

International Conference

Drought Risk & Drought Risk Management in Romania & in Europe

October 30 and October 31 in Bucharest, Romania
Novotel, Calea Victoriei 37



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Presentations and Speakers

Presentations Monday, October 30, 2023

Drought 2022 in Romania and in Europe

Natalia Limones, World Bank Drought Expert, University of Seville, Spain

To set the stage for the Conference, Natalia we will present a brief high-level overview of historical impacts of the drought in Romania on different sectors, with a focus on those experienced in the event back in 2022. We calculated basin (RBD)-level and NUTS2 and NUTS 3-levels drought hazard indices and compared them with the impacts experienced in water resources reduction, hydropower generation, navigation, industrial activities, agriculture or the environment over time. For assessing this, data on drought impacts was collected from Romanian statistical services and counting with the collaboration of the sectors.

However, drought is not only a country-level challenge, so the talk will reflect as well on the regional drought issue- coming back to the example of the 2022 extreme drought - and the need to act under the perspective of a future drier Europe.

NATALIA LIMONES is a Professor for the Department of Physical Geography at the University of Seville (Spain) and a Consultant in Drought Management for the World Bank (WB) Water Global Practice. With a background in physical geography and hydroclimatology, she has researched and cooperated with international experts and stakeholders from more than 20 countries in the fields of Water, Disaster Risk Management and Environment. Dr. Limones holds a PhD and an MSc from the University of Seville and the University of Bristol, both recognized with the highest honors.

Ongoing Developments on Water Scarcity and Drought Risk Management at EU level

Luca Perez, DG Environment

The presentation will give a state of play on ongoing developments at EU level in relation to water policy with a focus on recent relevant action to tackle water scarcity and drought.

LUCA PEREZ is currently Deputy Head of the Unit responsible for Sustainable Freshwater Management at the Directorate-General for Environment of the European Commission, which is responsible for the implementation of the EU Water Framework Directive, as well as the EU Floods Directive. He previously

worked as Deputy Head of Unit responsible for Bilateral and Regional Environmental Cooperation where he also served as EU Focal Point for the UN Convention to Combat Desertification and the UNECE Water Convention. Previously as Team Leader for International Forest Issues at DG Environment, he was responsible for the external representation of the EU in multilateral fora on forest issues (UNFF, ITTO, FAO), the implementation of the EU FLEGT Action Plan, and wider EU action on combating deforestation and forest degradation. He previously worked as policy officer at the Directorate-General for Research and Innovation working on research projects in the area of climate change and in climate change negotiations under the UNFCCC. Luca has worked for several UN agencies (UNEP-WCMC, UNDP), non-governmental organisations and the private sector in Europe, Africa and Latin America. He holds an MSc in Economics of tourism and sustainable development and a BA in International Relations and Development Studies.

Climate Change & Drought in the Danube River Basin - Transboundary Challenge and Coordinated Activities towards Water Resilience.

Birgit Vogel, Executive Secretary, International Commission for the Protection of the Danube River

The presentation will provide a brief overview of the past and current drought events in the Danube River Basin (DRB) and their consequences to the environment and water-dependent economic sectors. The mechanisms and tools of the International Commission for the Protection of the Danube River (ICPDR) to address the drought topic will be discussed. These include a new basin-wide Significant Water Management Issue on effects of climate change within the river basin management process of the Water Framework Directive and the ICPDR Climate Change Adaptation Strategy offering a guidance on the integration of climate change adaptation into ICPDR planning processes and an overview of potential adaptation measures. The strategic approach of the ICPDR to tackle droughts and low water levels in the DRB will also be presented. An ICPDR Workshop on Droughts was organized to understand and identify transboundary needs in the DRB regarding droughts and low water levels to put forward possible actions on the ICPDR level to tackle these needs. Moreover, a state-of-the-art Overview Report is under development outlining key aspects, challenges and priorities of drought management, addressing related approaches, activities and policies in the ICPDR countries and providing a list of recommendations and key transboundary activities regarding droughts to be tackled within the ICPDR network.

BIRGIT VOGEL is the ICPDR Executive Secretary since August 2021. She is the first woman to take on the role. She holds a very elaborated multicultural and international work experience in river basin management and transboundary cooperation. Ms. Vogel has worked for the ICPDR before as well as for the Secretariat of the Mekong River Commission and has managed the India-EU Water Partnership for 5 years being based in India.

Over more than 20 years, she has worked across Europe, India, South-East Asia, China, Africa, and the South Caucasus, covering many transboundary river basins like the Danube, Mekong, the Ganga, the Okavango and many more.

EDORA Project

- European drought impact database (EDID)
- European drought risk atlas
- Review of Drought management plans in the EU

Dario Masante, Joint Research Centre of European Commission

The presentation will give an overview of the results of the EDORA project, by covering its main products: the European drought impact database, the European drought risk atlas, as well as summarizing briefly the status of drought management plans and adaptation measures in the EU. While illustrating only broadly the EDORA outputs, the talk will cover also the rationales, methods and challenges for drought risk and impact assessment.

The risk assessment, carried out by combining expert knowledge with data driven methods, highlights areas of concern for the present and under three global warming scenarios, for different sectors and ecosystems. The approach allowed also to identify European regions with similar vulnerability profile by sector, as well as potential entry points for adaptation within them.

The impact database, with several thousands of records from 1970 onwards, is the most comprehensive database of drought impacts for Europe and offers a flexible but structured data model to be extended and adopted by stakeholders. However, it presents some key biases that need to be addressed with a new communal and systematic approach to data collection.

Finally, the presentation will highlight the urgent need for a close collaboration among (institutional) stakeholders and cross-sectoral approach for the development of relevant data and methodology for drought risk and impact assessment, due to the inherent complex and multi-faceted nature of drought disaster.

DARIO MASANTE is project officer at the Joint Research Centre of the European Commission, he has worked at the Global and European Drought Observatories for seven years, fluctuating between operational monitoring, research activity and project management. As one of the supervisors of the EDORA project, he focused primarily on the new drought impact database EDID. He holds degrees in environmental sciences and ecology, and worked before in ecosystems assessment and research, as well as GIS specialist.

Drought Risk Assessment for the Danube Region

Raimund Mair, World Bank and Dor Fridman, International Institute for Applied Systems Analysis

Drought Risk Assessment for Romania

Dor Fridman, International Institute for Applied Systems Analysis

The Western Balkan and Eastern European countries are part of the Danube Region and the home of over 66 million people. Water is vital for human life and prosperity and for the environment. Among other things, they are used for drinking and sanitation, agricultural production, transportation, and energy generation. Droughts, a temporary water deficit, may impact the functioning of these human and environmental systems, resulting in decreasing productivity, economic losses, and negative consequences to human well-being. Over the years, the Western Balkan, Eastern Europe, and Romania have experienced mild to severe droughts, including the severe drought events of 2022. These events resulted in yield loss, water supply deficiencies, reduced hydroelectricity production, and restrictions on inland water transport.

We present the assessment of drought impact in the Western Balkan and Eastern Europe region (eight countries) and a Deep-Dive for Romania. The analysis uses the EDORA-EU framework to quantify drought impacts on environmental systems like forests and wetlands and human systems and activities, including agriculture, energy production, water supply, and inland water transportation. We estimate drought risk and impacts for 30 years (1990 -2019) and under climate change until 2100. Both assessments indicate significant drought-related impacts in multiple sectors, particularly agriculture and energy production, which are estimated to increase in the future due to climate change. The availability of locally relevant, detailed, and accurate data has proved crucial for training meaningful and useful models and interpreting the results. We propose ways to enhance the assessment with additional data or further exploratory use of the EDORA-EU framework.

DOR FRIDMAN is a Water Security Research group research scholar at the International Institute for Applied Systems Analysis (IIASA, Austria). His research includes hydrological modeling of urbanized and intensively managed river basins using the Community Water Model (CWatM), assessing the potential of reclaimed wastewater for crop irrigation, and assessing drought risks and impacts. Dr. Fridman holds a PhD from the Department of Geography and Environmental Development at Ben Gurion University of the Negev, Israel, during which he explored the environmental impacts of internationally traded food crops. He holds a BA in Geography and Economics and pursued his MA in the Urban Planning program at the Geography Department at Ben-Gurion University of the Negev, Israel. Dr. Fridman's research interests include exploring the interaction between human societies and environmental systems and the capacity of human society to adapt to a constantly changing Earth

Water Resources and Hydrological Drought – Current Trends and Future Projections.

Viorel Chendeș, National Institute for Hydrology and Water Management

At the level of Europe, an increase in vulnerability to the effects of climate change is expected in the coming decades, but climate projections still have a high degree of uncertainty. This is the reason why the studies developed in the last 10 years by National Institute of Hydrology and Water Management (NIHWM) aimed at identifying current trends in the evolution of water resources and the phenomenon of hydrological drought, as well as evaluating the impact of future climate changes.

In recent years it has been observed a decrease in the water resource (for example. In the period 2016-2020, the average stock was 35.5 billion m³), as well as a continuous downward trend of the resources in the period 2010-2020. This occurs on the background of a more frequent return of years with deficit water resources, such as 29 billion m³ in 2017 or 30 billion m³ in 2020.

The studies carried out by NIHWM regarding the trends of the annual minimum runoff highlighted an increasing trend of the deficit of the water resource and its duration.

In order to estimate the impact of climate changes and variability on the monthly, seasonal and annual discharge in the analysed river basins, long-term simulations were carried out. At the level of multiannual mean discharges, the simulations generally indicated for the analyzed river basins a decrease trend of maximum 15 % (lower values being obtained for the hydrographic basins in the northwest of the country, and higher, up to -40 % in the Vedea River basin).

VIOREL CHENDEȘ is a senior researcher and scientific director of NIHWM. A graduate of the Faculty of Geography, but also of a postgraduate course at the Faculty of Hydrotechnics, he specialized in Hydrology and GIS methods. He has published numerous scientific articles in national and international publications, some on the topic of recent trends in streamflow in Romania.

He received the "Simion Mehedinți" Romanian Academy's award (2011) for the book "Water resources in Curvature Subcarpathians. Geospatial assessments", Romanian Academy Publishing House.

The affects of drought and climate change on agricultural crops

Elena Tatomir, Ministry of Agriculture and Rural Development

The presentation will provide a view on the influence of climate change on agricultural crops. The presentation covers both the legislation underlying the compensation for production losses due to drought and other levers through which farmers can be supported to conclude policies insurance both in the field of arable crops and in the field of horticultural crops, respectively the cultivation of vines. Other risk management tools set out in the Strategic Plan 2023 – 2027 will also be presented, which farmers can benefit from to counteract the negative effects of climate change, respectively of the drought.

ELENA TATOMIR, a professional agronomist engineer, is currently the general director of the General Directorate of Agricultural Policies within the Ministry of Agriculture and Rural Development. With experience in agricultural policies for over 25 years she is actively involved in developing policies materialized in various forms of support, financed from both the European Union and the national budget. She holds a master's degree in rural management and development and a phd in agriculture.

Drought Risk for Romania's Water Supply Sector

Anca Bors, World Bank

Romanian water and sanitation sector are strongly impacted by the droughts, over 200 communities were temporarily cut from drinking water supply in 2022 and the Inspectorate for Emergency Situation (IGSU) had to deliver emergency water to these communities. Water security is vital to life and livelihoods: any uncertainty to access drinking water is felt very strongly by both users and suppliers. Beyond the effects of restricted supply of and access to drinking water, operating water supply and waste water treatment under drought conditions is likely to have economic impacts on the actors of the sector.

To better understand the drought impacts on the water supply sector in Romania, the World Bank realized an preliminary assessment based on benchmarking data, provided by Romania Water Association (ARA) and several in-depth interviews with water service providers, both regional and local operators. The results reveal the different degrees of vulnerability of the water service providers, in many cases low awareness of drought risks and also the lack of plans or measures to pro-actively manage drought risks, reducing the risk of (economic) impacts. The presentation will provide an overview of the methodology and results of the assessment realized.

ANCA BORS has more than 20 years of experience as consultant in the environment and public utilities sector. She was involved in major projects from utilities sector in Romania with impact on environment: MELF (Municipal Environment Loan Facility), FOPIP (Financial and Operational Performance Improvement Programme), application for Cohesion Funds and Benchmarking. Mrs. Bors has a MBA in Process and Project Management and a Master Degree in Environmental Impact Assessment, combining in assignments the financial expertise with the sound environmental understanding of the projects impacts. Mrs. Bors has gathered the financial, environmental and social experience from assignments

carried in Romania, Republic of Moldova, Jordan, Albania, Bulgaria and Azerbaijan. Mrs. Bors was the project manager of two major benchmarking projects in Romania that designed the national benchmarking system that is currently used in Romania and assisted all the water and wastewater regional operators for performance improvement (43 companies). Since 2019, she was involved in World Bank environmental projects for water and wastewater.

Effects of Drought on Navigation Conditions on Danube River, Downstream of Iron Gate

Mr. Romeo Soare, Lower Danube River Administration

The presentation will provide information, for a period of the last ten years, about the hydrological parameters, water levels and the water flow discharge, on the characteristic river sections, of the free-flowing sector of the Danube, downstream of the Iron Gate II, as results of the daily monitoring activities of the hydrological conditions. Further content of the presentation:

- information about the fairway characteristics and the needs to ensure minimum navigation conditions for inland transportation on the Lower Danube sector and fairway parameters monitoring activities.
- Information about the impact of changes in the hydrological regime caused by the drought phenomenon to the fairway parameters and navigation conditions on the Lower Danube.
- Information about the applied or proposed measures to limit the effects and influence of hydrological parameters changes to the navigation conditions and environmental factors.
- Information about conclusions of the Climate Change Study developed for Lower Danube sector regarding the prediction of the evolution of the hydrological conditions.

ROMEO SOARE graduated Geology and Geophysics at University of Bucharest in 1993. Now he is working for River Administration of the Lower Danube Galati in field of inland waterway management, having responsibilities in safety of navigation as marking system coordinator (1993 - 1995), hydrotechnical and fleet department as head of department (1995 - 2005), waterway management as head of branch (2005 - present).

In his work he performed hydrographic and hydrological surveying and is involved in developing studies for river geomorphology and he executed morphology of the river bed. He also coordinated several sediment transport studies.

Mr. Soare was involved in project management activities for several TEN-T and CEF Actions: Implementation of River Information Services – IRIS Europe (2009-2014), Network of Waterways Danube Administrations – NEWADA (2009 – 2014), Data for Danube Warehouse – D4D (2007-2015), FAST DANUBE - Feasibility Study for Improving the Navigation Conditions on the Danube River (2015-2023). The main objectives of these projects were to improve the waterway infrastructure in order to ensure a Good Navigation Status and to develop River Information Services Infrastructure. The projects included different activities: hydrological and hydrographic measurements, analysis of sediment transport models, fairway rehabilitation parameters, dredging pilot actions, developing scenarios for improving the navigation conditions, testing and implementation of systems to increase safety of navigation, data exchange for river information services, creating and updating electronic navigation charts.

After 2011 he was directly involved in coordinating GIS Forum Danube, an organization which brings together all Danube countries. He is now member of cross border commission for maintaining the navigation conditions between Romania, Republic of Bulgaria and Republic of Serbia. At the moment he is also responsible for the coordination of CEF projects, FAST DANUBE and SWIM-SMART Waterway Integrated Management, FAIRway Danube and PRIMUS.

Presentations Tuesday, October 31, 2023

Overview Drought Risk Management

Natalia Limones, World Bank Drought Expert, University of Seville, Spain

To start day two of the conference, this talk emphasizes the paramount importance of proactively managing droughts and addressing them as significant disasters with far-reaching and diverse impacts across multiple sectors. Droughts not only pose complex challenges, but also are becoming increasingly frequent and severe, affecting millions of people each year, and disproportionately impacting the most vulnerable.

Historically, they have been addressed reactively. To transition from this "hydro-illogical cycle," the World Bank has introduced the Drought Risk and Resilience Assessment (DRRA) process. DRRA focuses on prioritizing investments options by assessing drought risks, impacts, vulnerabilities, and needs across sectors and systems. We will present an overview of the building blocks to perform a comprehensive DRRA, providing insights into its practical application on the ongoing DRRA efforts in Romania. Moreover, the World Bank goes beyond this analysis and supports its clients into realizing those priority investments to build drought resilience. Specific examples from the World Bank's portfolio will be presented as illustrations of this proactive support.

NATALIA LIMONES is a Professor for the Department of Physical Geography at the University of Seville (Spain) and a Consultant in Drought Management for the World Bank (WB) Water Global Practice. With a background in physical geography and hydroclimatology, she has researched and cooperated with international experts and stakeholders from more than 20 countries in the fields of Water, Disaster Risk Management and Environment. Dr. Limones holds a PhD and an MSc from the University of Seville and the University of Bristol, both recognized with the highest honors.

Drought Risk Management at National Level - Overview Romania

Olimpia Negru, Ministry of Environment, Water and Forests

The intervention contains the presentation of the existing legal framework in Romania regarding the management of the hydrological and pedological drought, which are responsible authorities and their responsibilities, as well as the legislative provisions in force for the management of this type of risk.

SIMONA-OLIMPIA NEGRU has over 23 years of experience within the Ministry of Environment, Water and Forests, occupying various positions within the Institution. As background, she graduated from the Faculty of Geography, within the Bucharest University, "Meteorology-Hydrology" specialization.

The main responsibilities / responsibilities held - for over 13 years she is coordinating the activity of the General Water Directorate, by elaborating the national policies and strategies for risk management in the medium and long term, combating water scarcity, weather and hydrological drought and assessing water resources in the conditions of climate change; Coordination and monitoring of the implementation of Directive 60/2007 / EC on flood risk assessment and management; Coordination of the elaboration of Risk Management Plans at Floods; Coordination of the strategy for organizing at national level the activities of meteorology, hydrology and hydrogeology, of the information system,

forecasting and warning of dangerous hydrometeorological phenomena and the accident warning system for hydrotechnical constructions; Coordination of the activity Operational Center for Emergency Situations (C.O.S.U.- M.M.A.P.) as Head of Consultant Operational Center within the National Committee for Special Emergencies Coordinating the functioning at national level of the hydro-meteorological information flow warning-alarmed of the population in emergencies generated by the specific risks of M.M.A.P. Actively involved in developing, updating, coordinating and monitoring the implementation of national strategies and action plans for water management, , application of bi- and multilateral agreements in the field of waters and coordination of activities in transboundary river basins and in the international district of the Danube-River on Romanian territory, coordination and monitoring of the implementation of the management and management guidelines of the river basins (management plans), of programs of measures on basins or groups of river basins for the rational use of water resources and the achievement of the good state of water, according to the international commitments to which Romania is a party. Coordinating the elaboration and implementation of the national strategy on medium and long term regarding flood risk management; coordinating the elaboration of basin plans for prevention, protection and mitigation of flood effects, including actions and measures to remove destructive effects in riverbeds in critical areas – bridges, bridges, riverbeds; Participation in the implementation of new information systems for data collection and warning for flood cases, co-ordination of the elaboration of Restrictions Plans and use of water in deficient periods, coordinating the elaboration of hazard maps and flood risk maps at the level of basins or groups of river basins. President PHI-UNESCO Romania (UNESCO International Hydrological Program). Active involvement in attracting funds for launching programs and projects to reduce the risk of floods, droughts and accidental pollution, in many projects fulfilling the position of project manager.

Water Allocation Mechanisms at River Basin Scale

Cristian Rusu, National Administration Romanian Waters

The presentation address to Romania's approach on water allocation system. It summarizes the organizational framework and principles guiding water allocation on river basin scale, water demand and water abstraction statistics, future trends, and the Water Exploitation Index. It also highlights the balance between water abstraction and resource availability and discusses key components of an effective water allocation system, including water balance, water regulation, and the generation of relevant outputs. The presentation concludes by addressing challenges and the path forward for Romania's sustainable water management.

CRISITAN RUSU is the Head of the River Basin Management Plan Office within the Integrated Management and Water Resource Department of the National Administration for Romanian Waters. With over 25 years of experience in water resource management, primarily focused on implementing the Water Framework Directive. Member of technical groups within the International Commission for the Protection of the Danube River, the European Commission, and serves as a technical expert in several relevant projects within the Danube Basin.

Drought Planning and Drought Management in Spain

Daniel Chico Zamanillo, Mediterranean Network of Basin Organizations

Spain's approach to water resources governance and drought management is built upon a comprehensive framework of legislative and administrative tools, based on the Water Framework Directive (WFD) and the Spanish Water Law. These regulatory instruments provide a structured approach to water management, ensuring alignment with European Union directives while facilitating effective coordination between the central government and regional administrations.

In terms of drought risks, a central aspect of Spanish strategy lies in the distinction made between natural droughts (unpredictable natural phenomenon derived mainly from a lack of precipitation), and occasional scarcity (a temporal lack of water resources that hinders the ability to meet water demands). To manage these situations, the main instrument used are the Special Drought Management Plans, prepared each 6 years by the river basin organizations in consultation with the basin stakeholders. Their aim is to minimize the adverse effects of water scarcity and droughts on the environment and mitigate their impact on water users.

Drought Management plans are based on a double framework of monitoring indicators and scenarios for drought and temporal scarcity, allowing the evaluation of the severity of the situation and an early detection of events from their onset. The plans define the measures to be taken at each stage by the main stakeholders, with regards to infrastructure management, demand limitations, coordination of administrative bodies, additional water resources and increased monitoring of protected areas. They also set the stage for the design of drought management plans in urban supply systems.

In essence, Spain's approach to drought management and water governance is characterized by its integrated, multi-level framework, active stakeholder engagement, and flexible, adaptive Special Drought Management Plans.

DANIEL CHICO ZAMANILLO is specialist in water security, integrated water resource management and agricultural water use and Ph.D. in Agricultural Economics and Natural Resource Management. Technical manager for the Mediterranean Network of River Basin Organizations (MENBO), he has worked in the development of river basin and drought management plans in Spain for the Jucar river basin organization. He has also participated as water security and water accounting expert in various international projects in the European and Latin American context, contributing for example to the development of guidelines for the evaluation of water security in Chilean river basins, water accounting in Chile and Colombia, water footprint assessments in Spain, Colombia and Bolivia. As a researcher, his focus has been the links between agricultural and trade policies on water resources, the evaluation of the water framework directive implementation and the role of stakeholders such as multinational companies in water security and governance.

Integrated Drought Risk Management in the Czech Republic

Lukáš Záruba, Ministry of the Environment, Czech Republic

Long-term drought on the territory of the Czech Republic, which already in 2015 ranked among the most historically significant drought episodes in our territory, escalated even more in the following years. This fact led into amendment of the water management, focusing mainly on a list of drought measures designed to cover all critical pillars of drought management and water scarcity.

The presentation will provide a brief overview of the past drought events in the Czech Republic, the strategic approach in drought policy to tackle droughts and low water at national and regional level and explain the amendment to the Water Act in more detail. Moreover, drought forecasting service is included, which shows current drought status and predicts the hydrological situation for up to 8 weeks. Last but not least, showcase of successes in addressing water scarcity through implemented projects and the support of the Ministry of the Environment in their financing. The presentation concludes by addressing challenges and the path forward.

LUKÁŠ ZÁRUBA studied at the Faculty of Management of the University of Economics and later obtained his master's degree at the Faculty of Law of Charles University in Prague.

His lifelong devotion to the environmental issues took his career path to the Ministry of the Environment where he has been working since 2009. Until 2015 he was a part of the Department of Legislation and afterwards started working as the Head of the SEA Department. In 2017 he became the Director of the Department of Water Protection.

In the past he was, among others, a member of the group of EU member states experts who put into action a project supporting the Ministry of Environmental Protection of Ukraine in implementing environmental law.

EUSDR PA5 – The Danube Basin Approach to Drought and Water Scarcity

Gheorghe Constantin, Ministry of Environment, Water and Forests

The presentation "EUSDR PA5 – The Danube Basin Approach to Drought and Water Scarcity" refers to the activities carried out within Priority Area 5 regarding environmental risks related to drought and water scarcity. These mainly include the projects carried out under the various funding programs and how they are supported by the EUSDR as well as the future goals related to drought and water scarcity.

GHEORGHE CONSTANTIN is Deputy General Director of the General Water Directorate of the Ministry of the Environment and Co-coordinator of Priority Area 5 - Environmental Risk Management of the EU Strategy for the Danube Region (EUSDR). He graduated from the Faculty of Land Reclamation and has a long experience in the field of water for over 30 years and is involved in various European and international organizations.

Ecological Reconstruction of Wetlands as Instrument for Reduction of Climate Change Effects

Marian Tudor, Danube Delta National Institute for Research & Development

Climate change, at the beginning of this decade, century, millennium, represents one of the biggest threats to human development and nature around the world, through a series of unprecedented processes. If, for a while, it was considered that the limit of 2°C was sufficient and the processes had somehow not reached their limits with what was called the "Industrial Revolution", here is that the deep and accelerated process of change also penetrated the ecological balance, producing upheavals and mutations that today we can hardly interpret only through a purely evolutionary conception of climate dynamics and imposing the implementation of the fourth industrial revolution, characterized by the application of information and communication technology at an industrial level, called "Industry 4.0", which will lead to "Climate Neutrality" and "Net Zero Carbon".

Rising temperatures will have catastrophic effects such as rising sea levels, droughts, floods, storms and heat waves.

The Danube Delta is no exception. In the last 10 years natural disasters have become more and more frequent. Some, such as the highest and lowest water levels in the Danube River in the last 100 years, were recorded in the last decade - knowing that the Danube Delta has the lowest annual rainfall (330-350mm), but the highest absolute maximum amounts in 24 hours (530.6mm); the longest periods of dryness (6-7 consecutive months) and drought (3-4 consecutive months), and evapotranspiration exceeds 800mm in a year. The likely consequences of climate change - frequent floods, long periods of drought, deterioration of water quality and declining fish stocks - threaten the well-being of communities living in the Danube region. Let's not forget that these changes will also have a significant impact on the Delta's unique biodiversity, birds and especially waterfowl colonies.

Marian Tudor, as senior scientist has large expertise in river/wetland/floodplain ecology, aquatic ecosystems services and ecosystem management especially ecological restoration. Expertise in biodiversity aspects in riverine landscapes, research on interactions between fluvial dynamics and ecosystem processes, wetlands restoration applications, conservation and restoration strategies for riverine landscapes, nature conservation and nutrient management in Danube River basin. He is currently General Director of Danube Delta National Institute for Research and Development, Principal researcher, licensed in Ecology and also PhD at "Ovidius" University from Constanta – Environmental Sciences faculty focusing on Environment Protection – Ecology.

Drought Risk Management in the Water Supply Sector - Reduction of NRW

Raimund Mair, World Bank

The effective management of drought risk and the development of climate resilience are crucial in ensuring the sustainability of water supply systems. One key aspect that deserves attention is the reduction of non-revenue water (NRW) in these systems. NRW refers to water that is lost or unaccounted for due to leaks, theft, or inaccurate metering. By minimizing NRW, water utilities can optimize water resources and enhance their ability to cope with drought conditions. This reduction not only improves water availability during periods of water scarcity but also contributes to climate resilience by conserving water resources and reducing the need for additional water supply infrastructure. Furthermore, reducing NRW can lead to increased energy efficiency in the water supply system. By minimizing leaks and improving system efficiency, less energy is required for pumping and treating water, resulting in reduced greenhouse gas emissions and overall energy consumption. Therefore, addressing NRW in the water supply system is a critical component of drought risk management and climate resilience strategies.

RAIMUND MAIR joined the World Bank Group Water Global Practice in January 2019. In his position as Senior Water Resources Management Specialist in the Water Unit for Europe and Central Asia, he is supporting countries in the sustainable management of water resources, ensuring access to safe water supply and sanitation services, and mitigating water-related risks. He is leading the Danube Water Program, which is a Technical Assistance Program supporting the water sector in Danube region countries. In his previous occupations at the European Commission, the International Commission for the Protection of the Danube River, and the Austrian Ministry of Agriculture, he was working on the implementation of EU Water Directives and transboundary cooperation. Mr. Mair holds diplomas in Engineering from the University of Natural Resources and Life Sciences, Vienna, and Water Policy from Cranfield University, United Kingdom.

Drought Monitoring in Romania

Daniel Alexandru, National Meteorological Administration

Drought represents a state of a biologic system in which the water requirement/need is below the optimal values, the supplying functions significantly vary, function of the growth and development stage. Drought is one of the most damaging natural hazards through its effects on agricultural, hydrological, ecological and socio-economic systems. In this context, a distinction can be made between meteorological drought (low rainfall), hydrological drought (low river flow and abnormal low groundwater levels) and agricultural drought (low soil moisture content). The primary cause of the occurrence of drought in a region is determined by the failure or absence of rainfall. High air temperatures and evapotranspiration rates may increase the intensity and duration of droughts. Drought periods and heat waves are of particular interest, the main agricultural crops in Romania, winter wheat and maize, being the most affected crops by the occurrence of these two phenomena. In this context, the adaptation of crop species to limitative conditions can be mainly based on scientific approach.

Accurate diagnose of agrometeorological conditions is a crucial process needed for understanding the risks caused by extreme weather events and for decision making and sustainable development actions. Crop efficiency in Romania is strongly influenced by climate variability, thus the agrometeorological monitoring methods corroborated with additional specialized field observations are the crucial information sources needed for a correct assessment of vegetative stage, pointing also to the main characteristic of the limiting factor.

ALEXANDRU DANIEL is head of the Agrometeorological Department in Romanian National Administration of Meteorology since 2011. Expert in soil moisture content, potential evapotranspiration, analysis of agro-meteorological phenomena impacting crops (frost, heat, deficits, etc.), agrometeorological databases and phenological production, development of case studies on the impact of agro-meteorological occurrence of risk factors on agricultural production.

Since 2018 it is responsible for RA VI region of the WMO CAgM Expert Team on AgroClimatic Data and Sub-seasonal to Seasonal Forecasts for Agriculture (3.2). Also is the president of the Romanian Society of Agro-Meteorology from 2017, with responsibilities in capitalizing climatic data in projects dedicated to agriculture, drought prevention and management and other extreme weather phenomena impacting the agricultural crop yield.

Space-based RDI projects in support of drought effects mitigation

Cristian Moise, University of Agronomic Sciences and Veterinary Medicine of Bucharest

The presentation provides information on several relevant research and development projects in which the University of Agronomic Sciences and Veterinary Medicine of Bucharest has been or is currently involved in.

CRISTIAN MOISE is a Lecturer at the Faculty of Land Reclamation and Environment Engineering, University of Agronomic Sciences and Veterinary Medicine of Bucharest and a Senior Researcher at the Romanian Space Agency. He teaches several courses related to satellite remote sensing and cartographic modeling. He was involved in multiple international and national projects, focusing on Earth Observation from space and the application of geospatial techniques in environmental and agricultural domains.

New Data, new Insights: The next Generation of Drought Risk Finance Instruments

Markus Enenkel, World Bank

As climate change intensifies, Europe is facing escalating impacts and costs related to drought events. However, there are novel climate data and parametric insurance models that can support risk mitigation and risk transfer. This talk will highlight a new drought program being led by the World Bank's global water practice, which combines the drought risk and resilience assessment (DRRA) methodology, a novel drought bulletin, the exploration of risk financing for the water service sector to close the gap between micro and macro level applications, and other efforts to proactively help countries build drought resilience.

The convergence of evidence between various climate data plays a crucial role to increase the confidence of stakeholders in both the monitoring process and the performance of data-driven financial instruments. New combined drought indices are already exploiting the added value of complementary variables, such as rainfall, soil moisture, evapotranspiration, and vegetation health. In some cases, datasets are covering periods of 35+ years. Simultaneously, understanding potential impact scenarios that might be very different to any of the drought years on record is gradually becoming more important. Hence, there is a clear need for advanced drought risk modeling, technical capacity building, and clear communication of any model's strengths and weaknesses to avoid the development of analytical black boxes.

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