BOOK OF PROCEEDINGS

1st International Conference on Built Environment

ICBE 2026

MAY 08th-09th, 2026
POLIS University, Tiranë

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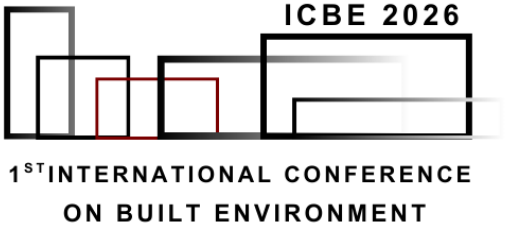
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1st International Conference on Built Environment

ICBE 2026

Conference Theme and Rationale

The 1st International Conference on Built Environment (ICBE 2026) was conceived as an international and interdisciplinary forum for advancing knowledge, critical discussion, and innovation across architecture, urban planning, engineering, construction, materials, design, and the wider built environment. Organized by POLIS University in collaboration with the National Agency for Scientific Research and Innovation in Albania (AKKSHI), the Academy of Sciences of Albania and the University of Ferrara in Italy, the conference brought together academics, researchers, practitioners, students, and industry representatives to exchange research findings, professional experience, and emerging perspectives on the transformation of contemporary cities and territories.

The conference theme reflected the increasingly complex challenges shaping the built environment, with particular attention to sustainability, resilience, technological innovation, heritage preservation, and socially responsive design. Contributions addressed sustainable architecture and green building, innovative construction technologies and materials, climate-responsive and energy-efficient design, disaster risk reduction, circular approaches to construction, and the integration of renewable energy. Equal emphasis was placed on digital transformation through Building Information Modeling, Geographic Information Systems, artificial intelligence, data analytics, automated solutions, digital fabrication, and advanced manufacturing.

ICBE 2026 also recognized that the future of the built environment cannot be approached through technological innovation alone. Urban transformation, cultural heritage, adaptive reuse, inclusive design, ecological thinking, art, and interdisciplinary research were therefore integral to the conference rationale. The scientific sessions examined topics ranging from seismic resilience, geotechnical engineering, and structural safety to urban fragmentation, public space, heritage conservation, adaptive environments, and new relationships between human and non-human systems.

Through keynote lectures, scientific presentations, case studies, and interdisciplinary debate, the conference encouraged connections between research and practice while promoting approaches capable of responding to environmental, social, cultural, and technological change. The breadth of contributions demonstrated the value of bringing engineering, architecture, urbanism, design, heritage, and emerging technologies into a shared academic framework for more resilient, sustainable, adaptive, and human-centered environments.

Held on 8-9 May 2026 at POLIS University in Tirana, with in-person and online participation, ICBE 2026 welcomed guest speakers and participants from Albanian and international universities, research institutions, professional organizations, and industry. Its sessions established a platform for presenting current research, exchanging expertise, strengthening meaningful collaboration, and identifying future directions for the built environment.

The event

The **1st International Conference on Built Environment (ICBE 2026)** is an interdisciplinary academic and professional forum dedicated to exploring contemporary challenges, emerging research, and innovative approaches shaping the future of the built environment. Bringing together researchers, academics, architects, engineers, urban planners, designers, practitioners, and industry professionals, the conference promotes the exchange of knowledge and encourages collaboration across traditionally interconnected disciplines. Its thematic scope encompasses sustainable and resilient construction, technological innovation, advanced building materials, urban transformation, cultural heritage, and interdisciplinary design approaches. Particular attention is given to the growing role of digital technologies, data-driven methodologies, intelligent design processes, and advanced analytical tools in supporting more informed and responsive approaches to architecture, engineering, and urban development. At the same time, ICBE 2026 recognizes the importance of environmental responsibility, cultural identity, social needs, and human-centered design in shaping contemporary cities and territories. Through keynote lectures, scientific sessions, case studies, and interdisciplinary exchange, the conference provides a platform for presenting current research, discussing professional experiences, and developing new perspectives capable of contributing to **safer, more sustainable, adaptive, inclusive, and resilient built environments**.

Objectives

- Promote interdisciplinary collaboration among researchers, academics, practitioners, and professionals in architecture, engineering, urban planning, construction, design, heritage, and related fields of the built environment.
- Advance the use of digital technologies and innovative methodologies, including BIM, GIS, artificial intelligence, data analytics, digital fabrication, and parametric approaches, in research and professional practice.
- Encourage sustainable, resilient, and climate-responsive approaches to architecture, construction, and urban development through innovative materials, energy-efficient strategies, and environmentally responsible design.
- Address contemporary challenges affecting cities, buildings, and infrastructure through scientific research, applied case studies, evidence-based approaches, and innovative design solutions.
- Promote the conservation, transformation, and adaptive reuse of cultural heritage, balancing cultural identity, contemporary needs, structural safety, and responsible urban development.
- Support human-centered and socially responsive urban transformation, considering public space, mobility, ecological systems, community needs, and the wider social and economic impacts of the built environment.
- Provide a platform for knowledge exchange and emerging research, enabling scholars, young researchers, professionals, and students to present innovative ideas, strengthen international collaboration, and contribute to future directions in the built environment.

Main Conference Themes

- Sustainable architecture and green building practices.
- Innovations in construction technologies and materials.
- Heritage preservation and adaptive reuse in the built environment.
- Digital tools and smart technologies in architecture and construction (e.g., BIM, GIS).
- Climate-responsive and energy-efficient design.
- Disaster risk reduction and resilience in the built environment.
- Circular economy approaches in construction and material usage.
- Integration of AI and data analytics in building design.
- Acoustic and thermal performance in building design.
- Renewable energy integration in building systems.
- Advanced manufacturing techniques in construction, such as 3D printing.
- Innovations in construction technologies and materials.
- Heritage preservation and adaptive reuse in the built environment.
- Disaster risk reduction and resilience in the built environment.
- Digital tools and smart technologies in architecture and construction.
- Advanced manufacturing techniques in construction.
- Geotechnical Engineering for Sustainable Development.
- Cartography and Geographic Information System.
- Computer Automated Solutions for Built Environment.
- Reliability in Civil Engineering.
- Urban planning strategies for resilient cities.
- Climate-responsive and energy-efficient design.
- Regulatory frameworks and policies impacting construction and urban development.
- Design in the Era of Anthropocene (Rethinking the Relation between Human and Non-Human Species)
- Speculative Design (with Attention to “Discursive” and “Critical” Design)
- Design and Cross-Disciplinarity (with Emphasis on Processes rather than Design Outputs)
- Inclusive Design
- Art and Urban Regeneration (Focus on Participatory, Collaborative, and Research-Based Practice)
- Relational Art and Architecture
- Monuments and ‘Anti-Monuments’ (Particular Attention to the Process of Designing and Building the City)

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The conference is structured around six thematic sessions, each addressing a specific area of research and practice within the built environment.
Each session is coordinated by experts in the relevant disciplinary field and is open to professors, researchers, PhD candidates, and other scholars and professionals contributing to the conference themes.

SESSION I
Urban Planning and Societal Impact

Chair: Dr. Gent Avdija

This session examines the relationship between urban transformation, spatial development, and their social implications within contemporary cities. Contributions address rapid urbanization, urban fragmentation, the transformation and loss of public space, informal and spontaneous development, and the challenges associated with balancing growth and modernization with human-scale urban environments. Particular attention is given to the evolving conditions of Albanian cities and to planning approaches capable of supporting more inclusive, sustainable, socially responsive, and livable urban environments.

SESSION II
Sustainable Materials, Resilient Construction & Smart Design

Chair: Dr. Endri Duro

This session explores innovative approaches to sustainable construction, resilient structural systems, and environmentally responsive design. Particular attention is given to sustainable materials, energy-efficient and climate-responsive strategies, prefabricated and lightweight construction technologies, and human-centered approaches to structural and architectural design. The session investigates how material innovation, technological development, and responsible design practices can contribute to safer, more efficient, adaptable, and environmentally sustainable built environments.

SESSION III
Technological Advancements and Seismic Design for Resilient Places

Chairs: Dr. Seyyed Behrad Emadi & Dr. Ornela Şen

This session examines the role of technological innovation and advanced engineering methodologies in developing safer, more resilient, and adaptable built environments. Contributions address seismic hazard and risk assessment, digital fabrication, parametric and computational approaches, transformations of building envelopes and prefabricated housing systems, and emerging concepts for future urban mobility. The session highlights how the integration of engineering knowledge, digital technologies, and resilience-oriented design can strengthen the capacity of buildings, infrastructure, and urban environments to respond to contemporary and future challenges.

SESSION IV

Cultural Heritage

Chairs: Dr. Nikolla Vesho & Dr. Marsela Demaj

This session addresses the preservation, interpretation, and transformation of cultural heritage within contemporary architectural and urban contexts. Contributions explore conservation strategies for historic buildings and sacred architecture, seismic assessment and strengthening of heritage structures, adaptive reuse, and the social implications of urban regeneration and heritage loss. Particular emphasis is placed on achieving a responsible balance between conservation ethics, cultural identity, structural safety, and the evolving functional requirements of historic buildings and urban environments.

SESSION V

Spaces of Connection: Art and Design for an Interspecies and Interdisciplinary Environment

Chair: Dr. Francesco Scasciamacchia

This session explores the intersections of art, architecture, design, technology, and the built environment through interdisciplinary and experimental perspectives. It investigates changing relationships between human and non-human systems, spatial perception, adaptive reuse, post-industrial landscapes, urban representation, digital heritage, and environmentally and socially engaged design practices. Through critical, speculative, participatory, and research-based approaches, the session examines how art and design can generate new forms of connection, reinterpret existing environments, and contribute to emerging cultural and spatial narratives within contemporary cities.

SESSION VI

Next-Generation Pioneers of the Built Environment

Chair: Dr. Flogerta Krosi

This session provides a dedicated platform for emerging researchers and students to present innovative, experimental, and forward-looking approaches to the built environment. Contributions span architecture, engineering, urban planning, environmental resilience, design, and related creative disciplines, reflecting the interdisciplinary character of a new generation of researchers and practitioners. Through projects addressing topics such as bioclimatic design, flood-risk management, structural technologies, architecture-inspired design, and critical interpretations of objects and social space, the session encourages critical inquiry, experimentation, and new perspectives on the future of the built environment.

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SESSION VI

Next-Generation Pioneers of the Built Environment

Emerging research and experimental design: Student research / Young scholars / Innovative methodologies / Experimental approaches to the built environment.

Sustainable and bioclimatic design: Bioclimatic architecture / Climate-responsive design / Environmental performance / Sustainable building concepts.

Resilience and risk management: Flood-risk management / Environmental resilience / Disaster-aware planning / Adaptive urban strategies.

Structural and technological innovation: Steel-frame technologies / Construction systems / Emerging building technologies / Engineering innovation.

Architecture, design and society: Architecture-inspired design / Fashion and spatial concepts / Objects and social space / Interdisciplinary creative practice.

Future-oriented thinking: Innovation / Critical inquiry / Interdisciplinary experimentation / New professional perspectives / Future built environments.

Integrated Flood Risk Management in Albania:
Human drivers, Basin dynamics and Policy gaps

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Abstract

Albania possesses a dense hydrographic network and significant freshwater resources, with an average annual runoff of approximately 41 billion m^3 and high hydrological module values. While this water wealth supports agriculture, hydropower and economic development, it simultaneously exposes the country to recurrent and often severe flooding. Over the past three decades, flood events have generated economic damages estimated at approximately 2.5 billion USD and have resulted in substantial social and environmental consequences.

This study examines the structural, environmental and anthropogenic factors that intensify flood risk in Albania, with particular focus on major river basins such as Drin-Buna. Through a qualitative-analytical review of documented flood events (2010-2026), institutional reports and basin characteristics, the research identifies the interaction between natural hydrological conditions and human-induced pressures. Although high annual precipitation (1400-1500mm) and geomorphological features contribute to natural vulnerability, findings indicate that unplanned urbanization, illegal construction in floodplains, deforestation, degradation of drainage systems, poor river maintenance, and inadequate management of hydraulic

infrastructure significantly amplify flood magnitude and frequency.

The Drin-Buna basin, characterized by dense population, agricultural activity and hydropower installations, represents a critical case where structural exposure intersects with management deficiencies. Inadequate maintenance of levees, pumping stations and drainage canals further reduces system resilience, leading to repeated humanitarian and economic crises, particularly in northern lowland areas.

The paper argues that flood risk in Albania is no longer solely a hydrological issue but a governance and spatial planning challenge also. Strengthening integrated river basin management, enforcing land-use regulations, investing in maintenance infrastructure, and adopting preventive rather than reactive strategies are essential to reducing long-term vulnerability. A shift toward proactive risk governance is necessary to safeguard communities, economic assets and environmental stability.

Keywords: *Hydrological vulnerability, river basin governance, civil emergency policy, drainage systems, land-use regulation*

1. INTRODUCTION

1.1 General information and main questions

Albania, due to its distinctive physic-geographical conditions, possesses substantial water resources and a dense hydrographic network. This network collects the waters of a drainage basin with a total surface area of 43,305 km², of which 28,550 km² lie within the state territory of the Republic of Albania. The mean annual runoff has a total water volume of approximately 42.25 billion m³, corresponding to a high specific discharge (runoff modulus) of about 30 L/s per km² (Geography of Albania 2022)

This considerable water wealth, in addition to its positive contributions to the economy, agriculture, energy production, and tourism, also has adverse implications during periods of intense precipitation, leading to significant flooding events. These floods can cause substantial material damage and, in some cases, loss of human life.

Hydrological risk constitutes a fundamental component in the development of Civil Emergency Plans and represents an issue of national importance. It is also among the main points of the standards required to join the European Union. The main questions that arise are:

- What are the natural and anthropogenic factors influencing these flood events?
- Are we capable of preventing such floods?
- If prevention is not feasible, how can we minimize their economic and human impacts?
- What are the fundamental problems affecting the protective infrastructure?

1.2 Damage caused by flooding over the years

According to the State Supreme Audit Institution - KLSH, the economic damage caused by floods over the past three decades has reached a substantial value of approximately 2.5 billion USD (KLSH, 2024). Furthermore, based on unofficial statistics, it is estimated that floods have caused, directly or indirectly, the loss of around 270 human lives - an alarming figure for responsible authorities, experts, and society as a whole.

In addition to economic and human losses, these recurrent flood events also produce significant social and psychological impacts on affected populations. Citizens often experience a loss of hope and trust, which in many cases compels them to migrate. This, in turn, leads to severe and often irreversible consequences for both society and the country.

2. LITERATURE REVIEW

2.1 The largest floods in Albania in recent years

Flooding in Albania occurs every year. We have selected five of the most significant flood events in recent years (Figures 1–5), and compiled a table with the corresponding statistics for each event (Table 1).



Figure 1. The 2010 Shkoder Flood. Source: Copernicus



Figure 2. The 2015 Flood in South Albania. Source: Copernicus



Figure 3. The 2017 Flood in Center and Southwestern of Albania. Source: Copernicus



Figure 4. The 2021 Shkodra flood. Source: Copernicus

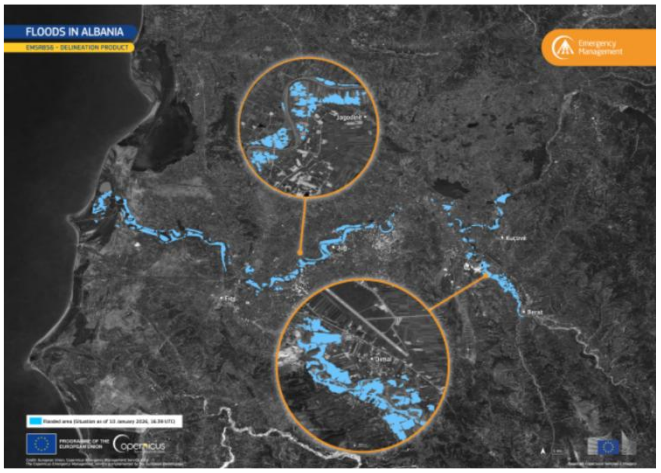


Figure 5. The 2026 Flood. Source: Copernicus

During the process of preparing the material, we also examined other countries that face flooding or heavy rainfall issues similar to Albania, in order to understand how they have addressed these problems.

Netherlands

Problem: A large part of the country lies below sea level, making it highly vulnerable to flooding from rivers and the sea.

Solutions:
Delta Works: a system of dikes and pumping stations that controls water flow.
Modern canals, reservoirs, and pumping stations to remove water during storms.
Increased afforestation and creation of water retention areas.

(Government of Netherlands 2021)

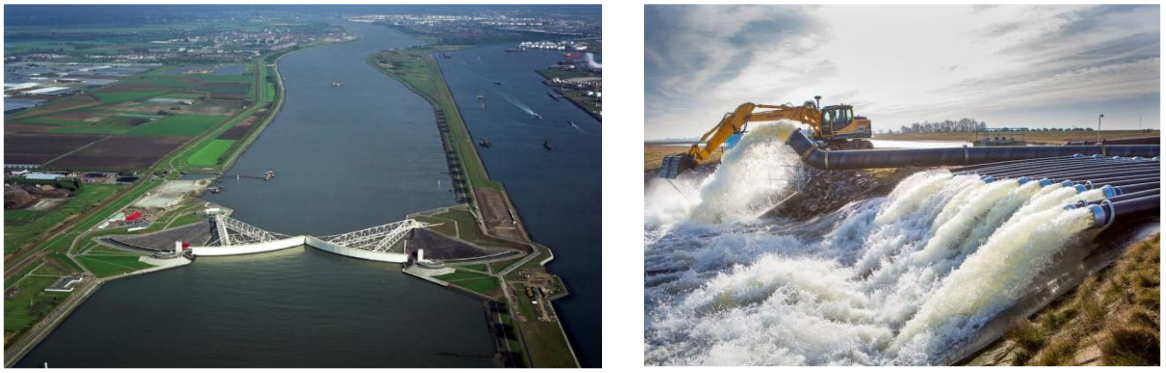


Figure 6. Delta Works in Holland (left) and modern canals (right)

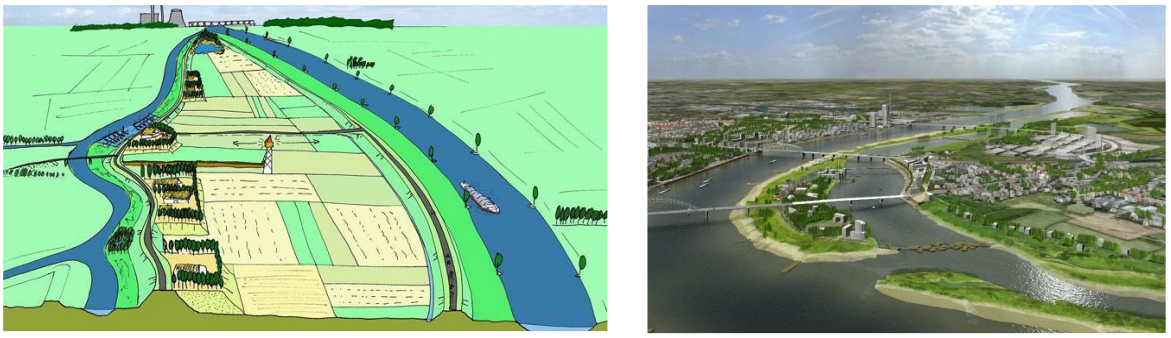


Figure 7. Project “Make Room for River”. Source: Haskoning

Flood (Year)	Main Areas	Affected Population / Evacuations	Housing & Infrastructure	Agriculture & Environment	Key Short- & Long-Term Impacts
Shkodra & Northern Albania (2010–2011)	Shkodër, Lezhë	~10,000–12,000 affected; >5,000 evacuated	~2,200–2,500 houses flooded; local roads destroyed; power outages	~10,000–14,000 ha of agricultural land flooded; livestock losses	Local humanitarian crisis; major economic losses; need for embankment reconstruction
Southern & Central Floods (2015)	Fier, Vlorë, Berat, Gjirokastër	Thousands affected; hundreds evacuated	Hundreds of houses damaged; damage to bridges and rural roads	Tens of thousands of hectares of agricultural land damaged; crop losses	Economic losses estimated at ~€100–110 million; strong impact on agriculture and rural incomes
Nationwide Floods (December 2017)	Central & Western Albania	~70,000 people indirectly affected; local	Over 4,000 structures damaged;	~15,000 ha of land flooded; soil and canal pollution	Disruption of critical services; need for improved urban

Flood (Year)	Main Areas	Affected Population / Evacuations	Housing & Infrastructure	Agriculture & Environment	Key Short- & Long-Term Impacts
		evacuations			drainage
Northern Albania (Shkodër & Lezhë – 2021)	Shkodër, Lezhë	Hundreds of families evacuated	Hundreds of houses flooded; damage to secondary roads	Thousands of hectares of agricultural land flooded	Worsening of chronic flooding situation in Shkodër;
January Floods (2026)	Fier, Berat, Durrës, Shkodër, Vlorë	Hundreds evacuated; 1 reported fatality	Homes and businesses flooded; roads blocked; damage to critical infrastructure	Large areas of agricultural land flooded; landslides	National emergency response activated; emphasis on need for better river management

Table 1. Damages caused by these floods. Source: Authors.

2.2 Human factors that cause floods

In addition to geomorphological and hydrological factors, as well as the heavy rainfall that our country experiences (annual average 1400–1500 mm), another influencing factor is human activity, which in most cases worsens the impact of floods. These factors are presented through illustrative images (Figures 8–14).



Figure 8. Unauthorized Construction. Source: ASIG GeoPortal



Figure 9. Deforestation. Source: INSTAT



Figure 10. Riverbed pollution. Source: Syri TV



Figure 11. Blockage of sewer systems. Source: Report TV



Figure 12. Unregulated releases from hydroelectric dams. Source: Shqiptarja.com



Figure 13. Lack of greenery. Source: vna.al



Figure 14. Malfunctions in pumping stations. Source: BoldNews

These human-related factors, linked to our actions or inactions, have the following impacts:

- Water has nowhere to disperse and overflows from the riverbed.
- Surface runoff and erosion increase.
- Rivers fill up and overflow more quickly.
- Flooding occurs even after relatively light rainfall.

- Water accumulates in fields and residential areas.
- Sudden rise in river levels downstream of dams.
- Water flows rapidly toward rivers and floods low-lying areas.

3. METHODOLOGY

3.1 Basin and geographic map of Albania

Based on the basin map, it can be observed that almost the entire territory of the Republic of Albania is covered by river basins (Figure 13).As indicated on the map (Figure 14), the western region of Albania is characterized by low-lying terrain, which is more susceptible to flooding and riverine overflow. The interaction of low-lying topography, significant water presence, and topographic factors renders this area highly vulnerable to flooding. For this reason, our study will concentrate and be further elaborated on the Drin–Buna basin within the jurisdiction of the Municipality of Shkodër.

3.2 Drin-Buna Basin

Near the city of Shkoder, the Drin River splits into two branches: one branch continues toward the Buna River, while the other (Drin of Lezha) flows directly into the Adriatic Sea. The Buna River itself originates from Lake Shkoder and flows into the Adriatic Sea, forming a complex and highly dynamic hydrological system.The interaction between the Drin and Buna rivers is particularly significant in terms of flood risk and water level regulation. High discharges from the Drin, directly influence the water levels of the Buna River. This interaction is further complicated by the hydraulic conditions of Lake Shkoder, which acts as a natural buffer but can also contribute to backflow effects when water levels are elevated (Figure 15). As a result, the Drin–Buna basin is considered one of the most flood-prone areas in Albania. The low-lying topography of the Shkoder region, combined with river overflow, sediment transport, and limited drainage.

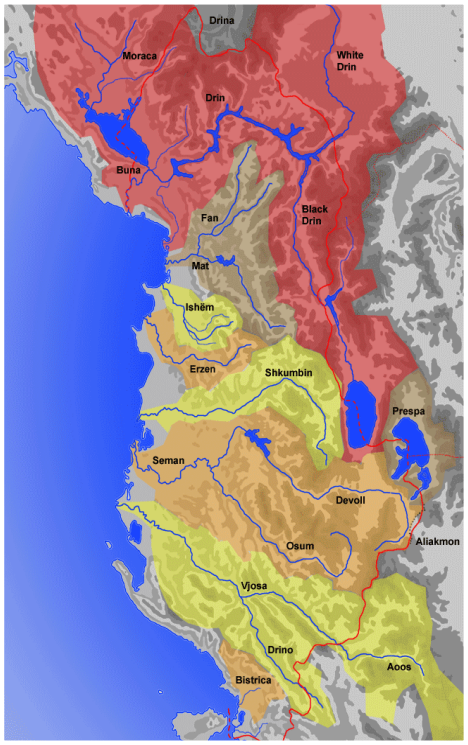


Figure 15. Basin map



Figure 16. Geografic map



Figure 17. Drin-Buna basin map. Source: Semantic Scholar

3.3 Hydrologic system within the Municipality of Shkoder

The most significant hydrological features within this territory include Lake Shkodër, the Drin River, the Buna River, the Kir River, the Shala River, the Viluni Lagoon, the Domni wetland etc (Figure 18).



Figure 18. Hydrologic system. Source: Strategic Environmental Assessment (SEA)

In 2010, due to improper management of these hydropower plants (HPPs), 12,450 hectares of farmland were inundated for a duration of 25–30 days (Figure 19).

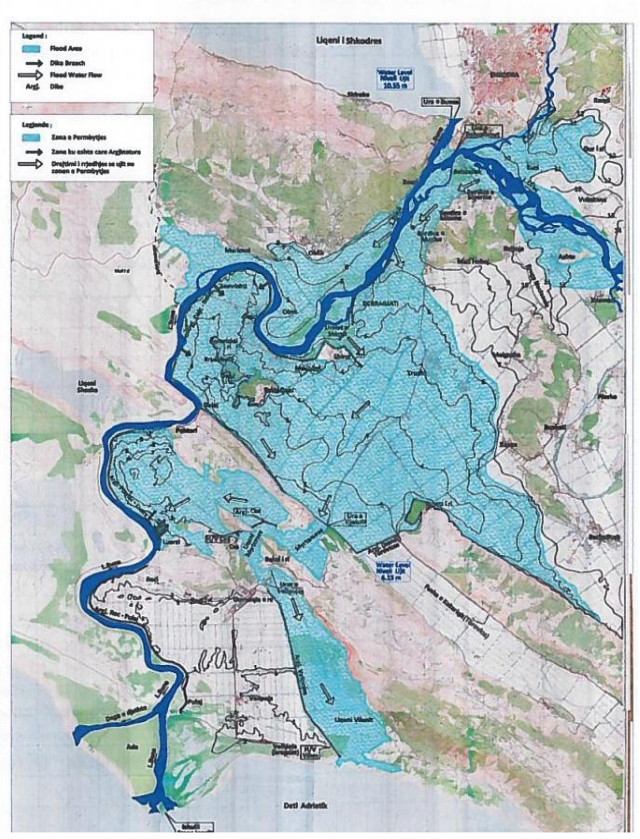


Figure 19. The major flooding of November–December 2010. Source: SEA.

3.4 Human factors contributing to the intensification of floods

Mismanagement of hydropower plants (HPPs)

On the Drin River, there are three hydropower plants of first-class importance in terms of hazard potential, where the management of dams and inflows is critical for preventing flooding in the territory of the Municipality of Shkodër (Figure 18):

- **Koman Hydropower Plant**:
  - Dam total volume: 5.7million m^3
  - Reservoir: 432million m^3
- **Fierza Hydropower Plant**:
  - Dam total volume: 8 million m^3
  - Reservoir: 2.1 billion m^3, surface area: 61.4km^2
- **Vau i Dejës Hydropower Plant**:
  - Dam total volume: 3.1million m^3
  - Reservoir: 499 million m^3, surface area: 21km^2 (KKDM)

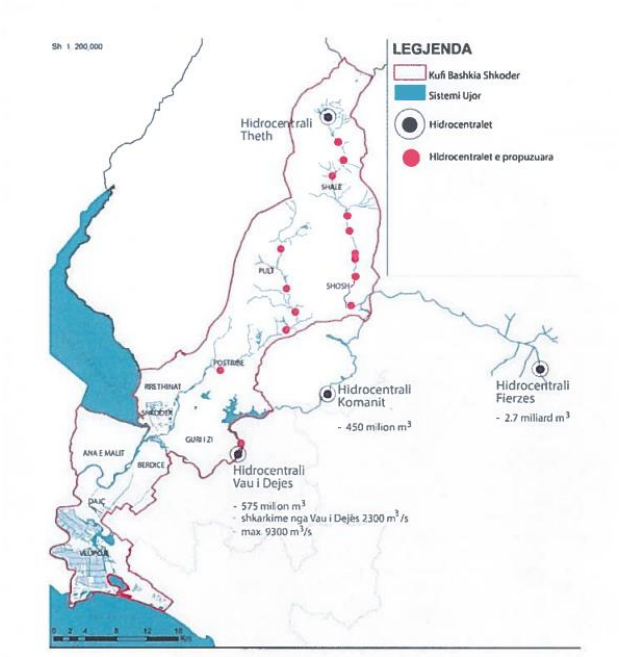


Figure 20. Map of HPPs. Source SEA

Utilization of inert materials

During the last three decades, aggregate extraction along the riverbeds of the Drin, Buna, and Kir rivers has led to substantial hydro-technical impacts, such as the deterioration of 55%–60% of riverbed protective structures, severe riverbank erosion, formation of new flood-prone zones, damage to forest cover, and a decreased sediment supply to the Buna estuary. (SEA, Municipality Shkoder).

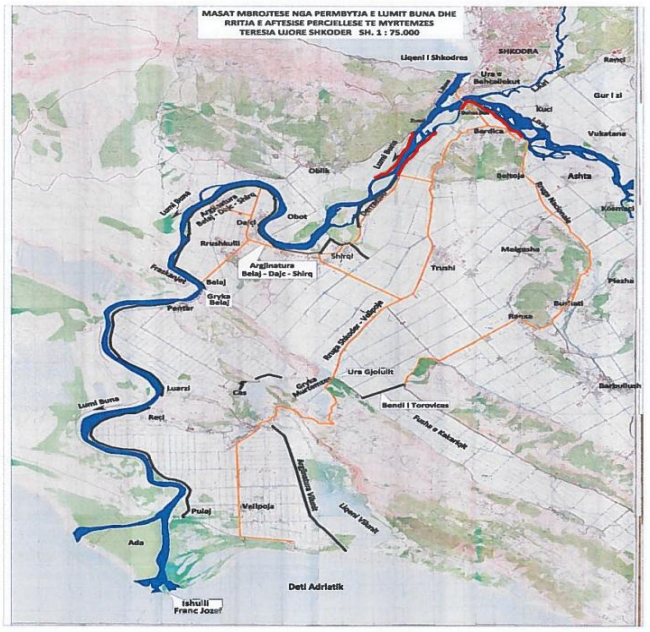


Figure 21. Map of flood protection structures along the Buna River. Source SEA

The embankments currently handle Buna River discharges of 2,200 m^3/s, a flow rate that is relatively low and inadequate for effectively preventing floods in Lower Shkodër. Therefore, the embankments require modernization and repairs, especially in critical sections, including the two dikes extending from Shirq to the Gjonluli Bridge (SEA, Municipality Shkoder).

Malfunctioning or absence of an effective drainage system in the floodplain areas

In the lower Shkoder area, where the slope is mainly 0–5% and some areas are below sea level, there is a lack of functioning and maintenance of the drainage channels. Across 30,000 ha, there are 1,650 km of drainage channels (primary, secondary, and tertiary), of which only 25%–30% are operational. As a result, during floods, these channels cannot convey surface waters effectively (SEA, Municipality Shkoder).

Maps of dranaige system

The area of Mbishkodra

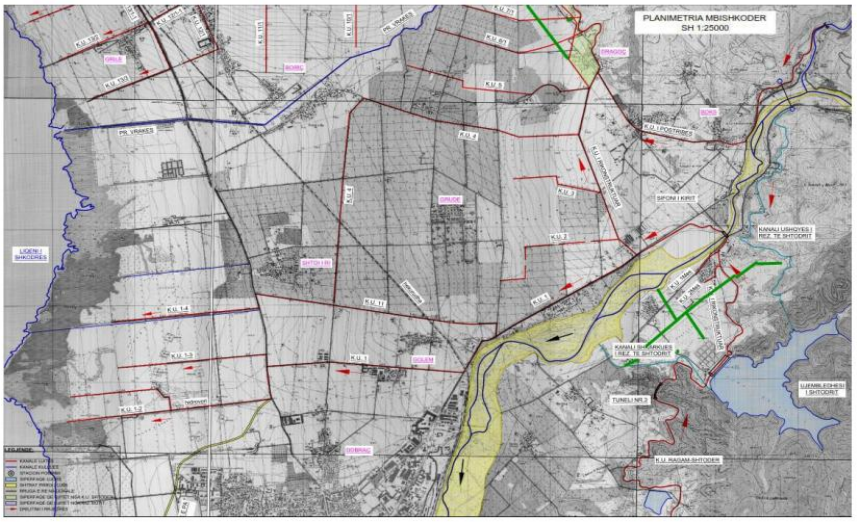


Figure 22. Dranaige system. Source: Strategic Environmental Assessment (SEA)

The area of Nenshkodra

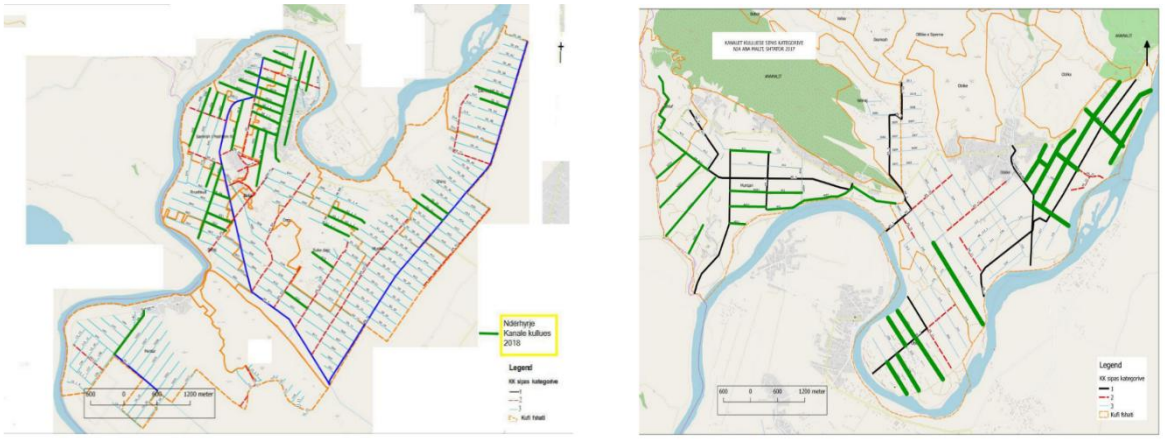
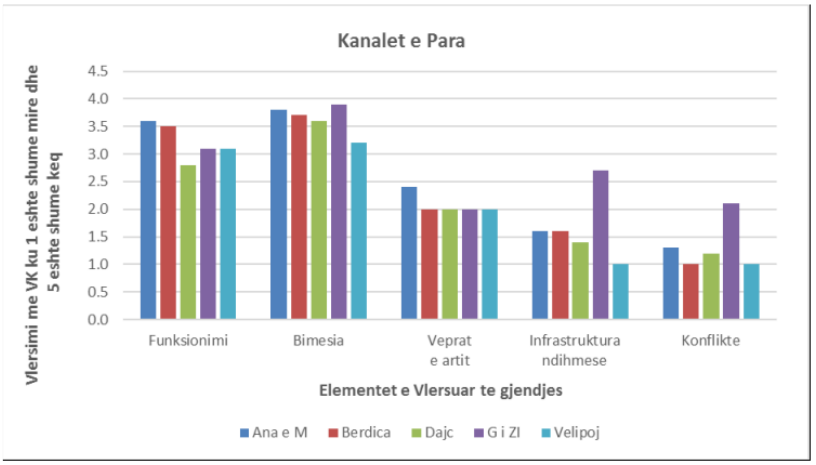


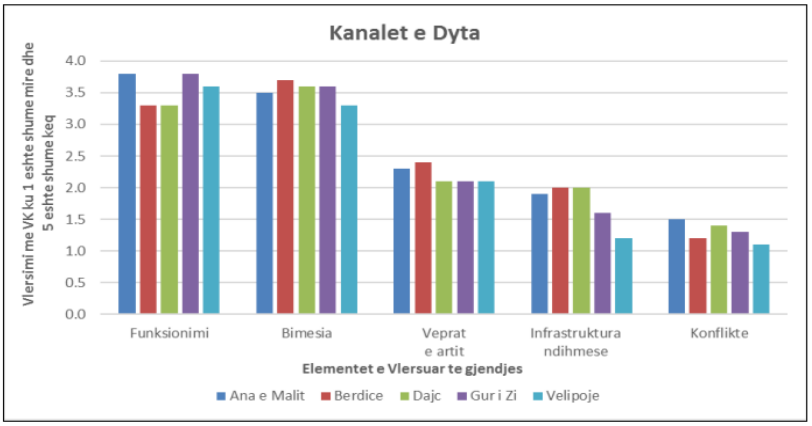
Figure 23. Drainage system. Source: Strategic Environmental Assessment (SEA)

Condition of the drainage system

The following graphs (Graphic 1–4) show a relatively poor condition and performance, which contributes to the worsening of the flood situation. There is a pressing need for the construction of new drainage channels, alongside urgent interventions in the existing drainage infrastructure.

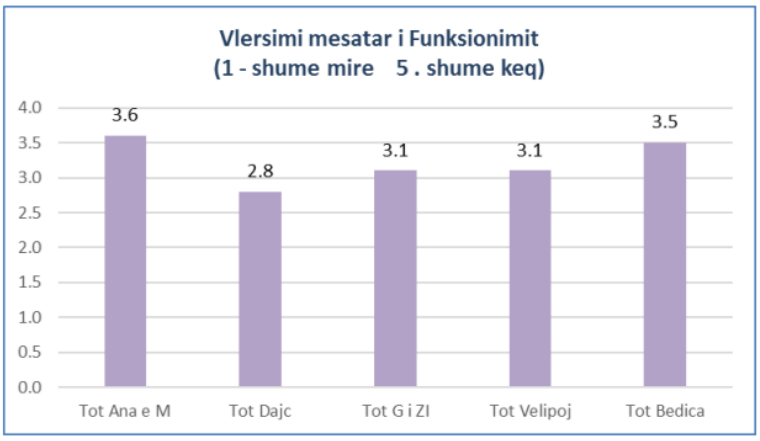


Graphic 1. Condition of the first dranaige system. Source: Porta Vendore

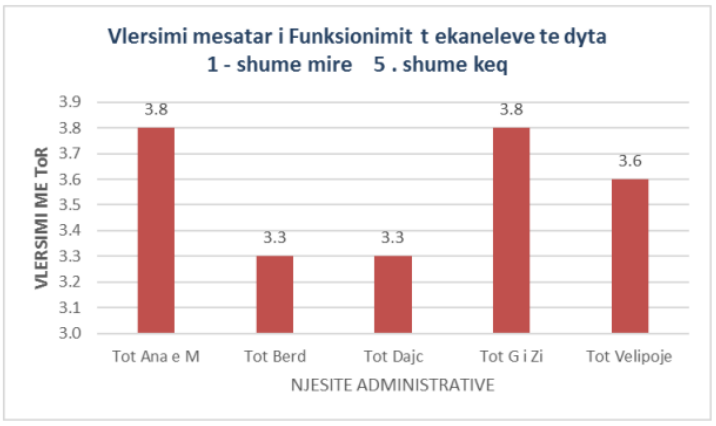


Graphic 2. Condition of the second dranaige system. Source: Porta Vendore

Functionality of the drainage system



Graphic 3. Functionality of the main dranaige system. Source: Porta Vendore



Graphic 4. Functionality of the secondary dranaige system. Source: Porta Vendore

There is a pressing need for the construction of new drainage channels, alongside urgent interventions in the existing drainage infrastructure.

Informal areas and constructions

After the 1990s, unauthorized constructions and developments without proper urban planning began to proliferate, causing pollution and blockage of sewer collectors and drainage channels. This type of urbanization, implemented without assessing its impact on drainage systems, as well as newly constructed provisional drainage channels lacking expert evaluation, contributes significantly to the flooding of many areas."

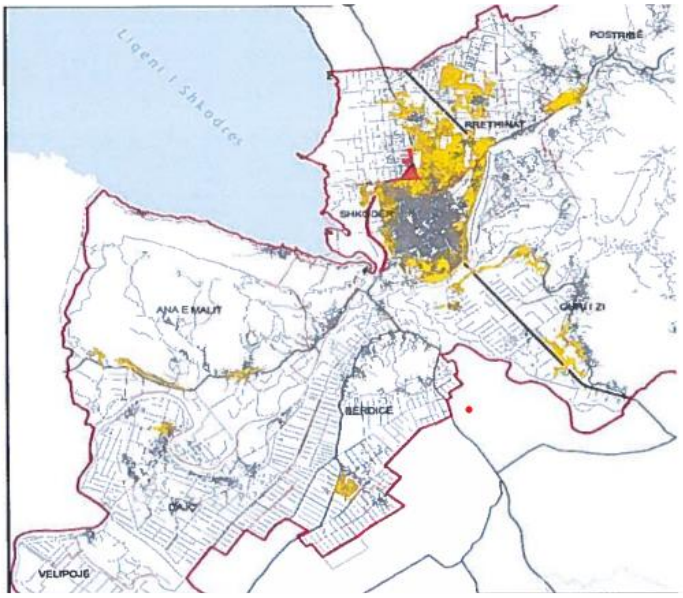


Figure 24. Map of informal constructions. Source: Strategic Environmental Assessment (SEA)

Lack of Coordination between Local and Central Authorities and Insufficient Funding

In many cases, bureaucratic obstacles and disagreements between the two levels of government, as well as a lack or mismanagement of funds for the construction, reconstruction, or cleaning of drainage channels and embankments, aggravate the flooding situation. The outdated mindset of political actors, in which political conflicts frequently deprive ordinary citizens of essential funding across all areas of life."



Western bypass

The construction of this bypass, in addition to its infrastructural importance, adversely affects water circulation. Waters coming from upstream cannot properly discharge into Lake Shkodra, causing flooding in the city and surrounding areas. It is essential to review the bypass and implement interventions to prevent obstruction of water flow into the lake."

Figure 25. Map of western bypass. Source: Strategic Environmental Assessment (SEA)

Lack of modern equipment for channel cleaning

A negative impact on flood protection is evident in Shkodra Municipality, as there is a lack of modern equipment for cleaning an extensive sewer network. Outdated tools and methods from over 30 years ago are still in use.

Massive deforestation in the Drin river basin

In the slopes of the mountainous areas, large-scale interventions have been carried out without criteria or proper studies regarding deforestation. Together with the lack of reforestation, the terrain remains exposed to the risk of erosion. Under these conditions, where forest cover in the Drin river basin does not exceed 50% of the area, water flow is unrestricted. Therefore, flood protection efforts must begin in the upper Mbishkodra area, where engineering measures are lacking, improvement of existing forests is needed, and new reforestation initiatives should be implemented.

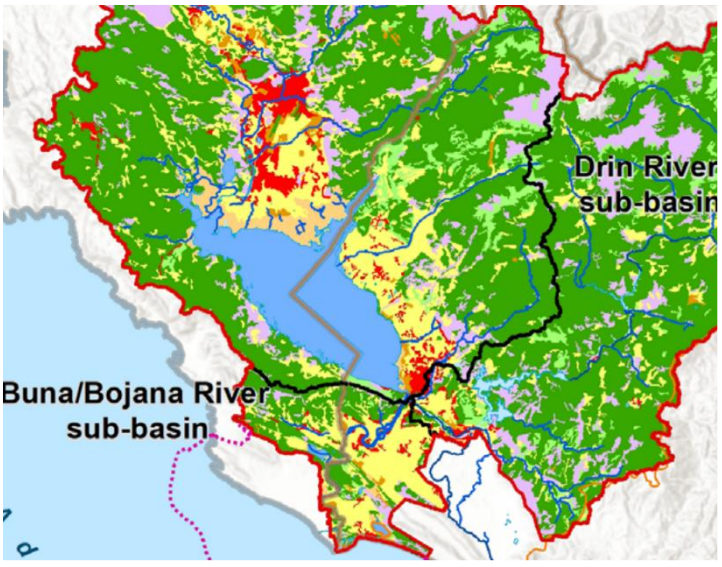


Figure 26. Map of forest zones

Pumping Stations

The main pumping stations in Shkodër Municipality, which 'drain' agricultural lands from excessive water presence are: the Velipojë pumping station, the Ças pumping station, the Vilun pumping station, and the Liria neighborhood pumping station. There are no official reports on the condition and capacity of these pumping stations, but based on the situations caused by rainfall and river inflows, which have led to massive flooding, we can conclude that they need intervention and modernization, or that investment is required in the construction of new pumping stations.

4. RESULTS AND DISCUSSIONS

Scientific documents from the Ministry of Environment indicate that from the mid-20th century to the beginning of this decade, annual precipitation has decreased by approximately 2–5%. However, since the 1990s, Albania has experienced dozens of flood events with significant impact, with at least 1–2 major floods occurring annually at the national level.This is also a result of the negative impact that human factors have had on the worsening of the flood situation over the past 30 years (Source: Ministry of Environment). Another tragic-comic situation appears in a table that clearly shows that documents, plans, and vision remain only on paper, without any real implementation. (Source: Bashkia Shkoder)

Management of irrigation and drainage infrastructure 2022

Nr	Project Name	Planned Value	Financed Value
1	Management and operation of D.SH.B.P	15,841,000 Lekë	0 Lekë
2	Cleaning of drainage canals in Dajc Area	9,916,000 Lekë	0 Lekë
3	Cleaning of drainage canals in Berdice Area	0 Lekë	0 Lekë
4	Cleaning of drainage canals in Ana e Malit Area	0 Lekë	0 Lekë
5	Cleaning of drainage canals in Guri i Zi Area	0 Lekë	0 Lekë
6	Cleaning of drainage canals in Rrethinat Area	0 Lekë	0 Lekë
7	Cleaning of drainage canals in Velipoje Area	0 Lekë	0 Lekë
8	Maintenance of Guri i Zi irrigation scheme	12,074,000 Lekë	0 Lekë
9	Maintenance of Rrethinat irrigation scheme	0 Lekë	0 Lekë
10	Maintenance of Berdice irrigation scheme	0 Lekë	0 Lekë
11	Maintenance of Postribe irrigation scheme	0 Lekë	0 Lekë
12	Maintenance of Postribe irrigation scheme	0 Lekë	0 Lekë
	Total	**37,831,000 Lekë**	**0 Lekë**

Figure 30. Drainage infrastructure management plan. Source: Bashkia Shkoder

From this study and these data, several fundamental questions arise that we must answer:

Why does Albania still face flooding problems in 2026 caused even by moderate rainfall?

Why are other countries, like the Netherlands or Singapore, not used as examples?

Why does such a critical phenomenon for national security, and beyond, continue to repeat year after year?

Where does the essence of the problem lie: in the lack of response or the "habit of citizens being accustomed to floods," in the absence of vision and investment, in political will, in the interests of narrow groups, or some other reason?

5. CONCLUSIONS AND RECOMMANDATIONS

Based on the study and the data, we have concluded that floods are a natural phenomenon whose impact is greatly exacerbated by human activity. In addition to human influence, indifference or the lack of vision and proper infrastructure increases the recurrence of this phenomenon every year. Studies show that with proper infrastructure and water management, more than 30% of the damages can be minimized. The heaviest burden falls on specialists and state authorities responsible for this phenomenon, which devastates the country's economy. We have also observed that investments often remain only on paper, with no real implementation.

Floods remain a scourge for Albanian welfare and economy, destroying agriculture, livestock, infrastructure, and more. This recurring situation every year demoralizes citizens and makes them feel abandoned in the face of this "water monster," often forcing them to leave the country. From the ordinary citizen to the highest levels of responsible authorities and state hierarchy, everyone must demonstrate responsibility and vision in addressing this highly concerning and devastating issue, which critically impacts national security and Albanian society.

Based on the above-mentioned issues, we recommend:

1. A detailed plan for surface water management and adherence to the hydrological year.
2. Unblocking of sewers and collectors, as well as their modernization and maintenance.
3. Real investments in collectors, drainage channels, and protective infrastructure.
4. Raising public awareness about avoiding pollution and construction near riverbeds.
5. Increasing forested areas.
6. Advancement and implementation of the Skavica and Bushat hydropower plant construction projects.
7. Deepening of the Buna River and the use of dredgers.
8. Implementation of innovative projects such as "Room for the River" or "Floodable Parks," avoiding unnecessary concretization.
9. An emergency plan, water stations, and evacuation equipment—all fully modernized.
10. Training of new professionals in this field.
11. Compensation for citizens affected by floods, to cover part of the damage and prevent migration.
12. Strict monitoring and control by legal authorities over fund management, investment efficiency, maintenance of existing infrastructure, as well as deforestation and damage to riverbeds.

6. REFERENCES

Ziu,M. Gjeografia e Shqiperise, Botimet Pegi 2022

KLSH, Raport përfundimtar për auditimin tematik “Për verifikimin e shkaqeve, pasojave dhe reagimit të institucioneve, lidhur me situatën e krijuar nga përmbytjet masive në qytetin e Vlorës” https://klsh.org.al/wp-content/uploads/2025/11/Raport-Permbytjet-ne-Vlore-per-web-1-1.pdf

Bogdani.M & Selenica.A. Catastrophic floods and their 'risk' in the rivers of Albania.

Bashkia Shkoder. Vleresimi Strategjik Mjedisor 152-161

https://bashkiashkoder.gov.al/wp-content/uploads/vsm_i_ppv_shkoder_2416.pdf

KKDM. Rregjistri i digave te medha ne Shqiperi sipas lartesise se tyre H. AlbCold

https://albcold.gov.al/wp-content/uploads/2025/03/Rregjistri-Kombetar-i-DM-2024-sipas-H.pdf

Goverment of Netherlands. Delta Programme 2021

Ministria e Mjedisit. https://mjedisi.gov.al/