Seminar 2

CONTEMPORARY ISSUES AND CHALLENGES IN WATER GOVERNANCE

As the consequences of water scarcity are better addressed from a multidimensional systemic perspective, Seminar 2 of the UNITA Starting Grant project entitled CONTEMPORARY ISSUES AND CHALLENGES IN WATER GOVERNANCE took place on 23 April 2026, at the Institute of Advanced Environmental Research, West University of Timişoara, Romania, under the coordination of team members Bogdan Dima & Flaminia Stârc-Meclejan (UVT). The event brought together practitioners and academics from several fields to find common ground in addressing current challenges and in proposing novel approaches for equitable water management under climate change.

The opening session included contributions from Stefana Maria Dima (Senior Researcher, ICAM/UVT; Co-leader UNITA Circular Economy & Environment R&I HUB), SG' PI Marta Domini (UniBS) and Bogdan Dima (UVT), overall concerning the activities of CE&E hub, various opportunities for academics and introducing to the participants the main objectives of the current SG.

The sessions included the following lectures:

I. "AQUATIM S.A. Towards sustainability" - **Radu Bejenariu (Economist, AQUATIM)** presented the case study of the main regional public utilities operator (water supply and wastewater services), in the area of Timiș County. The company operates more than 3 000 km of drinking water network, more than 2 000 km of sewer network, 47 water treatment plants, 30 wastewater treatment plants, serves 170 localities, more than 570 000 residents, and reports 70 17 million in green investments.

Main takeaways:

- A description of the core activities, operational scope, and service focus of the respective company were provided;
- The 2025 sustainability strategy was detailed and key sustainability actions in the short and medium term were mentioned;
- The alignment with EU Climate and Sustainability Standards and frameworks was extensively addressed including:
    - CSRD / ESRS aligned reporting issues dealing with governance of sustainability, the environmental role in core business impact, balancing emissions reduction with infrastructure modernization, pollution control (ESRS E2), water resource management (ESRS E3), circular economy & waste (ESRS E5), balancing employee development with community services, stakeholders' engagement;
    - EU Taxonomy Alignment - the company identified six taxonomy-eligible activities in 2025, but no taxonomy-aligned activities;
- Faced challenges (including transition to measurable ESG KPIs and integration of sustainability into operations)

- Key opportunities for growth and development.

In conclusion, the lecture indicates that for the respective company, sustainability is embedded in operations, governance and investment decisions. Also, there is a certain institutional maturity in ESG reporting as Aquatim has already published two sustainability reports prepared under European reporting standards. Digitalization is treated as a sustainability enabler, SCADA based monitoring, automation, and integrated data systems are presented as tools for better resource use, more reliable operations, and improved customer experience. Water resource security and climate resilience are central strategic concerns as the company explicitly links ecological responsibility to securing water resources, strengthening critical infrastructure resilience in heatwave and drought periods, monitoring of temperatures and hazardous substances and reducing exposure to volatile energy costs.

II. "Boosting /Promoting the Circular Economy Transition: Good Practices. AQUATIM Sludge Drying and Energy Recovery Facility." - **Cristina Borca (Communication Manager, AQUATIM)** addressed a relevant project for the West Region of Romania, highlighting general project information, relevance and transferability, the design parameters and the adopted technology implementation.

Main takeaways:

- Key challenge: the removal of surplus biological sludge coming from domestic, commercial and industrial sources, as Timisoara has a unitary sewerage system, meaning that industrial and rainwater are collected together. Sludge can have negative effects on human health, with toxic substances that can be present in soil, plant crops, animals.
- Project status: in early 2022, Aquatim launched the construction of a new Sludge Drying and Energy Recovery Facility, financed through European funds. The total project value amounts to EUR 10.35 million, excluding VAT. The project is currently 75% completed. A slight delay has occurred due to supply chain issues related to materials for the incineration facility.
- The construction of this facility is part of a major investment project (EUR 239.5 million) - financed through European Union funds-The Regional Water and Wastewater Infrastructure Development Project in Timiș County continues with ERDF funding through the Sustainable Development Programme 2021–2024 (PDD) - supporting the development of drinking water supply and wastewater management systems in Timișoara and 81 localities across Timiș County.
- The adopted technology - TWO (Thermal Waste Oxidation) - converts the organic matter contained in the sludge into synthesis gas through a gasification process. By burning the synthesis gas, thermal energy is generated and used for: Sludge drying; Electricity production (approx. 300 kWh), used within the recovery process; Heating of technological facilities; Technological Process Flow;
- The technological process of the sludge drying and energy recovery facility can be divided into three main stages which were extensively described by the lecturer:
    a. Reception, drying and pelletizing
    b. Thermal treatment and energy recovery
    c. Treatment of air, water and ash resulting from the process

Overall, the lecture indicated that the project aligns with EU circular economy goals and environmental regulations, offering a scalable and transferable model for municipalities. Its energy self-sufficiency and cost reduction show the potential of strategic funding for innovation to solve infrastructure challenges sustainably and efficiently.

III. "SNMRI 2023-2035: A New Legal Paradigm" – **team member Flaminia Stârc-Meclejan (UVT).** The lecture was meant to introduce the audience to a legal perspective of the Romanian medium- and long-term National Flood Risk Management Strategy, updated recently to deal with climate change consequences – e.g. Government Decision (HG) 1023/2023, updated by HG 1566/2024, which officially adopts the National Strategy for Flood Risk Management (Romania's official answer to the EU Floods Directive). The document sets out the directions for the protection of population and property, via an integrated approach aiming at reducing flood risk by uniting water management, land use planning and environmental protection policies. The most important aspect - it transforms strategic recommendations and European guidelines into binding administrative law for all Romanian public institutions.

Main takeaways:

- Historically, flood management was reactive. Transition from "Ex-post" liability (reactive compensation) to "Ex-ante" regulation (proactive prevention) under EU Directive 2007/60/EC.
- The Fundamental Legal Conflict: Property vs. Life. What makes this transition so complex - a permanent tension between the Right to Property (Protocol 1, Art. 1 ECHR) and the Right to Life (Art. 2 ECHR). ECHR case law is unequivocal (e.g., Öneryildiz v. Turkey), the State has a legal duty to take preventive measures against known natural risks to protect human life. This positive obligation provides the legal basis for the State to restrict private development in flood-prone areas without it being considered "illegal expropriation."
- Proportionality Tests in Modern Governance: How do we decide which right prevails? Modern methodology requires a "Proportionality Test" to balance individual economic freedom against collective security. Legal principles establish that the protection of human health and the environment take absolute precedence over private real estate development. Establishing that the "social function of property" implies that land use must not endanger the community or public safety.
- From Water Control to Vulnerability Governance: the legal focus is now on regulating where we build; reducing exposure is the most cost-effective and legally sound method of protection. Legally identifying and prioritizing infrastructures (hospitals, schools, power plants) that require absolute protection layers.
- Hazard and Risk Maps as Enforceable Legal Tools: the primary instrument in this effort is the Flood Hazard Map - legally binding prerequisite for all General Urban Plans (PUG) and County Plans (PATJ). Any construction permit issued in an area designated as "High Hazard" without proper mitigation is legally null and void. The State has a legal duty to make these maps public to ensure citizens can make informed decisions before purchasing property or investing.

- Structural vs. Non-Structural Legal Hierarchy: the 2023-2035 Strategy explicitly prioritizes "Non-structural" measures (legal bans, early warning, insurance) over expensive "Structural" engineering.
- Legal preference for restoring floodplains and wetlands, treating "Natural Water Retention" as a mandatory part of river basin management.
- It is an 'eco-legal' approach - aligning flood management with the Water Framework Directive to ensure environmental protection is not sacrificed for flood defense.
- Climate Change as a Precautionary Legal Duty: Scientific uncertainty regarding climate intensity is no longer a legal excuse for administrative inaction or lack of planning. The 2023-2035 Strategy mandates that all risk assessments incorporate climate projections, especially regarding the increased frequency of flash floods. Public authorities are legally liable for failing to account for documented climate trends in their regional development and safety plans.
- A legal prohibition on "Risk Transfer": measures taken in one community must not increase the risk for downstream neighbors.

Overall, this legal framework prioritizes "ex-ante" regulation (prevention), seen as significantly cheaper and more ethical, instead of "Ex-post" compensation (damages paid after destruction). SNMRI 2023-2035 transforms technical risk data into enforceable law, protecting the Right to Life through modern administrative governance.

IV. A national perspective on EU Floods Directive - **Mariana Stanciu** (Hydrologist, Department of Hydrology, Hydrogeology, and Hydrological Forecast, Banat River Basin Administration) looked at Romania's high risk flood profile and discussed the objectives and outcomes of the RO-FLOODS I (2019-2023) in strengthening the capacity of the central public authority in the water governance sector in order to implement the Floods Directive in Romania.

Main takeaways:

- Effective flood risk management was severely hampered by a disconnect between top-down institutional planning and realities in grassroots communities (marginalized groups exposure; institutional bottlenecks, etc.);
- Romanian water authorities faced a difficult calculus: mitigating massive projected damages while constrained by rigid funding models that failed to capture the value of non-structural investments;
- RO-FLOODS is a national technical assistance and modernization initiative designed to strengthen flood risk management, update Flood Risk Management Plans (FRMPs), and integrate risk reduction into spatial planning. Carried out alongside the World Bank and state authorities, it spans multiple implementation phases to upgrade national prevention infrastructure and hazard modeling;
- As an EU Member State, Romania is implementing the EU Floods Directive. This Directive requires Member States to follow 3 steps to ensure the flood risk identification and mitigation as per the existing international standards and best practices. All such information is embedded into the Flood Risk Management Plans (FRMPs).
- The project deployed advanced, localized economic models to translate overwhelming national risk into prioritized, highly defensible investment packages.

- The RO - FLOODS project has developed: a database of localized depth damage curves specific to Romanian context (as part of the Damage Assessment and Risk Methodology - DARM); an Appraisal Summary Tool in the context of the ROFLOODS as a evaluation instrument used for multi-criteria analysis and rapid cost-benefit analysis; a functional GIS portal.

In conclusion, RO-FLOODS project (and its subsequent II and III phases) contributes to the compliance with the EU Flood Directive but also delivering the operational blueprint for a flood resilient Romania in the context of climate change.

V. Pathways to pro-environmental behaviour – Assoc.Prof. **Corina Ilin &** Research assistant **Patricia Albulescu** (Psychology Department & BEHAVE GREEN – Laboratory in Environmental Psychology, ICAM, UVT) – addressed the role of environmental psychology in the analysis of the determinants of sustainability-related behavior. This presentation highlighted the central role of individual and contextual factors in shaping the social acceptability of water reuse. The Theory of Planned Behavior was presented as a framework for identifying and understanding the factors that facilitate or inhibit the acceptance of water reuse. In addition, some strategies were proposed to address these factors and promote greater acceptance of water reuse.

Main takeaways:

- Water Conservation: a social dilemma. Pro-environmental behaviors, such as recycling and reuse, are essential for sustainable living practices that aim to reduce environmental degradation and conserve valuable resources. Among these behaviors, water reuse is a crucial strategy for addressing the global water crisis by maximizing the efficiency of water use.
- Water pollution: it directly affects human survival and development, and both the government and the public have long been regarded as important actors in environmental governance. As the core driver, the government steers water governance through regulation, enforcement, and investment.
- Water pollution reduces the probability of pro-environmental behavior: Environmental concern and environmental knowledge act as mediating variables in the impact of water pollution on public pro-environmental behavior. Local government input exerts a more significant influence on pro-environmental behavior than central government input. For both central and local governments, the impact of their input on pro-environmental behavior is moderated by environmental concern, and the mediating effect of environmental concern on central government input is more pronounced.
- In relation to the acceptance of water reuse initiatives, several aspects were mentioned:
  - The predictors of water reuse acceptance are complex, heterogeneous, and strongly interconnected. The success of implementing any water reuse scheme depends on the willingness of individuals to interact with or use the proposed solution, risk perception and trust in public authorities.
  - Predictors of general pro-environmental behavior: a focus on the benefits is important when public acceptance is needed for water reuse in general, but the perception of risks

becomes vital in conversations about the use of recycled water for drinking purposes, where the use is increasingly personal; public perceptions related to the competence and credibility of those managing the implementation of recycled water interventions are important factors to consider for public or

- Contextual Predictors of Water Reuse Acceptance*:* cultural factors can lead people to reject reuse practices due to a culture of waste and undervaluation of water sources.
- Prior EU projects description and outcomes (2): FP7 project LOW CARBON AT WORK. Modelling agents and organizations to achieve transition to a low carbon Europe; Area 6.4.2.3 Interplay to enhance behavioral and societal changes; ENV. 2010.4.2.3-1 Foresight to enhance behavioral and societal changes enabling the transition towards sustainable paths in Europe; http://www.locaw-fp7.com; project entitled *Study on the assessment of the situation of drinking water supply and sewerage in rural areas in seven Eastern European countries, in various stages of integration in the EU* (2016 – 2018), financed by the World Bank through the Danube Water Program, World Bank, National Regulatory Authority for Community Services of Public Utilities; UVT participated as partner of the Water & Environmental Efficiency Association. Several scientific results were mentioned, including: Stancu, A., Ariccio, S., DeDominicis, S., Ganucci Cancellieri, U. Petruccelli, I., Ilin, C., Bonaiuto, M., (2025). Place attachment styles and their mediated effects on flood risk coping, through self-control, distress, and solastalgia. Journal of Community & Applied Social Psychology, volum 35/issus 3, 2025: https://doi.org/10.1002/casp.70083; Stancu, A., Ariccio, S., De Dominicis, S., Ganucci Cancellieri, U., Petruccelli, I., Ilin, C., Bonaiuto, M. (2020). The better the bond, the better we cope. The effects of place attachment intensity and place attachment styles on the link between perception of risk and emotional and behavioral coping. *International Journal of Disaster Risk Reduction*, 51, 101771. https://doi.org/10.1016/j.ijdrr.2020.101771

In conclusion, the growing concern for sustainability, has stimulated a trend in environmental psychology towards studying positive transactions between humans and the environment, such as health-promoting effects of natural environments and positive contributions of pro-environmental behavior to environmental quality and quality of life. Scientists and policymakers involved in the planning and implementation of water reuse projects need to consider both the socio-affective dimensions and the interconnectedness of individual emotional responses with broader societal processes and social representations.

VI. "My Open Questions: An Economic Perspective" - **Bogdan Dima (UVT)** debated over several of the economic implications arising from water governance related regulatory frameworks (including the EU Water Framework Directive, Flood Directive and OECD Council Recommendation on Water, etc.).

Main takeaways:

- Regarding the financial, environmental and resource costs of using water, recovering these full costs means ensuring that the price of water covers all associated expenses, including those for supplying the water, treating wastewater, and the negative impacts on ecosystems and future water availability. Here many issues emerge, like: which approach is most adequate for a complete assessment of financial, resources and environmental costs by

accounting for their interdependencies; which cost recovery mechanisms are more efficient; which methods for economic water valuation are appropriate and what type of data are required (and available) for their implementation, etc.;

- Concerning the setting of water prices that promote water use efficiency, one of the most sensitive issues is the estimation of non-market costs and benefits in monetary terms;
- Moreover, the lecturer identified: the need to use economic analyses and appropriate data to document costs of measures and investments, their allocation, and the contribution of different water users (households, industry and agriculture) towards cost recovery; and also a stringent prerequisite for good quality data and a need for a comprehensive analysis of the interlinkages between ecological status of countries and regions, ecological indicators, and environmental quality and human wellbeing outcomes.
- Contemporary challenges were discussed, among which the impact of AI on water management: beyond the potential benefits of using AI in water management (for quality monitoring, leak detection and prevention, infrastructure maintenance, flood prediction, the building of smart machines, robots and sensors that optimize farming systems or water conservation) there are several ways in which AI can negatively impact the water resources:
    - *Data centers require freshwater to cool servers and produce the electricity*: a projection estimates that by 2028 AI will require as much as 720 billion gallons of water annually just to cool AI servers which is, enough water to meet the indoor needs of 18.5 million households. Currently, OECD estimates that globally, the electricity consumption of data centers rose to 460 terawatt-hours in 2022. This would have made data centers the 11th largest electricity consumer in the world, between the nations of Saudi Arabia (371 terawatt-hours) and France (463 terawatt-hours).
    - AI uses and pollutes water through related hardware production. Producing the AI hardware involves resource-intensive mining for rare materials and extracting these materials has a significant impact on the environment and contributes to water pollution.

In conclusion, as the European Environment Agency notes:" Water is a valuable resource that is under pressure in Europe, with only 38 % of surface water bodies being in good ecological status and 30 % in good chemical status". Therefore, urgent measures are required to ensure the increase of water use efficiency and the preservation of the existing resources.
The seminar also included a roundtable with the participants that was dedicated to the collaboration between the academic and socio-economic environment for sustainable policies in the field of water governance.

Overall, the participants conclude that water governance should go beyond technical issues by accounting for a broad spectrum of social, legal, economic, and psychological factors. An adequate strategy to deal with its multidimensional nature should involve investors, local communities, central and regional public authorities, different professional and social groups and organizations, and other stakeholders; it should be based on an integrated policy framework that recognizes the intricate nature of the relevant drivers and is based on high-quality data as well as an evolved assessment methodology. Additionally, any policy measure should be subject to an effective communication strategy able to attract global societal efforts to prevent and mitigate the

negative consequences of climate change over water resources, to ensure the efficiency of their usage and, most importantly, their preservation for intergenerational social justice.

The seminar illustrated the importance of building a network of academics, researchers, public local authorities, and members of civil society interested in water governance. Such a network can provide a European-level perspective, facilitate the exchange of ideas and best practices, and can generate applicable and relevant solutions for the use of water and, broadly, of the natural resources.