

Climate services in Montenegro

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November 2014**



**Turkish State
Meteorological Service**

Content

- Introduction
- Capacities for the management of climatic data, climate monitoring and provision of climate services to climate-sensitive sectors
- Limitations of the NMHSs in the provision of climate services
- User Interface Platforms
- Good practices in the development and application of climate services

Institute of Hydrometeorology and Seismology of Montenegro is formed by Decree on the organization and manner of work of Public Administration, 23 January 2012, by merging two institutions:

IHMS in EMI structures

Within European Meteorological Infrastructure (EMI) Montenegro is:

- EUMETNET-full member
- ECMWF-cooperating state
- EUMETSAT-not member yet



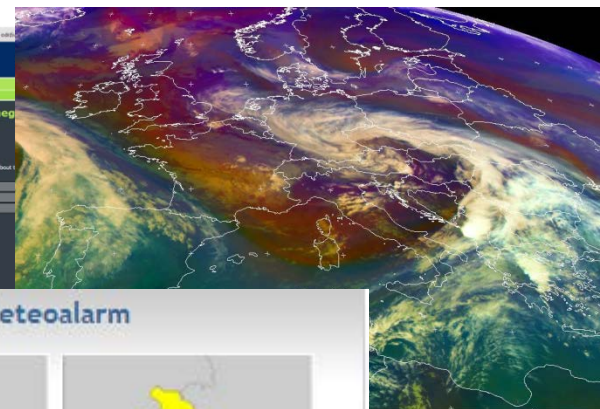
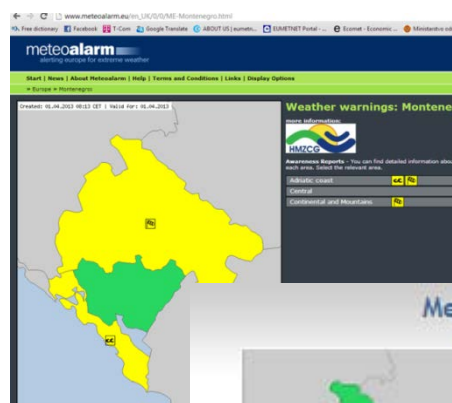
Government of Montenegro
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[http:// www.seismo.co.me](http://www.seismo.co.me)



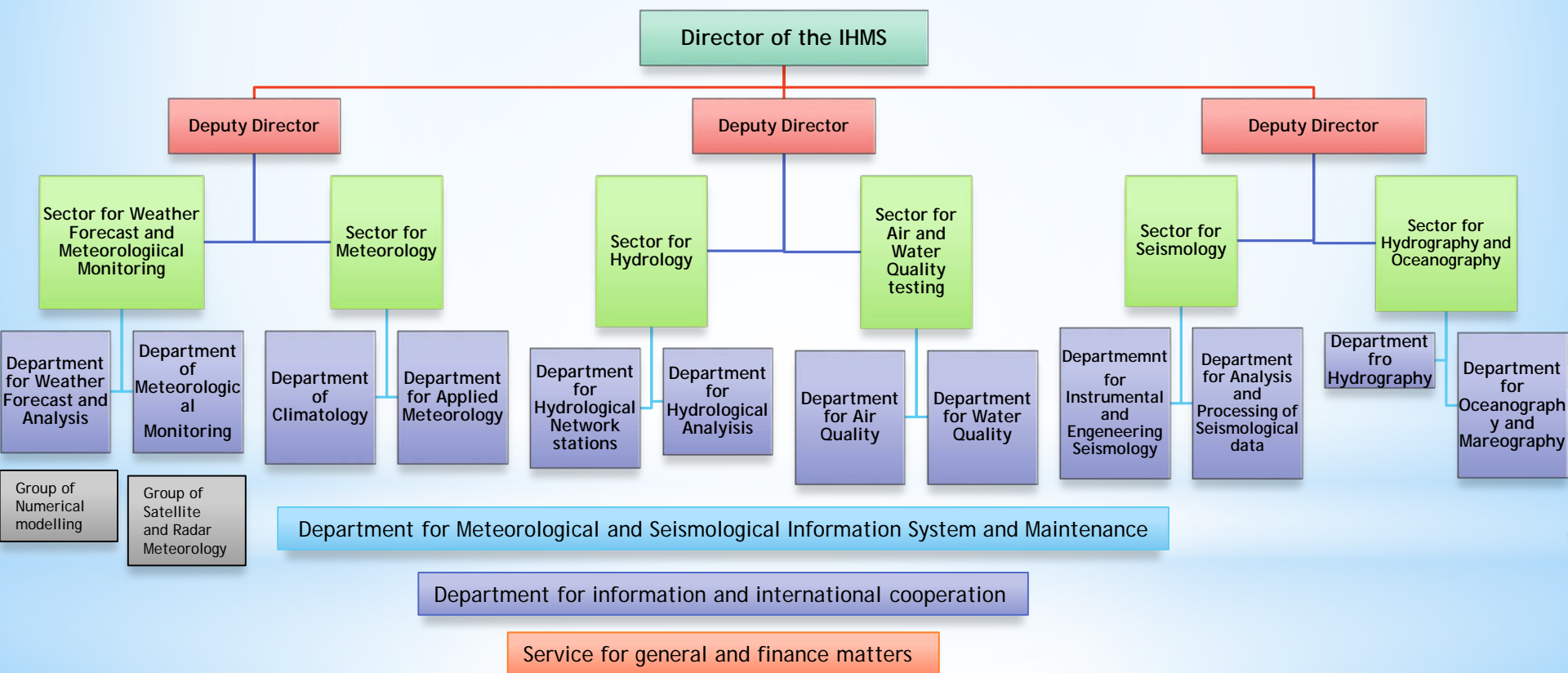
Mandate of IHMS MNE

- Observation and measurement of meteo, hydro, eco, agrometeo, seismic parameters
- Analysis, processing, archiving of measured and observed parameters
- Production of studies, elaborates, analysis and information about climate, condition of the soil, air, surface and ground water and coastal sea
- Forecast and Provide data (meteo, hydro, eco and agrometeo)
- Production of information, announcements and analysis of meteorological parameters for certain period for electronic and writing media
- Control and Assess of surface and ground water quality, precipitation, air, soil on the basis of physical-chemical, biochemical and radiological parameters

- Establish IT system with databases (climate, hydrology, ecology, agrometeo, seismic)
- Establish and Maintain of Network Station (meteo, hydro, agrometeo, seismic) to monitor weather condition, water, air, soil

- Climate Monitor and Assess
- Analysis of Extremes through Climate Indexes

Organisational Chart of the Institute of Hydrometeorology and Seismology of Montenegro



Capacities for the management of climatic data

Data digitized from 1949, referring to the climatological terms

Hourly data for the early period prior to the introduction of AWS not digitized except for the wind and air temperature

The data are available before 1949 that are still in paper form but there are plans to digitize those, and what was then identified as important has already been digitized.

Data availability at the **ECMWF's Meteorological Archive and Retrieval System (MARS)** for Montenegro, showing the fraction of digitized data currently available at MARS and estimated from the period 1960-2010 for several climatic variables and for the most common daily observing time frequency encountered for each station

Data availability at the ECMWF MARS Archive for Montenegro

WMO code	Country	Station name	Latitude	Longitude	SLP %	WD %	WS %	TT %	DP %	RR %	SD %	RH %
13363	Montenegro	Pljevlja	43,35	19,35	17	29	29	29	29	19	0	29
13459	Montenegro	Niksic	42,77	18,95	50	50	50	50	50	29	0	50
13562	Montenegro	Ulcinj	41,92	19,22	71	71	71	71	71	29	0	71
13462	Montenegro	Podgorica- Golubovci	42,37	19,25	80	80	80	80	80	52	0	80
13455	Montenegro	Herceg Novi- Igalo	42,4	18,73	56	55	55	56	56	55	0	56
13463	Montenegro	Podgorica- Grad	42,43	19,28	19	19	19	19	19	12	0	19

SLP-sea level pressure; WD-wind direction; WS-wind speed; TT-hourly temperature; DP-dew point;
RR-precipitation; SD-snow depth; RH-relative humidity

CLIDATA

Since October 2008, in operational use is CLIDATA - a system for storing climatological data prepared in accordance with the WMO recommendations and standards in this area.

Ataco spol. s.r.o. in cooperation with the Czech Hydrometeorological Institute

IHMS collects climate data (not all) that are listed as ECVs (Essential Climate Variables)

<http://www.wmo.int/pages/prog/qcos/index.php?name=EssentialClimateVariables>

- There are available products derived from CLIDATA
- The reference climatological period in use is 1961-1990
- There is access to the climatic database and climatological products. Relevant IHMS employees can access to the climatic database and climatological products.

Quality control and homogenization

- Data that manually entered into the database **regularly checked before entry into the database** and **then be controlled using the methods implemented in the database** (this does not apply to automatic measurements).
- It also carried out a series of historical control data when it moved to a new system CLIDATA.
- The conclusion is: complete database is controlled by the existing methods of control that are implemented in the database. For some elements such as precipitation, Tx and Tn done to further control via software RClimDex. It can be said that there is a high percentage of processed data.

*Through project activities the DMCSEE were done checking the homogeneity of time series, using the software developed for this purpose.

Quality control and validation is performed on 3 levels:

- Observers/employees of IHMS carried out an evaluation of the measured values
- Meteorological technician checks the logical consistency of data from paper documents before entering into the database
- Quality control procedures in the database CLIDATA (logical filters, limits, check the consistency of the data and spatial control).

DATA ENTRY

- Manual and automatic

QUALITY CONTROL DATA

- The definition of limit values, formulas and spatial control

PRODUCTS

- Definition of automatic calculation
- Already defined advanced products (Wind rose; map the intensity of rainfall ...)

ADMINISTRATION

- User-group strategies, roles, rights

Reports and Analysis

- Discoverer, SQL+, GIS utilities

AUTOMATIC BACKUP

CLIDATA procedure

Climate atlas of Montenegro

- Information about the network of meteorological stations, the mean annual temperature in the country, high rainfall, the average number of summer days.
- Climate data of Montenegro were last recorded in the Atlas climate of SFR Yugoslavia.
- Climate Atlas of Montenegro issued a Montenegrin Academy of Sciences and Arts, 2012.
- The book was published in only 400 copies.
- The authors:
M. Buric, B. Micev, L. Mitrovic, Climate atlas of Montenegro, Montenegrin Academy of Sciences and Arts, 2012,



<http://www.meteo.co.me/index.php?id=152>

Current capacities for climate monitoring

National Observation Network for climatic purposes are defined and established according to the GCOS standards, and selection of the automatic measuring equipment (manufacturers Lambrecht, OTT) duly adhered to the recommendations of the WMO on standardization of automated measurements.

During July-September 2013, the project WMO/ UNISDR, on two occasions, carried out the calibration of measuring instruments on weather stations, with these purposes foreseen calibration set.

MAIN STATIONS



1. ULCINJ
2. BAR
3. H.NOVI
4. PODGORICA
5. NIKŠIĆ
6. KOLAŠIN
7. ŽABLJAK
8. PLJEVLJA
9. CETINJE
10. BERANE (in preparation)

9 AWS –Lambrecht, Germany, 7 sensors, GPRS communications
3 AWS – OTT Hydrometrie, 3 sensors, GSM communications

<http://www.meteo.co.me/misc.php?text=43&sektor=1>

Aeronautical meteorological

Stations:

1. Tivat and
2. Golubovci

Observations on main stations are done hourly, and

data are available on www.meteo.co.me

AWS



- 1st AWS in IHMS Montenegro 2000
- Automatic Measurement Equipment
– (Lambrecht GmbH)
- From AWS to headquarters in Podgorica via GPRS
- Data from AWS are updated every 10 minutes

station	date	time	T	H	GR	P	RR	WD	WS	GUST
BAR	01.04.2013	08:10	16.4	69.7	413	1007.5	0	184	4.2	9.3
CETINJE	01.04.2013	08:10	10.4	68.7	111	933.2	0	145	1.8	4.1
HERCEGNOVI	01.04.2013	08:20	15.1	74.5	254	1003	0	82	2.3	4.4
PODGORICA	01.04.2013	08:10	16.3	?	384	843.9	0	144	2.7	5.7
ULCINJ	01.04.2013	08:10	16.3	89.3	452	?	0	208	5.9	8.7
NIKŠIC	01.04.2013	08:10	7.6	99.9	197	931.8	0	153	6	9.5
KOLASIN	01.04.2013	08:10	6.2	92.6	527	899.1	0	162	1.7	4.1
ZABLJAK	01.04.2013	08:10	2.4	99.9	140	843.2	0.1	176	5.5	10.2
PLJEVLJA	01.04.2013	08:10	9.1	60.2	72	915.1	0	47	1.8	13.5

Hydrological stations network of hydrometric measurements



- 1 Plavnica
- 2 Ckla
- 3 Brodska njiva
- 4 Fraskanjel
- 5 Međuriječje
- 6 Pernica
- 7 Zlatica
- 8 Podgorica - M
- 9 Podgorica - R
- 10 Trgaj
- 11 Gornje polje
- 12 Nikšić
- 13 Duklov most
- 14 Dučice
- 15 Rošca
- 16 Danilovgrad
- 17 Vranjske njive
- 18 Šasko jezero
- 19 Nudo

- 1 Rožaje
- 2 Bać
- 3 D.Vusanje
- 4 Gusinje
- 5 Plavsko jezero
- 6 Plav
- 7 Meteh
- 8 Murino
- 9 Andrijevisa - Lim
- 10 Andrijevisa – Zlor.
- 11 Berane
- 12 Ravna rijeka
- 13 Bijelo Polje
- 14 Gubavač
- 15 Dobrakovo
- 16 Crna poljana
- 17 Trebaljevo
- 18 Mojkovac
- 19 Bistrica
- 20 Brštanovica
- 21 Timar
- 22 Bijela
- 23 Šavnik
- 24 Duži
- 25 Ribnjak
- 26 Čirovići
- 27 Pljevlja
- 29 Zabrdje
- 28 Gradac
- 30 Biogradsko jezero
- 31 Crno jezero - malo
- 32 Crno jezero 14 vel.

Analysis of climatic extreme events

IHMS has conducted analysis of climatic extreme events.

The report on extreme events is sent to WMO as a part of report on status of climate as well as to SEECOF and MEDCOF, and other institutions on request.

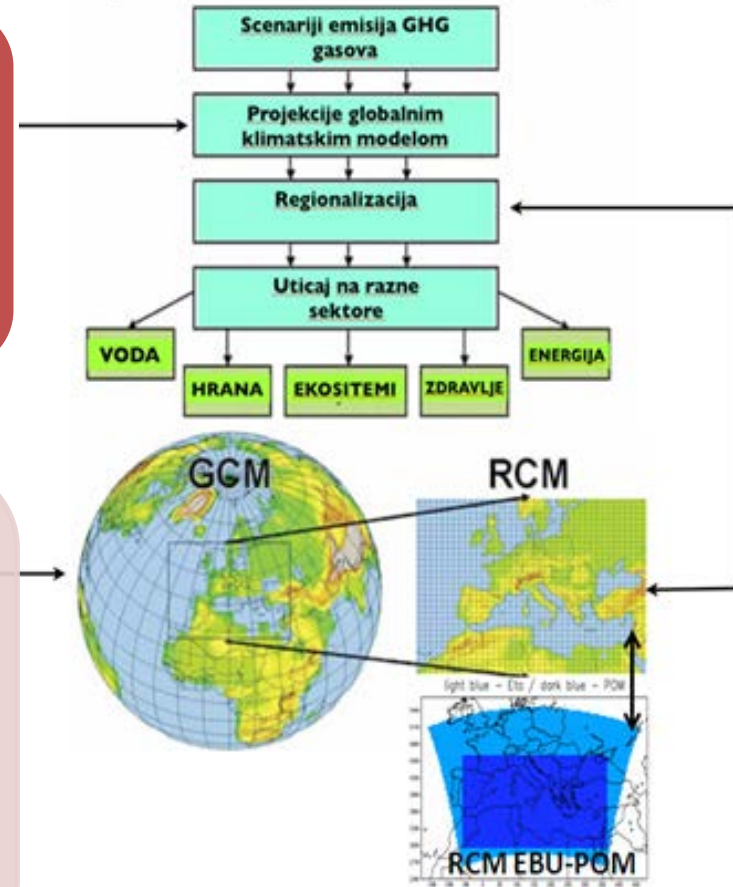
IHMS maintains analysis of climatic trends and detection of climate change at **national and sub-national levels** and has the data derived from climate change scenarios for analysis and application.

EBU-POM

The model that is used to simulate changes in climate and extremes is EBU-POM coupled regional climate model.

It is coupled atmosphere-ocean model:

- Atmospheric part: Eta/NCEP model (EBU=Eta Belgrade University)
- Oceanic part: POM (Princeton Ocean Model).



Current capacities for the provision of climate services to climate-sensitive sectors



Priority areas



Agriculture and food security



Disaster risk reduction



Health



Water

Climate services to agricultural sector

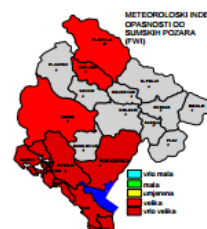
- Drought monitoring (using SPI index and satellite data for FVC (Fraction Vegetation Cover index) and LAI (Leaf Area Index) for the vineyards AD Plantaze
- analysis and monitoring of the soil temperature
- **Agricultural bulletin based on climate services**→
- Activities within the project: Drought Management Centre for South-Eeaster Europe – DMCSEE, <http://www.dmcsee.org/>
- data about the values of meteorological parameters on the request for scientific work and research in agriculture
- information on analysis of phenological data according to customer requirements and other types of information related to agriculture

■ Staff:

■ 3 agricultural engineers

■ Activities:

- monitoring soil temperature
- agrometeorological bulletins
- Fenology
- FWI-not permanently



AGROMETEOROLOGICAL BULLETIN

MAY 2014	NK	KOL	PV	PG	BR	UL
Air Temperature °C						
Tmax at 2m	26.2	27.2	28.5	30.6	27.2	27.8
Tmin at 2m	3.2	-1.6	1.2	8.2	10.4	10.1
Tav at 2m	13.5	11.9	12.5	19.1	17.8	17.7
Tmin at 5 cm	-1.0	-4.0	-8.0	7.0	6.0	7.0
Soil Temperature °C						
Tmax at 5 cm depth	26.4	22.8	24.3	27.9	35.5	x
Tmin at 5 cm depth	10.9	7.3	8.7	15.0	12.1	x
Tmax at 20 cm depth	19.5	18.1	19.4	25.9	28.0	x
Tmin at 20 cm depth	12.7	10.1	10.4	13.7	16.0	x
Precipitations						
Total precipitations (mm)	101.9	96.6	115.4	64.0	60.8	113.8
No of rainy days (≥1mm)	12	14	14	9	8	11
Snow depth max (cm)	0	0	0	0	0	0
Soil condition (prevails)	1	1	1	1	1	1

A few years ago, IHMS processed meteorological danger indices of occurrence of forest fires, "the state of risk of fire on that day"- FWI.

Mapping of and Policy Orientation for Adaptation to Climate Change
<http://www.fao.org/europe/vstrechi-i-sobytiya/cc-tcprer3203/cc-belgrade/ru/>

Climatic services to the health sector



Requests is mostly focused on providing information on heat waves



Preparation for implementing Bio-meteorological forecast is done within Second National Communication on climate change of Montenegro to the UNFCCC.



This forecast is not yet applied due to the lack of financial support for the Emergency Medical Assistance centre which task is to collect relevant data from their data archive).



Ongoing projects relative for health sector

IHMS - partner in the project **Surveillance of invasive and native mOsquito VeCtors and pathogENs they transmit in Montenegro**— acronym LOVCEN which leads Faculty of Biotechnology and funded by the World Bank. Project of the Government of Montenegro conducted by the Ministry of Science and Ministry of Education

<http://www.heric.me/en/kategorije-clanaka/grant-lovcen>

IHMS participate in the implementation of activities Pollen suspended in the air, within the project „**Capacity Building for the integration of global environmental commitments in the areas of investment/development decisions**“ <http://www.epa.org.me/>

Climate services you to the water sector

hydrological and meteorological data, products, analysis, and information on disasters affecting the water management sector (drought, floods), mostly basic statistical analysis of precipitation

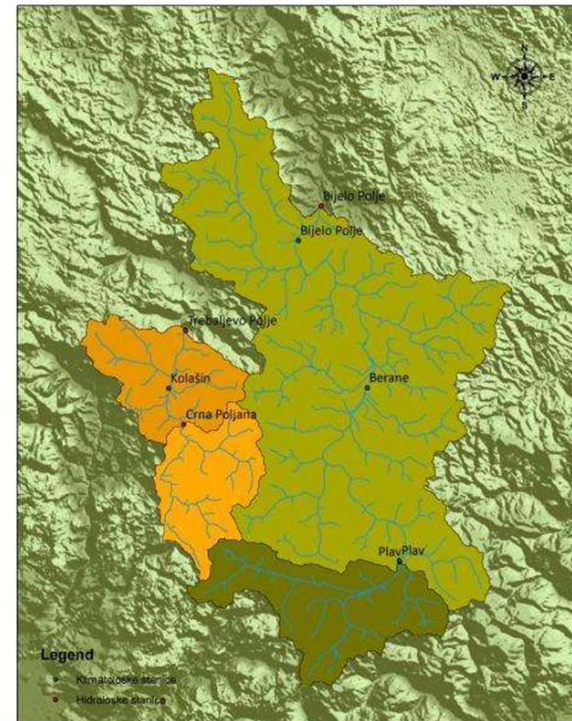
data and specific analysis of rainfall, ITP (intensity, duration, period) curves for research purposes of discharge of river flows and river basins (mini hydro power plants), climatic characteristics of river basins

Climate services and products in water sector

Activities within the Second National communication on climate change to UNFCCC

„Hydrological modeling of rivers: Lim and Tara”

- Impact of climate parameters changes on water regime of two rivers (Temperature and precipitation) from climate projections
- Selected profiles:
 - Location Bijelo Polje on River Lim and
 - Location Trebaljevo on River Tara



It is expected a reduction of number of winter droughts and increase number of summer droughts, as well as slightly increase of droughts with duration more than 30 days

Climate services to the disaster risk reduction sector

Climate services of IHMS provide climate data in order to reduce risks and improve resilience: spatial planning and design documentation,

Impact of the expected extreme values of climate parameters with a certain return period, to buildings or infrastructure adequately constructed and resistant to these extreme climatic parameters

„Achieving the highest safety and technical quality of construction“-EUROCODEs Project

- Here in the climate component is not included Weather Forecast as **Early warning system (EWS)** in order to reduce the risk of disaster and mitigate the consequences. For weather components has responsible the Department of Weather forecast and Analysis, within the IHMS.

DRR ACTIVITIES

- the WMO project on “Regional cooperation in South Eastern Europe for meteorological, hydrological and climate data management and exchange in support of disaster risk reduction” (DRR/SEE Project), http://www.wmo.int/pages/prog/dra/eur/DRR_SEEProject.php
- Building resilience to disasters in Western Balkans and Turkey, <http://www.preventionweb.net/ipadrr/>
- EUROMED Programme on Prevention, Preparedness and Response to Natural and Man-made Disasters” (the PPRD South), <http://euromedcp.eu/>
- SEE Forum on Climate Change Adaptation
- GIZ project „ Climate change adaptation in Western Balkan“



Recently, Government of Montenegro established the Committee on Disaster Risk Reduction, with two members from IHMS



Climate services to other sectors

We provide climate services for:

- **Energy sector, particularly Energy Enterprises Company,**
- **Urban Planning,**
- **Tourism,**
- **Transport,**
- **Civil engineering,**
- **Building and Construction,**
- **Insurance,**
- **Public sector...**

It depends on request and special purposes.

There are a few types of communications with customers: via telephone, e-mail, fax or written request.

Climate Forums

National climate forums are:

- National Council for climate change, established for preparation of Technology Needs Assessment for Climate Change Mitigation and Adaptation for Montenegro(TNA), for preparation of National Strategy and Action Plan, 2011.
- Within the SEE-FCCA, there is National climate forum known as „Climate response“, 2008, and renew on 2011, initiated by Montenegrin Red Cross.

Regional climate forums are:

- SEE Climate Change Framework Action Plan for Adaptation, financially supported by the Royal Ministry of Foreign Affairs of Norway, November 2008,
- Regional Ministerial Climate change forum, 2009,
- The SEE Forum on Climate Change Adaptation, aims at increasing awareness of humanitarian, social, economic, environmental and health impacts of climate change in the region and to foster joint initiatives of international, regional and national stakeholders, incl. civil society actors and the Red Cross, 2011,2012
- SEECOF, 2008-...
- MEDCOF,2013-...

Limitations of the NMHSs in the provision of climate services

Main limitation is lack of number of employees engaged for this purpose and low budget of the IHMS

Currently there are few people (5) dedicated to provide climate services upon different types of requests

There are a lot of activities (training, education) and planned additional training to increase these number

Restrictions in terms of information technology and specific software.

Related to the involvement of sectors:

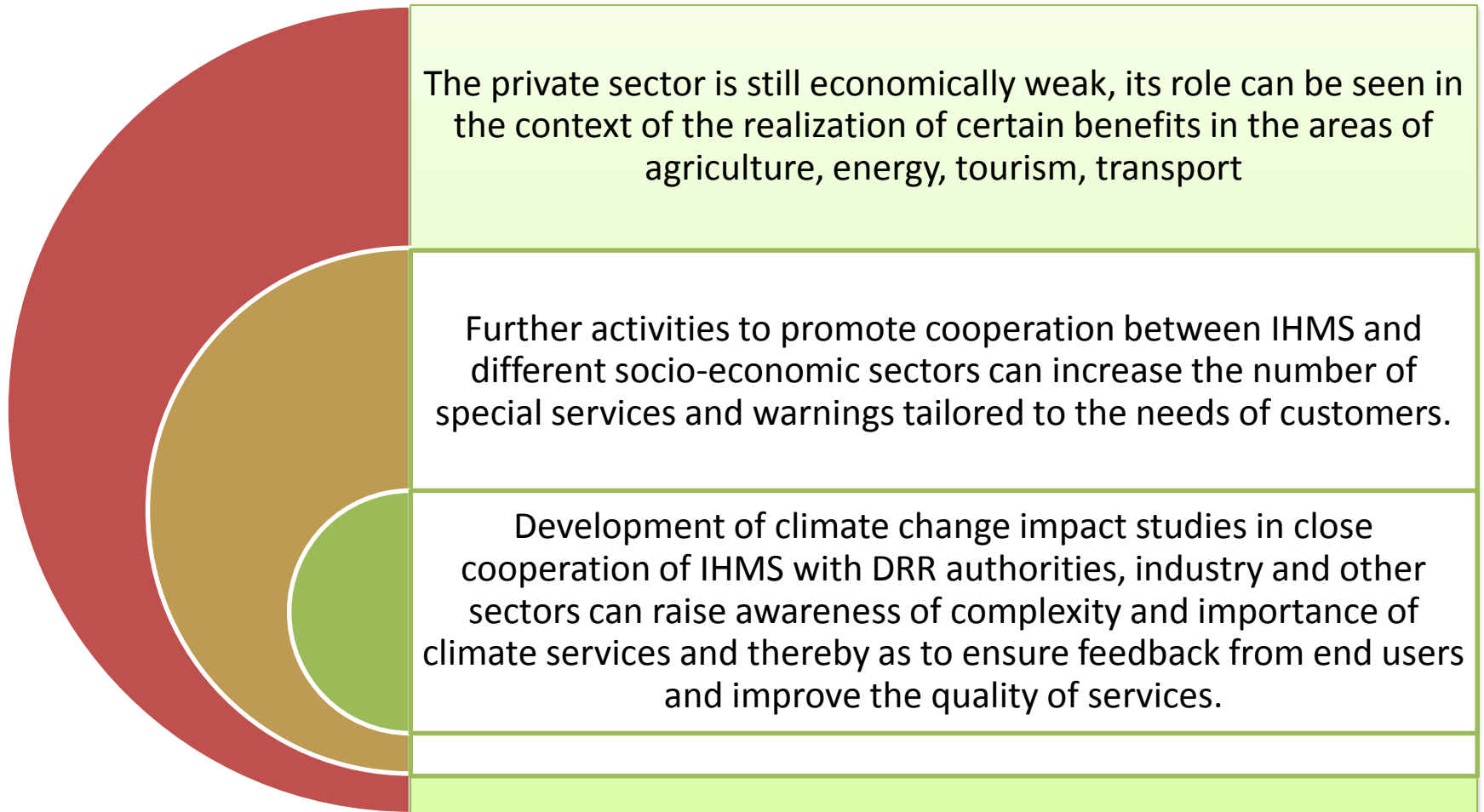
- **Agricultural Sector** is still not involved appropriately. We work on their engagement and usage of our specific products such as SPI indexes, Fractional vegetation cover (FVC) and Leaf area index (LAI), seasonal weather forecast, climate watch advisory
- **Public Health** could benefit more from specific climate services including the SEECOF, MEDCOF or seasonal weather forecast from the Regional Centres, Climate Watch advisory as well.

Priorities and opportunities to strengthen the provision of climate services

- to increase the volume of data and improve quality control
- to provide capacity-building, training of employees
- to improve hydro-meteorological observing system to upgrade hardware and software.

The on-going institutional strengthening process, which encourages result-oriented planning and project execution, will also greatly contribute to the sustainability of strengthening the provision of climate services in Montenegro.

Role of private sector



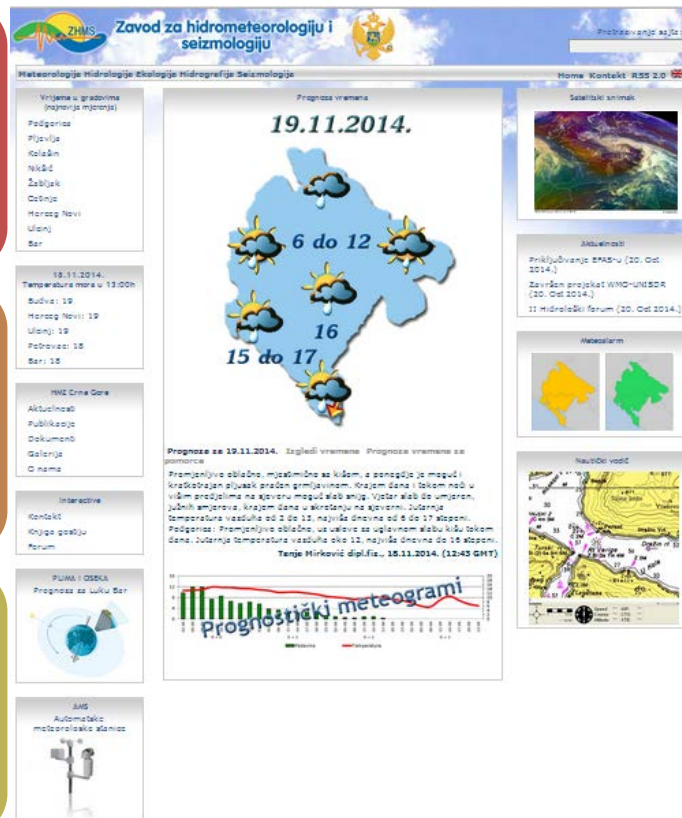
User interface Platforms

Requests for data can be submitted via IHMS web page:
www.meteo.co.me or by sending a fulfilled request for data on official mail address: office@meteo.co.me.

The request can be downloaded from IHMS web page.

After receiving the request the person in charge for this domain send the confirmation of receipt of the request to its sender and the information that the request will be processed within determined legal time limit (till 15 days).

The received request must be recorded in the IHMS archive and then forwarded to the Director/Deputy director who delegates the person who will process the request and contact the sender in case of further information/clarification needed or just send the requested information/data.



Interface mechanisms with users

On the website of the IHMS there is a section dedicated to climatology, which includes climate analysis for each month, season (season) and year.

Analyses are regularly updated and engaged primarily temperature and precipitation in Montenegro, actual values and deviations from the normal.

The forum on our site is being developed, at times, very lively discussion in the section devoted to climatology, especially the topic called climate change.

Of course, this is not formalized and institutionalized discussion, but among the more than 300 posts on the subject, there are those who certainly deserve attention.

Good practices in the development and application of climate services

Local level

- GIZ „Adaptation of the capital town Podgorica on climate change and extremes“: extreme events, overview their consequences per sectors and according to that assessment of their vulnerability.



National level

- project CAMP where according to the provision of the climate services were made vulnerability assessments on hazardous situation such as the drought, forest fires, heavy rainfall and storms on the coastal area of Montenegro.
- Climate services for the project related to the forest data base
- DMCSEE project and their outputs such as vulnerability map on drought for agricultural s



Lessons learnt

Local authorities should be more engaged as end users, and networked in IHMS's contacts.

It is necessary to work on increase their awareness on how to use climate information.

Climate sensitive sectors (agro, health, DRR, water,...) should be actively involved as the end-users.

They should be trained how and why to use climate services.

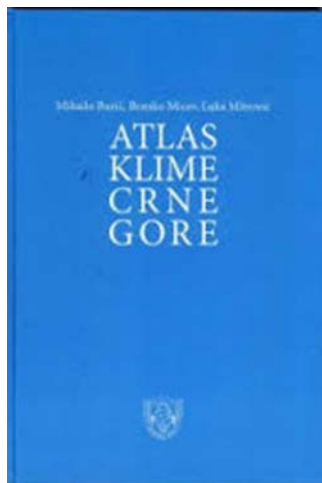
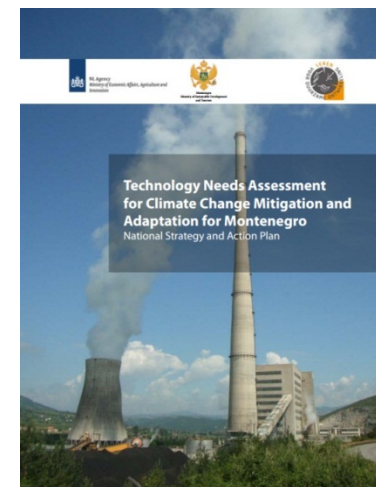
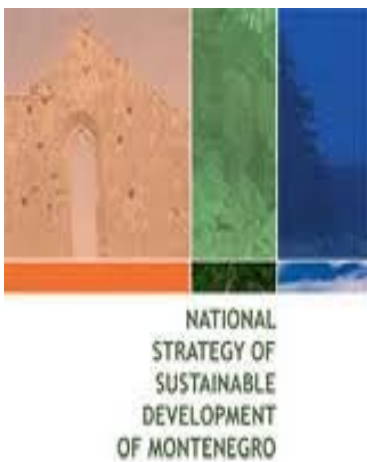
What should be done?

It is necessary to promptly improve Hydrological Observation Network: classical and automatic hydro-meteorological stations, the use of satellite data (DAWBEE 2010) and establish the first national meteorological radar network (*Country Strategy paper* IPA 2014-2020)

A prerequisite for all of these activities is to strengthen the human and technical capacity of IHMS

To achieve this needs **greater financial support and national budget allocations**, in order to **establish a functional EWS** in activities to reduce the risks of natural disasters and so contribute to the sustainable development of Montenegro

Montenegrin climate related publications



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Beautiful Getinge
Biodiversity Strategy and Action Plan
Business clusters for sustainable economic growth
Coastal area management
Environmental indicators
Strengthening sustainability of protected areas
Financial sustainability of protected areas
Promoting renewable energy sources
Second National Communication on Climate Change

Second National Communication on Climate Change Overview

FLOODS IN MONTENEGRO IN 2016. PHOTO: UNDP IN MONTENEGRO/MILO VUKOTIĆ, MEDANJIN

Project Overview
Status: Active
Project Start Date: March 2011
Estimated End Date: March 2014
Geographic Coverage: Nationwide, Montenegro
Focus Area: Economy and Environment
Project Officer: Ms. Snežana Maratijepović
snezana.maratijepovic@undp.org
Tel: +382 20 22 55 33
Fax: +382 20 22 55 51
Partners: Ministry of Sustainable Development and Tourism of Montenegro

Top news Most read

05.05.2011

Montenegro tops WTTC report in growth of tourism contribution to GDP

Over the next ten years, Montenegro is expected to experience the world's fastest growth of total contribution of travel and tourism to GDP at 12.4 per cent a year, the World Travel and Tourism Council (WTTC) has announced in its latest report...

- PUBLIC INVITATION for participation in International Public Tender for Long-term Lease of tourism co
- THE PUBLIC INVITATION for participation on the Tender (HTP "ULCINJSKA RIVIJERA" AD, Ulcinj, Montenegro
- FOURTH NATIONAL REPORT OF MONTENEGRO TO THE CONVENTION ON BIOLOGICAL DIVERSITY

Projects of the Ministry

Bjelostica and Komovi

Current News

10.09.2013.

Law on spatial development and construction of structures

Law on spatial development and construction of structures

more...

31.07.2013.

Interview: Branimir Gvozdenović, Montenegro Tourism and Sustainable Development Minister

Interview: Branimir Gvozdenović, Montenegro Tourism and Sustainable Development Minister



BIODIVERZITET VAZDUH ZEM

Praćenje stanja biodiverziteta za cilj ima njegovo očuvanje, unaprijeđenje i zaštitu, a usmjeren je na praćenje najprezentativnijih vrsta i staništa od međunarodnog i nacionalnog značaja.

Vazduh kao jedan od najznačajnijih činioča životne sredine, svojim kompleksnim sastavom i osobinama zahtjeva stručno praćenje i analizu.

Zemlj, elem, sredi, uslov

20.11.2014.

Temperatura mora u 13:00h

Petrovac: 18

Tivat: 18

Budva: 18

Bar: 18

Ulcinj: 18

Herceg Novi: 18

AKTUELNO

Ekološki čas u OŠ "Štampar Makarije"

Petak, 27. Septembar 2013.

U okviru edukativnog programa iz ekologije, dana 27. septembra 2013. god., predstavnici Agencije za zaštitu životne sredine održali su e...

Press konferencija – „Informacija o stanju životne sredine za 2012.god.“

Četvrtak, 26. Septembar 2013.

Povodom usvajanja dokumenta: „Informacija o stanju životne sredine za 2012. god.“, dana 26. septembra, u Podgorici u multimedijalno...

Podgorici u multimedijalno...

PLUMA I OSEKA

Prognoza za Luku Bar



Address:

IV proleterske 19

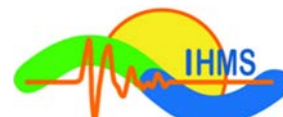
81000 Podgorica

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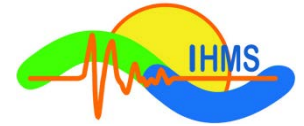


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