WMO

Multi-Hazard Early Warning System (MHEWS): Policy and Legal Framework in Serbia as a useful example for the RCOF regions

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Republic Hydrometeorological service of Serbia

The Tenth Session of the South-East European Climate Outlook Forum (SEECOF-10)
Belgrade, Serbia, November 20-21, 2013

Republic Hydrometeorological Service of Serbia- Brief History

Meteorological and hydrological activity in the territory of Serbia has a long tradition. Systematic hydrological observations started in 1812 (Danube, Novi sad) and meteorological activity started on 1 January 1848, when Professor Vladimir Jaksic (1824-1892) introduced the first meteorological observations in Belgrade.

Meteorological Observatory Belgrade was established in 1887 and soon after that the Ministry of Education of the Kingdom of Serbia, on 27th September 1888 adopted a decision to set up a network of meteorological stations in Serbia. This date is the day of the official establishment of the National Meteorological Service of Serbia.

The Republic Hydrometeorological Service of Serbia (RHMSS) was established in 1947. In this way, all meteorological and hydrological activities in Serbia were integrated, excluding those carried out at the University.

Republic Hydrometeorological Service of Serbia (RHMSS) is a special organisation within the state administration responsible to the Government of the Republic of Serbia.

RHMSS as a NMHS of Serbia fulfils the international obligations of the Republic of Serbia in the field of meteorology, climate research and hydrology and takes part in the international cooperation through global and regional programmes of WMO, WCRP, IPCC, ECMWF, EUMETSAT and EUMETNET, EU FP7, as well as through the existing regional and bilateral projects.

Multi Hazard Early Warning System at RHMS of Serbia-The main achievements within governmental administration reform and the implementation of the National Programme for the Integration of the Republic of Serbia in the European Union during the last decade:

- Improved legal and institutional framework of the RHMSS;
- Enhanced capacity of the RHMSS to support DRR and adaptation to climate change, participation in governmental disaster risk and climate change activities and structures;
- Established of the operational national Climate Watch System as part of MHEWS and further development of the meteorological, climate and hydrological services;
- Enhanced infrastructure and capacity of the RHMSS to support WMO RA VI RCC Network-SEEVCCC operations and research functions;
- Enhanced Regional and International Cooperation and Partnership.

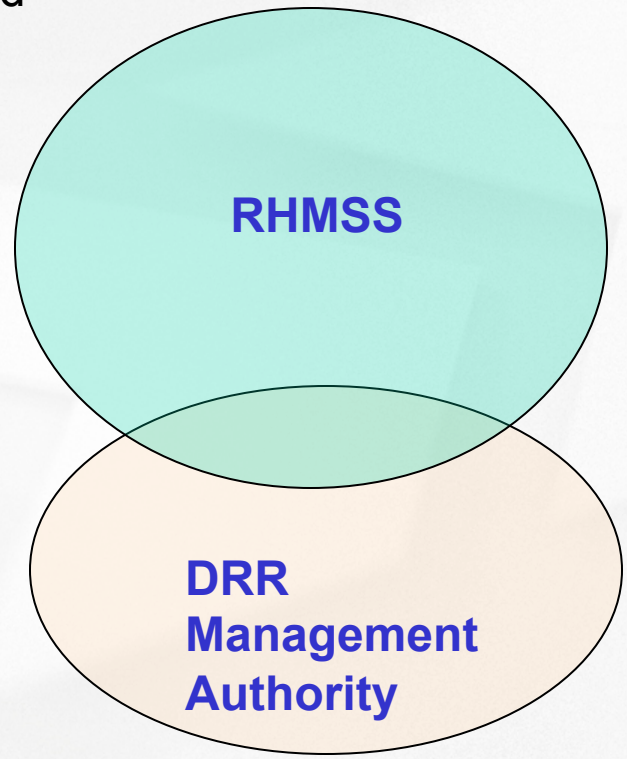
Improved legal and institutional framework of RHMSS

A new Law on Meteorological and Hydrological Activities ("Official Gazette of RS", No. 88/2010), recognizing goals of the Hyogo Framework for Action 2005-2015 and strategic priority of WMO and UNISDR, provide exclusive responsibility of the RHMSS for the issue of warnings and alerts and **defines the competences of the RHMSS as National Hydrometeorological Service in regard to the establishment and functioning of national multi-hazard hydro-meteorological early warning system (MHEWS),** which also includes risk mapping of disasters of meteorological and climate origin, creation of the national infrastructure of spatial meteorological and hydrological data in accordance with the EU INSPIRE directive, and the assessment of climate change impacts, vulnerability and options for adaptation to natural disasters related to climate change.

legal and institutional framework of RHMSS, Cont.

Responsibilities of RHMSS in Multi Hazard Early Warning System operations:

- Risk identification-Monitoring (Meteorological and Hydrological observing system)
- Hazard forecasting and early warning
- Issuance of warnings and dissemination
- Hazard, Vulnerability and Risk assessment and mapping (weather and climate related hazard)
- Risk analysis/hydrological hazard
- Activation of emergency plans



Weather, Climate and Water monitoring and warning of dangerous meteorological and hydrological phenomena is assured 24h/7d.

legal and institutional framework of RHMSS, Cont.

In accordance with the Low on meteorological and hydrological activities, **a set of bylaws** was adopted and Quality Management System (ISO 9001:2008) implemented. This established a legal framework for the integration of CWS in MHEWS and the implementation of the international standards and EU directives relevant to MHEWS.

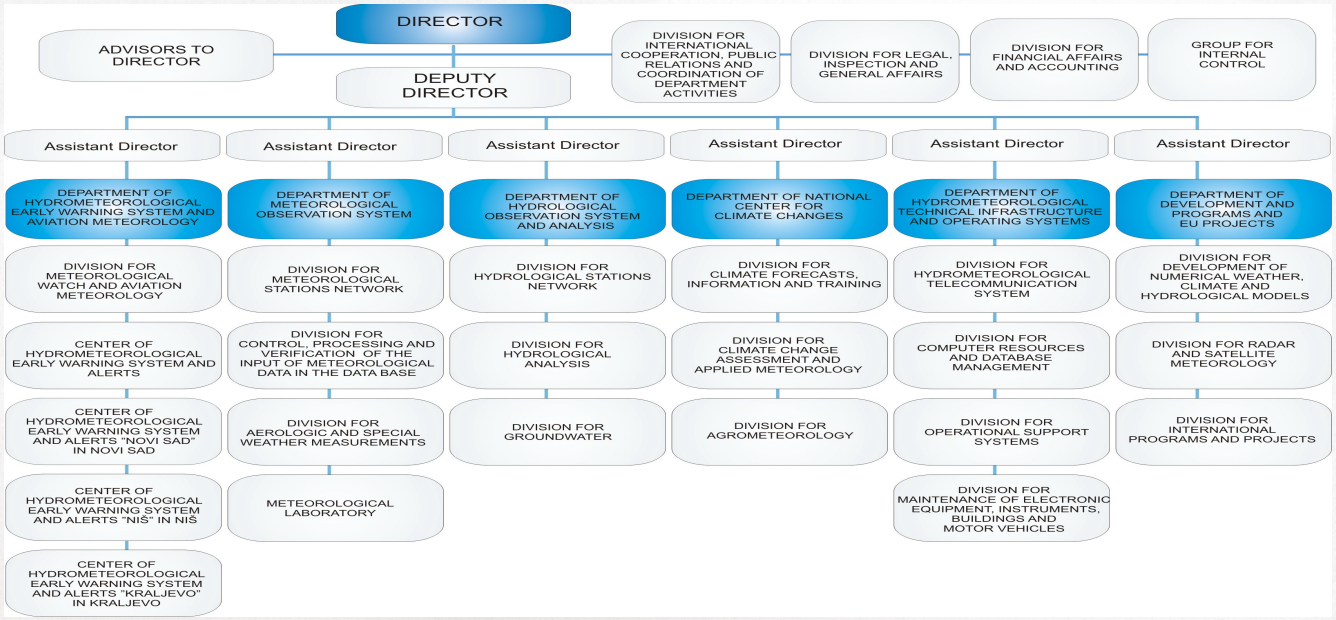
Categories (STATUS GREEN,YELLOW, ORANGE, RED) of severe weather, climate and water related phenomena encompassed by the National Multi Hazard Early Warning System, together with the associated criteria and impacts **are defined by Rulebook on the manner of producing, issuing and communicating meteorological and hydrological emergency information and warnings in the period before, during and immediately after the close of meteorological and hydrological disasters and in case of imminent nuclear accidents.**

The following hazards are covered by MHEWS /RHMSS:

Wind, Rain, Snow, flash floods, river flooding, Low/High Temperatures, Fog ,Thunderstorms, hailstorm, freezing rain, heat wave, cold wave, sand/dust storm, hydro meteorological hazard for aviation, icing of roads, forest fire, volcanic events, UV/Sunburn, nuclear accidents events

legal and institutional framework of RHMSS-Cont.

By virtue of the Government Decree a new Rulebook on Internal Organization and Structure of Work Posts at RHMSS has been adopted in 2011, **establishing National Centre for Meteorological and hydrological early warning system and Three Regional Centers for meteorological and hydrological early warnings (Novi Sad, Kraljevo, and Nis)**



New Organizational Structure of the RHMSS, 484 posts

Governance Support

Political commitment is crucial to allocate the necessary resources for RHMSS operations, and R&D activities. For this purpose effort was made to integrate contributions of RHMSS in DRR and sustainable development into other relevant national lows and strategies:

- Law on Emergency Situations/ "Official Gazette of RS" nos. 111/09, 92/11 and 93/12 and National Strategy for Protection and Rescue in Emergency Situations
- Law on Water/ "Official Gazette of RS" nos. 30/10, 93/12,
- Law on fire protection/ "Official Gazette of RS" no. 111/09,
- Law on Environment Protection/ "Official Gazette of RS" No. 135/04, 36/09, 72/09, 43/11/,
- National strategy for sustainable development, etc.

According to mentioned laws and strategies, **MHEWS/RHMSS is recognized as an integral part of the national system of protection and rescue in the event of natural disasters and technological hazards**, and the Director of RHMSS as a permanent member of the Republic Headquarters for Emergency Situations/National Platform for DRR, who regularly present reports on weather, climate and hydrological forecasts and warnings to this body.

Enhanced capacity of the RHMSS to support DRR and CC Adaptation /Observing systems

The **meteorological and hydrological observing system** consists of:

36 stations performing SYNOP and hourly climatological observations and 30 AWS

97 ordinary climatological stations,

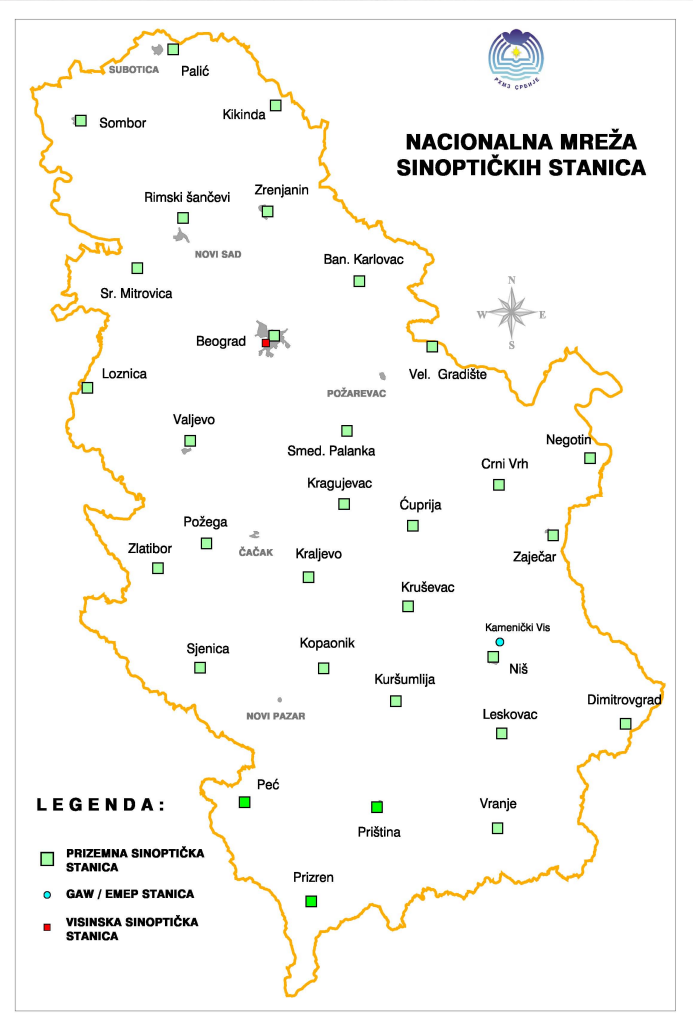
558 precipitation and 52 phenological stations;

15 weather radars,

1 radiosounding station,

190 surface water, 400 ground water, 66 automatic hydrological stations, and 160 stations for discharge measurements.

All synoptic and 30 hydrological stations are included in the international data exchange under the WMO programmes.

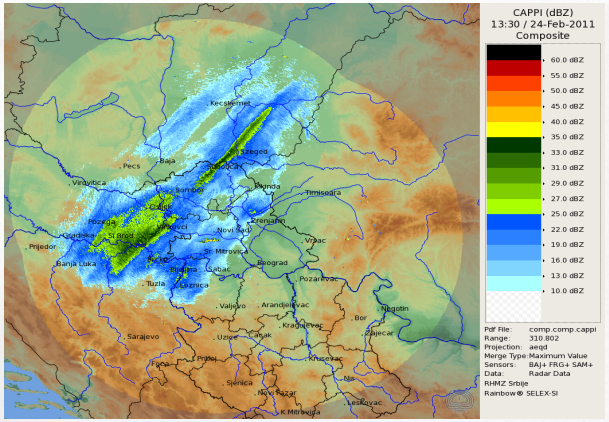


Enhanced capacity of the RHMSS to support DRR / Observing systems, Cont.

Modernization of the State meteorological radar centers network (Centers of the RHMSS and hail suppression Centers of the Ministry for interior-responsible for DRM)

Gematronic	S band	3 (hail supp.)
Mitsubishi	S band	10 (hail supp.)
MRL 5	X/S band	1 (RHMSS)
LAWR	X band	1 (RHMSS)

New Gematronic S band – dual polarization radar at Jastrebac mountain operational from October 2013 (RHMSS)



Enhanced capacity of the RHMSS to support DRR / Communication system-IT, Cont.

RHMSS Telecommunication system is based on WMO RMDCN link to ECMWF, DWD, Vienna and Budapest (512Kbps). Other telecommunication means used are: Internet connection with DWD and Montenegro, Satellite distribution systems – DWD Sat, SADIS, Kongsberg.

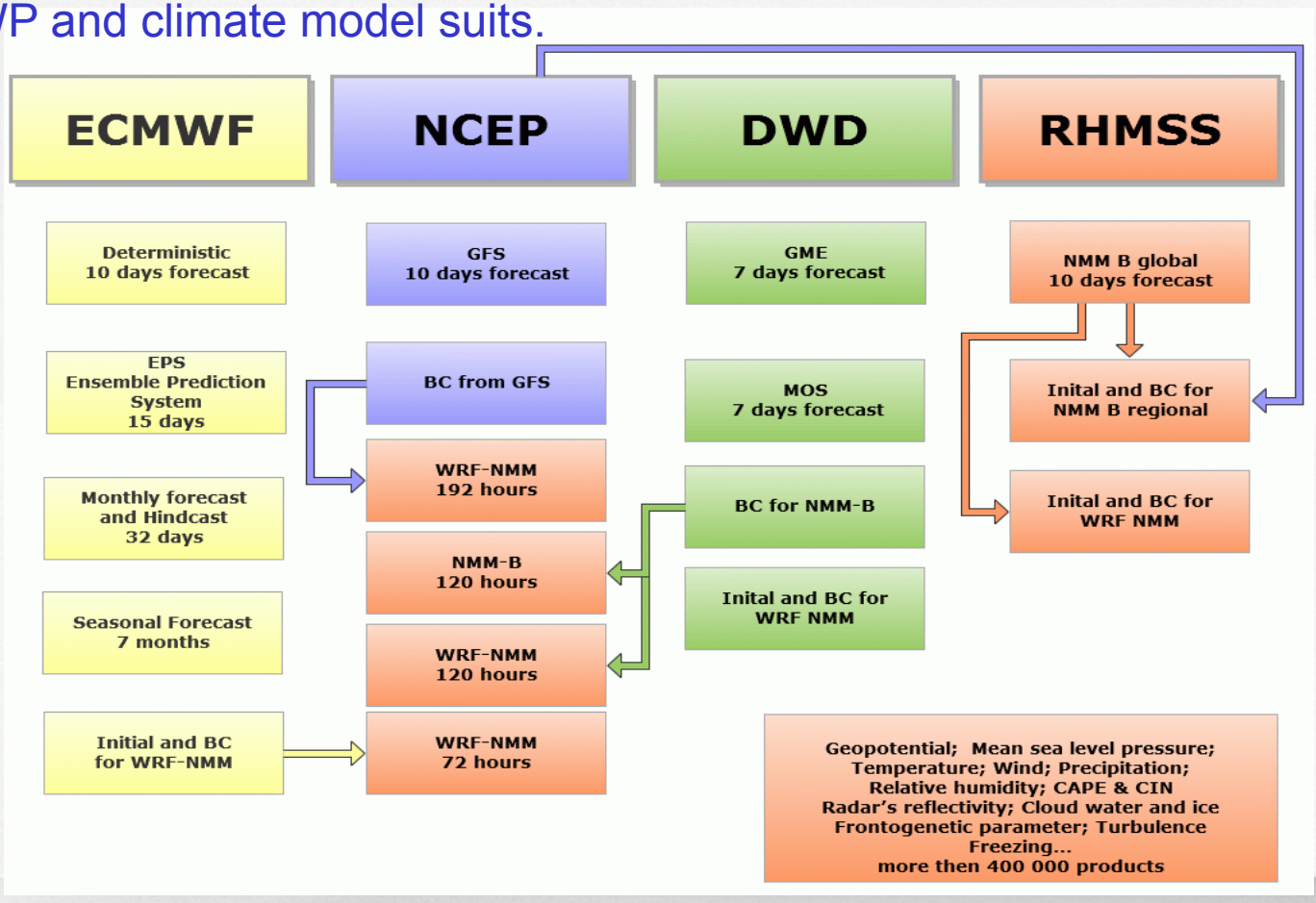
Computer platforms for running NWP and climate models and storage/archive resources:

HP XC7000bl Cluster (32 nodes, 16 BL2 x 220c G6 servers); **HP x 3600** (Single stand-alone HPr x 3600, Two Intel dual-core Itanium2 processors); **HPXC** – 384 cores (32 nodes x 2cpu x 6 cores,G7 servers);

Data storage - HP EVA 4400, Controller Model HSV300, Management Software Command View EVA v9.4 or v10.0, RAID supported Vraid0, Vraid1, Vraid 0+1,Vraid5, Vraid 0+5, Vraid 6, Number of controllers 2, Cache (per controller pair) 4GB Host Connectivity Fibre Channel, Enclosures 3: 24 x1 Tb FATA HDD (2 enclosure) 12 x 400GB Fc HDD (1 enclosure).

Enhanced capacity of the RHMSS to support DRR and Climate Change Adaptation– NWP and Climate Models & Products in use in RHMSS

In performing a wide range of tasks in short to medium range weather forecasts and seasonal to long-term climate prediction, RHMSS in its forecasting operative work utilise the products and data of WMO GPCs (ECMWF, DWD, Météo-France, ROSHYDROMET, and NCEP), EUMETSAT, as well as data and products from its own NWP and climate model suits.



Enhanced capacity of the RHMSS to support DRR and Climate Change Adaptation– Numerical Weather and Climate Models & Products in use in RHMSS

Emerging Technologies (Weather and Climate Time Scales) in support to MHEWS/RHMSS operations

Short- to Medium-Range Weather

Seasonal Forecasts Short-Term Climate

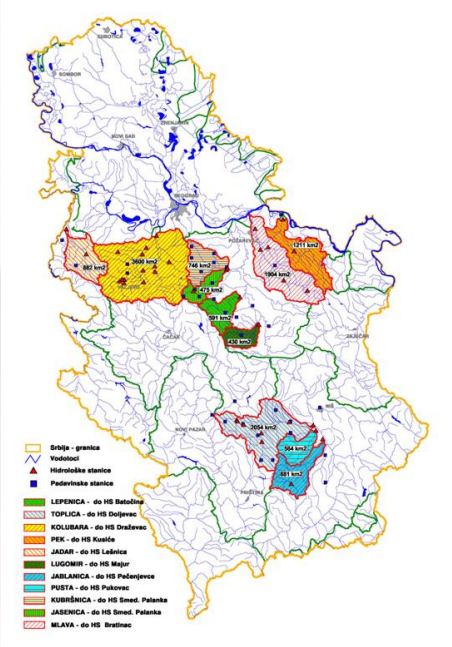
Long-Term Climate

0-14 days ⟷ **months to seasons** ⟷ **decades to century**

SEEVCCC/RHMSS available technologies:

- NCEP NMM-B: Unified Nonhydrostatic Multiscale Model on B grid (Zavisa Janjic, NCEP)
  - SEEVCCC LRF System: NCEP/Eta (Eta Belgrade University = EBU) + POM (Vladimir Djurdjevic, Borivoj Rajkovic, Belgrade University)
  - DREAM: Dust Regional Atmospheric Model (Slobodan Nickovic, WMO)
  - HYPROM: Hydrology prediction model (Nickovic, WMO, Pejanovic, SEEVCCC/RHMS)
  - .....

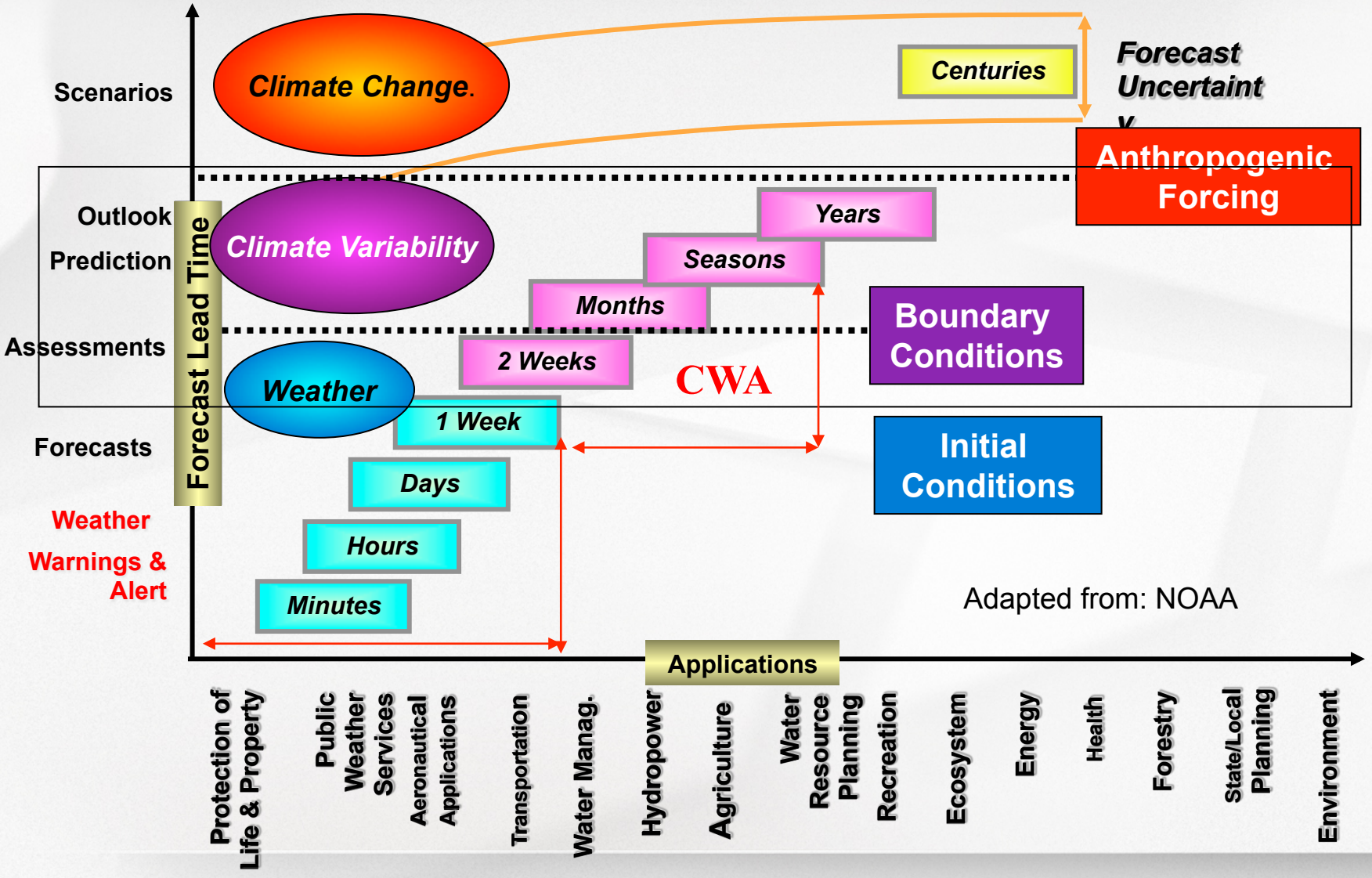
Enhanced capacity of the RHMSS to support DRR and Climate Change Adaptation– Numerical Hydrological Models & Products in use in RHMSS



Catchments in Serbia where the HBV model is applied

Hydrological forecasting models, early warnings and alerts are developed and introduced in the operational practice. For big water bodies, i.e. for the Danube, Tisa, Sava and Velika Morava with tributaries, water forecasting models based on the laws of open flow and statistical dependency are used. At smaller and medium water courses models based on the analysis of the process rainfall-runoff are used, together with the adapted known hydrological forecasting models, such as TANK model for the Kolubara river and HBV model for the Jadar, Kubrsnica, Jasenica, Mlava and Toplica.

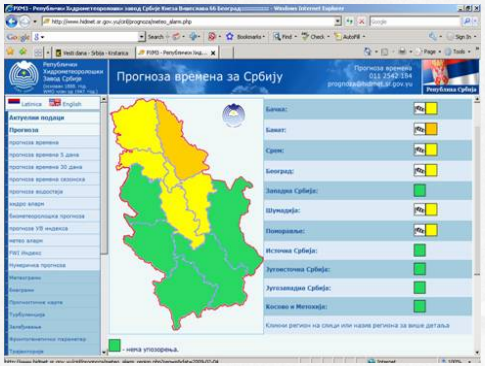
Enhanced capacity of the RHMSS to support DRR and Climate Change Adaptation– RHMSS/SEEVCCC Weather and Climate Prediction and Warning Framework



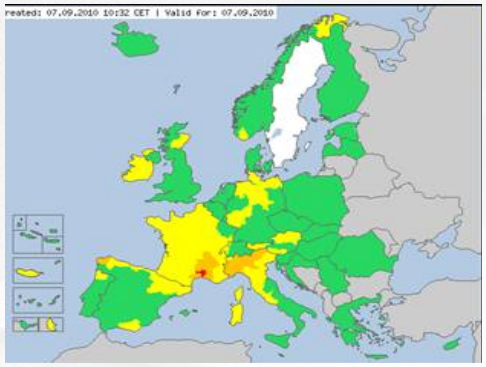
Enhanced capacity of the RHMSS to support DRR and Climate Change Adaptation– MHEWS/ Meteoalarm & Hydroalarm

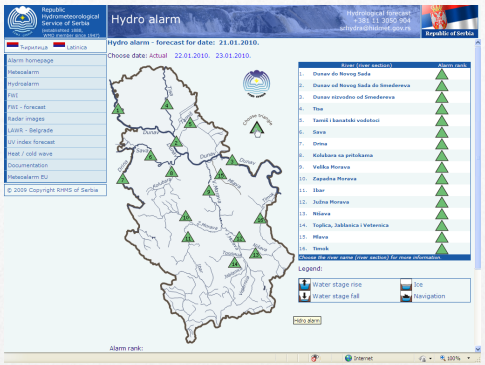
Within National MHEWS, RHMSS established the operational system for the Meteoalarm and Hydro-alarm systems as part of the EU Meteoalarm and EFAS.

RHMSS meteoalarm: www.meteoalarm.rs

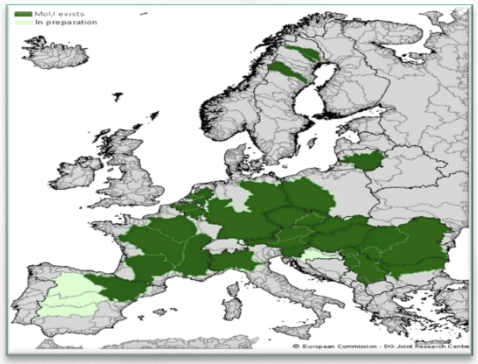


Meteoalarm-alerting Europe for extreme weather /EUMETNET





RHMSS hydro alarm: www.hidmet.gov.rs



The European Flood Alert System (EFAS)

Enhanced capacity of the RHMSS to support DRR and Climate Change Adaptation– Climate Watch System (CWS) as an integral part of the MHEWS

To reduce the risk of climate extreme events and disasters related to climate change, Republic Hydrometeorological Service of Serbia, according to recommendation of the World Meteorological Organization and responsibilities, establish a national operating system for monitoring and early warning of climate anomalies and extreme-Climte Watch System (CWS).

National Climate early warning system is an integral part of the MHEWS, and operational performance of the system is based on the existing infrastructure.

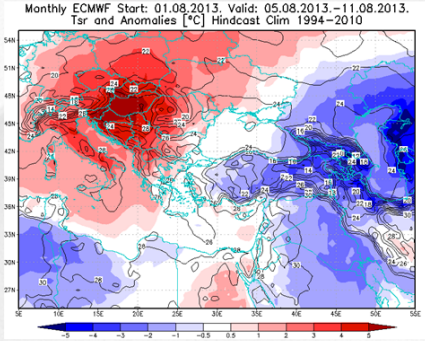
CW Advise for Serbia according the SEEVCCC/RHMSS
CW Advise for SEE -Example 1

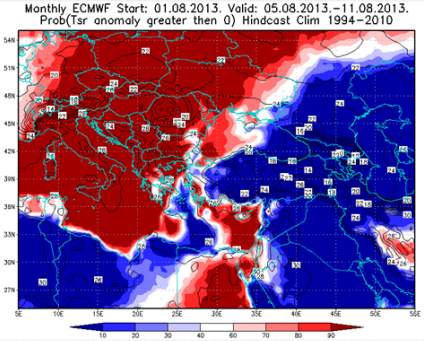
CW Advice for SEE

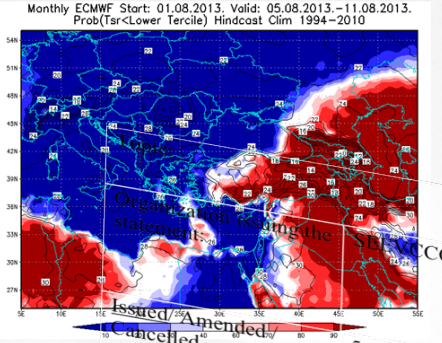
Temperature above normal and Heat Wave in August 2013.

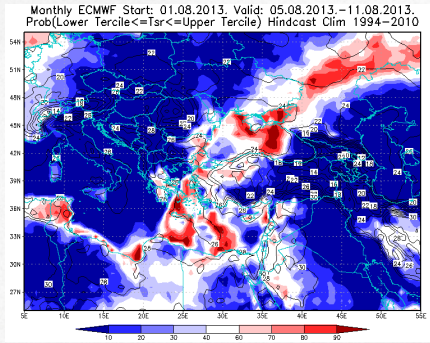
CW Advice was issued on 05. August 2013.

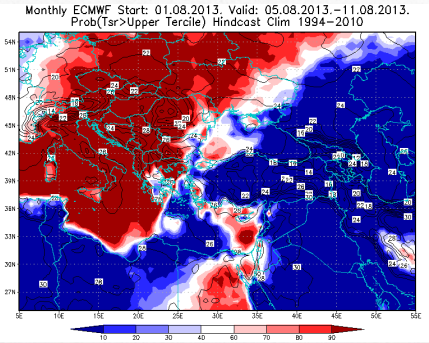
Affected area: Balkans











Organization issuing the Statement: SEEVCCC

Issued/Amended/Cancelled

5-8-2013 12:00 P.M.

Contact:

E-mail: cws-seevccc@hidmet.gov.rs
Phone: +38112066925
Fax: +38112066929

Valid from – to: 5-8-2013 – 18-8-2013

Region of concern: South-Eastern Europe

Next amendment: 12-8-2013

Warning:

0	No particular awareness
1	Potentially dangerous
2	Dangerous
3	Very dangerous

„Within next month, with probability exceeding upper/lower tercile of around 90 %, above normal temperature is expected in most of SEE region (up to +3 °C) and below normal temperature (around -2 °C) in eastern Turkey and South Caucasus. During next week precipitation deficit is expected in the entire SEE region, except in east Turkey and South Caucasus where average precipitation is predicted. Probability for is around 90 %.“

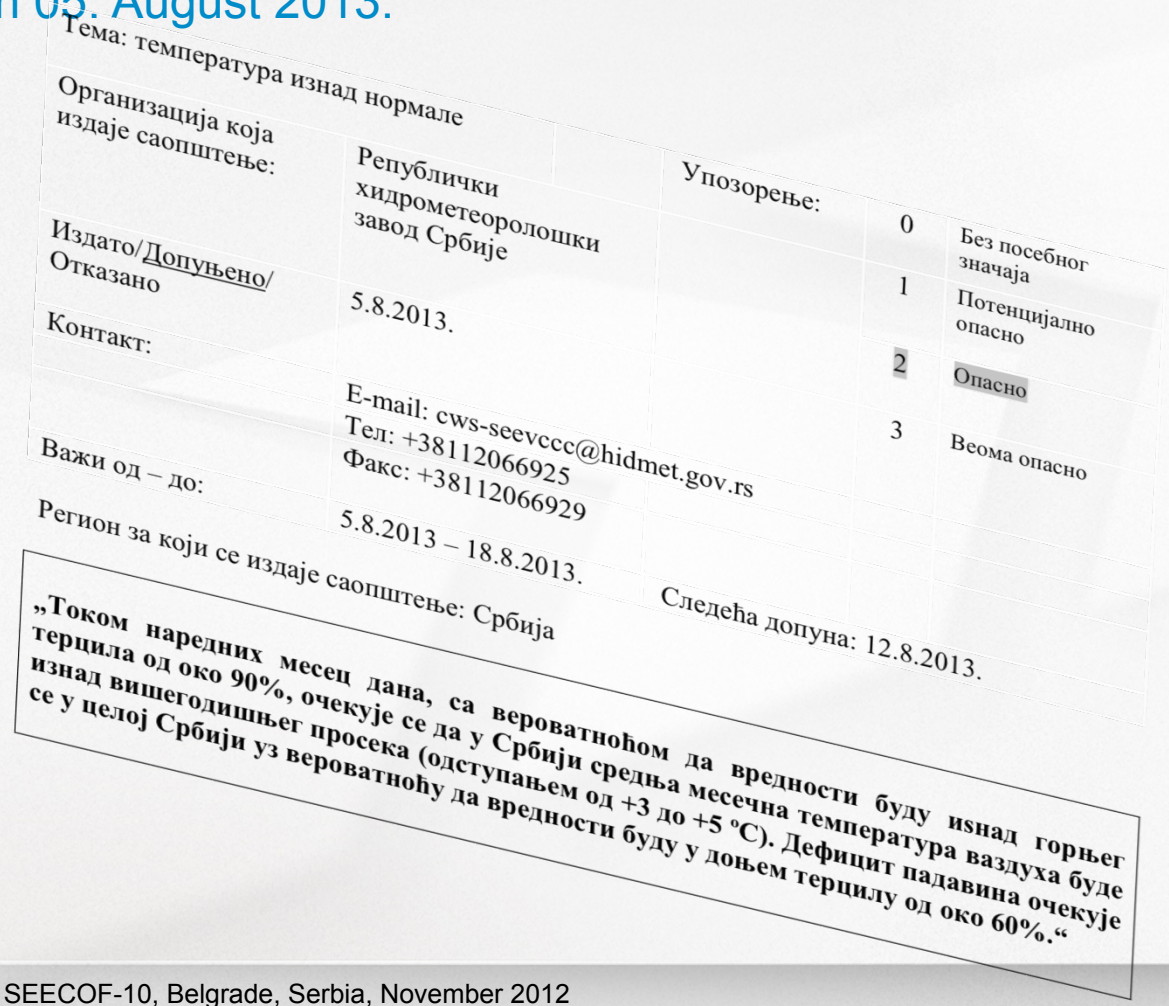
CW Advise for Serbia according the the SEEVCCC/RHMSS
CW Advise for SEE -Example 1 Cont'd.

CW Advice for Serbia

Temperature above normal and Heat Wave in August 2013.

CW Advice was issued on 05. August 2013.

Affected area: Serbia



Тема: температура изнад нормале

Организација која издаје саопштење:	Републички хидрометеоролошки завод Србије	Упозорење:	0	Без посебног значаја
Издато/Допуњено/ Отказано	5.8.2013.		1	Потенцијално опасно
Контакт:	E-mail: cws-seevccc@hidmet.gov.rs Тел: +38112066925 Факс: +38112066929		2	Опасно
			3	Веома опасно
Важи од – до:	5.8.2013 – 18.8.2013.			
Регион за који се издаје саопштење: Србија		Следећа допуна: 12.8.2013.		

„Током наредних месец дана, са вероватноћом да вредности буду изнад горњег терцила од око 90%, очекује се да у Србији средња месечна температура ваздуха буде изнад вишегодишњег просека (одступањем од +3 до +5 °C). Дефицит падавина очекује се у целој Србији уз вероватноћу да вредности буду у доњем терцилу од око 60%.“

CW Advise for Serbia according the SEEVCCC/RHMSS
CW Advise for SEE -Example 1 Cont'd.

Monitoring

In the period from August 04th to 10th in Serbia temperature above normal 1981-2010, with anomaly from +3.5 up to +6.7 °C, was recorded. Daily maxima were from over 35 °C and heat wave was detected. No significant precipitation was recorded.

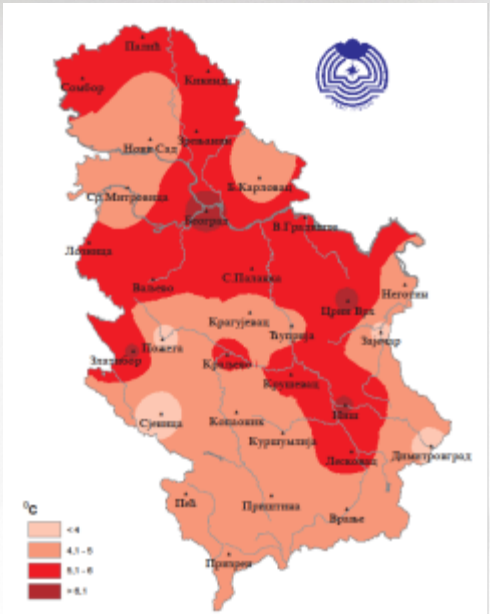
Update – 12. August 2013.

Cancelled - 19. August 2013.

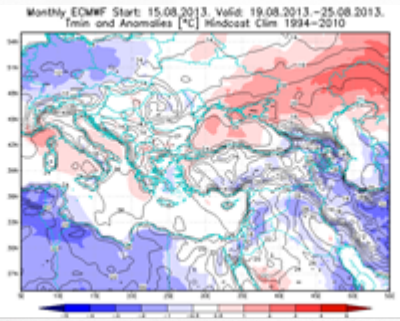
Issued/ Amended / Cancelled	12-8-2013 12:00 P.M.		3	Very dangerous
Contact:	E-mail: cws-seevccc@hidmet.gov.rs			
	Phone: +38112066925			
	Fax: +38112066929			
Valid from – to:	12-8-2013 – 25-8-2013	Next amendment: 19-8-2013		

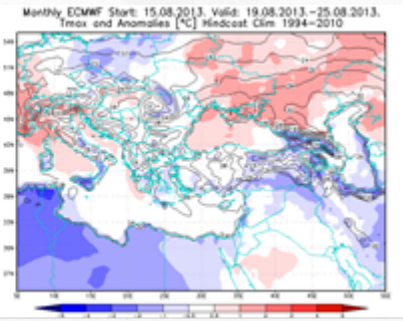
Region of concern: South-Eastern Europe

„With probability of 70% for upper tercil, during next month, in almost whole SEE region temperature above normal is expected (temperature anomaly up to +2 °C). Normal to dry weather conditions is expected in the region till beginning of September. "



Monitoring of Mean Temperature from 4. – 10.8.2013.

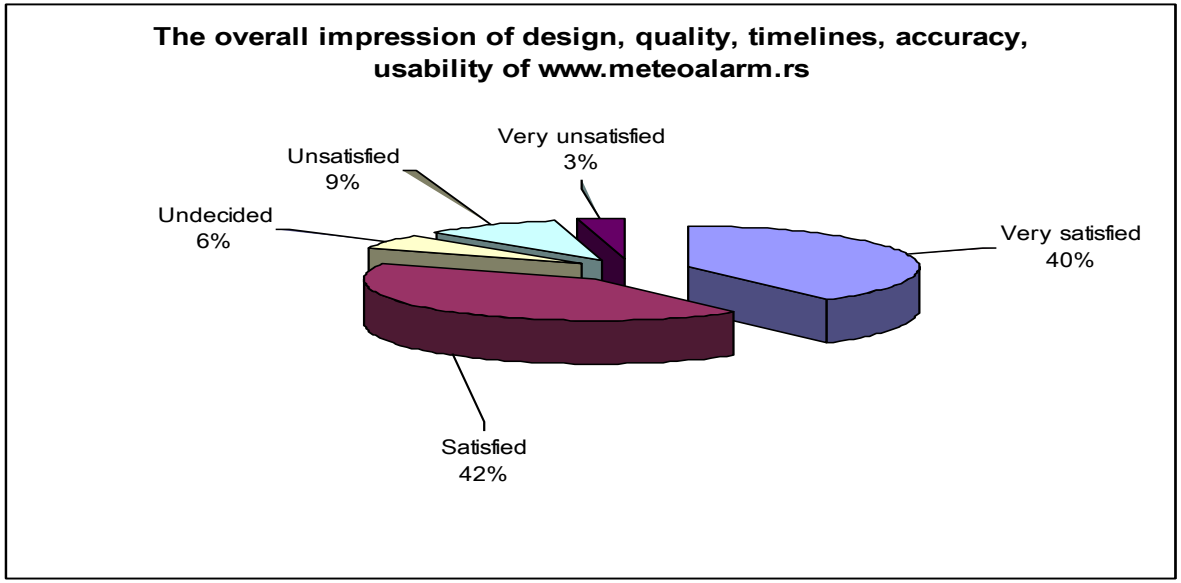




Enhanced capacity of the RHMSS to support DRR and Climate Change Adaptation–MHEWS/Communication

In case of a severe weather, climate-related and hydrological event the warnings are disseminated to: Republic Headquarters for Emergency Situation, Ministry of Internal Affairs, Department for Protection and Rescue, Government of the Republic of Serbia, Ministries responsible for agriculture, water management, forestry, transport, energy and environment protection, Republic Directorate for Water, Water management centers, Electric Power Industry of Serbia, Serbian Army, local authorities and media.

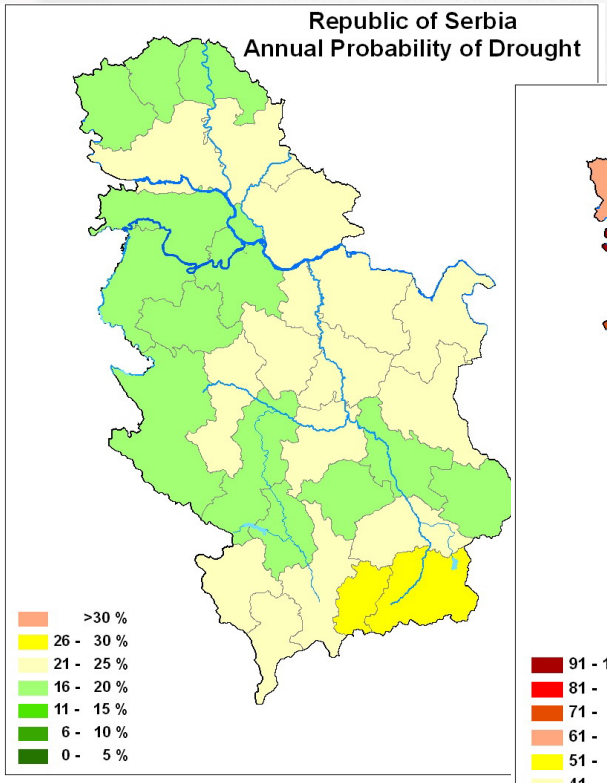
The warnings are disseminated by fax (special bulletins), by phone, by E-mail, by mobile phone as SMS, to "client" computers by File Transfer Protocol (FTP), or through the RHMSS website.

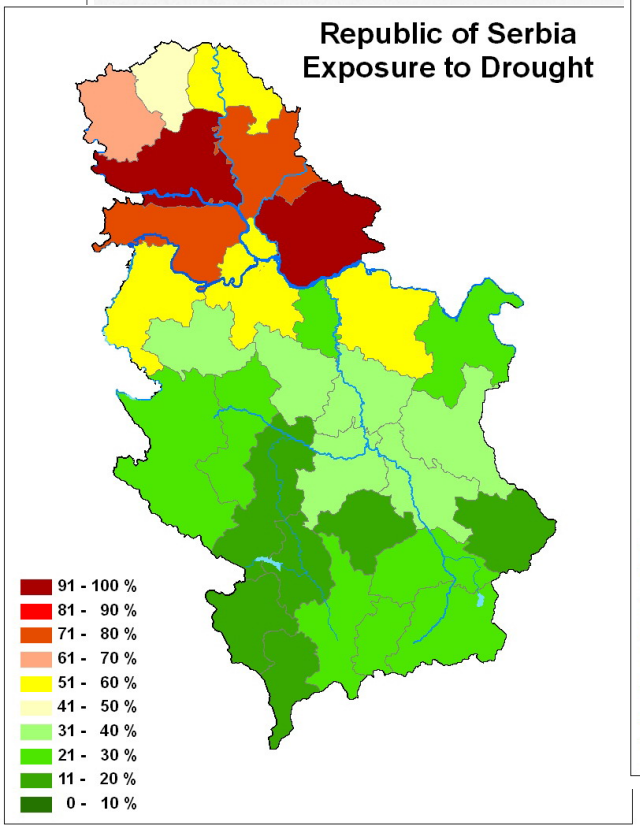


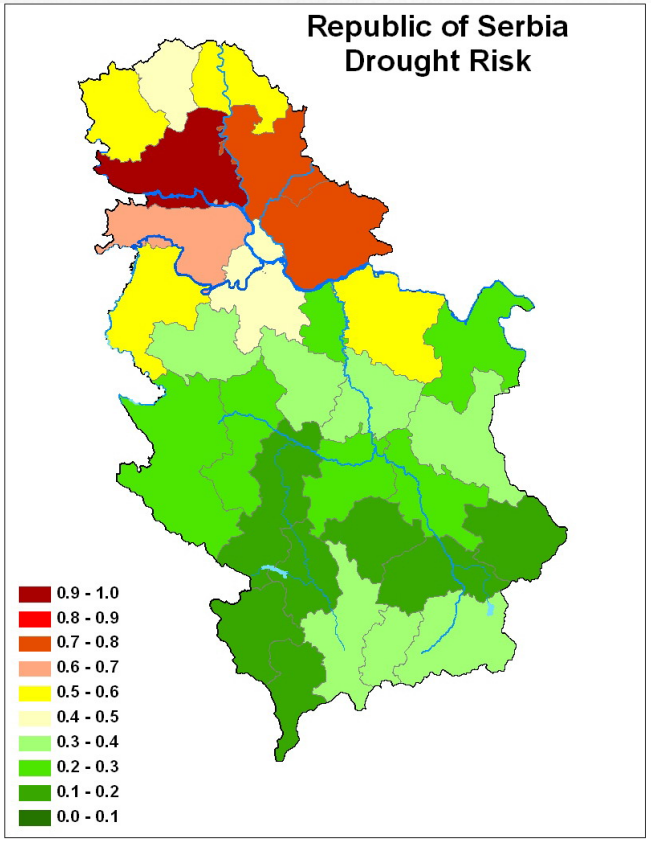
Feedback analyses for the period from 14th May 2010 to 27th September 2011

Enhanced capacity of the RHMSS to support DRR and CC Adaptation– MHEWS - Climate extremes risk assessment– preliminary results

According to it's responsibilities the RHMSS participated in development of Risk Assessment Methodology related to Natural Disasters in coordination of the Ministry of Interior – Sector for Emergency Management, and hazard, vulnerability and risk assessment and mapping







Enhanced capacity of the RHMSS to support DRR and CC Adaptation– MHEWS - SOFT ADAPTATION OPTION

Adaptation is a response measure promoted by the UNFCCC and Early Warning Systems are one way of reducing vulnerability and enhancing adaptive capacity to weather events and climate change.

Enhanced collaboration is needed between the climate and disaster reduction communities to the implementation of measures as environmental planning, data and information pooling, improved observation systems, best practices exchange, strengthened technical cooperation, and close collaboration with policy makers.

RHMSS FUTURE PLANS

Strategic priorities of RHMSS in the forthcoming period include:

- Strengthening of regional centres of the national hydro-meteorological early warning and alert system related to extreme meteorological, climate and hydrological phenomena and catastrophes;
- Improvement of meteorological, climate and hydrological services, particularly aviation meteorological services, by improving ISO 9001, 17025 and introducing standard related to DRR, IT, database management, web portal and other relevant standards;
- Implementation of the new five-year Program of meteorological and hydrological development and research activities for 2013-2017;
- Building up human resources through the permanent training program;
- Building up the research capability of RHMSS to address the needs of policy-makers and vulnerable communities for new information.
- Improvement of international and regional cooperation by further strengthening the operational and research functions of sub-regional South-East European Virtual Climate Change Centre and the partnership with the DRR and CC stakeholders and other relevant national, regional and international institutions.

WMO

SEE VCCC

THANK YOU FOR YOUR ATTENTION !

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