

**AIR AND WATER  
COMPONENTS OF THE ENVIRONMENT**

**March 22  
WORLD WATER DAY**

**March 23  
WORLD METEOROLOGICAL DAY**

## SCIENTIFIC COMMITTEE

PhD. Prof. N. V. ALADIN	Laboratory of Brackish Water Research, Saint-Petersburg, Russia
PhD. Assoc. Prof. M. BELDEAN-GALEA	Babeş-Bolyai University, Cluj-Napoca, Romania
PhD. Emeritus Senior Scientist R. BERTONI	CNR-IRSA Water Research Institute, Verbania, Italy
PhD. Assoc. Prof. P. BREȚCAN	"Valahia" University, Târgoviște, Romania
PhD. I. ČANJEVAC	University of Zagreb, Department of Geography, Croatia
PhD. V. CHENDEȘ	N.I.H.W.M., Bucharest, Romania
PhD. S. CHEVAL	National Meteorological Administration, România
PhD. Eng. D. CIATARĂȘ	C.A. „Someș” S.A., Cluj-Napoca, Romania
PhD. Assoc. Prof. S. CÎNTĂ PÎNZARU	Babeş-Bolyai University, Cluj-Napoca, Romania
PhD. Prof. M. CURIC	University of Belgrad, Serbia
PhD. Prof. M. DEMIRCI	Iskenderun Technical University, Turkey
PhD. Cp. I. C.S. DRAGOTĂ	Romanian Academy, Institute of Geography, Bucharest
PhD. Assoc. Prof. M. ELIZBARASHVILI	"Ivane Javakhishvili" Tbilisi State Univ., Georgia
PhD. Doc. Prof. P. GĂȘTESCU	"Hyperion" University, București, Romania
PhD. Assoc. Prof. M. GEORGESCU	Arizona State University, USA
PhD. Prof. I. HAIDU	University of Lorraine, France
PhD. Prof. C. IOJĂ	University of Bucharest, Romania
PhD. Prof. Ewa ŁUPIKASZA	University of Silesia, Poland
PhD. Prof. W. Marszelewski	Nicolaus Copernicus Univ. Toruń, Poland
PhD. Prof. J. MIKA	University Eszterházy Károly, Eger, Hungary
PhD. Assoc. Prof. I. MINEA	„Al. I. Cuza” University, Iași, Romania
PhD. Assoc. Prof. F. MOLDOVAN	Babeş-Bolyai University, Cluj-Napoca, Romania
PhD. Eng. C. NEAMȚU	C.A. „Someș” S.A., Cluj-Napoca, Romania
PhD. Prof. G. PANDI	Babeş-Bolyai University, Cluj-Napoca, Romania
PhD. Prof. D. PETREA	Babeş-Bolyai University, Cluj-Napoca, Romania
Eng. I.S. RÎNDAȘU-BEURAN	„Romanian Waters” National Administration, Romania
PhD. Prof. H. SAARONI	Tel Aviv University, Israel
PhD. Assoc. Prof. L. SFÎCĂ	„Al. I. Cuza” University, Iași, Romania
PhD. M.M. SOMMERHÄUSER	Dep. of Water Manag., Emschergerossenschaft, Deutschland
PhD. Prof. V. SOROCOVSCHI	Babeş-Bolyai University, Cluj-Napoca, Romania
PhD. Res. H. TABARI	KU Leuven University, Belgium
PhD. Roman TANDLICH	Rhodes University, Grahamstown, South Africa
PhD. Prof. E. TEL-OR	Hebrew University of Jerusalem, Israel
PhD. Prof. L. TOUCHART	University of Orléans, France
PhD. J. TURNER	CSIRO Manufacturing, Australia
PhD. Prof. F. ÜNES	Iskenderun Technical University, Turkey
PhD. Prof. L. ZAHARIA	University of Bucharest, Romania
PhD. Prof. M. ZELENKOVA	Technical University of Košice, Slovakia

## ORGANIZING COMMITTEE

PhD. Assoc. Prof. Gh. ȘERBAN	Babeş-Bolyai University, Cluj-Napoca, Romania
PhD. Lect. Cs. HORVÁTH	Babeş-Bolyai University, Cluj-Napoca, Romania
PhD. Prof. I. HOLOBĂCĂ	Babeş-Bolyai University, Cluj-Napoca, Romania
PhD. Prof. A. CROITORU	Babeş-Bolyai University, Cluj-Napoca, Romania
PhD. Lect. R. BĂTINAȘ	Babeş-Bolyai University, Cluj-Napoca, Romania
PhD. Lect. T. TUDOSE	Babeş-Bolyai University, Cluj-Napoca, Romania
Soc. V. CROITORU	C.A. „Someș” S.A., Cluj-Napoca, Romania

<http://aerapa.conference.ubbcluj.ro/wordpress/>

**e-mail:** [airandwaterconference@gmail.com](mailto:airandwaterconference@gmail.com)

**BABEȘ-BOLYAI UNIVERSITY  
FACULTY OF GEOGRAPHY  
PHYSICAL AND TECHNICAL GEOGRAPHY DEPARTMENT**

**&**

**“AIR AND WATER” ASSOCIATION**

in collaboration with:

**„SOMEȘ” S.A. WATER COMPANY CLUJ**

**&**

**„SOMEȘ-TISA” REGIONAL WATER BASIN ADMINISTRATION**

# **AIR AND WATER COMPONENTS OF THE ENVIRONMENT**

**MARCH 17, 2023, CLUJ-NAPOCA, ROMANIA**

**EDITORS:**

**GHEORGHE ȘERBAN, CSABA HORVÁTH, IULIAN HOLOBĂCĂ,  
RĂZVAN BĂTINAȘ, TRAIAN TUDOSE, ADINA CROITORU**

**CLUJ-NAPOCA, 2023**

**Partner institution:**

**HIDROELECTRICA S.A. - CLUJ BRANCH**

**ISSN: 2067-743X**

© 2023 All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, scanning or otherwise, except as described below, without the permission in writing of the editors.

**Universitatea Babeş-Bolyai  
Presa Universitară Clujeană  
Director: Codruța Săcelean  
Str. Hasdeu nr. 51  
400371 Cluj-Napoca, România  
Tel./Fax: (+40)-264-597.401  
E-mail: [editura@editura.ubbcluj.ro](mailto:editura@editura.ubbcluj.ro)  
<http://www.editura.ubbcluj.ro/>**

## TABLE OF CONTENTS

Răzvan BĂTINAȘ: *World Water Day – March 22, 2023*.....VIII

Traian TUDOSE: *World Meteorological Day – March 23, 2022*.....X

### I. Air and Water Environment Monitoring

1. Robert STRECHE, Oana ORZA, Sabina BOSOC, Filip OSIAC, Cristina BĂLĂCEANU, George SUCIU: *Implementing Blockchain Technology in IoT Vineyard Monitoring System* .....1

2. Gheorghe ȘERBAN, Răzvan BĂTINAȘ, Daniel SABĂU, Estera HADA, Ana-Maria POP: *Water Quality Assessment in Peatlands from North-Western Romania: Iaz and La Poduri Case Studies* .....12

### II. Climatic and Hydrological Hazards

3. Abdelmoumen BENCHATTOU, Mohamed EL GHACHI: *Modelling of the Floods of Rivers for the Integrated Management of the Risk of Inundation: Case of the Basin Overturning of Toudgha (Southeast of Morocco)* .....22

4. Alexandru COROCĂESCU, Pavel ICHIM, Claudiu Ștefănel CREȚU, Alexandra DIOR, Lucian ȘERBAN, Vlad-Alexandru AMIHĂESEI, Lucian SFÎCĂ: *Assessment of Climate Characteristics of an Urban Park Using Satellite Imagery and In-Situ Measurements. Study Case of Cancicov Park from Bacău City (Romania)* .....33

5. Narcisa MILIAN, Udo RECKERH: *Variations of Nivometeorological Parameters During 2021-2022 Winter*.....47

6. Dorian-Udo RECKERH, Narcisa MILIAN: *Favorable Conditions for the Release of Avalanches in the 2021- 2022 Winter Season – Case Study* .....57

### III. Water Resource Management

7. Robert Florin BEILICCI, Erika Beata Maria BEILICCI: *Advance Hydraulic Modelling of Excavation Pit, Study Case ISHO Timisoara, Romania* .....66

8. Andrei-Bogdan DĂNILĂ, Cristina BĂLĂCEANU, Oana ORZA, Sabina BOSOC, Mădălin SILION, George SUCIU: *Smart Electronic System for Monitoring Water Quality Parameters in Fish Tanks* .....74
9. Yunus Ziya KAYA, Mustafa DEMİRCİ, Hakan VARÇİN, Evren TURHAN: *Monthly Trend Investigation of the Discharge of a Stream in Cache County. Utah* .....85
10. Katarzyna KUBIAK-WÓJCICKA, Patrik NAGY, Martina ZELENÁKOVÁ: *Flow Duration Curves (FDC) for Selected Mountain Catchments in Slovakia* ...95
11. Bestami TAŞAR, Fatih ÜNEŞ, Ercan GEMİCİ, Mustafa DEMİRCİ, Yunus Ziya KAYA: *Numerical Modeling of Submerged Vane Flow* .....111
12. Hakan VARÇİN, Fatih ÜNEŞ, Ercan GEMİCİ, Bestami TAŞAR, Evren TURHAN: *Numerical Analysis of the Flow Over the Dam Spillway* .....121
13. Melinda VIGH, Gavril PANDI: *The Influence of the Hydro-Technical System on the Water Flow of the Sebeş River* .....130

#### **IV. Climatic Changes and Their Impact**

14. Igor LEŠČEŠEN, Biljana BASARIN, Dragoslav PAVIĆ, Minučer MESAROŠ: *Extreme Precipitation Analysis in Novi Sad* .....140
15. János MIKA, Csaba KÁROSSY, László LAKATOS: *Analysis of Frequency Trends in Amalgamated Peczely Macro-Synoptic Types (1971-2020) Characterising Continental-Scale Circulation Parallel to the Global Warming*.....148
16. Laura Elena PETRESCU: *The Evolution of the Maximum Extreme Temperatures in the Area of the Romanian Black Sea Coast During 1961 – 2020*.....158

#### **V. Pollution and protection of air and water environment**

17. Erika BEILICCI, Robert BEILICCI: *Comparison of Different Methods of Modeling the Phenomena of Sediment Transport in Riverbeds* .....171
18. Christof LANZERSTORFER: *Road Dust and House Dust: Nexus of Metal Concentrations* .....184

#### **VI. Potential of hydro - climatic resources**

19. Anca - Paula CIURBA (PASTOR), Ionel HAIDU, Ovidiu GACEU, Cristina  
AUR: *Therapeutic Valorisation of Thermal Waters from Rural Locations of Bihor  
County*.....192

## WORLD WATER DAY – 2023

### *ACCELERATING CHANGE*



This year celebration of World Water Day is related to the actions needed to be implemented in order to accelerate the changes we must make in order to cope with water crisis and achieving the United Nations Sustainable Development Goals no. 6 – Clean Water and Sanitation by 2030.

The sixth goal of 2030 Sustainable Development Agenda is about how we can all access clean water and sanitation, preserve our health and use water wisely.

Today, world community notes with concern that we are far from achieving this goal. Billions of people and communities cannot develop and live healthy, because the rights of all who need to have access to water and sanitation are not yet fulfilled. The new agenda, underlines the actions and commitment needed to be done, to proper manage our daily water from a qualitative and quantitative point of view. Stronger measures and actions must be undertaken by governments, businesses, organizations, institutions and associations involved in water policies. Next week, at the UN Water Conference in New York on 22-24 March 2023 these commitments will constitute the base of the new Water Action Agenda.

United Nations presents the global water and sanitation crisis and emphasize that:

- In recent decades, almost half of the wetlands around communities have disappeared, which will increase the risk of floods;
- Agriculture and industry is consuming more than over 80% of the available water;
- Due to climate change, drought would increasingly affect water resources availability and food supplies. Flooding would endanger water and sanitation facilities, contaminating water resources;
- The poorest and most vulnerable members of world population, disproportionately affected by the crisis, would have the hardest fight to get authorities to improve their water and sanitation services.

The human population growth and the constant acceleration for more and more clean water will increase the demand for this resource, the need for energy-intensive water pumping, transportation and treatment. This increasing demand must be mitigated by several key decisions like adopting climate-smart agricultural techniques and increasing the safe reuse of wastewater.

This year general theme "Accelerating change!" it is complemented by a more detailed one: "Make the change you would like to see in the world! Every drop or gesture counts!".

In fact, we can do small steps to mitigate climate change by taken simple measures that involves water:

- Save water: Take shorter showers and don't let the tap run when brushing my teeth, doing dishes and preparing food.



- Stop polluting: Don't put food waste, oils, medicines and chemicals down my toilet or drains.
- Eat local: Buy local, seasonal food and look for products made with less water.
- Protect nature: Plant a tree or create a raingarden – use natural solutions to reduce the risk of flooding and store water.
- Clean up: Take part in clean-ups of my local rivers, lakes, wetlands or beaches.
- Travel more sustainably and save energy.

This year logo picture associated with WWD starts from an old story of the Quechua people of Peru about a hummingbird which is trying to put out a huge forest fire by carrying a few drops of water in its beak. When she is asked how she thinks she can put out the fire in the forest, she answers: "I do my part. Every drop counts!". The campaign launched by Un-Water thus encourages people to be like the hummingbird, that is, to do everything in their power to help solve the water and sanitation crisis.

On the current projections, it is estimated that by 2050, population growth will increase the demand for water by 55% which will cause great pressure on natural water systems. The future of this resource and humanity depends on finding effective and sustainable solutions for its management and equitable distribution, and achieving this goal depends in large part on adequate practices for water use.

As presented in the SWA (Sanitation and Water for All) briefing papers “the water and sanitation sector are already affected in many different ways by weather and climate-related phenomena such as variability, seasonality and extreme weather events. These often negatively impact the availability, accessibility, affordability and quality of water and sanitation. Climate change puts additional stress on achieving public health targets. For example, if there is a decline in the availability of water supplies (e.g. due to lowering of water levels), people may be forced to drink contaminated water (e.g. untreated surface water), leading to an increase in waterborne diseases. The pollution of wells and flooding of latrines also increases the risk of a higher incidence of infectious diseases”.

Changes in water use, the new demands determined by an increase population, challenges generated by climate change, the actions needed to reach the sixth UN SDG 2030 Agenda are the main topics which will be covered by the new Water Action Agenda.

## **BE THE CHANGE YOU WANT TO SEE IN THE WORLD**

**Răzvan BĂȚINAȘ**, PhD. Lecturer

## WORLD METEOROLOGICAL DAY – 2023

### *THE FUTURE OF WEATHER, CLIMATE AND WATER ACROSS GENERATIONS*



This year's World Meteorological Day (WMD) celebrates 150<sup>th</sup> anniversary of World Meteorological Organization (WMO) since its foundation as International Meteorological Organization (IMO), in 1873. For this event, the achievements, progress and potential of WMO community are about to be remembered/presented through a special theme: *The future of weather, climate and water across generations*.

The main challenges of the humanity in the past 150 years, present and future are: a rise in average global temperature of more than 1 °C, extreme manifestations of weather, warmer and more acidic ocean water, the rise of sea levels and the melting of glaciers and ice. On the other hand, in the latest decades, the fast development of science and technology improved the weather forecasts and early warning life-savings, as well as new tools like machine learning and Artificial Intelligence are expected to.

Let's have a short journey through the last 150 years of weather and climate service in order to point out the main achievements and challenges!

- In the **19<sup>th</sup> century**, the standardization of maritime data and meteorological observations at sea is considered to be the milestone of weather forecasting, due to lieutenant Matthew Fontaine Maury (US Navy). Beginning with 1860, Admiral FitzRoy started to issue storm warnings for sailors of the coast of UK, and one year later, general weather forecasts. The first use of electric telegraph for transmitting weather reports was made in 1849, but the Morse Code was not a proper system for exchanging meteorological observation data from large areas.

In the opening of IMO (1873), Prof. Buys Ballot stated: "It is elementary to have a worldwide network of meteorological observations, free exchange of observations between nations and international agreement on standardized observation methods and units in order to be able to compare these observations". In its early years, IMO achieved improvements in meteorological instrumentation – and efforts to develop a worldwide network of meteorological stations.

At the end of the 19<sup>th</sup> century, the *First International Polar Year* (1882-1883) set up observing stations around the North Pole, while, at the *Second International Polar Year* (1932-1933) the importance of these observations for weather forecasting around the world was demonstrated.

- The **20<sup>th</sup> century**, marked by The First and Second World War, has recorded, in the late 1950's, major steps for the meteorological programme, by solar radiation and atmospheric ozone measurements and set a new era for the atmosphere observations: the first Earth-orbiting satellites SPUTNIK-1 and SPUTNIK-2 were launched (1957), as well as the first world's weather satellite (on the April 1<sup>st</sup>, 1960)-TIROS-1. As a result of these actions, in 1963, WMO launched *World Weather Watch Programme*, which celebrates its 60<sup>th</sup> anniversary this year. It was meant to

realize meteorological observations over land, on sea and from space; prepare weather forecasts and warnings; exchange information globally and in real time.

Another important feature of the late 20<sup>th</sup> century was the development of *Numerical Weather Prediction* (NWP) program which significantly improved the accuracy of weather forecasts.

Extreme weather phenomena, like storms, floods, droughts and others were present in the Earth's history, but 1970's brought new *Challenges*, as the terrible drought in Africa or the world's deadliest known tropical cyclone in today's Bangladesh (it killed up to half millions of people). The latter tragedy set the foundation of *WMO Tropical Cyclone Programme*, that covers all oceans affected by tropical cyclones and its purpose is to observe and research for improving monitoring, forecasts and warnings.

*The Water Decade (International Drinking Water Supply and Sanitation Decade)* and *Climate change* were among the two main concerns in the 1970's and 1980's. The Water Decade showed the high pressure on freshwater resources and the importance of oceanographic and hydrological services for climate prediction, water resource management and security. The first statement on climate changes was issued in 1976 and *World Climate Research Programme* was established in 1979, while in 1988, the *Intergovernmental Panel on Climate Change* came into being.

- Into the **21<sup>st</sup> century**, the development of weather observations and modelling technologies led to the following results: more reliable five-days forecast; real time access to observations; a growing number of observations; seasonal and long-term forecast, used in agriculture, health system, water, transport etc.; an increase in data exchange in areas like hydrology, atmospheric composition etc., which will help monitoring and prediction of all Earth-system components.

Regarding the *challenges*, *Global Climate reports* show that climate change indicators (greenhouse gas concentrations, surface temperature, ocean heat etc.) are at record observed highs, generating more extreme weather and climate events: longer/more intense heatwaves, heavier rainfall, and more severe droughts. For this, it is necessary to improve monitoring, prediction and communication regarding the evolution and effects of weather ("what the weather will be and what the weather will do"). This will help communities to understand and adapt to the weather conditions in the future.

*Early Warnings for All* it's the initiative of WMO to be sure that everyone is protected by early warning systems in the next five years. It is considered to be a cheap and effective way to protect people and goods of extreme weather. For example, an investment of US\$800 million on such systems in developing countries would avoid losses of \$3 to 16 billion per year (Global Commission on Adaptation).

- **The future** is considered to *raise the demand for weather, climate and water forecast information in support of decision-making*. All these services are influenced by technology evolution (supercomputers, satellite technology, smart mobile devices etc.), as a result of investments mostly from the private sector.

*Researches* are very important to understand the scale and pace of changes in weather, climate and water circle and help us to adapt to these changes.

Climate changes is not only about changes in temperature, but into a lot more elements: wetness and dryness, winds, snow and ice, coastal areas and oceans. “Without urgent and deep reduction of emissions, limiting global warming to 1.5°C is beyond reach”, the IPCC latest report states.

Our action today will shape the future of the planet!

**Traian TUDOSE**, PhD Lecturer