAPACITIES OF HMS IN SUPPORT TO MHEWS

Conclusion

- HMS has a promising organizational and technical capacity to base its further development aiming ultimately at providing a high quality service to DRM authorities. Future capacity building and development is to be firmly associated with enhanced regional and international collaboration involving the hydrometeorological and DRM communities.
- On-going work on the implementation of a **QMS at HMS** will substantially contribute, through hierarchical and procedural consistency in the production of warnings within the MHEWS, to their better serving the needs of DRM stakeholders in the country and internationally, and by doing so to improve the relationship between HMS and DRM authorities.
- In order to further improve the service to DRM associated to flood hazards at national scale, it is recommended to **enhance the hydrometeorological observation networks, including weather radar systems, and the forecasting capabilities**, in particular those focused on the identified small river catchments within the country, but also to the cross border river catchments.
- As far as the meteorological forecasting is concerned, a list of technical requirements is given in this chapter, which takes into account different components of the forecasting system, but also stresses the need for further improvements in IT sector. As an example, in order to better serve the needs of numerical weather prediction, it is recommended to improve upper air observations, upgrade the existing forecasting system, and seek for new and additional expertise in NWP for meteorological department which could be either project-based or conceivably permanently hired by the HMS.
- As an important contribution to the MHEWS in the former Yugoslav Republic of Macedonia, with in-country and international significance, it is recommended to implement the road weather forecasting and warning system on Corridor 10 through the former Yugoslav Republic of Macedonia.
- Regarding the drought hazard, it is recommended to further improve the climate watch system which is in operational use at HMS, and the agro-meteorological observation network.

Montenegro

PRESENT STATUS OF ENABLING ENVIRONMENT FOR THE NATIONAL EWS

Conclusion

- The institutional framework for DRR is well structured and the cooperation is well regulated and in place notwithstanding it is essential to better define roles and responsibilities amending the Law on Protection and Rescue and adopting a new Law on Water in line with the current efforts. **The ongoing work on the National Platform on DRR should be accelerated and finalized.** There is a need to accelerate the actions for the innovation of the National Strategy on Emergency Situations emphasizing the role of prevention and mitigation as well as the importance of an integrated approach in DRR.

Montenegro

KEY STAKEHOLDERS AND DECISION MAKERS AND THEIR RELATIONSHIP WITHIN THE MULTI-HAZARD EARLY WARNING SYSTEM

Conclusion

Significant progress has been achieved for effective coordination of crisis management and response but in the hydrological sector it is mainly focused on preparedness and response with respect to prevention and mitigation. DEM plays a key role in Risk Assessment and effectively cooperates with MARD and WD as well as with technical Institutes like IHMS. Notwithstanding there is an urgent need to better define roles and responsibilities in flood risk assessment and to finalize the ongoing work on the 112 System.

Montenegro

OPERATIONAL COOPERATION BETWEEN THE DEM AND THE IHMS

Conclusion

- The current IHMS operational support to DEM for MHEWS purposes is based on a high level scientific and technical background that benefits of the international cooperation (the European Meteorological Infrastructure, GIZ….). In order to improve this support, it is recommended to enhance the modernization of the hydrological network and to establish a weather radar and lightning observation networks. At the same time it is recommended that IHMS implements and/or enhance an hydrological, an oceanographic and an high resolution meteorological forecasting model as outcome of a regional cooperative effort.

Montenegro

TECHNICAL CAPACITIES OF IHMS IN SUPPORT TO MHEWS

Recommendations

- There is a need to **increase the number of automatized hydrological observation stations**, including the automatic rain gauges in order to enable IHMS to support DEM in their decision making with regard to the potential hazards on the following highly critical river catchments:
  - Rivers Tara, Lim, Zeta and Ibar: Output profiles for other countries. Rain Gauge in the basins of these rivers – 4 Automatic Hydrological Stations (AHS), and 4 Automatic Rain Gauge Stations (ARG) (rehabilitation of the old stations)
  - Rivers Lim, Tara, Ćehotina and Cijevna – 7 AHS, 7 Automatic Rain Gauge stations (ARG) (rehabilitation of the old stations and rain gauge in the basins of these rivers)
  - Rehabilitation of the old stations on Rivers Rijeka Crnojevića and Piva. New station on river Zaslapnica. Rain gauge in the basins of these rivers – 3 AHS, 3 ARG (rehabilitation of the 2 old stations, 1 new station)
- Need to **set-up one upper-air station** (consider jointly with the regional partners);
- There is a need to **establish a lightning detection network** to cover the entire territory of Montenegro;
- There is a need to establish a calibration laboratory. Initially it could be considered to utilize the calibration kit from Bosnia and Herzegovina;
- There is a **need to purchase one or two weather radars and strengthen the sub-regional cooperation in exchange of radar data**;
- There is a need to grant access to the outputs of hydrological and meteorological systems through a cooperative effort at regional level (RA VI, and SEE);
- There is a **need to implement, through international collaboration, a hydrological numerical forecasting model** on river catchments (e.g. river Drin-Buna catchment);

Serbia

PRESENT STATUS OF ENABLING ENVIRONMENT FOR THE NATIONAL EWS

Conclusion

- There is a clear policy for disaster risk management in Serbia, which is focused on a single, integrated MHEWS. The roles and responsibilities are well defined, and the coordinating mechanism is implemented through central and regional governing structures. In order to further improve the enabling environment, it is **recommended to finalize the ongoing work on the enabling environment and expand the existing regional and international cooperation.**

Serbia

KEY STAKEHOLDERS AND DECISION MAKERS AND THEIR RELATIONSHIP WITHIN THE MULTI-HAZARD EARLY WARNING SYSTEM

Conclusion

- According to the law, SEM has the lead in DRM in Serbia. The RHMSS plays a central technical role in MHEWS, and is a permanent member in the Republic Headquarters for Disaster Risk Management. RHMSS actively cooperates with other key stakeholders and decision makers in country. In order to further improve this cooperation, it is **recommended to refine the existing and adopt new procedures, particularly at local level to fully benefit of the distributed operational structure of the SEM and RHMSS.**

Serbia

OPERATIONAL COOPERATION BETWEEN THE SEM AND THE RHMSS

Conclusion

- RHMSS current technical capability allows to provide full support to SEM for the main hydrometeorological hazards in Serbia. Ongoing cooperative effort between SEM and RHMSS on implementation of the methodology for risk assessment will expand the support provided potentially leading to a broadening of the list of hazards covered. In order to further improve this support, it is **recommended to enhance the observing networks, and to implement new methodologies for vulnerability and risk assessment on different natural disasters.** Moreover, the encouraging results of the new operational forecasting system could be further optimized and tailored, in perspective of MHEWS.

Serbia

TECHNICAL CAPACITIES OF RHMSS IN SUPPORT TO MHEWS

Conclusion

- RHMSS has the organizational and technical capacities for providing a high quality service for all MHEWS components, and it is actively linked to regional and international hydrometeorological community. The QMS system is fully implemented in the production of warnings within the MHEWS.
- In order to further improve the service to DRM related to flood hazards at national scale, it is recommended to enhance the hydrometeorological observing networks, including weather radar systems, and the forecasting capabilities, inter alia, on the identified small river catchments within Serbia, but also in the neighboring countries (in connection to cross-boundary hazards).
- Regarding the drought hazard, it is recommended to further improve the climate watch system which is in operational use at RHMSS, and the agro-meteorological observing network (deep soil measurements).
- As far as the hydrometeorological modeling is concerned, a list of technical requirements is given in Chapter 5, which takes into account different components of the forecasting system (**data assimilation, NWP model, operational data base, telecommunications, high performance computational resources, etc**.). As an example, in order to better serve the needs of numerical weather forecasting it is recommended to improve upper air observations.
- **As an important part of the MHEWS in Serbia, it is recommended to implement the road weather forecasting and warning system on Corridor 10 through Serbia.**

Serbia

TECHNICAL CAPACITIES OF RHMSS IN SUPPORT TO MHEWS

Recommendations

Key issues to be addressed are:

- There is a need to enhance the hydrological observing network with automatic hydrological stations and automatic rain gauges in order to support DRM decision making and modeling efforts on the highly critical river catchments …
- There is a need to implement hydrological numerical forecasting model on large and small river catchments (e.g. rivers Jadar, Kolubara, Tamnava, Peštan, Ub, Ljig, Sava);
- There is a need to cover two river sub-catchments on the river Lim (upstream in Montenegro, and downstream in Bosnia and Herzegovina-Republic of Srpska) with AHSs and ARGs in order to apply the hydrological forecasting model which will benefit these two States, but also Serbia (through the river system Lim-Drina-Sava-Danube);
- There is a need to install a new weather radar to complete the full coverage of the territory of Serbia in western Serbia;
- There is a need to accelerate the joint work with DRM agency on designing the products for road maintenance companies, which include DRM contingency plans;
- There is a pressing need to improve telecommunication capabilities regarding radar data dissemination to sub-national early warning centers in Niš, Novi Sad and Kraljevo, so that these centers could benefit the real-time radar observations;
- There is a need to substantially increase the existing high performance computational resources (supercomputer) for the efficient implementation of MHEWS operational and research activities;
- There is a need to:
  - Implement higher resolution meteorological forecasting model (2km horizontal resolution, and 121 vertical level, with a focus on the planetary boundary layer) to better predict the localization and the intensity of all meteorological hazards.
  - Implementation of the operational cloud model forecasting, including radar data assimilation, and increase the model cycle updates to 4 instead of 2 per day.
  - Introduction of Data Assimilation in RHMSS NWP operational cycle.
- There is a need to develop a project on the road weather meteorological monitoring and early warning system along the European Corridor 10 highway through Serbia;
- There is a need to further develop and refine the Climate Watch System advisories, including to improve its spatial resolution;
- There is a need to establish joint working groups to tailor the products for different end-users (agriculture, electric power company,

Turkey

PRESENT STATUS OF ENABLING ENVIRONMENT FOR THE NATIONAL EWS

Conclusion

- The institutional framework for DRR is very well structured and the cooperation is well regulated and in place.
- Notwithstanding it is essential to continue the coordinating efforts between AFAD and MFAL/GDAR in relation to droughts and between AFAD and KOERI with respect to earthquakes.

Turkey

KEY STAKEHOLDERS AND DECISION MAKERS AND THEIR RELATIONSHIP WITHIN THE MULTI-HAZARD EARLY WARNING SYSTEM

Conclusion

Significant progress has been achieved for effective coordination between the main stakeholders in MHEWS with AFAD playing a key role in decision making and risk assessment. The operational cooperation between TSMS and AFAD, MFAL-GDAR , DSI and KOERI is in place and effective notwithstanding there is a need for the upgrading or implementation of data links for real time exchange. The ongoing efforts for the integration of KOERI NTEON seismological network in the AFAD TDVM should be strengthened.

Turkey

OPERATIONAL COOPERATION BETWEEN THE AFAD AND THE TSMS

Conclusion

- The current TSMS operational support to DEMP for MHEWS purposes is based on a high level scientific and technical background that benefits of the international cooperation (ECMWFl,EUMETSAT) and of an effective coordination at national level. **In order to further improve this support, it is recommended to enhance the link with the European Meteorological Infrastructure and in particular joining as full member ECOMET and EUMETNET or specific EUMETNET Programmes like OPERA, EMMA, EMMA Hydrology, C-SRNWP and Climate Programme** activities on operational meteorological (ECA&D) and phenological (PEP725) databases. It is also recommended to implement as soon as possible the planned upgrade of the data links for real time exchange between TSMS and DEMP and TSMS and DSI.

Turkey

TECHNICAL CAPACITIES OF TSMS IN SUPPORT TO MHEWS

Conclusion

- TSMS and DSI have the organizational and technical capacities for providing a high quality service for hydrometeorology MHEWS components, and it is actively linked to regional and international hydrometeorological community. The QMS system is fully implemented in the production of warnings within the MHEWS.
- In order to further improve the service to DRM related to flood hazards at national scale, it is recommended to **further enhance the hydrometeorological observing networks, including weather radar systems, and the forecasting capabilities, inter alia, on the identified small river catchments within Turkey,** but also at cross boarder river catchments (in connection to cross-boundary hazards).
- Regarding the drought hazard, it is recommended to further improve the **climate watch system**, and the agro-meteorological observation network and forecasting practice.
- As far as the hydrometeorological modeling is concerned, a list of technical requirements is given in Chapter 5, which takes into account different components of the forecasting system (data assimilation, NWP model, operational data base, telecommunications, high performance computational resources, etc.). As an example, in order to better serve the needs of numerical weather forecasting it is recommended to improve upper air observations.

Thank you.

Sergio Pasquini & Milan Dacic