

ENHANCED WATER RESOURCES MANAGEMENT AND EU DIRECTIVE ALIGNMENT IN ALBANIA: CHALLENGES, INVESTMENTS, AND POLICY IMPLICATIONS

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ABSTRACT: This paper provides a comprehensive policy-oriented analysis of water resources management in Albania in the context of European Union (EU) water directives. Drawing on national strategic documents, monitoring data, and sectoral analyses, the study examines water availability, water quality, infrastructure gaps, institutional arrangements, and investment needs. The findings reveal that while Albania is relatively rich in water resources, significant challenges persist in terms of water quality deterioration, groundwater depletion, insufficient wastewater treatment, and institutional fragmentation. The paper further evaluates Albania's progress in aligning with key EU directives, including the Water Framework Directive, Groundwater Directive, and Urban Wastewater Treatment Directive. Although substantial progress has been made in legislative approximation and strategic planning, implementation gaps remain considerable. The study concludes that achieving full compliance will require large-scale investments, improved governance, and a transition toward integrated and data-driven water management.

KEYWORDS Water management, Albania, EU directives, groundwater, wastewater.

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1. INTRODUCTION

Water resources management represents a critical component of environmental governance and sustainable development, particularly for countries undergoing European integration. Albania, as a candidate country for European Union membership, is required to align its water sector with the EU acquis under Chapter 27 (Environment and Climate Change).

Over the past decades, Albania has undertaken significant reforms to modernize its water sector, including the adoption of integrated water resources management principles and the development of national strategies aligned with EU directives. Despite these efforts, the sector continues to face structural challenges related to infrastructure deficits, pollution, and institutional coordination.

This paper aims to provide a comprehensive assessment of Albania's water sector, focusing on:

- the status of water resources and their management
- water quality and environmental pressures
- infrastructure and service provision
- alignment with EU directives
- investment needs and institutional challenges

2. WATER RESOURCES OVERVIEW

Albania is considered a water-rich country, with significant renewable water resources derived from

both surface water and groundwater systems. The country is characterized by a dense hydrological network, including major river basins such as Drin-Buna, Vjosa, Seman, and Shkumbin.

Despite the overall abundance, water resources are unevenly distributed both geographically and seasonally. Western lowland areas tend to have higher water availability, while certain inland regions experience seasonal shortages. Climate variability further exacerbates these imbalances, particularly during prolonged dry periods.

Groundwater resources play a crucial role in ensuring water supply, particularly for drinking water purposes. However, increasing demand, combined with insufficient recharge management, has led to growing pressure on aquifers in several regions.

3. WATER RESOURCES OVERVIEW

3.1 Surface Water Quality

Surface water quality in Albania varies significantly across river basins. While certain rivers, such as the Vjosa, maintain relatively good ecological conditions, many others are affected by pollution, particularly in downstream areas.

The primary sources of pollution include:

- untreated urban wastewater
- agricultural runoff containing fertilizers and pesticides
- industrial discharges

Monitoring data indicate that a considerable number of water bodies fail to meet good ecological status, reflecting the combined impact of these pressures [1].

3.2 Groundwater Quality and Trends

Groundwater constitutes the main source of drinking water in Albania, supplying a large proportion of the population. However, recent trends indicate increasing stress on groundwater systems.

Key issues include:

- declining groundwater levels in several regions
- contamination from surface pollutants
- over-extraction exceeding natural recharge rates

The observed decline in groundwater levels, in some cases exceeding 0.5 meters per year, raises concerns about long-term sustainability and resilience.

3.3 Coastal and Marine Waters

Coastal and marine waters are also subject to environmental pressures, primarily due to:

- discharge of untreated wastewater
- tourism-related pollution
- agricultural runoff

The limited treatment capacity for wastewater significantly contributes to the degradation of coastal water quality.

4. WATER SUPPLY AND WASTEWATER INFRASTRUCTURE

Water supply and sanitation services in Albania have improved in recent years; however, significant gaps remain.

While access to drinking water has increased, the quality and continuity of supply are still inconsistent in many areas. More critically, wastewater treatment infrastructure remains underdeveloped.

Key challenges include:

- low wastewater treatment coverage
- aging infrastructure
- high levels of non-revenue water

The imbalance between water supply expansion and wastewater treatment capacity has led to increased environmental pressures, particularly on surface water bodies.

4.1 Sector Objectives and Targets

The overall sector vision, mission, and policy objectives are defined in the “National strategy of the water supply and sewerage sector, 2023-2030” as follows:

Vision	A reliable nationwide system for water supply, removal, and treatment of polluted water that meets the needs for economic development and society in general, preserving and protecting the environment, health, and safety of the population in the Republic of Albania.
Mission	Designing appropriate policies and committing sufficient funds to improve the quality of water supply services, wastewater removal, and treatment, and to move steadily towards compliance with European Union standards and development objectives stable.
Mission Objective 1	Expanding and improving access to water supply systems for the population and improving the quality-of-service delivery.
Mission Objective 2	Increase the number of consumers accessing urban wastewater collection, transport and treatment systems and improve the quality-of-service delivery [2].
Mission Objective 3	Implement the Program for Regional Reorganization of Water utilities.
Mission Objective 4	Improve financial stability, service affordability and asset management.
Mission Objective 5	Increase capacity building towards good service administration.
Mission Objective 6	Improve and update the legal and regulatory framework.

Selected sector targets to be achieved in accordance with the “National strategy of the water supply and sewerage sector, 2023-2030” are summarized as follows:

Table 1. Water Supply and Sanitation Sector Target

Nº	Sector Target Indicator	Definition	Baseline 2021	Target Value 2025	Target Value 2030
1	Water Supply connection rate	% of the population connected to a water supply system	77.7%	82 %	90 %
		- Urban areas	92.0%	95%	99%
		- Rural areas	57.9%	64%	85%
2	Wastewater connection rate	% of the population connected to a wastewater collection and disposal system	53.0%	55.5 %	64.8%
		- Urban areas	82.4%	84 %	93.0%
		- Rural areas	12.6%	15 %	26.0%
		% of the population connected to a wastewater treatment plant	14.4%	16.5%	26.0%
3	Service continuity for water supply	Number of hours per day the population is provided with drinking water supply services	15	18 hours/day	24 hours/day
		- Urban areas	16	20	24
		- Rural areas	12	16	24
4	Water reuse plans	Number of WSSCs that implement a water reuse plan according to the principles of the circular economy	0	3	15
5	Energy Savings	Number of UKRs that implement a new/alternative approach for investment in energy savings (solar power, microturbines, etc.)	0	5	5
		Number of UKRs with Energy efficiency plan prepared	0	15	15
		% Energy efficiency plans operational in UKRs	0	50 %	100 %
6	Non-Revenue Water	% of water that is not sold to customers (lost) out of the total system input	65.4%	60 %	45 %
7	Metering rate	% of customers endowed with water meter out of the total number of customers	78.4%	87%	100%
8	Drinking water quality monitoring	Number of regional water quality laboratories established by UKR	0	15	15
		Implementation of Drinking Water Safety Plans	0	60%	100%
9	Water disinfection	% of automatic drinking water disinfection systems out of the total number of disinfection systems	0%	70 %	100 %
10	Asset Management System / Automation	Number of digital asset management systems implemented	0	10	15
		% of automated (SCADA) water supply and wastewater system of total systems	0%	30%	80 %
11	Training expenditures	% of staff funds used for training at the national, regional, and local level	0%	2	2.5
	Staff certification	% of UKR's staff is certified	0%	60 %	100 %
12	Financial sustainability and affordability	O&M Cost coverage	80.0%	100 %	100 %
		Unified tariff for UK regional companies	0%	100%	100%
		Current Collection Rate	72.4%	90%	100%

Source: National Strategy of the Water Supply and Sewerage Sector, 2023-2030

5. INSTITUTIONAL FRAMEWORK

Water resources management in Albania is governed by a framework that incorporates principles of integrated water resources management. Several institutions are involved in the sector, including:

- central government ministries

- regulatory authorities
- water utilities Although responsibilities are defined, coordination between institutions remains a challenge. Overlapping mandates and limited capacity contribute to inefficiencies in planning and implementation [3].

Table 2. Institutional Roles and Gaps

Institution	Core Responsibility	Identified Gap (2025-2030)
MIE / AKUK	Investment & Strategy	Need for a unified Project Management Office for EU Grants.
MTE / NEA	Monitoring & Permitting	Lack of equipment for Quaternary pollutant detection.
WRA	Tariff Setting	Absence of a "Carbon Neutrality" tariff incentive.
Regional Utilities	Operation & Maintenance	Significant shortage of certified WWTP operators.
Municipalities	Asset Ownership	Weak coordination between urban development and sewer planning.

6. ALIGNMENT WITH EU WATER DIRECTIVES

Albania is in the process of aligning its water sector with key EU directives, including:

- Water Framework Directive (2000/60/EC)
- Groundwater Directive (2006/118/EC)
- Urban Wastewater Treatment Directive
- Marine Strategy Framework Directive

Significant progress has been made in legislative approximation and the development of strategic planning instruments such as River Basin Management Plans and Directive-Specific Implementation Plans [4].

However, implementation remains uneven due to:

- financial constraints
- institutional limitations
- infrastructure deficits

7. INVESTMENT COST ESTIMATE

Achieving compliance with EU directives requires substantial financial investments, particularly in wastewater treatment and water infrastructure.

Investment needs are estimated in the range of several billion euros, reflecting:

- the scale of infrastructure gaps
- the need for modernization and expansion
- compliance with environmental standards

These financial requirements exceed current national capacities, making external funding and international support essential [5].

7.1 Legal, policy and institutional measures

The total estimated costs required for the

implementation of the legal and institutional building measures to achieve compliance with the UWWTD amounts to 19.5 MEUR, out of which 4.3 MEUR for specific support measures to MIE/AKUK, and 15.2 MEUR for legal and institutional capacity building measures to support implementation of the UWWTD. The above refers to the financing of specific measures supporting the process of UWWTD implementation, and do not consider the structural costs for supporting the Water Supply and Sanitation Reform (e.g. structural Project and Program Management support, staff enhancing to MIE/AKUK supporting the Reform process etc.), as these costs have been included in the Institutional Building cost estimates of the DWD DSIP (reference is made to NIPS Report Task 2/Vol. 2).

7.2 Wastewater collection and treatment infrastructure

The total capital investments required to achieve compliance with the UWWTD are estimated at 3,612 MEUR and 4,516 MEUR including engineering costs and contingencies. Due to increase in prices and scope the capital investment is about 77% higher than previous estimates (NIPS project) for compliance with the former UWWTD.

The majority of the investments (54.0%) will be needed for the extension and rehabilitation of the wastewater collection network, while the share of wastewater treatment facilities extension and rehabilitation is 36.3%. These are then followed by investment for the advanced treatment of sludge (5.2%), Energy neutrality (4.0%) and storm water retention (0.3%). The provision of laboratory equipment for monitoring represents a negligible fraction of the overall estimated capital investment (0.1%).

Table 3. Summary of cost estimate capital investments in MEUR

Measure	Capital investment	Extension and/or New	Rehabilitation	Total	Share
		MEUR	MEUR	MEUR	%
WWC-1	Connection rate	1,393.418	556.685	1,950.103	54.0%
WWC-2	Combined sewer outfalls management	11.955	0.000	11.955	0.3%
WWT-1	Treatment capacity and level	1,309.694	3.405	1,313.099	36.3%
WWT-2	Energy neutrality, efficiency and equipment reliability	70.967	73.916	144.883	4.0%
WWT-3	Monitoring-Laboratories	3.820	0.000	3.820	0.1%
WWT-4	Sludge and resources recovery	188.653	0.000	188.653	5.2%
TOT	Total Net Capital Investment Costs	2,978.508	634.006	3,612.513	100.0%
ENG	Engineering (feasibility studies, detailed design, supervision of works)	446.776	95.101	541.877	15.0%
CON	Contingencies	297.851	63.401	361.251	10.0%
GT	Grand Total	3,723.135	792.507	4,515.642	125.0%
	% of total	82.4%	17.6%	100.0%	

The total cost for Legal, Policy and Institutional measures to achieve compliance with the UWWTD amounts to 23.4 MEUR, out of which 5.2 MEUR for specific measures to support MIE/AKUK in its role to programming and implementing the UWWTD (MEUR for capacity building (service contracts for MIE/AKUK, NEA, WSSC and other organizations) and 18.2 MEUR for other legal and institutional capacity building measures needed to implement the UWWTD. Overall, the capital investment and legal, policy and institutional measures are estimated at an amount of about 4,495 MEUR. It should be noted that for implementing the measures for expansion of the wastewater collection and treatment infrastructure necessary to achieve compliance with the UWWTD, not only significant capital investments (CAPEX) are needed but the expansions are associated with a substantial increase in operational expenditures (OPEX) related to maintenance, energy consumption, staffing, chemicals, transport costs and other costs. The technology proposed in this DSIP is based on least cost principles (minimum of investment and operational cost), which will enable a fair and transparent distribution of investments among local beneficiaries in an optimal manner [6]. To avoid excessive costs, staged investments were proposed as far as possible. An assessment of OPEX is included as part of the affordability analysis in the NIPS Report for Result 4 – Investment Program. However, such exercise was based on the measures identified for compliance with the old UWWTD. The time frame for implementation of the capital investment measures is proposed to be 29 years starting in the year 2027 (assuming that no measures can be

reasonably implemented in 2026) and ending in the year 2055. The implementation period has been divided into 6 periods, 1 for each priority level [7].

The time frame for implementation of the legal, policy and institutional building measures is 9 years starting in the year 2027 and ending in the year 2035. The priority measures to be implemented in the short-term (2027-2030) amount to 10.6 MEUR, and the medium-term measures (2031-2035) amount to 12.8 MEUR. The following has been considered for prioritization of legal, policy and institutional measures:

- Priority legal and policy measures (2027 – 2030): Higher priority should be given to complete the transposition of the UWWTD, INSPIRE, IED; to harmonize the existing legal framework, avoiding duplications and implementing constraints; the institutional set up and the system of competences has to be clearly defined in the sector legal framework. Besides, the implementing secondary legislation should be adopted following.
- Priority institutional measures (2027 – 2030): Priorities for institutional measures were defined based on their contribution to achieve compliance with the UWWTD and were grouped in two priority areas: Short-term measures include most of the institutional reform and capacity building measures, which are prerequisites for implementing capital investment measures.

Overall, the estimated costs for implementing the measures proposed to achieve compliance with the requirements of the UWWTD amount to 4,539 MEUR out of which 410 MEUR to be implemented in the period 2027-2030 (103 MEUR/year).

Table 4. Summary of phased implementation plan in MEUR

Type of Investment	Unit	2027-2030	2031-2035	2036-2040	2041-2045	2046-2050	2051-2055	Total
Wastewater Collection	MEUR	104.674	300.671	344.047	297.563	247.194	655.954	1,950.103
Combined Sewer Overflow Management	MEUR	0.000	0.000	0.000	10.911	1.045	0.000	11.955
Wastewater Treatment	MEUR	200.396	230.337	225.920	165.741	354.220	136.484	1,313.099
Energy Neutrality	MEUR	11.961	24.622	0.299	37.113	9.045	61.844	144.883
Monitoring infrastructure	MEUR	1.475	1.340	1.005	0.000	0.000	0.000	3.820
Sludge advanced Treatment	MEUR	1.203	22.676	78.395	24.476	59.263	2.640	188.653
Total Net Capital Investment Costs	MEUR	319.708	579.646	649.666	535.805	670.766	856.922	3,612.513
Engineering and Contingencies	MEUR	79.927	144.912	162.416	133.951	167.692	214.231	903.128
Total Capital Investment	MEUR	399.635	724.558	812.082	669.756	838.458	1,071.153	4,515.642
Legal, Policy and Institutional Measures	MEUR	10.600	12.800	0	0	0	0	23.400
Grand Total Capital Investment and Legal, Policy and Institutional Measures	MEUR	410.235	737.358	812.082	669.756	838.458	1,071.153	4,539.042
Average yearly Investment Amounts	MEUR/year	102.6	147.5	162.4	134.0	167.7	214.2	156.5

Ongoing and pipeline projects

The table below shows the budget for ongoing projects with a breakdown into National (State Budget) and International (donor) funded projects (51% of the total budget). For wastewater collection

and treatment, the ongoing capital investment projects amount to 145 MEUR. Of the amount of 61 MEUR financed by the state budget, 22 % has already been implemented and the remaining amount which will be implemented until 2025 is 48 MEUR (78%).

Table 5. Summary of ongoing projects

Type of Investment Project	National Budget		International		Total	
	EUR	%	EUR	%	EUR	%
Water Supply	421,102,373	87%	149,149,800	29%	570,252,173	57%
Wastewater	61,094,389	13%	83,857,235	16%	144,951,624	15%
Mixed WS&WW	1,504,088	0%	278,687,778	54%	280,191,867	28%
Total	483,700,850	100%	511,694,813	100%	995,395,663	100%
%		49 %		51 %		

Source: AKUK

8. CHALLENGES

Table 6. Key Challenges, Impacts and Recommended Solutions in Albania's Water Sector:

Problem	Impact	Recommended Solution
High groundwater extraction and declining levels	Reduced long-term water availability; risk to drinking water supply	Implement sustainable abstraction limits and strengthen groundwater monitoring systems
Low wastewater treatment coverage (~15%)	Pollution of rivers, lakes, and coastal waters	Increase investments in wastewater treatment plants and expand sewerage networks
High non-revenue water (NRW) (~65%)	Increased residence time, water losses, reduced efficiency	Network rehabilitation, leakage control, and DMA (District Metered Areas) implementation
Agricultural and urban pollution	Deterioration of surface water quality	Introduce stricter pollution control measures and monitoring programs
Institutional fragmentation	Inefficient water management and overlapping responsibilities	Improve coordination between institutions and clarify roles
Limited financial resources	Delayed implementation of EU directives	Increase access to EU funds and develop long-term financing strategies

Problem	Impact	Recommended Solution
Climate variability and seasonal imbalance	Water shortages during dry periods	Develop integrated water resource management and storage solutions

9. CONCLUSIONS

The analysis of water resources data in Albania reveals a complex interaction between natural availability and anthropogenic pressures. Despite the country's relatively high per capita water availability, the effective usability of these resources is constrained by spatial variability, seasonal fluctuations, and insufficient infrastructure. Monitoring data indicate that a significant proportion of surface water bodies fail to achieve good ecological status, particularly in basins affected by urban discharge and agricultural runoff. This suggests that water abundance alone does not guarantee water security, especially in the absence of adequate treatment and management systems.

Groundwater trends further reinforce this concern. The observed decline in groundwater levels across several regions reflects both over-extraction and inadequate recharge management. Given that groundwater supplies a large share of drinking water in Albania, this trend poses a long-term risk to water sustainability and resilience. Moreover, the deterioration of groundwater quality due to infiltration from polluted surface sources highlights the interconnected nature of water systems, emphasizing the need for integrated management approaches.

From an infrastructure perspective, the limited coverage of wastewater treatment remains one of the most critical challenges. The low percentage of treated wastewater directly contributes to the degradation of surface and coastal water quality. This creates a feedback loop in which polluted water bodies further compromise groundwater quality and increase treatment requirements for drinking water supply. The gap between water supply coverage and wastewater treatment capacity illustrates a structural imbalance that must be addressed through targeted investments.

In terms of alignment with EU directives, Albania has made notable progress in transposing legal requirements and developing strategic planning instruments such as River Basin Management Plans and Directive-Specific Implementation Plans. However, the implementation gap remains significant. Financial constraints, institutional fragmentation, and limited technical capacity hinder the full realization of these policies. The estimated

investment needs, reaching several billion euros, underline the scale of the challenge and the necessity for long-term financial planning and international support.

Overall, the findings suggest that achieving compliance with EU water directives in Albania will require not only regulatory alignment but also substantial improvements in infrastructure, monitoring systems, and institutional coordination. A shift toward integrated, data-driven water management is essential to ensure both environmental protection and sustainable service delivery.

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