BOOK OF PROCEEDINGS

2nd INTERNATIONAL CONFERENCE ON HOUSING, PLANNING, AND RESILIENT DEVELOPMENT OF THE TERRITORY

TOWARDS EURO-MEDITERRANEAN PERSPECTIVES

OCTOBER 16th-17th, 2025

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2nd International Conference on Housing, Planning, and Resilient Development of the Territory

Towards Euro-Mediterranean Perspectives

Conference Theme and Rationale

This conference returned for the second time within the Albanian and Mediterranean academic context, aiming to build a tradition of collaboration centered on scientific research and academia. Following the success of the first edition held on October 13th-14th, 2023, where proceedings were published in the Book of Proceedings, Albanica journal, and various international academic platforms, POLIS University and the Academy of Sciences of Albania relaunched this important event. The 2025 edition focused on housing, urban planning, and resilient territorial development, offering a platform for researchers, policymakers, and experts from the region and beyond.

Albania and the Western Balkans have faced major transformations in urbanization, spatial planning, and environmental management. Demographic changes, economic pressures, and environmental challenges created a need for new strategies in architecture, planning, and governance. This conference brought together diverse voices to explore these themes and promote resilient and sustainable development.

Key topics included architecture and the city, with emphasis on urban form, housing typologies, and the role of cultural heritage in modern urban design; urban mobility, addressing traffic challenges, public transport, and the use of technologies like GIS and AI in planning; and new housing models, focusing on affordability, energy efficiency, and innovative materials.

Discussions also covered demography and economy, exploring territorial governance, smart cities, social enterprises, and digital technologies such as AI, VR, and the Metaverse in urban management. Finally, the urban and natural environment was addressed through topics like pollution, adaptive planning, and nature-based solutions for climate resilience.

Through this conference, POLIS University and the Academy of Sciences of Albania aimed to foster a broad interdisciplinary debate on these pressing issues, combining academic and practical perspectives to offer concrete recommendations for future urban and territorial development policies and projects.

Organizers' Announcement

The International Scientific Conference on Housing, Urban Planning, and Resilient Territorial Development: Toward Euro-Mediterranean Approaches was held on October 16th-17th, 2025, in Tirana, Albania. Organized by POLIS University in collaboration with the Academy of Sciences of Albania and supported by national and international partners, including the University of Ferrara and Co-PLAN, Institute for Habitat Development, the event brought together researchers, academics, policymakers, and professionals to address key challenges in urban development, with a focus on resilience and sustainability in the Euro-Mediterranean region. The first day of the conference took place at the Academy of Sciences, while the second day was hosted at POLIS University.

The conference explored five main themes:

I. Architecture and the City, which investigated the typological and morphological dimensions of urban form, the evolution of collective and individual housing types, the relationship between architectural design and urban identity, and the role of historical and cultural heritage in shaping contemporary cities;
II. Urban Mobility and Resilient Cities, which addressed traffic congestion, infrastructure challenges, and public transportation, while also promoting the redesign of public spaces – such as streets, squares, and pedestrian zones – to improve accessibility and mobility; it also explored the integration of digital technologies like GIS, AI, and simulation tools to enhance planning, automation, and infrastructure management;
III. New Housing Models, which examined innovative approaches to affordable and social housing in response to demographic shifts and technological change, along with energy efficiency strategies, passive energy systems, and the application of new sustainable materials and construction technologies;
IV. Demography and Economy, which focused on macro-regional and national dynamics impacting territorial development, including urban governance, disaster risk reduction, and the rise of smart and inclusive cities; it also explored how emerging technologies – such as AI, VR, and the Metaverse – along with social enterprises and circular economy practices, could foster more equitable and adaptive urban systems; and
V. Urban and Natural Environment, which analyzed environmental degradation in urban settings, including air, water, and soil pollution, and promoted nature-based solutions, ecosystem-based planning, and adaptive strategies to enhance environmental sustainability and climate resilience.

The conference was conducted in English and Albanian (with self-translated texts where applicable) and was free of charge, with all registration fees fully covered by POLIS University in support of open academic exchange. Key deadlines included abstract submission by June 15th, acceptance notification by June 30th, first draft of papers by September 15th, and final submissions by October 31st.

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Air, water, and soil pollution / Ecosystem services for protected and urban areas / Strategic environmental assessments / Nature-based solutions / Urban biodiversity assessment.

Assessing Water Quality and Pollution Sources in the 'Kune-Vain-Tale' Lagoon

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Abstract

Water resources are of use for all categories in conditions where pollution indicators and toxins are within the approved national and international organisations that enable use as drinking water, agricultural water, or water discharged from economic activities, mainly industrial ones. Other studies, or those taken from the monitoring system at different levels, show that waters of rivers, lakes, seas and reservoirs in the country contain contaminating substances in values that damage the aquatic environment and reduce use values. From analyses performed in drainage hydrovore 'Tale', in the city of Lezha, at three monitoring points: before hydrovore, after hydrovore, and before the sea release for pH inductivity indicators, chlorides, sulphates, phosphates, nitrite, nitrates, ammonia, turbulence, dissolved oxygen, temperature, COD (chemical need for oxygen), coliform, Cu, Pb, Zn, and Cr.

It turns out that at the points that we analysed, the parameter content is above the limits allowed for substances such as phosphates and heavy metals. At all three points, they have emerged above the permitted value, as well as high organic loads of BOD and COD. Like physico-chemical parameters and microbiological parameters (e-coli, coliform) indicate considerable faecal pollution. The study performed shows us the impact of urban and agricultural pollution as well as marine salts on water quality.

Keywords

Water quality, chemical, biological paramters, physicochemical parameter, lagoon

1. Introduction

One of the main challenges today around the world is water pollution, which has a direct impact on human health, biodiversity and the development of urban and rural areas. The many causes of water pollution come from anthropogenic activities, including industry, intensive agriculture, and wastewater discharges. Water pollution is classified as surface water or groundwater pollution. One of the main sources of surface water pollution in our country is urban discharges containing nitrogen and phosphorus compounds, organic matter that favours the eutrophication process, pathogenic viruses and bacteria, heavy metals, and substances that spoil the appearance of water and give it a bad smell (Lin, Yang and Xu, 2022).

In some European countries, surface water is used more than groundwater. The reason lies in the fact that groundwater, which is used as the main source for public use, has a very high processing cost and the supply of such water is relatively small until the water has acquired high quality for consumption. The demand for a clean, potable water supply has been and will remain a challenge for developing countries in the revolution as well as for countries with the most advanced technology (Damania et al., 2019). In recent times, we have been using water in an uncontrolled way in terms of quality to determine whether it can be consumed or not. From the past experiences of various societies, it is known that from polluted water, which does not meet the conditions for consumption, humanity suffers global catastrophes, disease and death (du Plessis, 2022). Water is important and essential for all forms of life and the world in which we want to live.

Water in nature makes up the largest part of the surface, occupying about 70.1% of it, of which 97% of the world's water reservoirs are oceans, of which only 3% is freshwater. Of the total amount of freshwater, 77% of the water is glaciers and snow, and only 1% of that is surface water, including rivers, lakes, and ponds (USGS, 2019). Marine pollution is a consequence of water pollution. The marine environment is a marine space with water resources, flora and fauna, and the surface of the sea, including the coastline, beaches, inland waters, lagoons, and river estuaries. It is state property, and its administration is carried out by state bodies designated by law. Marine environments are used for commercial, scientific, social, economic, tourist, military, and sporting activities.

Figure 1. *Kune Vain Lagoon.*

Albania is a mountainous country with about 450 km of coastline and numerous water reserves, such as rivers, springs and natural lakes. Over 152 rivers and streams, ultimately forming 8 major rivers, flow from southeast to northwest, mainly towards the Adriatic coast. Of the total annual flow of 42.25 billion m^3, only 12.8 billion belong to groundwater. The average annual precipitation in the Albanian territory is 1,430 mm/year but is distributed unevenly throughout the year: about 40% in winter, 32% in spring, 17% in autumn and only 11% in summer. The temperature fluctuates from 3.5 to 8.9°C in winter and from 17.8 to 24.6°C in summer (Nationally Determined Contribution Albania, 2022).

Albania is rich in lakes (Enti Rregullator i Ujit, 2021); it has 247 natural lakes and over 800 artificial ones. According to the origin of formation, natural lakes are divided into tectonic, tectonic-karst, glacial, karst and coastal lakes. In Albania there are about 15,000 ha of coastal lagoons, which serve as a shelter for the protection, nutrition and reproduction of many living things. Albanian aquatic habitats are naturally important for the great diversity of flora and fauna. Surface waters also constitute a great asset for the country's economy (Sulçe et al., 2018). They are important for many traditional uses such as: irrigation, fishing, tourism and industry. Almost all rivers, lakes and coastal areas serve as discharge sites for urban and industrial liquid and in some cases solid waste. The main sources of water pollution in Albania in the last decade are untreated urban discharges. Urban wastewater and other industrial discharges are discharged directly into watercourses and go to rivers, lakes or the coast due to the lack of wastewater treatment plants (National Environment Agency, 2014).

Albania has four main lagoons. The Karavasta Lagoon is the largest lagoon in Albania and one of the largest in the Mediterranean Sea since 1994, located near Divjaka(Ramsar Convention Secretariat, 1994). The lagoon is part of the Karavasta Divjaka National Park, with an area of 45 kilometres and a maximum depth of 1.3 metres. To protect several ecosystems of national importance, it is home to about 5% of the world population of the rare species of the Dalmatian pelican. The second largest lagoon in Albania and one of the largest in the Adriatic Sea, located in the south of Albania near the city of Vlora. Narta Lagoon has an area of 26.7 kilometres. Inside the lagoon are also the islands of Zvernec, known for hosting the greater flamingo. Lake Butrint is a salt lagoon with a length of 7.1 kilometres and a width of 3.3 kilometres and a surface area of 16 kilometres. The lagoon is known for housing a great diversity of fauna and flora. The lake is connected to the Ionian Sea through the Vivran Channel. Patoku Lagoon is located between the Ishem and Mat rivers along the Adriatic coast of Albania in the west within the Lezha district. It has a surface area of 4.8 kilometres, and its average depth is 0.7 metres. Patoku Lagoon is part of the Patok-Fushekuqe-Ishem Natural Park, declared by the Albanian government in 2010 to protect its diversity and unique flora. Other lagoons include the Viluni and the Kune-Vain-Tale Lagoon. Hydrovore 'Tale' is located in the Vain-Tale area – one of the most important lagoons in Albania near the Mat River and closely connected to the Adriatic Sea. The dams were built to enable the management of water flows and to protect agricultural lands from flooding.

Through this paper, the findings of the assessment of pollutant and toxic indicators in the waters of the Vain Lagoon area will be presented. Through data obtained from water samples analysed for chemical-physical and microbiological indicators. The area is sensitive to wastewater discharges, urbanisation, and water pollution from agriculture's pesticides and fertilisers.

Figure 2. *Kune Vain Lagoon pollution.*

2. Methodology

The methodology consists of taking samples at three different points: before discharge from inside the lagoon and before exiting for the sea. The analysis of the indicators is conducted using the relevant methods, and the results are interpreted according to the Albanian version of the international standard S SH ISO/17025:2017, which pertains to the competence of testing and calibration laboratories. ISO/IEC 17025:2017 is a global standard that specifies the requirements for laboratories to demonstrate their impartiality, competence and consistent operation to produce reliable and valid results. Samples for analysis were taken in two different periods in May and September. In both periods, we took samples at three different points and on the water surface. The analyses were carried out in the Environment Laboratory of POLIS University with standard equipment and methods. Some of the equipment used in performing analyses for certain parameters:

- Multimeter for pH, EC, temperature and turbidity;
- Spectrophotometer for phosphates, nitrites, nitrates, total phosphorus and heavy metals;
- Gravimetric method for chlorides,
- BOD/COD analyser for organic load;
- Bacteriological analysis for E. coli and coliforms.

3. Results

The sampling process was carried out in accordance with standard guidelines for collecting water samples. The sampling bottle was pre-rinsed with the sample water 2–3 times to avoid possible contamination and to ensure real representativeness of the sample. After rinsing, the container was completely filled with the sample water up to the neck, leaving no space for air, in order to avoid the presence of oxygen that could affect the chemical composition of the sample.

At each of the designated points, a water sample was taken in two different time periods. Specifically, at the first point (before hydrovore), the sample was taken on 16/05/2025 May at 09:15. As mentioned, the procedure performed is in accordance with the standard of collection of aquatic samples where

specifically: the nature of the sample is superficial; the water temperature is 20.1°C; the preservative used- is HNO3 (nitric acid) for heavy metals; sample appearance -slightly blurry; weather conditions- sunny; Sample container type: 1.5 L plastic bottle; Sample volume: 1.5 L; Storage and transport conditions: the sample is stored in a refrigerated box (ice box) at a temperature of 4 °C until arrival at the laboratory. The analysis of the sample begins immediately as soon as the sample has reached the laboratory and the ambient temperature is taken.

The sampling procedure at the second and third points are also based on the standard of collection of aquatic samples. The difference lies only in some parameters such as:

In the second sample: water temperature 23.6°C; time of its intake 10:40.

In the third sample: water temperature 23.6°C; pick-up time 12:55.

The second period of measurements and sampling was carried out in September in order to comparatively assess the water quality after the summer season and to identify possible physico-chemical changes caused by climatic and anthropogenic factors. The sampling procedure continues the same in this period, with the following changes:

First point: date of receipt 02/09/2025 at 10:15; water temperature 19.5°C;

Second point: intake time 11:55; water temperature 22.5°C;

Third point: 13:50; water temperature 15°C;

The following table illustrate measurements taken in May and September at three different locations (before hydrovore, in hydrovore and before sea release) in the Laguna Vain Hidrovor Tale area.

Parameter	**Before hydrovore**		**After hydrovore**		**Before sea release**		**Norm**
	May	**Sep**	**May**	**Sep**	**May**	**Sep**	
*Chlorides, Cl-(mg/l)	1293.93	1701.6	2442.21	24992.3	2215.63	4324.9	250
*Electrical conductivity, EC (µs/cm)	5320	5380	7760	61800	7640	12760	≤2500
*Sulphates, SO4 (mg/l)	117.64	915.26	244.21	2334.31	229.17	503.83	≤250
BOD (mg/l)	65	72	33	97	36	59	≤ 3
COD (mg/l)	135	120	98	141	137	115	≤ 25
O2 (mg/l)	2.93	3.74	3.43	3.58	4.35	4.21	≥ 5
*Nitrites, NO2- (mg/l)	0.12	0.12	0.14	0.03	0.12	0.05	≤ 0.1

Lead Pb (mg/l)	0.23	0.14	0.19	0.21	0.15	0.18	≤ 0.01
Nickel Ni (mg/l)	0.1	0.03	0.13	0.05	0.11	0.15	≤ 0.02
*Phosphates, PO4 (mg/l)	6.64	2.29	2.87	14.2	8.8	1.96	≤ 2.0
*Nitrates, NO3- (mg/l)	3.82	3.67	3.71	6.68	3.72	3.76	≤ 25.0
*Ammonia, NH4+ (mg/l)	0.31	0.3	0.22	0.12	0.11	0.59	≤ 2.0
Turbidity NTU	5.56	8.13	7.31	12.34	8.57	5.92	≤ 25
Temperature ˚C	20.1	19.5	23.6	22.5	23.4	16.9	20-25
E-Coli CFU/ 100ml	2500	2700	1400	500	1200	640	≤ 2000
Koliform CFU/ 100ml	10	400	5	450	15	28	≤ 5000
Chrome Cu (mg/l)	0.02	0.03	0.04	0.06	0.07	0.13	≤ 0.1
Zinc Zn (mg/l)	0.058	0.06	0.018	0.048	0.02	0.04	≤ 0.5
Chrome Cr (mg/l)	0.04	0.03	0.04	0.03	0.05	0.05	≤ 0.1

Table 1. *Analysis result.*

4. Discussion

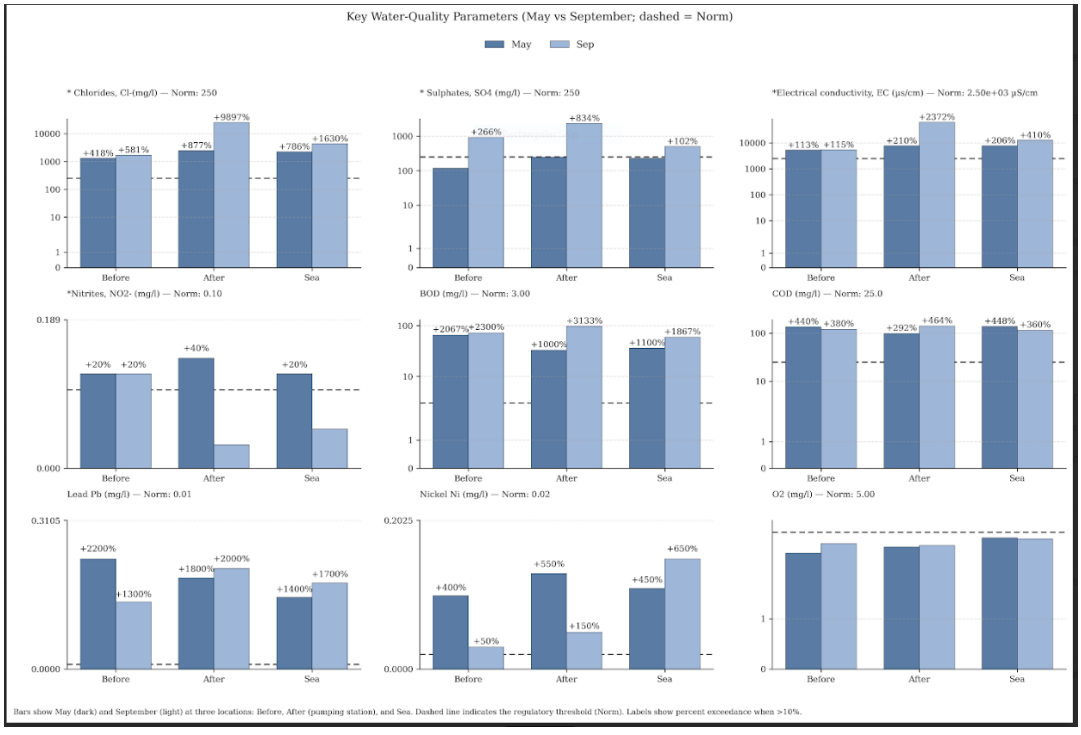
After receiving the results, it is observed that the water quality in the Vain Lagoon area is affected by a series of environmental factors, some of which have exceeded the permitted norms, disrupting the natural balance of the area. But on the other hand, there are also parameters that are below these norms, such as O_2. Specifically for the month of May, the results obtained from the analysis of the aforementioned parameters can be interpreted as follows:

- High salinity (EC, Cl^-, SO_4^{2-}): The values obtained in these parameters are well above the permitted limits, indicating direct influence from the sea and infiltration of saline waters.
- Organic load (BOD, COD): Much higher than the standards → indicating pollution from the discharge of agricultural waters and sewage.
- Dissolved oxygen: The value obtained is below the minimum level necessary for the aquatic ecosystem, this indicates that there will be a direct unfavorable impact on aquatic life.

- Phosphates and nitrites: The values obtained from these two parameters have high concentrations that lead to eutrophication, especially at point 3 (in front of the sea).
- Heavy metals: The values obtained from the parameters of heavy metals such as: lead (Pb) and nickel (Ni) exceed the permitted norms, posing a serious risk to the health of living beings.
- Microbiological parameters: The measured microbiological parameters E. coli and Coliforms present at high levels indicate that we have fecal pollution.

While for the month of September, the measurements made and the values obtained can be read as follows:

- Many key parameters exceed national limits when compared to the values of the drinking water regulation (e.g. Pb, Ni, E. coli, BOD/COD, Cl^-, EC). This means that the water is not suitable for consumption without further treatment and poses a health risk.
- Lead and nickel are very high compared to national values (lead 10 µg/L, nickel 20 µg/L). This is an important signal: lead concentrations (150-230 µg/L) are many times above the norm.
- Microbiological parameters (E. coli) are very high – an indicator of faecal contamination and the risk of water-related diseases. For drinking water, the norm is 0 CFU/100 mL.
- Many parameters (BOD, COD, PO_4, turbidity, EC, Cl^-) very high values were obtained for organic pollution, food (fertilizers) and salinity (coastal impact / marine intrusion).



Graphic 1. *Key water- quality parameters (May vs September).*

At the end of the analyses performed, a graphical summary of the results for the main parameters of laboratory measurements was performed. The graphs provided show the values of each analyzed parameter, emphasizing in particular those that have resulted below the established norms or above the limits allowed according to the water quality standards. This visual representation serves to clearly

illustrate general trends and identify parameters that require further monitoring or intervention to improve environmental quality.

5. Conclusion

After parameter measurements have been carried out at all three monitoring points and in two different time periods, it results that the level of water pollution is high, reflecting the impact of numerous environmental and human factors. One of the main sources of this pollution is the uncontrolled and untreated discharge of urban and agricultural wastewater, which carries chemicals such as phosphates and nitrates, as well as concentrations of organic matter harmful to the ecology of the environment. These chemicals lead to the transformation of natural habitats, endangering the ecosystem. Wastewater contains not only domestic and organic pollutants but also chemical fertilisers and pesticides. Furthermore, this situation increases the biochemical demand for oxygen, necessary for the development of aquatic flora and fauna. A parameter that is vital for aquatic life, dissolved oxygen is below the minimum value, which causes unfavourable conditions for biodiversity. This indicates that the conditions are not optimal for aquatic life, risking the degradation of the ecosystem. In general, pollution was found to be higher at the monitoring points before entering the hydrovore and before discharge into the sea, which suggests that pollution comes from both the inputs of polluted waters before the hydrovore, as well as from transport processes before discharge into the sea.

The results obtained reinforce the urgent need to develop strategies and mechanisms for treating wastewater before its discharge into the sea to avoid the destruction of ecological chains. The development of well-defined environmental policies and community awareness about the controlled use of water resources helps establish an environmental balance.

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