

Romanian Meteorological Service

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National Meteorological Administration



18th Session of the Informal Conference of South-East European NMHSs
Directors (ICSEED-18)
Tel Aviv, Israel
4th November 2019



National Meteorological Administration - profile

1884 – 2019 / 135 years of existence

- **National authority in the meteorological field in Romania, with a continuous service since 1884** (<http://www.meteoromania.ro/>).
- **NMA is subordinated to the Ministry of Environment (ME)**, functioning on the basis of Law 216/2004.
- The National Meteorological Observation Network within the NMA is made up of 7 Regional Meteorological Centres. National Meteorological Administration has in its structure the National School of Meteorology (<http://snm.meteoromania.ro/>)
- International meteorological data exchange with 23 stations in RBSN (Regional Basic Synoptic Network), and 14 stations in RBCN (Regional Basic Climatological Network).

□ **Romania is a founding member of the International Meteorological Organization (IMO), and beginning with 1948 it has become a full member of the World Meteorological Organization (WMO).**

□ A domain of fundamental importance for the operational meteorology and the research activity, the NMA played an important part within European meteorological bodies like the European **Organization for the Exploitation of Meteorological Satellites (EUMETSAT)**, the **European Centre for Medium-Range Weather Forecasts (ECMWF)**, the **European National Meteorological Services Network (EUMETNET)** and the **Economic Interest Grouping of the National Meteorological Services of the European Area (ECOMET)**.



ROMANIAN METEOROLOGICAL SERVICE / General introduction

Mandate: to monitor weather and climate as well as provide weather forecasts and advisories to central/regional/local authorities and other stakeholders for use in sustainable development of the country

Mission: to contribute to the protection of life and property against weather disasters

Vision: Provision of efficient meteorological services/products to safeguard life and property

Organization structure: HQ in Bucharest including the National Weather Forecasting Centre and 7 Regional Meteorological Centres;

Infrastructure: meteorological and agrometeorological network, radar network, nivological network, satellite reception system, etc;

Human resources profile: The National Meteorological Administration of Romania employs around 1200 people, and about 300 of them work at the headquarters in Bucharest and 900 at the RMCs. From the total employees 576 are women's and the staff include 4 Executive Director Women's at HQ and 4 Directors RMCs. The young experts (<35 ys) represent >39%.

Education and training program: National Meteorological School (<http://snm.meteoromania.ro/>)

- **Initial, continuous basic training programs:** secondary (5 modules) and higher education personnel (10 modules);
- **Specialized training programs:** short term specialized stages (5 weeks)
- **Permanent training programs:** short internships (3 weeks)
- **Personalized training programs:** on demand (e.g. aviation meteorology)

Budget allocation: In 2019, the total budget of NMA was of Euro 14.961.700 Euro. The total budget of the NMA is made of budgetary funds by Romanian Government through Ministry of Environment (80%) and extrabudgetary funds (20%)

Service delivery and product: oriented activities according with the users need – decision level and operational use

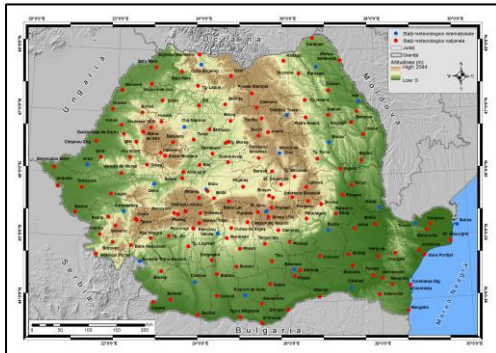
National cooperation activities: ROMATSA for aviation meteorology; GEOECOMAR for marine meteorology; National Hydrology Institute for hydrology information

Regional perspectives: Regional Agrometeorological Centre in RAVI-Europe

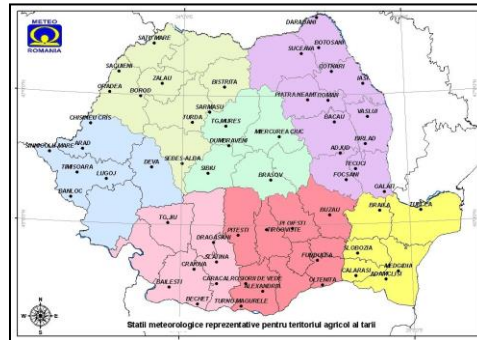
National Meteorological Observation Network of Romania

- 163 automatic weather meteorological stations (MAWS)
- 55 weather stations integrating a special program of agrometeorological measurements - soil moisture and phenological data (winter wheat, maize, sunflower, rape, fruit trees and vineyards)
- 8 Doppler radars: 5 WRS-98D (S-band) and 3 EEC and Gematronik (C-band)
- 15 weather stations integrating a special program in the mountain area with high avalanche risk

METEOROLOGICAL NETWORK



AGROMETEOROLOGICAL NETWORK



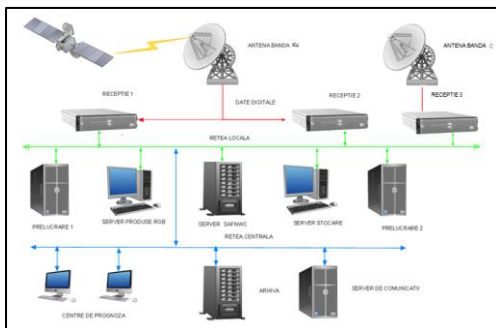
RADAR NETWORK



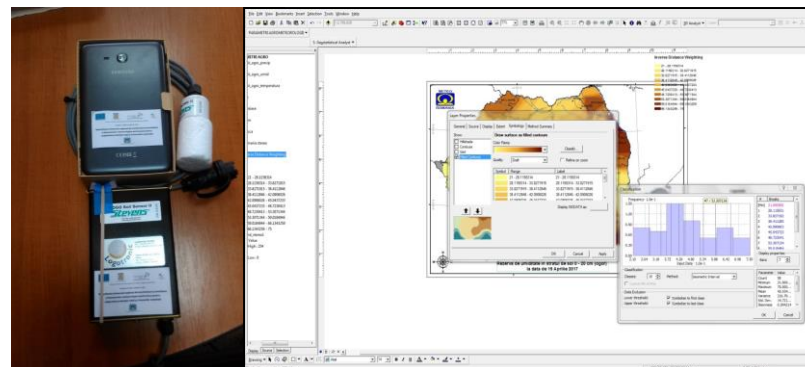
NIVOLOGICAL NETWORK



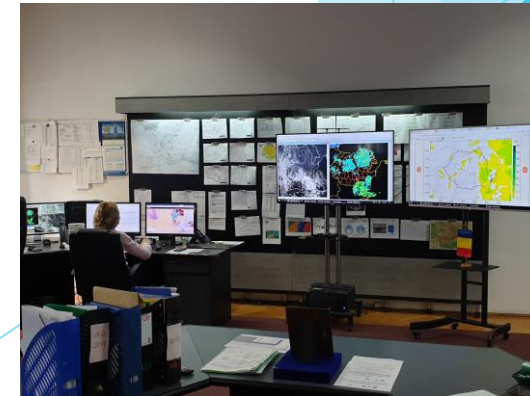
SATELLITE RECEPTION SYSTEM



SOIL MOISTURE MONITORING SYSTEM



NATIONAL WEATHER FORECASTING CENTRE



Romanian Meteorological Service: beneficiaries - oriented activity

- **Operational activity / forecasts and warnings**

- Very-short range (now-casting / 0-6 hours) – based on radar data and satellite imagery
- Short (24 -48 h) and medium term (3-5 days) – based on numerical weather models
- Weekly estimation of air temperature and rainfall (4 weeks) at national level – based on the ECMWF information
- Weekly estimation of extreme air temperature (min and max) and rainfall – at regional level
- *Agrometeorological bulletin weekly* (updated daily) includes specific information (air temperature, precipitation, ETP, soil moisture, crop water requirement) useful for assessing the occurrence of drought

- **Specialized products**

- **Parameters and maps of thermal vulnerability** and risks at national level, regional / local (temperature, cold/frost units, intensity and duration of the scorching heat, etc.)

- **Indicators of water stress at national, regional and local level** (precipitation, ETP, relative air humidity, rainfall, **Aridity indices**, etc.)

- **Soil moisture maps**, weekly agrometeorological information and seasonal forecasts which are updated daily according to the operational activity are made available to the public on the **NMA website** (www.meteoromania.ro) and on the new mobile application **INOVAGRIA** (<https://www.inovagria.ro/componente/50-meteo>).

For:

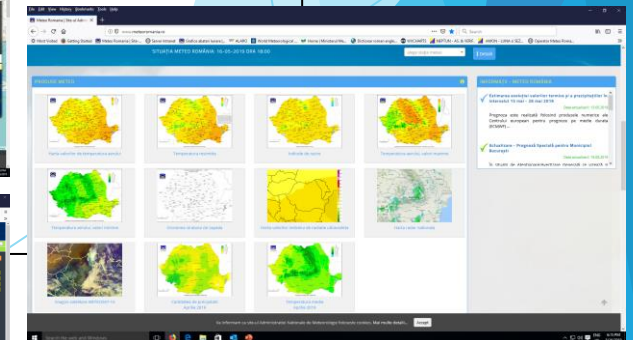
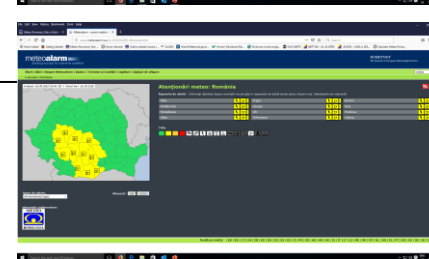
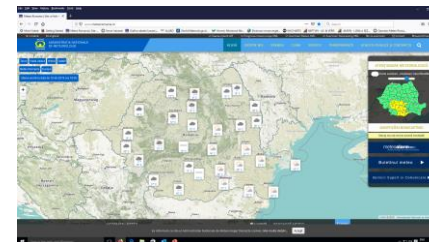
- Governmental institutions - Presidency, Government, Ministry of Environment, Ministry of Waters and Forests, Ministry of Internal Affairs, Ministry of Agriculture and Rural Development - for informational and decision-making purposes.
- Central, regional/local authorities in the field of environmental protection, emergency situation and civil protection, agriculture, water management, energy, transport, tourism, etc.
- Mass-media and population

- **Research activity as Lead-partner or Partner in consortium**

- pilot-studies, national and international projects

<http://www.meteoromania.ro/>

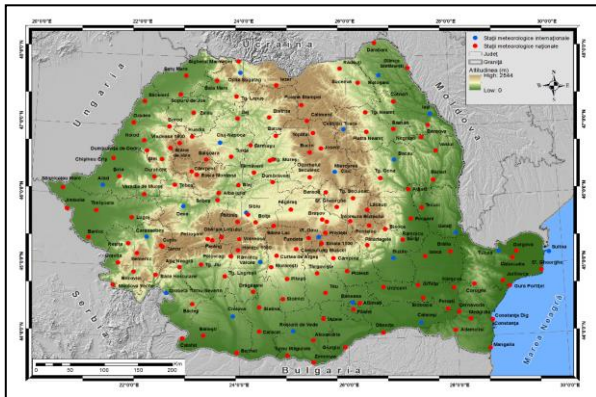
http://www.meteoalarm.eu/index.php?lang=ro_RO



Upgrade the observation systems to monitor extreme weather events and climate change, under Operational Program of Large Infrastructure (EU Funds, 2007-2013 and 2014-2020)

**NMA project: Developing the national system for monitoring and warning of extreme weather phenomena for the protection of life and property /
cca. 60 Mill. Euro**

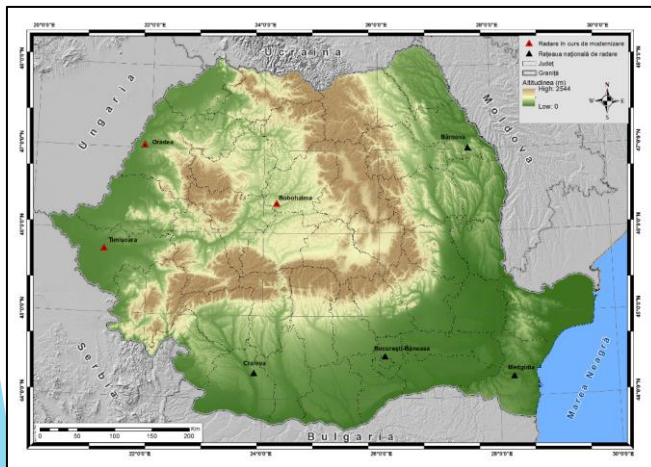
- 3 sequenced projects (implemented, ongoing and in preparation) addressing to the development of observation system including modernization of the automatic weather stations, radar network, computing system, visualization system, climate data management system, etc.)



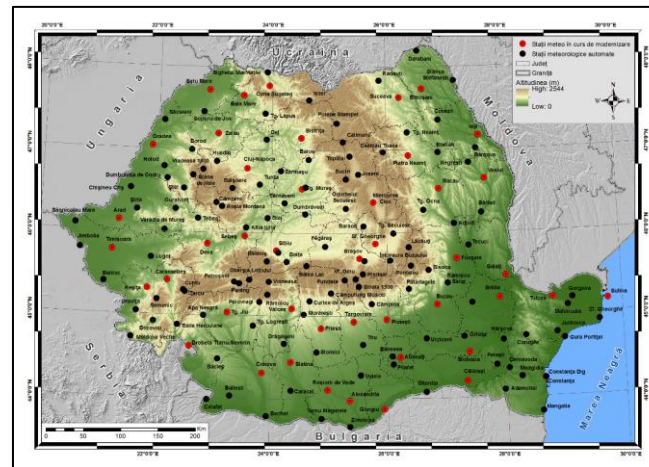
Relevant outcomes of ongoing projects within Operational Program of Large Infrastructure (EU Funds, 2014-2020) / 6.4 Mill. Euro

- Upgrading of the radar network (3 S band radar) and the specialized applications, including data processing servers;
- Upgrading of the current network of automatic weather stations – 45 stations;
- Modernization of the Telecommunication System and visualization of weather forecasting products and dangerous weather phenomena warning;
- Climate Data Management System (CDMS) modernization using geospatial representation standards;
- Data assimilation system and operational applications upgrading in the short and very short-term forecast (nowcasting).

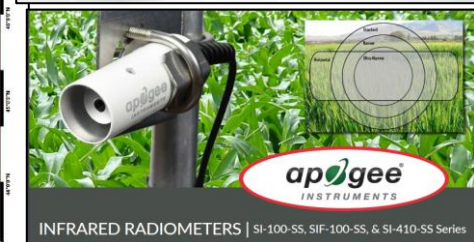
Radar - 3 in S band



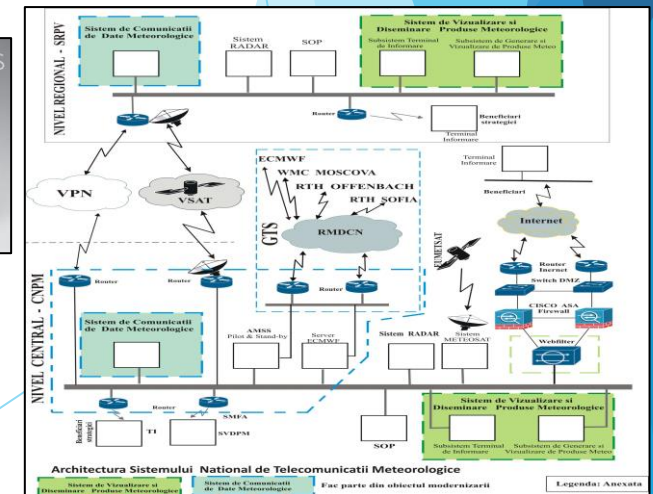
45 automatic weather stations



SUV | Smart Ultraviolet Radiometers



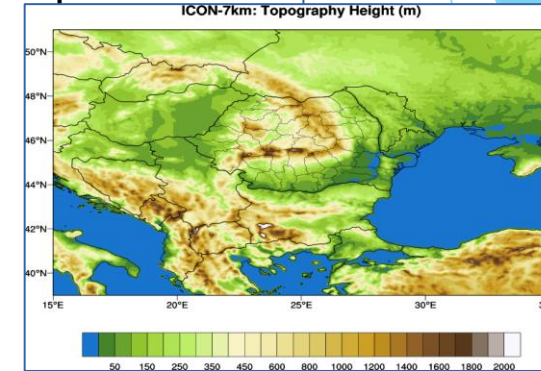
Visualization scheme



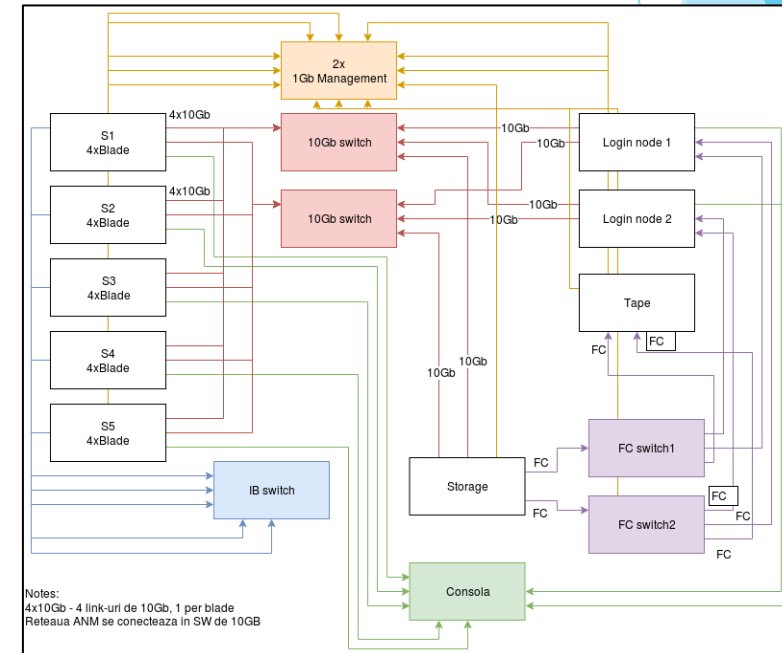
ICON-7km for Romanian territory soon will be pre-operational against COSMO-7km / end of 2019

NMA new HPC architecture:

- 5 Lenovo chassis, each with 4 Lenovo ThinkSystem SD536 compute nodes
- 2 Intel Xeon Gold 6130 processors / node
- 16 cores / processor
- 2 Lenovo ThinkSystem SR650 login nodes
- Infiniband FDR Mellanox SX6036
- Storage DellEMC Unity 300 / 45Tb
- Operation System Centos 7
- Lico infrastructure management software



Model	Proc.	No. Cores	IO	Run time
ICON-LAM-7km	X E5640	56	0	~250 min
ICON-LAM-7km	X E5345	80	0	~181 min
ICON-LAM-7km	X E5345	88	16	~146 min
ICON-LAM-7km	XG 6130	320	10	~20 min
ICON-LAM-7km	XG 6130	160	10	~32 min



Expected outcomes of projects in preparation / INFRAMETEO

Project "Technical assistance for preparing the financing application and the awarding documentation for INFRAMETEO Project - Modernization of the monitoring and warning infrastructure for severe hydro-meteorological phenomena in order to ensure the protection of life and material goods" / **APPROVED**

LARGE INFRASTRUCTURE OPERATIONAL PROGRAMME (LIOP) 2014 - 2020

Priority Axis 5 - Promoting *climate change* adaptation, risk prevention and management

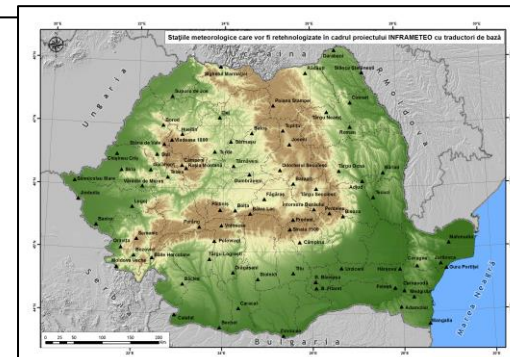
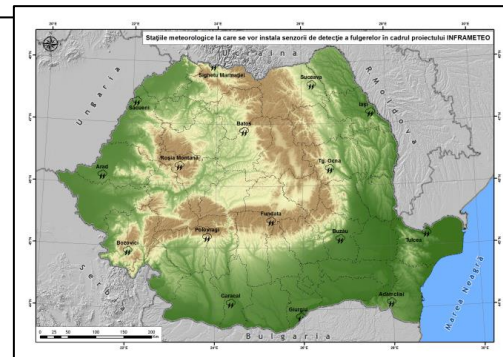
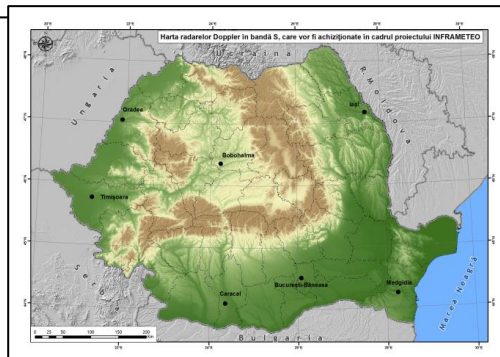
Specific Objective 5.1 – Reducing the effects and damages on the population caused by the natural phenomena associated with the main risks accentuated by the climatic changes, mainly of floods and coastal erosion.

Objectives:

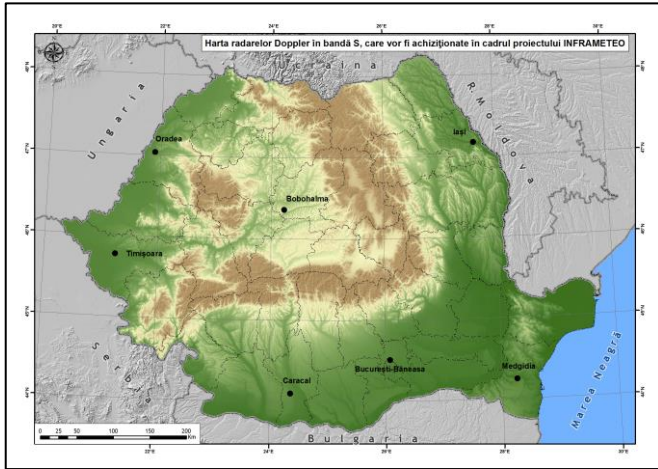
1. Modernizing of the meteorological radar network (7 Doppler S-band, dual- polarimetric);
2. Modernizing of the lightning detection network;
3. Modernizing of the communications infrastructure and improving of the National Meteorological Administration's IT system performance;
4. Extending modernization of the national automatic weather stations network (80 AWSs);
5. Hot-standby system for receiving, processing, visualizing, archiving and disseminating data from meteorological and atmospheric surveillance satellites;
6. System for receiving, processing, archiving and disseminating data from the Copernicus Sentinel-1, Sentinel-2, and Sentinel-3 satellites able to monitor the areas affected by disasters or crisis situations on the national territory;
7. Setting up of the Regional Agrometeorological Centre for WMO Regional Association VI (Europe)

Feasibility study: 1,7 Mill. Euro for, 2019-2020 period

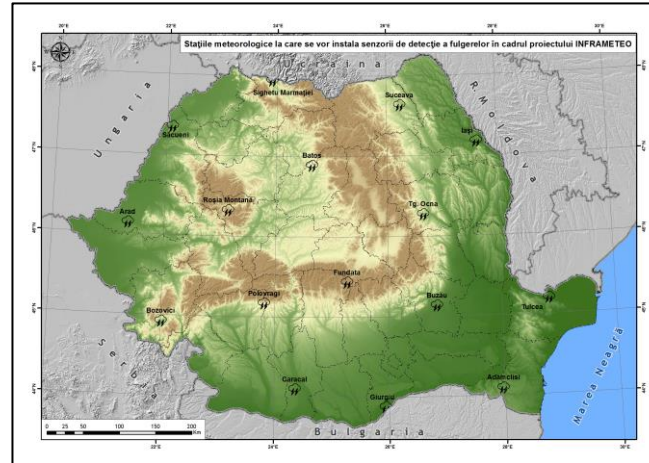
Total Project Objectives: 50 Mill. Euro, 2020-2023 period



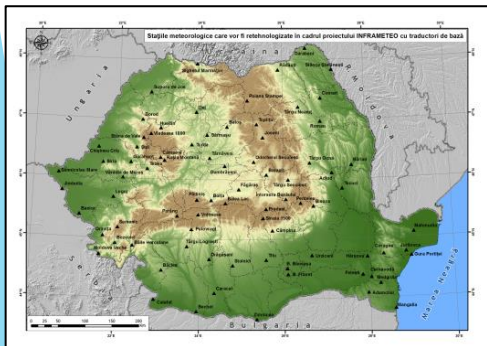
Objective 1. 7 S band dual polarimetric Doppler radars



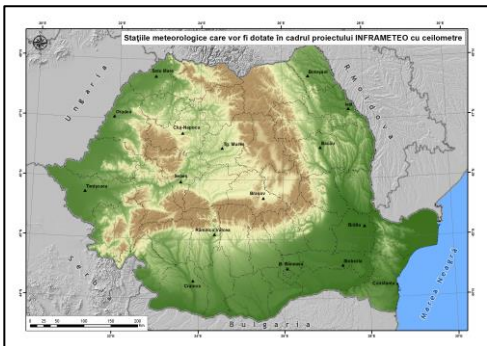
Objective 2 2. 16 lightning detection sensors



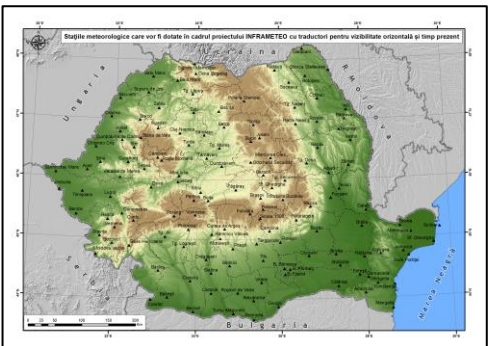
Objective 4. Extending modernization of the national automatic weather stations network / 80 meteorological stations



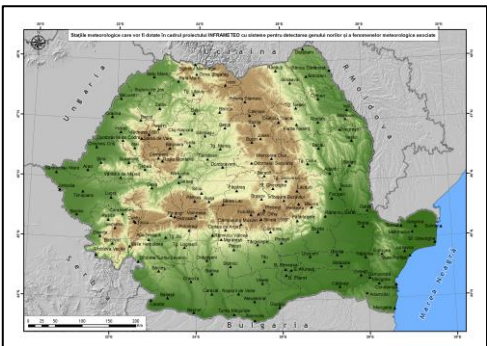
80 meteorological stations, basic traductors



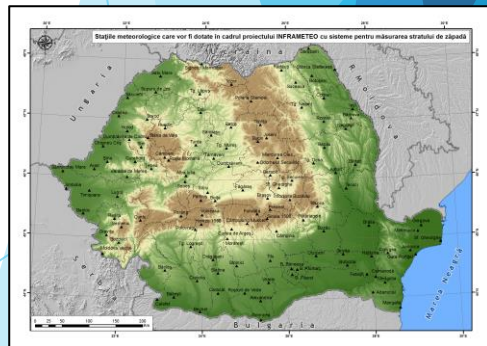
16 meteorological stations equipped with ceilometers



140 Present time and horizontal visibility sensors



156 cloud and associated weather phenomena detecting systems



120 snow depth measuring traductors

NMA - at the fore front of climate policies in Romania

- NMA has developed in recent years 17 other projects to address the challenge of extreme events and their impacts, with outputs relevant for various sectors: DRR, agriculture health, tourism, water, air quality, urban.
- 4 other flagship projects are advancing the work on DRR and adaptation (see below) or building capacity, in line with the EU and Romanian adaptation strategies.
- *Developing the administrative capacity of the Ministry of Environment regarding the management of the emergency situations generated by the hazards specific to the activity of the ministry and of the situations concerning the state of the environment - COSU (5,32 Mill. Euro - **APPROVED**)*

EU - Actions in the Adaptation Strategy
Priority 1: Promoting action by Member States
Priority 2: Better informed decision-making
Priority 3: Adaptation in key vulnerable sectors

ROMANIA - Actions in the Adaptation Strategy / 2019-2022

1. Consolidating the institutional capacity for the improvement of policies in the domain of climate change and adaptation to the effects of climate change - ROADAPT (4,22 Mill Euro) / APPROVED:

- Digital Platform of CC adaptation for the 13 key sectors (National Climate Action Plan 2016-2020)
- National Centre for Climatic Monitoring to provide tailored products/services
- Review of the National Strategy on CC and economic growth and of the National Adaptation Plan (2021-2030 vs. 2016-2020) according with the international agreements (Paris Agreement, Sendai Framework for DRR, 2030 Agenda - SDGs)

2. Increasing the institutional capacity of the Ministry of Environment for the implementation of environmental policies on the basis of a Digital Climatic Atlas- ROATLAS (2,55 Mill Euro) / UNDER EVALUATION

- First digital climatic atlas of Romania, with complementary information of soil, water resources and weather warnings archive; all information will be available online (free of charge) via a WebGIS platform.
- A methodology for establishing critical alert thresholds for meteorological phenomena and review of the weather warnings procedures.

3. Developing the administrative capacity of implementing environmental policies through the integration of observation, satellite, air and in-situ data - CAMUSS (3,19 Mill Euro) / UNDER EVALUATION

- Digital Platform to integrate observation, satellite, air and in-situ data provided by the Earth Observation (COPERNICUS)
- Methodologies and guidelines for using of the Copernicus information in the environmental monitoring activity, including atmospheric monitoring and climate change



FUTURE REGIONAL PERSPECTIVES

ROMANIA – Ministry of Environment / National Meteorological Administration

Regional Agrometeorological Centre in Regional Association VI-Europe (2019) 2-14 June 2019, Congress of Meteorology, Geneva – WMO

The main goals of the Centre are to support a sustainable agricultural production and include the following activities:

- Soil health and moisture research, development, and management, including soil moisture flux measurements and associated research;
- Phenology research and development;
- Systems production research across the whole value chain in agricultural production - from farm level issues through to harvesting, transport, milling, and trading/exporting, considering factors associated with weather and climate;
- Understanding of extreme weather and climate events and food security issues, especially related to agricultural production;
- Enhanced capability in development of weather/climate-agricultural decision support systems and further development of more effective transfer and training mechanisms associated with workshops, field days, and more effective web sites and similar;
- Increased cooperation and exchange expertise with other regional and global initiatives such as DMCSEE, Regional Climate Centres, etc.

- The Centre will contribute to determine the impact of the weather and climate on existing and future agricultural systems as well as the actions needed to ensure the long-term sustainability of agricultural systems within RA VI Europe.
- The Centre will provide relevant European agrometeorological data and information to European countries, such as soil moisture and phenology of plants, bulletins and agrometeorological products / services, as well as professional training support activities.

The operational and research activities of the European Agrometeorological Center will take place in a **Green and Smart** building at the NMA headquarters in Bucharest.

The building will incorporate modern technological instrumentation in order to achieve energy efficiency and long-term sustainability.



8 June 2019 / Regional Agrometeorological Centre for RA VI - a WMO initiative meant to enhance cooperation in agricultural field, in the context of future CC



IMPLEMENTATION PROCESS

- **Determine the proper user needs in RA VI:**
 - Observation data: phenology and soil moisture
 - Products/services: agromet diagnosis/forecasts, monthly bulletin, map indicators, etc
 - Research: EU pilot projects in common thematic areas / climate change impacts and water resources management, etc
 - Capacity development: user oriented services and training programs
- **Develop knowledge hubs for agricultural meteorology (WIGOS, WIS) with regional centres including WMO regions /DMCSEE / <http://www.dmcsee.org>;**
- **Determine aspects related to the WMO Global Framework for Climate Services (GFCS) and liaise with GFCS help desk on this process and relevance by creating a Regional GFCS Hub for agricultural meteorology;**
- **Determine processes on engaging with other sectors (eg. water management, agricultural re/insurance, etc).**
- **Determine processes for scaling-up similar activities in other RA's.**

The Centre will provide the full range of activities, starting from monitoring and observation, going through data exchange and processing, ending up with service delivery.

The Centre will be meant to strengthen collaboration among National Meteorological and Hydrological Services, enhance capacity building and facilitate beneficial partnerships at European and international level, aiming at successfully implementing the research projects and programs oriented towards the mitigation of effects of global warming and climate change.

NATIONAL EVENT / Q1 of 2020

Regional Agrometeorological Centre in Regional Association VI-Europe

Challenges :

- To develop the observations network: the density of the stations at national level for a better data coverage and forecasting activities
- Voluntary network to improve phenological observations and soil moisture measurement
- Numerical modelling and data assimilation
- Historical data records and CC impacts analysis
- Users service delivery for a better understanding of the products
- Strengthening capacity development through meteorological training and education at the national and regional levels;
- Building and enhancing partnerships and cooperation through working in collaboration with WMO technical commissions and European research organizations to create synergies and to support improved socio-economic development in the context of future climate change;
- National CC Strategy (NSCC) and Adaptation Plan (NAP)

The present-day and foreseeable climatic data highlight the increase in frequency and intensity of the extreme phenomena, its potential effects on the most vulnerable sectors (e.g. agriculture, water and forests, biodiversity, energy, transport), thus requiring specific adaptation measures to the limiting environmental conditions.

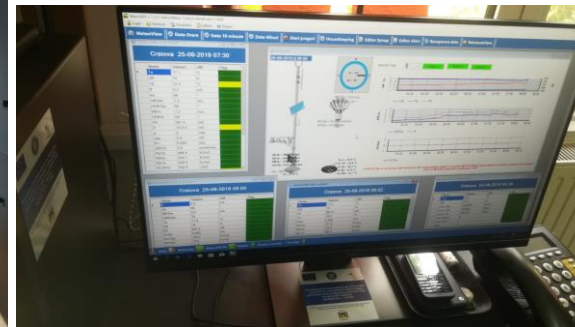


Instrumente Structurale
2014-2020

Modernization of the monitoring and warning infrastructure for severe hydro-meteorological phenomena in order to ensure the protection of life and material goods

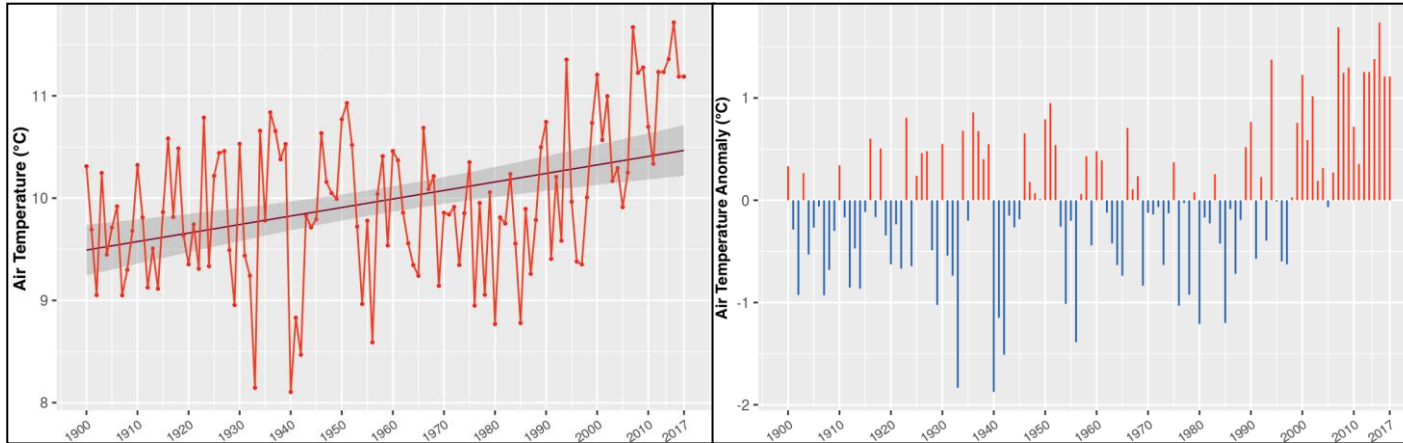
- SOP ENVIRONMENT 2007-2013: 5.387.417 lei / **IMPLEMENTED**
- LIOP 2014-2020:
 - 1. Cod SMIS 2014+ 127994: 29.956.584,25 lei / **UNDER IMPLEMENTATION**
 - 2. AT - INFRAMETEO: 6.930.620 lei / **APPROVED**
 - 3. PROJECT INFRAMETEO: 197.616.000 lei / **IN PREPARATION**

TOTAL: 239.890.621,25 RON / 51.040.557 Euro



Extreme weather events are becoming more frequent and/or severe
Increasingly frequent and/or severe weather events have serious consequences for society and ecosystems

Mean air temperature and anomalies



The warmest years in Romania

N°	Year	Mean annual air temperature (°C)	Anomaly (°C)
1	2015	11.72	1.7371
2	2007	11.67	1.6916
3	2018	11.57	1.5805
4	2014	11.36	1.3808
5	1994	11.35	1.3748
6	2009	11.28	1.2972
7	2013	11.23	1.2546
8	2012	11.23	1.2538
9	2008	11.23	1.2466
10	2000	11.21	1.2270

	Number of the general warnings	Number of the now-casting warnings
2011	37	1744
2012	90	1535
2013	70	2423
2014	73	2697, 3 / red colour - winter
2015	96	2261, 1 / red colour - summer
2016	101	3693
2017	114, 3 / red colour - summer	4211, 4 / red colour - winter
2018	77	5765, 1 / red colour - summer
2019	January - September 2019 / 88	January – September 2019 / 3753, 74 red colour Mai 2019: 524, 10 red colour June 2019: 1160, 51 red colour July 2019: 564, 11 red colour August 2019: 390, 2 red colour

◆ **9 from 10 the warmest years in the period 2000-2018**

◆ **12 years recorded positive thermal anomalies higher than 1°C, the last 7 years being consecutive (2012-2018)**

**ROMANIAN METEOROLOGICAL SERVICE
1884 – 2019 / 135 years of existence**

www.meteoromania.ro



THANK YOU FOR YOUR ATTENTION!

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