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Executive summary

This deliverable provides a comprehensive synthesis of the regulatory, technical and institutional landscape for the reuse of treated wastewater, greywater and rainwater across the seven SHARE.MedWATER partner countries: Albania, Cyprus, France, Greece, Italy, Malta and Spain. It situates national practices within the evolving European legal framework, notably Regulation (EU) 2020/741 and its Delegated Regulation, and combines a comparative legal review with on-the-ground evidence from local pilot areas. The report's aim is to map existing rules and practices, identify the principal barriers and enablers to safe and scalable reuse, and propose actionable recommendations that can be tested and refined through the project's pilot activities.

The analysis begins by framing reuse as a strategic response to mounting water stress in the Mediterranean region. Climate change, seasonal droughts and competing demands from agriculture, tourism and urban growth are increasing the frequency and severity of water shortages, making non-conventional water resources an essential component of resilient water management. Against this backdrop, the EU regulatory framework provides a common baseline for quality, monitoring and risk management, but national transposition and implementation remain uneven. Some partner countries have well-developed technical standards and risk-based approaches, while others allow small-scale collection or reuse without binding quality parameters or monitoring regimes. This heterogeneity creates uncertainty for system designers, operators and regulators and raises transaction costs that slow adoption.

The report organises its findings by water type to reflect the distinct technical, governance and social challenges associated with each resource. For treated wastewater, the main obstacles are regulatory fragmentation, complex permitting procedures involving multiple authorities, financing constraints for tertiary treatment and distribution, and insufficient storage and distribution infrastructure to manage seasonal surpluses. For greywater, the gaps are the absence of harmonised technical standards and monitoring protocols, unclear maintenance and liability arrangements, and social acceptance barriers that stem from perceived health risks and low visibility of successful installations. For rainwater, the issues are inconsistent legal status across jurisdictions, limited guidance on first-flush and storage hygiene for uses with potential human exposure, and weak integration of rainwater harvesting into urban planning and building regulations.

Across these categories, the report highlights recurring institutional weaknesses: fragmented responsibilities between national, regional and municipal authorities; limited monitoring capacity and data sharing; and a lack of standardised permit templates and risk-management documentation. These weaknesses not only impede safe deployment but also limit the ability of policymakers to evaluate performance, compare solutions and scale successful models. The report therefore emphasises the need for proportionate, risk-based approaches that protect public health and the environment while avoiding unnecessary administrative burdens that deter small-scale and decentralised solutions.

SHARE.MedWATER's pilot portfolio is presented as the practical mechanism to bridge analysis and action. Pilots at household, community and district scales will generate empirical evidence on system performance, monitoring needs and operational costs; they will test monitoring protocols and low-cost treatment and storage solutions in real contexts; and they will trial governance and financing arrangements such as community water-sharing models and cost-sharing tariffs. By pairing technical demonstration with targeted stakeholder engagement and capacity building, pilots will also address social acceptance and clarify maintenance and liability arrangements. The comparative legal synthesis produced in WP1 will feed directly into pilot design, ensuring that demonstrations are tailored to local regulatory realities while producing outputs that are transferable across partner countries.

The report translates these insights into a set of practical recommendations for policy and practice. Finally, the deliverable situates these technical and regulatory actions within a broader policy context. Mainstreaming non-conventional water reuse contributes directly to the European Union's circular economy and climate adaptation objectives by reducing pressure on freshwater bodies, lowering the energy footprint of long-distance water supply, and increasing local system redundancy.

The report argues that harmonisation is not an end but a means to achieve resilient, resource-efficient and socially acceptable water systems. SHARE.MedWATER's comparative work and pilots are therefore conceived as catalysts for institutional learning: by converting pilot evidence into standardised technical specifications, monitoring templates and governance experiments, the project aims to reduce regulatory uncertainty, mobilise investment and accelerate the safe scaling of reuse across diverse Mediterranean contexts.

In sum, this deliverable provides both the diagnostic foundation and the practical roadmap for the next phases of SHARE.MedWATER. It identifies where legal and operational gaps persist, explains how targeted pilot actions can generate the evidence and governance models needed

to close those gaps, and outlines the policy levers that will enable partner countries to translate innovation into routine practice that supports water security, circularity and climate resilience.

Introduction

Growing water scarcity across the Mediterranean is intensifying pressure on conventional supplies and forcing policymakers to treat water as a finite, strategic resource. In many regions seasonal droughts, rising demand from tourism and agriculture, and climate-driven variability make reuse of treated wastewater, greywater and rainwater not only an efficiency measure but a resilience imperative.

A clear, coherent legal framework is essential to translate the principles of the **circular economy** into safe, scalable water-reuse practice. Legislation provides the legal certainty operators and investors need, defines treatment classes and monitoring obligations, mandates risk management instruments such as Water Reuse Risk Management Plans (WRRMPs), and sets the institutional responsibilities that underpin public-health and environmental safeguards. Well-designed rules also unlock finance, incentivise investments in polishing and storage infrastructure, and enable proportionate permitting and tariff approaches that reflect end-use risk. Alignment with EU Regulation on Water Reuse ensures a common baseline for quality and monitoring while allowing Member States to add targeted safeguards for sensitive uses.

This report synthesises the regulatory landscape for the reuse of wastewater, greywater and rainwater across seven partner countries in the Mediterranean and adjacent Western Balkans region. Its primary objective is to map existing legal frameworks, evaluate alignment with the European Union's minimum requirements for water reuse, and identify institutional, technical and social barriers and enablers for scaling reuse practices. The analysis combines a review of national statutes, ministerial decisions and recent transposition measures with an assessment of local pilot implementations and documented incentives or constraints in the project pilot areas. Methodologically, the report applies a comparative legal review and a risk-based policy lens: it examines statutory provisions governing treatment standards, monitoring obligations, permitting procedures and risk management plans; it evaluates the degree of conformity with Regulation (EU) 2020/741 and its Delegated Regulation; and it synthesises findings through SWOT analyses for each water type and country.

The structure follows a progression from EU-level legal context and technical requirements to country-level descriptions, local variations in pilot areas, cross-cutting challenges, and targeted recommendations for policy and practice. The intent is to provide actionable guidance for policymakers, water utilities, regulators and stakeholders engaged in the Share.MedWATER project and similar regional initiatives, so that regulation becomes an enabling tool for resilient, circular water management rather than an obstacle to innovation and safe deployment.

Current water scarcity challenges and progress in water reuse implementation in Europe

Water scarcity represents one of the most significant environmental challenges facing contemporary Europe, with direct implications for water security, ecosystem resilience, and the sustainability of economic activities. Over the past two decades, the European Union has experienced an increase in the frequency and intensity of drought events, often associated with heatwaves, reduced precipitation, and changes in the seasonal patterns of surface and groundwater resources (IPCC, 2022). The European Environment Agency (EEA) monitors these dynamics through specific indicators, including the **Water Exploitation Index plus (WEI+)**, which measures the ratio between water abstraction and renewable availability. The WEI+ indicator, calculated at river basin or subunit level on a quarterly basis, expresses water consumption as a proportion of renewable freshwater availability. This approach allows for the identification of localized water stress conditions that may not be evident from annual or national-level indicators. Values above 20% denote water stress, while values exceeding 40% suggest severe and potentially unsustainable water use (EEA, 2025).

The graph in Figure 2, published by the European Environment Agency (EEA) on its portal dedicated to freshwater use in Europe, clearly shows that large portions of European territory experience significant levels of water stress.

According to analyses published by the EEA, water scarcity affected approximately 28% of the European Union's territory during at least one season in 2023. Although total water abstraction across the EU declined by about 14% between 2000 and 2023, this reduction has not translated into a consistent decrease in the spatial extent of water scarcity, aside from normal interannual variability. Considering projections indicating that climate change will further exacerbate the frequency, intensity, and impacts of drought events, a substantial reduction in water scarcity by 2030 appears unlikely (EEA, 2025).

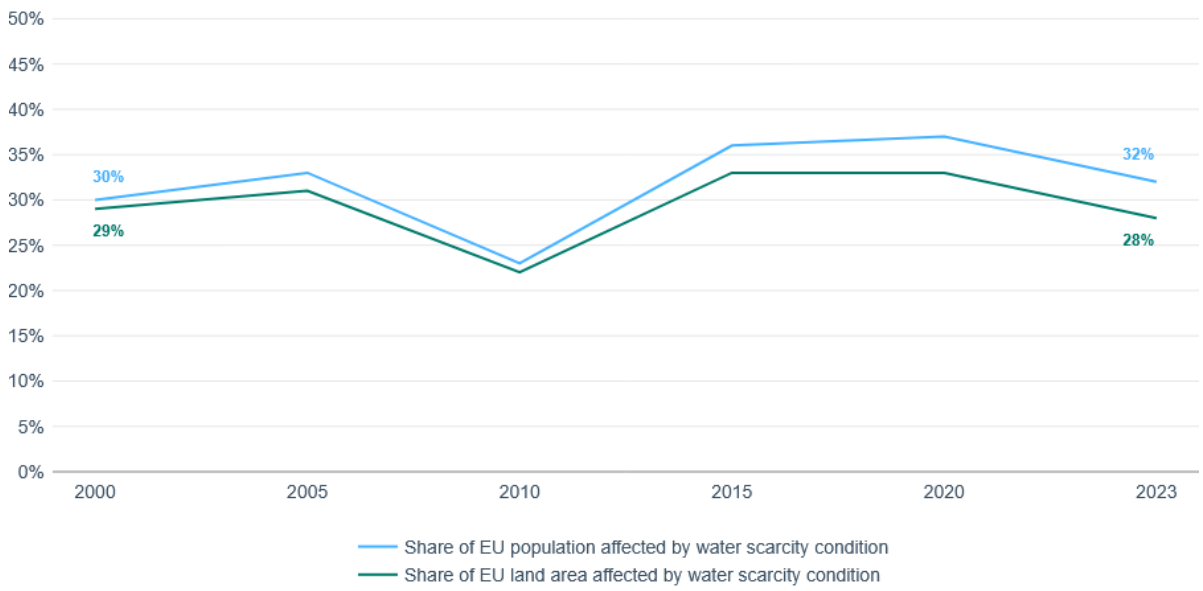


Figure 1 – Area and population affected during at least one quarter of the year by water scarcity conditions in the EU, measured by the water exploitation index plus

Freshwater resources are a critical component for human well-being, ecosystem integrity, and the functioning of economic and social systems. Nevertheless, across the EU these resources are increasingly exposed to multiple and interacting pressures. In response, the EU Water Framework Directive requires Member States to ensure sustainable use and long-term protection of available water resources, as highlighted in EEA assessments.

As shown in Figure 2, at the seasonal scale Cyprus and Malta exhibited the most severe water scarcity conditions among EU Member States, with seasonal Water Exploitation Index Plus (WEI+) values exceeding 40%. Other countries, including Greece, Romania, Portugal, Italy, and Spain, experienced pronounced water scarcity particularly during spring and summer months. Malta is characterized by persistent, year-round water scarcity, partly as consequence of its inherent hydro-climatic constraints. Among EEA member countries, Türkiye faces the most critical overall conditions (EEA, 2025).

Water scarcity generally intensifies between April and September across most European countries. This seasonal pattern reflects the combined effects of reduced precipitation, lower river flows, and increased water abstraction associated with irrigated agriculture, tourism, recreational activities, and other socio-economic demands during warmer months (EEA, 2025).

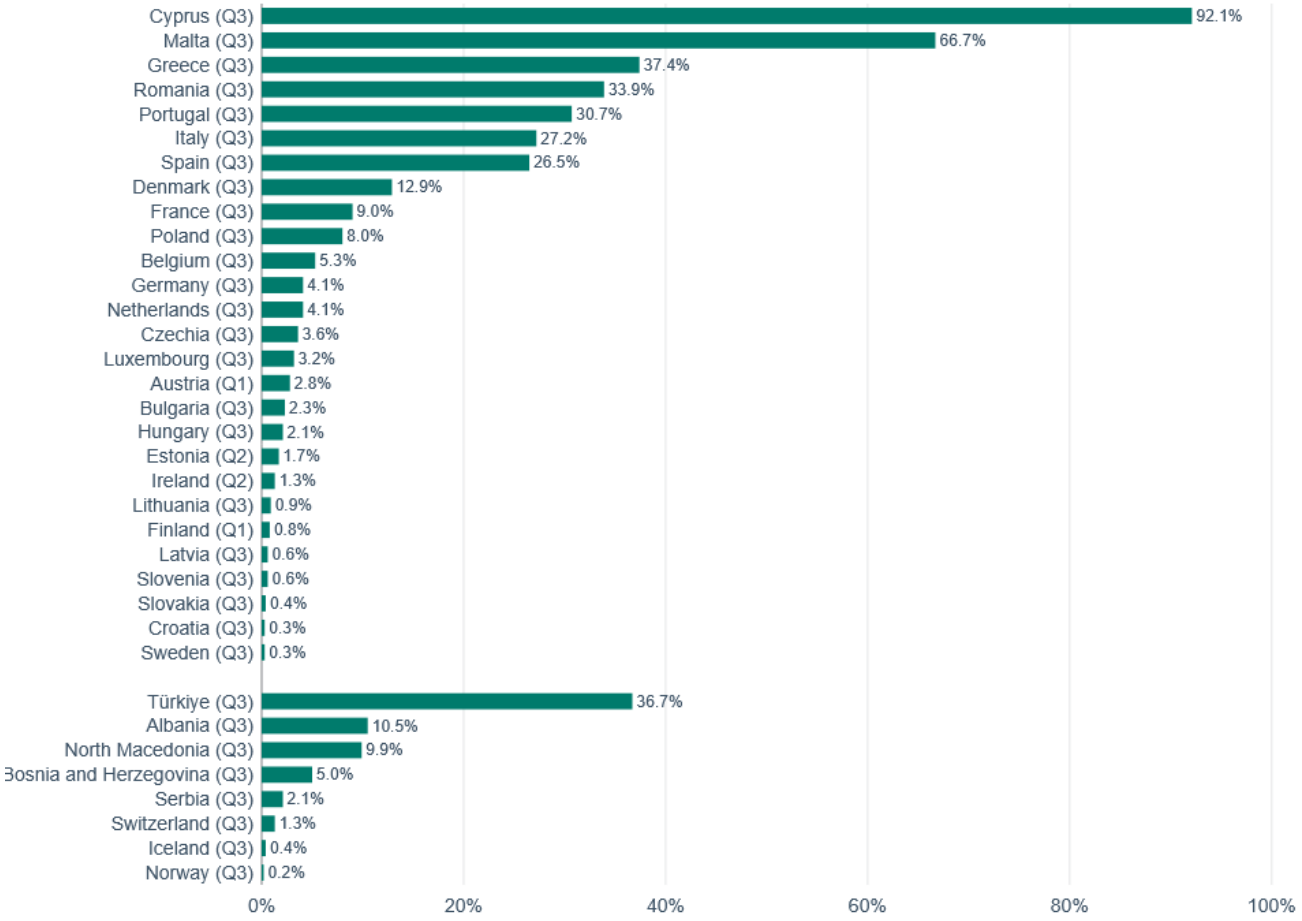


Figure 2 – Worst seasonal water scarcity conditions for European countries in 2023, measured by the water exploitation index plus (WEI+)

In 2023, several river sub-basins across Europe were affected by seasonal water scarcity. Countries such as Belgium, Bulgaria, Cyprus, Denmark, France, Germany, Greece, Italy, Malta, the Netherlands, Portugal, Romania, and Spain recorded seasonal WEI+ values above 20%, indicating significant pressure on local water resources.

EEA data further show that, on average, around 30% of EU territory and approximately 33% of the population are exposed each year to water scarcity in at least one quarter. In 2023, water scarcity affected 28% of the EU land area and 32% of its population. The comparatively lower spatial extent observed in that year relative to the 2000–2023 average is largely attributed to increased precipitation levels (EEA, 2025).

Water scarcity remains a persistent and increasingly critical phenomenon across Europe, with particularly severe impacts observed in southern regions. Approximately **30 % of the population in southern Europe lives in areas subject to permanent water stress**, while up to **70 % is**

exposed to seasonal water scarcity during summer months. In these regions, agriculture, public water supply, and tourism exert substantial and often competing pressures on limited freshwater resources. However, water scarcity is not confined to southern Europe alone; it affects multiple river basins throughout the European Union, frequently linked to high urban population density and intensive water abstraction for public supply, energy production, and industrial activities (EEA, 2021). Over the past decade, drought events have increased both in frequency and severity, further constraining seasonal water availability and exacerbating existing pressures on water systems.

According to assessments by the **European Environment Agency** (EEA), climate change is expected to intensify seasonal variability in freshwater availability across Europe. The projected increase in drought occurrence, combined with a deteriorating trend in water scarcity observed since 2010, suggests that achieving a substantial reduction in water stress by 2030 is unlikely without significant changes in water management practices. These developments highlight the growing limitations of relying solely on conventional freshwater resources to meet rising and increasingly variable water demands across the Union.

In this context, the reuse of treated wastewater has gained recognition as a strategic and complementary water resource. Despite increasing water scarcity pressures, wastewater reuse remains **comparatively underexploited at the EU level**. Aggregated data indicate that only about **2.4 % of treated urban wastewater is currently reused**, corresponding to approximately **1 billion m³ per year** (EC 2022a, Pistocchi et al., 2024). European Commission and Joint Research Centre analyses indicate that the technical and economic potential for reuse could be **up to six times higher** than current levels, particularly for agricultural irrigation, industrial applications, and environmental uses (EC, 2022; Alcalde-Sanz& Gawlik, 2017; Pistocchi et al., 2024). This gap between actual reuse and estimated potential underscores the substantial untapped capacity for wastewater reuse across the European Union.

Significant differences in reuse practices can be observed among Member States, reflecting variations in water scarcity conditions, regulatory frameworks, and levels of infrastructural investment. **Mediterranean countries**, where water stress is most acute, generally exhibit higher reuse rates (Pistocchi et al., 2024; Plan Bleu, 2023). **Cyprus** represents one of the most advanced cases in Europe, reusing **more than 90 % of its treated wastewater**, largely because of chronic freshwater scarcity and long-standing national reuse policies (Pistocchi et al., 2024; 35].

Other Southern Member States display more moderate but still significant levels of reuse. In **Spain and Greece** reuse rates typically range between **5 % and 12 % of treated wastewater**, with substantial regional variability related to agricultural demand, governance structures, and infrastructure availability (Pistocchi et al., 2024; Plan Bleu, 2023). In **Malta** reuse is close to 10%, it is however projected that with the conclusion of the New Water project this will rise to around

30%. While these countries have accumulated considerable experience in wastewater reuse, broader deployment is often constrained by administrative complexity, economic costs, and social acceptance issues (Alcalde-Sanz& Gawlik, 2017; Pistocchi et al., 2023). **Italy and France**, by contrast, have historically shown limited adoption of wastewater reuse, with national reuse levels **below 5%**, although recent policy initiatives aim to expand reuse in response to increasingly frequent drought events (Plan Bleu, 2023). **Portugal** also exhibits non-negligible reuse rates, broadly comparable to those observed in Spain and Italy, particularly in water-stressed regions (Pistocchi et al., 2024)

These disparities among Member States reflect broader structural, climatic, and institutional drivers. Countries facing recurrent droughts and persistent water scarcity—particularly in Mediterranean environments—tend to invest more decisively in reuse infrastructure and supportive policy frameworks, whereas others continue to treat wastewater reuse as a complementary or emerging option (Pistocchi et al., 2023; Plan Bleu, 2023). In this regard, the adoption of **Regulation (EU) 2020/741** represents a major milestone in EU water policy. The regulation establishes harmonised minimum quality requirements, monitoring obligations, and risk management procedures for the safe reuse of treated urban wastewater, particularly for agricultural irrigation, thereby providing a common regulatory foundation across Member States (EC, 2020; EC 2022a).

In response to the growing scale and persistence of water scarcity, wastewater reuse has therefore emerged as a central component of EU water policy, aimed at enhancing water security, reducing pressure on freshwater bodies, and supporting sustainable water use in regions most affected by water stress. Regulation (EU) 2020/741 forms part of a broader strategic shift toward **integrated and circular water management**, complemented by EU policies on climate adaptation and integrated water resources management, which encourage Member States to incorporate reuse into long-term planning frameworks (EC, 2020; Alcalde-Sanz& Gawlik, 2017).

In conclusion, water scarcity in Europe is a complex and multidimensional challenge shaped by climatic trends, socioeconomic pressures, and governance choices. EEA assessments provide a clear representation of current pressures on water resources and of the pronounced differences among countries and regions (EEA, 2021). Within this framework, wastewater reuse—supported by an evolving European regulatory environment—represents one of the most promising tools for addressing future water challenges (Pistocchi et al., 2023; Pistocchi et al., 2024). However, for reuse to be truly effective, it must be integrated into a broader systemic strategy that also includes water efficiency measures, technological innovation, territorial planning, and more coordinated water governance across institutional levels (EEA, 2021; Alcalde-Sanz& Gawlik, 2017). Only through such an integrated approach will it be possible to reduce Europe's vulnerability to water scarcity and build a more resilient and sustainable water future.

Legal Framework for water reuse in the EU

Regulation (EU) 2020/741 on minimum requirements for water reuse

Regulation (EU) 2020/741, effective since 26 June 2023, constitutes a fundamental step in the European Union's transition toward a more sustainable and circular management of water resources. Adopted in response to increasing water scarcity, climate variability, and the need to reduce pressure on freshwater bodies, the regulation establishes harmonized minimum requirements for the safe reuse of treated urban wastewater, primarily for agricultural irrigation. By providing a unified legal framework applicable across all Member States, the regulation aims to ensure a high level of protection for human health and the environment while promoting confidence in water reuse practices and supporting the development of resilient agricultural systems.

The regulation applies specifically to the reuse of treated urban wastewater for agricultural irrigation, recognizing agriculture as the sector with the highest potential for large-scale uptake. However, Member States may extend its principles to other uses—such as industrial applications, landscape irrigation, or groundwater recharge—if they choose to do so. The regulation covers the entire chain of reclaimed water production, from the output of the urban wastewater treatment plant to the point of delivery to end users, and assigns clear responsibilities to operators, competent authorities, and farmers.

Quality standards and monitoring requirements for reclaimed water

A central component of Regulation (EU) 2020/741 is the definition of **minimum water-quality requirements** for reclaimed water used in agriculture. These requirements ensure that reclaimed water is microbiologically safe and suitable for its intended use. The regulation defines **four quality classes (A, B, C, D)**, each associated with specific **agricultural applications** (Table 1).

Reclaimed water shall follow the requirements set out in Table 2 where the measurements for that reclaimed water meet all the following criteria:

- the values indicated for E. coli, Legionella spp. and intestinal nematodes are met in 90 % or more of the samples;

- none of the values of the samples exceed the maximum deviation limit of 1 log unit from the indicated value for E;
- coli and Legionella spp. and 100 % of the indicated value for intestinal nematodes;
- the indicated values for BOD5, TSS, and turbidity in Class A are met in 90 % or more of the samples; none of the values of the samples exceed the maximum deviation limit of 100 % of the indicated value.

Table 1 – Classes of reclaimed water quality and permitted agricultural use and irrigation method (Annex I, Table 1)

Class	Crop category*	Irrigation method
A	All food crops consumed raw where the edible part is in direct contact with reclaimed water and root crops consumed raw	All irrigation methods
B	Food crops consumed raw where the edible part is produced above ground and is not in direct contact with reclaimed water, processed food crops and non-food crops including crops used to feed milk- or meat-producing animals	All irrigation methods
C	Food crops consumed raw where the edible part is produced above ground and is not in direct contact with reclaimed water, processed food crops and non-food crops including crops used to feed milk- or meat-producing animals	Drip irrigation (**) or other irrigation method that avoids direct contact with the edible part of the crop
D	Industrial, energy and seeded crops	All irrigation methods***

(*) If the same type of irrigated crop falls under multiple categories of Table 1, the requirements of the most stringent category shall apply.
(**) Drip irrigation (also called trickle irrigation) is a micro-irrigation system capable of delivering water drops or tiny streams to the plants and involves dripping water onto the soil or directly under its surface at very low rates (2–20 litres/hour) from a system of small-diameter plastic pipes fitted with outlets called emitters or drippers.
(***) In the case of irrigation methods which imitate rain, special attention should be paid to the protection of the health of workers or bystanders. For this purpose, appropriate preventive measures shall be applied.

Table 2 – Reclaimed water quality requirements for agricultural irrigation (Annex I, Table 2)

Class	E. coli (cfu/100 ml)	BOD5 (mg/l)	TSS (mg/l)	Turbidity (NTU)	Other
A	≤ 10	≤ 10	≤ 10	≤ 5 (95% of samples);	Legionella spp.: < 1,000 CFU/L if there is a risk of airborne transmission Intestinal nematodes (helminth eggs): ≤ 1 egg/L for the irrigation of pastures or fodder crops
B	≤ 100	In accordance with Directive 91/271/EEC (Annex I, Table 1)	In accordance with Directive 91/271/EEC (Annex I, Table 1)	-	
C	≤ 1000			-	
D	≤ 10,000			-	

Reclamation facility operators shall perform routine monitoring to verify that the reclaimed water

follows the minimum water quality requirements. **Minimum frequencies for routine monitoring activities of reclaimed water used for agricultural irrigation** are shown in Table 3. The routine monitoring shall be included in the verification procedures of the water reuse system. The samples to be used to verify compliance with the microbiological parameters at the point of compliance shall be taken in accordance with standard EN ISO 19458 or with any other national or international standards that ensure equivalent quality.

Table 3 – Minimum frequencies for routine monitoring activities of reclaimed water used for agricultural irrigation (Annex I, Table 3)

Class	E. coli	BOD5	TSS	Turbidity	Legionella spp	Intestinal nematodes
A	Once a week	Once a week	Once a week	Continuous	Twice a month	Twice a month, or as determined by the operator of the reclamation plant based on the number of eggs present in the wastewater entering the reclamation facility.
B	Once a week	In accordance with Directive 91/271/EEC (Annex I, Section D)	In accordance with Directive 91/271/EEC (Annex I, Section D)	-		
C	Twice a month			-		
D	Twice a month			-		

Table 4 of Annex 1 to Directive (EU) 2020/741 sets out **the control parameters to be used for testing and commissioning purposes.** These parameters define the criteria and reference values that must be verified during the commissioning phase in order to ensure that the system complies with the technical and regulatory requirements established by the Directive. **Validation monitoring shall be performed in all cases where equipment is upgraded, and when new equipment or processes are added**

Risk management plan and Delegated Regulation (EU) 2024/1261

Regulation (EU) 2020/741 introduces a comprehensive risk-management framework to ensure that reclaimed water remains safe throughout its production, distribution, and use. Each reuse scheme must be supported by a Water Reuse Risk Management Plan (WRRMP). The WRRMP must:

- identify hazards and hazardous events;
- assess risks to human health and the environment;

- define preventive and corrective measures;
- establish operational limits and monitoring procedures;
- consider local conditions (crop type, irrigation method, hydrology, exposure pathways).

Competent authorities are responsible for approving WRRMPs, conducting inspections, and enforcing compliance.

Commission Delegated Regulation (EU) 2024/1261 supplements Regulation (EU) 2020/741 (the Water Reuse Regulation) by providing **detailed technical specifications for the key elements of risk management** that Member States must apply when developing water reuse risk management plans. It was adopted on 11 March 2024 and published in the Official Journal of the European Union, laying down comprehensive requirements to support systematic, robust, and scientifically sound risk assessments and mitigation strategies in reclaimed water reuse schemes for agricultural irrigation.

The Regulation elaborates on the provisions already established in Annex II of Regulation (EU) 2020/741 by specifying how risk management plans should be structured and documented to ensure that reuse practices are safe for human and animal health and for the environment. It requires a **comprehensive description of the water reuse system**, encompassing all stages from wastewater treatment to final reuse, and including storage, distribution infrastructure, and points of delivery in the supply chain. It further mandates detailed documentation of system characteristics and operational conditions relevant to risk assessment.

In relation to storage and distribution, the Delegated Regulation defines the types of information that are to be included in risk management plans, such as characteristics of storage facilities, management strategies to control physical, chemical and biological water quality, and the modes of irrigation application (e.g. sprinkler, micro-irrigation), with emphasis on exposure pathways for workers and bystanders. It also requires the identification of all **potential hazards and hazardous events**, including pathogens, chemical pollutants and other substances that could pose risks through ingestion, contact or inhalation, as well as environmental exposure routes such as infiltration to groundwater or runoff to surface waters.

The Regulation specifies that risk assessments must consider both human and environmental receptors, encompassing local context conditions (e.g. hydrogeology, climatic factors) and exposure mechanisms. It allows for the use of qualitative, semi-quantitative, or quantitative methods — including those aligned with recognized standards such as ISO 20426:2018 or WHO risk management guidelines — depending on data availability and risk magnitude.

Moreover, the Regulation provides technical requirements for **preventive measures and**

barriers, environmental monitoring systems, incident and emergency management protocols, and coordination mechanisms among actors involved in the water reuse system. These include procedures for routine monitoring of reclaimed water and environmental receptors, documented action to maintain protection under extreme conditions, and protocols for timely communication and response to failures or exceedances of identified risk thresholds.

In essence, Delegated Regulation 2024/1261 operationalizes the risk management framework of the Water Reuse Regulation by defining the **technical content, scope and procedures** for systematic risk assessment, preventive action, monitoring and emergency planning, thereby ensuring that reclaimed water reuse is managed in a way that protects health and the environment.

EU legislation related to water reuse

Urban Wastewater Treatment Directive (EU 2024/3019)

The EU Directive 2024/3019 marks a decisive shift in the European approach to urban wastewater management, embedding the concept of wastewater reuse within a broader framework of environmental protection, circular-economy principles, and climate resilience. Unlike the earlier Directive 91/271/EEC, which focused primarily on pollution control and minimum treatment standards, the new directive positions treated wastewater as a strategic resource that should be actively valorized wherever feasible. This evolution aligns with the EU's long-term objectives of reducing pressure on freshwater bodies, enhancing water security in the face of climate change, and promoting the recovery of valuable nutrients such as phosphorus and nitrogen.

Within this context, Article 15 plays a central role by **systematically promoting the reuse of treated urban wastewater from all treatment plants whenever appropriate**, with particular emphasis on regions experiencing water stress and on all suitable end uses. The directive does not treat reuse as an optional or marginal practice; instead, it integrates it into the core logic of wastewater management, requiring Member States to consider reuse as a standard component of planning and infrastructure development. This approach complements Regulation (EU) 2020/741, which sets quality and risk-management requirements for agricultural reuse, but goes further by embedding reuse obligations directly into the operational and strategic responsibilities of wastewater utilities.

Article 15 also introduces a flexible mechanism that links reuse with nutrient-removal requirements. When urban wastewater is treated for agricultural irrigation, Member States may grant derogations from tertiary treatment obligations for the fraction of wastewater destined exclusively for this purpose. Such derogations are permitted only under strict conditions:

- the nutrient content of the reused fraction must not exceed the nutrient demand of the crops concerned;
- no environmental risks may arise, particularly with respect to eutrophication within the same river basin;
- no risks to human health may be present, especially regarding pathogenic organisms;
- the treatment plant must have sufficient capacity to treat or store wastewater to avoid discharges into receiving water bodies that fail to meet tertiary-treatment standards.

These conditions ensure that flexibility does not compromise environmental integrity or public health, while simultaneously encouraging the productive use of nutrients contained in treated effluents.

By embedding reuse into the regulatory architecture and linking it to nutrient management, Directive 2024/3019 reinforces the idea that wastewater is not merely a waste stream to be disposed of but a resource that can contribute to agricultural productivity, reduce pressure on freshwater ecosystems, and support the EU's transition toward a circular and climate-resilient water economy.

Water Framework Directive (2000/60/EC)

The Water Framework Directive (WFD) provides the overarching legal and policy framework for the protection, management and sustainable use of water resources in the European Union. Its main objective is to achieve and maintain **good ecological and chemical status** of all surface waters and groundwater bodies. The Directive introduces an integrated approach to water management based on **river basin districts**, emphasizing the need to prevent deterioration, reduce pollution, and protect aquatic ecosystems. It also promotes efficient water use, requires the preparation of **River Basin Management Plans** and **Programmes of Measures** on a six-year planning cycle, and applies economic principles such as cost recovery and the "polluter pays" principle.

Although the WFD does not specifically regulate wastewater reuse, it creates the **environmental and strategic context** in which reuse can be developed. Wastewater reuse is consistent with the Directive's objective of sustainable water use, particularly in water-stressed regions, as it can reduce pressure on surface and groundwater resources. Reuse schemes may be included as measures in River Basin Management Plans, provided they contribute to achieving or maintaining good water status. At the same time, the WFD requires that wastewater reuse does not compromise environmental objectives, especially the protection of receiving waters and

groundwater quality.

Groundwater Directive (2006/118/EC)

The Groundwater Directive (GWD – Directive 2006/118/EC) establishes specific provisions for the protection of groundwater against pollution and deterioration and operates as a daughter directive of the Water Framework Directive. Its primary objective is to ensure the achievement and preservation of good chemical status of groundwater bodies throughout the European Union. To this end, the Directive defines groundwater quality standards for certain key pollutants, notably nitrates and pesticides, and requires Member States to establish threshold values for other substances that pose a risk at national or regional level. It also mandates the prevention or limitation of both direct and indirect inputs of pollutants into groundwater and introduces procedures for the assessment of chemical status, including the identification and reversal of significant and sustained upward trends in pollutant concentrations. The overall approach of the Directive is preventive and precautionary, recognizing groundwater as a strategic and vulnerable resource with long renewal times.

The Groundwater Directive is closely connected to water reuse practices, particularly where the reuse of treated wastewater may influence groundwater bodies through infiltration processes, agricultural irrigation, or managed aquifer recharge schemes. In such contexts, water reuse must be implemented in a manner that avoids any deterioration of groundwater chemical status and ensures compliance with applicable quality standards and threshold values. While water reuse can contribute to reducing pressure on groundwater resources by limiting abstractions, it also represents a potential pathway for the introduction of nutrients, salts, trace organic contaminants, or other pollutants into the subsurface. The monitoring and trend assessment requirements established by the Directive provide a regulatory basis for detecting and managing these risks at an early stage. Consequently, the Groundwater Directive functions as a key environmental safeguard within the broader EU framework on water reuse, ensuring that the use of non-conventional water resources is compatible with long-term groundwater protection objectives.

Nitrates Directive (Directive 91/676/EEC)

The **Nitrates Directive (Directive 91/676/EEC)** aims to protect water quality across the European Union by reducing pollution caused by nitrates from agricultural sources and by preventing further nitrate contamination of surface waters and groundwater. The Directive is grounded in the recognition that intensive agricultural practices, particularly the use of mineral fertilizers and

livestock manure, represent a major pressure on aquatic environments and drinking water resources. It requires Member States to identify waters that are polluted or at risk of pollution by nitrates and to designate **Nitrate Vulnerable Zones (NVZs)**. Within these zones, specific **Action Programmes** must be implemented, including limits on nutrient application, periods when fertilization is prohibited, and requirements for proper manure storage and land management. More generally, the Directive promotes the adoption of good agricultural practices to reduce nutrient losses to water bodies.

The Nitrates Directive is directly relevant to water reuse, especially in the context of the reuse of treated wastewater for agricultural irrigation. Reclaimed water often contains residual nutrients, particularly nitrogen, which can be beneficial for crop production but also represents a potential source of nitrate pollution if not properly managed. When reused for irrigation, treated wastewater must therefore be integrated into nutrient management planning to ensure that nitrogen inputs do not exceed crop uptake and do not lead to nitrate leaching into groundwater or runoff to surface waters. Compliance with the Nitrates Directive requires that irrigation with reclaimed water, particularly within Nitrate Vulnerable Zones, does not compromise the achievement of nitrate concentration limits and does not contribute to eutrophication. In this sense, the Directive acts as a regulatory constraint and safeguard, ensuring that water reuse practices are aligned with water quality protection objectives while encouraging a more efficient and controlled use of nutrients within agricultural systems.

Food safety regulations

The European regulatory framework establishes multiple provisions aimed at ensuring that the reuse of treated wastewater or other non-conventional water sources in agriculture does not compromise **food safety**. Key legislation, besides 2020/741 includes:

Regulation (EC) No. 178/2002 – General Food Law

This foundational regulation establishes the general principles of food safety across the EU, including risk analysis, precautionary measures, traceability, and operator responsibility. Its relevance to water reuse lies in the requirement that water used in primary production must not introduce hazards compromising the safety of food placed on the market.

Regulation (EC) No. 852/2004 – Hygiene of Foodstuffs

This regulation sets mandatory **hygienic requirements for food production at all stages**, including primary production. The use of reclaimed or non-conventional water is permissible only if it does not constitute a source of microbiological, chemical, or physical contamination and is integrated into the operator's HACCP-based or prerequisite hygiene systems.

Regulation (EC) No. 853/2004 – Specific Hygiene Rules for Food of Animal Origin

This regulation is relevant when water reuse may affect crops or feed that enter the animal-derived food chain. It implicitly requires that irrigation practices with reclaimed water do not compromise the safety of raw materials for animal production.

Regulation (EC) No. 1881/2006 – Contaminants in Food

This regulation establishes **maximum levels for certain chemical contaminants** in food. Water reuse practices must ensure that irrigation with non-conventional water does not lead to contaminant accumulation in crops beyond permissible limits.

Directive 2002/32/EC – Undesirable Substances in Animal Feed

Indirectly relevant when reclaimed water is used for irrigating feed crops. It aims to prevent contaminants from entering the animal feed chain, thereby protecting food safety in products of animal origin.

Legal Framework for water reuse across the project member states

Legislative framework for water reuse in Albania

Albania is not a member of the European Union but is an EU candidate country and must align its water sector with EU standards as part of the accession process. This requires adopting integrated water resources management, protecting water bodies, and managing water at river basin level in line with the EU Water Framework Directive.

Key priorities include improving drinking water quality, expanding and upgrading wastewater collection and treatment—especially in urban and coastal areas—and reducing pollution of rivers and seas. Albania also needs major investments in infrastructure, better operation and maintenance of water systems, and stronger monitoring and enforcement.

Institutional reforms are equally important, including clearer governance, stronger regulation, financially sustainable utilities, and improved coordination between national and local authorities. Overall, progress in water resources management is essential not only for EU accession but also for public health, environmental protection, and long-term sustainable development.

The Government of Albania (GoA) has approved the National Strategy for the Sector of Water and Sanitation 2023 - 2030 (**DCM No. 448, dated 26.07.2023**). With the new Strategy, GoA aims to build a reliable nationwide system for water supply and sanitation that meets the needs of a developing economy and society and that preserves and protects the environment, health and safety of citizens, in compliance with EU standards and Sustainable Development Goals. Expanding and improving the quality of the water supply and sewerage service is one of the main objectives of the Strategy.

By 2030 the GoA aims to achieve a national safety managed water supply coverage of about 90% (98% in urban areas and 80% in rural areas); **a national safety managed sewerage coverage of about 68%** (of which 98% in urban areas and 80% in rural areas); beyond that, the Strategy aims to address the **issue of wastewater treatment in a country wide approach targeting to achieve 30% of sewerage treatmen**t; 24 hours/day water supply at the country level. In efficiency and financial terms, by 2023, the implementation of the Strategy aims to achieve **reduction of NRW (Non-Revenue Water) at the level of 40%** as compared to 64% in 2023;

associated with 100% metering of production and consumption and revenue collection to achieve 98% of billed consumers. In financial terms, by 2039, implementation of the Strategy aims to achieve full coverage, otherwise 100% of both operation and total costs.

Albania's water supply and sanitation sector is governed by a comprehensive set of policies, strategies, laws, and programs that define institutional roles, guide sector reforms, and set long-term objectives for service quality, efficiency, and sustainability.

- At the strategic level, the **National Strategy for Water Supply and Sewerage 2023–2030**, adopted by the Ministry of Infrastructure and Energy, sets the overarching vision for the sector. It aims to ensure sustainable, high-quality, and affordable water and sanitation services for the entire population, with particular attention to women and vulnerable groups. A key pillar of the strategy is the promotion of **regionalization** to improve efficiency and service standards, fully aligned with national and sectoral policies.
- The **National Crosscutting Strategy for the Decentralization of Local Government 2023–2030**, approved in 2023, complements water sector reforms from a governance perspective. While its broader goal is to strengthen local government, promote democratic values, and align with the EU acquis, it explicitly recognizes weaknesses in the performance of municipally owned water utilities. In response, the strategy supports **regionalization and aggregation reforms** in the WSS sector to improve efficiency, service delivery, and access to capital investment, in line with the "leave no one behind" principle.
- This direction is reinforced by **Decision of the Council of Ministers (DCM) No. 302 of 2022**, which establishes national policies for the **reorganization of water supply and sewerage services**. The decision focuses on increasing efficiency and achieving economies of scale through the **aggregation of 57 local utilities into 15 regional water companies**, clearly supporting the ongoing sector reform agenda.
- From a regulatory standpoint, **Law No. 8102 on the Regulatory Framework of the Water Supply and Wastewater Sector**, originally adopted in 1996 and later amended, defines the role of the Water Regulatory Entity (ERRU/WRE). It establishes tariff-setting authority and aims to balance public interest among local governments, operators, central government, and the private sector. However, despite its importance, this law is not fully aligned with more recent sector policies and decentralization reforms.
- Similarly, **Law No. 139/2015 on Local Self-Government** assigns water supply and sanitation as an **exclusive function of local governments**, granting them administrative, investment, and regulatory responsibilities, including tariff setting. The law, however,

presents inconsistencies with the regulatory framework established under Law No. 8102, creating institutional misalignment within the sector.

- In terms of resource management, the **National Strategy for Integrated Water Resources Management 2018–2027** promotes an integrated and efficient approach to water use, supported by comprehensive monitoring and management systems. It aligns national policies with key EU directives and balances water needs for people, agriculture, the environment, industry, and energy.
- Finally, the **National Strategy for Development and European Integration 2030**, adopted in 2022, places the water sector within Albania's broader EU integration and sustainable development goals. While it envisions a dynamic and inclusive economy by 2030, it acknowledges persistent challenges in the water sector, particularly the need for **capacity building, better inter-sectoral coordination, and improved investment planning** to support social and economic development.

Overall, the framework shows a **strong strategic alignment toward regionalization, efficiency, and EU integration**, while also revealing **legal and institutional inconsistencies** that still need to be addressed to fully harmonize governance, regulation, and service delivery in the water and sanitation sector. Table 4 summarize key legislation governing water supply, sanitation, and water resources management in Albania.

Currently there are two major **technical assistance initiatives** aimed at strengthening Albania's water supply and sanitation sector.

- **Modernization Program (World Bank, 2024):** provides technical assistance to the Government of Albania, AKUK, and selected regional water utilities to improve governance and efficiency in the water sector, through business planning, utility restructuring, and clearer shareholder oversight at the national level.
- **National Coastal Water and Sewerage Plan (2018–2030):** aims to achieve full water supply and wastewater coverage in 10 coastal municipalities, especially in tourist areas, by expanding networks and treatment infrastructure, supported by substantial long-term capital investments.

Overall, both initiatives focus on **institutional strengthening, infrastructure expansion, and long-term planning**, with the shared objective of improving service quality, financial sustainability, and environmental protection in Albania's water and wastewater sector.

Table 4 - Legal framework for water in Albania

Title of Legislation	Type	Year Adopted	Aspects of WSS Sector Governance
Law no 8102 "on the Regulatory Framework of the Water Supply and Wastewater Disposal and Treatment Sector", amended	Legislation that governs rules and regulation of Utilities of WSS Utilities at national level	1996	Licensing of WSS utilities, monitor compliance of the utility with the license conditions; approves service tariffs as proposed by utilities following the opinion of LGUs. Monitoring and reporting on the performance of WSS companies
Law no. 9115, dated 24.7.2003, "On the environmental treatment of polluted waters, as amended with law no. 34/2013	Main scope of work of this law is related to the treatment of polluted urban waters	2003	This law aims to protect the environment and human health from the negative impacts of polluted water, also defining environmental treatment rules and obligations for polluters.
Law no. 9901, dated 14.4.2008, "For traders and commercial companies", as ammended	Framework law for the organization of water and sanitation companies in the country	2008	This is the framework law for the organization and operation of commercial companies, which is also applicable for the organization of water and sanitation companies
Law no. 10431, dated 9.6.2011 "on the protection of environment"	Environmental protection	2011	Provides horizontal principles and obligations applicable to the water and wastewater sector, including prevention and reduction of water pollution, environmental permitting, environmental monitoring, and enforcement measures to protect water resources and public health.
Law no. 10448 "on environmental permit"	Setting the basis for issuing environmental permits	2011	Regulates the permitting of activities with environmental impact and defines authorization, monitoring, and compliance requirements for water and wastewater installations, including wastewater treatment plants and discharge-related activities.
Law 111/2012 "on the management of water resources"	Govern the management of water resources	2012	Ensures protection and rational use of water resources; permission of use of water resources; monitor rational use of water resources

Law no. 139/2015 on Local Self-Government,	Govern the water and sanitation service at local level	2015	Municipalities are responsible for the following on their territory or jurisdiction: 1. Production, treatment, transmission and supply of drinking water; 2. Collection, removal and treatment of polluted water. Pursuant to article 14 of the Law no. 139/2015 on Local Self-Government on "Cooperation between two or more local self-government units".
DCM no. 302, dated 11.5.2022 "on national policies for the reorganization of the water supply and sewerage services"	Reforming and regionalization of water and sanitation sector;	2022	Regionalization of water and sanitation sector; amalgamation of 57 WS municipal utilities into 15 regional shareholding WS utilities with MIE owning 51% of the shares and 49% divided among at least two utilities composing the shareholders of the newly established Regional WS Companies

Wastewater reuse

Uses allowed

At present, Albania **does not have a fully developed, standalone secondary regulatory package that sets "reuse classes" and explicitly lists allowed end-uses** (e.g., irrigation, industrial cooling, urban non-potable uses) with corresponding quality requirements. However, the **legal basis for wastewater reuse exists under the integrated water resources management framework**, which foresees that reuse is subject to administrative permissions and that detailed rules should be defined through bylaws/decisions.

In practice, any civil or industrial reuse initiative is **therefore expected to be handled case-by-case through permitting and compliance with**:

- general water resources management requirements and authorizations.
- Environmental Protection requirements for wastewater treatment and discharges (urban and industrial).

Treatment level requirements

No microbiological and chemical parameters for the reuse of wastewater is in place in Albania. Albania's most explicit and recent parameterization is again found in the 2024 technical regulation (developed under urgent measures for protecting bathing waters). It references the broader legal framework (including wastewater and water resources laws and relevant EU

directives) and provides category-based effluent limits for key pollution indicators. It refers to the discharging of wastewater and not the reuse of the latest.

The 2024 technical regulation includes a set of microbiological indicators (notably intestinal enterococci and E. coli) linked to situations where treated waters discharge into bathing waters (especially through an individual collector). The table below shows the parameters set by the legislation for wastewater treatment.

Table 5 - Effluent quality standards and regulatory limits for wastewater in Albania

Parameter	**DCM No. 177 (2005) Allowed Norms for Liquid Discharges (municipal wastewater)**	**Joint Instruction No. 01 (01.02.2024) Standards for Discharges Into/Near Bathing Waters**
BOD_5 (Biochemical Oxygen Demand)	≤ **25 mg/L** (secondary treatment standard for urban wastewater)	*(Expected to be similar or equal to EU Bathing Water-related WWTP standards — e.g., ~25 mg/L) (Technical Annex not fully published)*
COD (Chemical Oxygen Demand)	≤ **125 mg/L**	*(Likely aligns with wastewater treatment standards used for bathing waters, e.g., ~125 mg/L) (Specific Joint Instruction annex details needed)*
Total Suspended Solids (TSS)	≤ **35 mg/L** for >10,000 PE *population equivalent*	*(Expected to align with best practice standards such as ~35 mg/L for treated discharge) (Specific Joint Instruction annex details required)*
Total Phosphorus (TP)	≤ **2 mg/L** (10,000–100,000 PE) ≤ **1 mg/L** (≥100,000 PE)	*(Likely similar or stricter for bathing water protection — but exact figures are in the Technical Regulation annex)*
Total Nitrogen (TN)	≤ **15 mg/L** (10,000–100,000 PE) ≤ **10 mg/L** (≥100,000 PE)	*(Likely included, but exact numeric values require access to the annex of the 2024 Technical Regulation)*
Other Parameters	The DCM 177 regime includes broader norms for pH and other general indicators for liquid discharge under treatment requirements, but the core ones used in practice are as above.	The 2024 Technical Regulation requires *activated sludge biological treatment*, pre-treatment units, and replacement of septic tanks. Exact numeric discharge limits for additional parameters (nutrients, pathogens) are set in the annexes (not publicly summarized in the available text).

Greywater reuse

In the Albanian legal framework, “greywater” is not commonly defined as a separate regulatory category with its own quality classes and reuse rules. In practice, **greywater** (typically wastewater

from showers/baths, hand basins and laundry, excluding toilet wastewater/blackwater) **is treated as part of used waters / wastewater and therefore falls under the general Albanian wastewater and water-resources management framework.**

Uses allowed

Because Albania has not yet established a dedicated reuse-class framework (like the EU's minimum requirements for reuse), allowed uses for treated greywater are not generally listed in one binding national "greywater reuse" regulation. Instead**, acceptability is determined case-by-case via permits and conditions.**

Treatment level requirements

Because there is no dedicated national greywater reuse standard, parameters are primarily controlled through wastewater treatment/discharge requirements, with additional focus where public health risks are elevated.

Rainwater reuse

Uses allowed

Albania does not yet regulate rainwater harvesting/reuse through a single, dedicated "rainwater reuse" bylaw that lists approved end-uses and quality classes. However, law No. 29/2024 "on water resources", article 134, point 4, outlines: "Everyone enjoys the right to free use of rainwater on their private land, provided that this water is not collected in artificial installations with a collection capacity greater than 20 m^3".

Treatment level requirements

No legal requirements are set in place. In practical terms, minimum treatment depends on intended use.

A. Low-contact non-potable uses:

- first-flush diversion and debris removal,
- storage management,
- basic filtration prior to use.

B. Higher contact:

- finer filtration,
- disinfection (UV/chlorination) to address microbiological risks,
- backflow prevention and clear non-potable labeling to protect public networks.

Permitting procedure

Requirements related to the law on environmental protection and law on permits. The development of Preliminary Environmental Impact Assessment.

Local regulatory variations in the pilot project area – Gjirokastër Municipality

Gjirokastër Municipality exercises its competencies in line with national legislation, notably in relation to:

- provision and oversight of water supply and wastewater services through the local water utility.
- management of urban drainage and rainwater systems, including flood risk mitigation;
- issuance of local permits and approvals for building-level or municipal infrastructure interventions;
- enforcement of local environmental protection measures and cooperation with national inspectorates.

The municipality acts as the primary implementing authority at local level, while remaining subject to national standards, environmental permitting requirements, and sector oversight by central institutions.

Incentives and barriers to reuse

The regulatory and policy framework in Albania allows incentives for wastewater, greywater, and rainwater reuse. It can be mentioned the following:

- National water security and resource efficiency objectives increasingly recognize the need to optimize limited water resources, particularly in areas facing seasonal water stress and climate variability, creating a favorable policy context for reuse initiatives.

- Ongoing alignment with the EU environmental standars (including future alignment with EU water-reuse standards) provides a strategic incentive for piloting reuse solutions at local level.

Despite these incentives, **several regulatory and institutional barriers** continue to constrain wider adoption of reuse. Albania lacks detailed secondary legislation defining reuse categories, quality standards, and standardized monitoring requirements, resulting in a case-by-case permitting approach that can increase administrative complexity and uncertainty for both municipalities and project developers. At local level, limited experience with reuse-specific risk assessment and monitoring further complicates implementation, particularly where public health considerations are involved.

Legislative framework for water reuse in Cyprus

Cyprus has established a comprehensive legal framework for water reuse, primarily through the Water Pollution Control Laws (106(I)/2002 to 2013), the Water Pollution Control (Discharge of Urban Wastewater) Regulations (No. 772/2003), and the Ministerial Decree on Sensitive Areas for Disposal of Urban Wastewater (No. 280/2013). These instruments regulate discharge standards, reuse conditions, and mandate tertiary treatment for urban wastewater, exceeding the minimum secondary treatment required by Directive 91/271/EEC**. The Code of Good Agricultural Practice further guides irrigation using reclaimed water.**

Cyprus fully aligns with EU Regulation (EU) 2020/741 on minimum requirements for water reuse, effective since 26 June 2023. Compliance measures include adoption of risk management plans for agricultural irrigation projects, implementation of water quality classes (A–D) with associated monitoring and transparency obligations. **Monitoring follows EN ISO 19458 standards for microbiological parameters. All urban wastewater treatment plants apply tertiary treatment, ensuring compliance with the highest quality classes for irrigation of food crops and green areas**. The WDD maintains a dedicated portal on the Regulation and its implementation.

Other relevant EU directives integrated into national policy include the Urban Wastewater Treatment Directive (91/271/EEC), Water Framework Directive (2000/60/EC), Groundwater Directive (2006/118/EC), and Nitrate Directive (91/676/EEC), complemented by food safety regulations (EC No 178/2002, 852/2004, 2073/2005).

Wastewater reuse

Uses allowed

- **Agricultural irrigation**: reclaimed water is primarily used for irrigating crops, green areas, and golf courses under the Code of Good Agricultural Practice.
- **Aquifer recharge**: effluent from Paphos and Limassol-Moni WWTPs is used to replenish Ezousa and Akrotiri aquifers during winter.
- **Indirect irrigation via dams**: treated effluent is discharged into dams (e.g., Polemidia, Tersefanou) for later irrigation use.
- **Industrial uses**: limited applications for cooling and process water, subject to permits.
- **Other disposal**: seasonal surplus may be discharged into the sea when storage capacity is exceeded (progressively minimized).

Treatment level requirements

National policy mandates tertiary treatment for all urban wastewater treatment plants. Tertiary treatment includes advanced filtration and disinfection (chlorination/UV), ensuring compliance with EU Regulation 2020/741 for agricultural reuse.

Indicative operational targets reported by WDD for reclaimed water used in agriculture include: **BOD5 ≤ 10 mg/L; TSS ≤ 10 mg/L; Conductivity ≤ 2500 µS/cm; E. coli ≤ 5 CFU/100 mL**. Projects using reclaimed water for agriculture **follow EU 2020/741 classes with required monitoring for E. coli, Legionella spp., helminth eggs, BOD_5, TSS** according to intended use and irrigation method.

Urban Sewerage Boards (USBs - District Development Authority) and Water Development Department (WDD) conduct sampling and analysis per discharge permits.

Frequency follows EU **Regulation 2020/741 and EN ISO 19458 standards**:

- Class A: weekly microbiological checks; monthly chemical parameters.
- Class B–D: reduced frequency based on risk assessment.

Continuous monitoring of effluent quality (pH, conductivity, flow, COD, nitrates) via SAIS system for real-time compliance.

Permitting procedure

Permits for reuse schemes are issued/overseen by WDD. Applicants demonstrate compliance with treatment and quality requirements, risk management plans (per 2020/741 and Delegated Regulation 2024/1765 technical specifications), and adherence to the Code of Good Agricultural Practice. Local water users' associations coordinate distribution and application protocols.

Greywater reuse

Greywater refers to wastewater generated from domestic activities such as showers, bathtubs, bathroom sinks, and laundry, excluding blackwater (toilet waste). It **typically constitutes 50–80% of household wastewater** and contains soaps, detergents, skin particles, and organic matter. Cyprus promotes greywater reuse mainly through technical guidance documents and pilot scale initiatives, rather than binding legislation. The Non-Conventional Water Resources (NCWR) Programme in Cyprus has installed greywater reuse systems primarily in public buildings such as schools, environmental education centers, and sports facilities. These actions are part of a

voluntary, project-based approach to support sustainable water use. These projects demonstrate practical greywater reuse solutions but do not constitute mandatory national regulation.

Uses allowed

- Domestic applications: toilet flushing, garden irrigation, and landscape watering.
- Public buildings: schools, sports centers, and environmental education facilities.
- Non-potable uses only: greywater is not permitted for drinking or cooking purposes.

Treatment level requirements

Greywater reuse is promoted as a cost-effective solution to water scarcity in Cyprus. Adoption remains **limited to pilot projects and voluntary systems, with no mandatory national standards**. Public awareness and technical training programs aim to increase uptake.

Greywater treatment systems in Cyprus generally include:

- **Pre-treatment**: screening (2 mm spacing) to remove hair, soap, and particulates; oil traps for kitchen sources.
- **Biological treatment**: biological aerated filters (BAF), rotating biological contactors (RBC), or sequencing batch reactors (SBR).
- **Filtration**: to achieve low turbidity and remove residual solids.
- **Disinfection**: chlorination or UV treatment as the final step to ensure microbial safety.

There are **no national** binding parameter tables for greywater reuse; however, systems aim for:

- E. coli: absence or minimal presence for non-potable uses.
- Turbidity: low levels post-filtration.
- Chemical safety: avoidance of harmful detergents and chemicals to protect soil and plants. International WHO guidelines recommend risk-based monitoring for pathogens and chemical contaminants.

As far as concern monitoring no formal national schedule exists: monitoring is risk-based and project-specific. Domestic systems provide for visual checks and periodic maintenance by users. Institutional systems: inspections under municipal programs and other initiatives.

Permitting procedure

Greywater reuse is **not regulated under a dedicated national law**; implementation occurs through:

- Local authority approvals for installations.
- Incentive schemes and educational programs (e.g., Mission Water and NCWR projects).

The Department of Environment oversees compliance with general environmental and water conservation laws.

Public awareness and technical training programs aim to increase uptake. Cyprus uses technical standards such as CYS EN 16941-2:2021, which provides guidance on:

- Design
- Sizing
- Installation
- Identification
- Commissioning
- Maintenance of greywater systems

It serves as a technical reference, not a regulatory requirement.

Rainwater reuse

Rainwater harvesting plays a strategic role in Cyprus' water management policy as a non-conventional water resource. Given Cyprus' semi-arid climate and frequent droughts, rainwater reuse is promoted to complement conventional sources such as desalination, groundwater, and reclaimed wastewater.

Strategic Role in National Water Policy:

- **Supplementary Resource**: rainwater harvesting reduces pressure on potable water supplies and supports irrigation and non-potable uses.
- **Integration with NCWR Programme**: Cyprus implements rainwater harvesting systems in schools, municipal buildings, and sports facilities under the Non-Conventional Water Resources Programme.

- **Climate Adaptation**: helps mitigate water scarcity and aligns with EU Water Framework Directive (2000/60/EC) and sustainability goals.
- **Urban Planning & Green Building**: encouraged in building codes for new developments, particularly for non-potable uses such as irrigation and toilet flushing.
- **Public Awareness**: educational campaigns promote rainwater harvesting as part of water conservation measures.

Rainwater reuse initiatives in Cyprus align with EU sustainability objectives, including the Water Framework Directive (2000/60/EC) and climate adaptation strategies. While there is no dedicated EU regulation for rainwater harvesting, Cyprus incorporates best practices through building codes and environmental programs supported by EU funding.

Cyprus does not have a dedicated national law specifically for rainwater reuse, but rainwater harvesting is addressed under broader water conservation and building regulations. The Water Conservation (Special Measures) Law of 2025 and its amendments aim to reduce water wastage and promote rational water use. While the law does not explicitly mandate rainwater harvesting, it encourages water-saving practices and penalizes wasteful use.

Rainwater harvesting is increasingly integrated into green building practices and energy efficiency standards aligned with EU directives. Local building codes encourage sustainable features such as rainwater collection systems for non-potable uses (irrigation, toilet flushing) in new developments and public buildings. These measures are supported by EU incentives for sustainable construction.

Environmental Protection Law (Law No. 9/2012) and Water Pollution Control Law (106(I)/2002):

These laws provide an overarching framework for water resource management and pollution prevention, indirectly supporting rainwater harvesting as a conservation measure.

NCWR Programme: The Non-Conventional Water Resources Programme promotes rainwater harvesting systems in schools, sports centers, and municipal buildings, combined with educational and awareness campaigns.

Uses allowed

- Non-potable applications: rainwater harvesting is primarily used for irrigation of gardens, landscaping, and flushing toilets in residential and public buildings.
- Public sector initiatives: the NCWR Programme promotes rainwater harvesting systems in schools, sports centres, and environmental education facilities.

- Agricultural use: limited pilot projects integrate rainwater harvesting with solar energy systems for irrigation in low rainfall areas (e.g., Gönyeli case study). Main use for citrus, olive trees, fodder crops, industrial plants (corn), potatoes and flowers (carnations).
- Aquifer Recharge: used to replenish groundwater sources.

Treatment level requirements

Cyprus does not have a dedicated national standard for rainwater reuse treatment, but the recommended minimum treatment levels for non-potable applications (such as irrigation and toilet flushing) follow international best practices and local guidelines under water conservation programs are:

- First-Flush Diversion: removes initial runoff from rooftops to eliminate dust, bird droppings, and debris.
- Filtration: basic sediment filtration to reduce turbidity and suspended solids.
- Storage Standards: covered tanks to prevent contamination and mosquito breeding.
- Disinfection: chlorination or UV treatment recommended for indoor non-potable uses (e.g., toilet flushing).
- Optional Advanced Treatment: for sensitive uses (e.g., irrigation of edible crops), additional steps like activated carbon filtration may be applied.

Note: Rainwater is not used for drinking water in Cyprus due to contamination risks and lack of potable water standards.

Specific regulations for domestic rainwater reuse testing aren't detailed in the snippets, but general best practice involves annual checks for bacteria (coliforms), nitrates, TDS, and pH, especially after new installations, emphasizing Cyprus's water scarcity means strict local guidelines likely exist for safe reuse

Microbiological parameters:

- E. coli: should be absent or below detection limits for non-potable indoor uses (e.g., toilet flushing).
- Total Coliforms: minimal presence; monitored periodically.
- Enterococci: checked in institutional systems for safety.

- Pathogens (e.g., Legionella): risk-based monitoring for systems connected to indoor plumbing.

Chemical Parameters:

- pH: 6.5–8.5 (neutral range for non-potable use).
- Electrical Conductivity: < 2,500 µS/cm (to avoid scaling and corrosion).
- Turbidity: low levels after filtration (typically < 5 NTU).
- Nitrates: < 50 mg/L (WHO guideline for non-potable water).
- Hardness: monitored for system maintenance.

These values are recommended for non-potable uses only. Rainwater is not used for drinking water in Cyprus, so potable standards do not apply. In Cyprus, rainwater reuse, mostly integrated with treated wastewater (reclaimed water) for agriculture/green areas, is highly regulated by the Department of Environment, under laws like Water Pollution Control & Integrated Water Management; permits involve applying to authorities (like Water Authority for supply), adhering to strict water quality standards (EU-aligned) for irrigation, using approved techniques (no leafy greens for untreated), and ensuring proper storage/monitoring, with the Ministry of Agriculture leading licensing/monitoring for treated water reuse.

Cyprus does not have a fixed national schedule for monitoring rainwater reuse systems. Instead, monitoring is risk-based, following international best practices (WHO guidelines) and project-specific requirements:

Domestic Systems:

- Visual inspections of tanks and filters every few weeks.
- Occasional water quality checks for turbidity and microbial indicators when used indoors.

Institutional/Public Systems:

- Periodic inspections under municipal programs (e.g., NCWR projects).
- Microbiological testing (E. coli, coliforms) and chemical checks (pH, conductivity) at least quarterly or after maintenance.

Risk-Based Approach:

- Monitoring frequency depends on intended use (e.g., irrigation vs. toilet flushing), system complexity, and potential exposure risks.

- Higher-risk applications (indoor plumbing) require more frequent checks and disinfection verification.

Permitting procedure

In Cyprus, rainwater reuse isn't a single-permit process but involves integrated water management under the Ministry of Agriculture, Rural Development & Environment, focusing heavily on treated wastewater reuse; for rainwater harvesting and reuse (especially for agriculture/green spaces), you need compliance with Water Pollution Control Laws, potentially Environmental Impact Assessments, and coordination with the Water Development Department (WDD) for large systems or specific guidelines, ensuring quality standards are met, often requiring licenses for activities impacting water/soil via the Department of Environment for installations.

Local regulatory variations in the pilot project area

Cyprus adopts **national laws for water management** therefore there are **no variations to the legislative instruments quoted belove both at the regional and local leve**l.

Incentives and barriers to reuse

Cyprus boosts water reuse through incentives like government funding for treatment plants, providing a reliable water source, reducing fertilizer costs for farmers, and strict regulations preserving freshwater; however, barriers include initial farmer skepticism (overcome by awareness campaigns), high costs (though government covers plant capex), technical challenges in existing schemes, and balancing economic needs with environmental signals, all under severe water stress.

Incentives

- **Water Security**: reclaimed water provides a constant, reliable source, vital for a water-stressed island facing climate change. Government Support: the government funds construction, operation, and maintenance of treatment plants, easing costs for local boards. Large-scale projects such as storage dams (e.g., Tersefanou, 4.5 million m^3), pipelines, and irrigation networks are being developed to maximize reclaimed water use.
- **Agricultural Benefits:** offer farmers savings on fertilizers, increased yields, and maintain traditional farming, plus replenish groundwater. Reclaimed water provides a reliable

irrigation source, reducing dependence on costly desalination and groundwater abstraction.

- **Environmental Protection**: reduces freshwater abstraction, protects groundwater from saltwater intrusion, and minimizes wastewater discharge.
- **Regulatory Framework**: EU directives and national programs promote reuse, pushing for better management and compliance.
- **Subsidy Programs & Awareness Campaigns**: past subsidies (1997–2010) for greywater systems, boreholes, and hot water recirculates saved over 12.4 million m³ of drinking water. Current NCWR Programme promotes greywater and rainwater reuse in schools and public buildings, funded by partnerships

Barriers

- **Public Acceptance Issues**: psychological barriers (the "yuck factor"), health risk perceptions, and distrust in authorities remain significant challenges. Early skepticism among farmers required intensive awareness campaigns and stakeholder engagement.
- **Seasonal Demand & Storage Constraints**: winter surplus of treated water cannot always be stored, leading to discharge into the sea (1.45 million m³ in 2023, down from 4.7 million in 2020).
- **Technical & Quality Issues**: high salinity levels in some treatment plants (e.g., Vathia Gonia, Larnaca) exceed permitted conductivity limits (up to 4,128 µS/cm vs. 2,500 µS/cm), posing risks for crops: difficulties integrating reuse into existing irrigation systems, noted by experts.
- **Bureaucratic & Land Allocation Delays**: infrastructure projects face slow permitting and land acquisition processes, delay implementation timelines.
- **Economic Constraints**: high capital costs for advanced treatment and distribution systems; reliance on EU and national funding for large-scale projects. High operating costs for advanced treatment and pricing issues that might deter farmers.
- **Demand vs. Supply**: in some areas, ample groundwater has historically reduced the immediate pressure to fully switch to reuse for all sectors, like energy storage.
- **Climate Change**: Increasing demand from population growth and urbanization exacerbates water stress, making solutions complex.

Key figures:

- Reuse Rate: >90% of treated wastewater reused in 2023 (≈28.2 million m³), mainly for agriculture—the highest in the EU.
- Projected Growth: Reclaimed water production expected to reach 65 million m³ by 2026

Legislative framework for water reuse in France

Their recovery of wastewater, greywater and rainwater is part of the water transition carried out by the Water Plan (2023), which aims at sobriety, reducing withdrawals and increasing reuse.

The legal framework is mainly based on the Environmental Code and the Public Health Code. It requires the protection of health and the environment, the prevention of pollution and the strict separation of drinking water and non-drinking water networks. Any use of non-potable water accessible to the public requires prefectural authorization issued after consultation with the Regional Health Agency, based on a health risk management plan specifying treatment barrier, monitoring and corrective measures.

Traditionally, before 2024, France had a relatively fragmented framework for water reuse, with rainwater harvesting regulated by an older decree of 21 August 2008 and treated wastewater governed by the March 2022 decree (Decree n° 2022-336 du 10 mars 2022) which, among other things, set up general conditions for authorizing new uses of treated wastewater. That decree was subsequently superseded and integrated into newer law as part of a broader national Water Plan to increase reuse in response to drought and water scarcity.

In recent years, French law has undergone a substantial transformation in the way it regulates the reuse of non-conventional water, a category that includes rainwater, greywater, treated urban wastewater, water derived from food processes, and other water not intended for drinking. The term non-conventional water is not a single legal definition in the statute books, but French rules now group several types of water that are non-potable or unfit for human consumption and regulate their collection, treatment and reuse for specific purposes, recognizing both environmental sustainability and public health protection.

Since 2023, France has been updating this system to align it with European developments. France's regulations on water reuse must also be read alongside European Union legislation, notably EU Regulation 2020/741 on the reuse of treated urban wastewater for agricultural irrigation, which sets minimum quality requirements for irrigation uses and has influenced national rulemaking in France—particularly in setting criteria and authorization procedures for treated wastewater used in agriculture or green spaces.

Overall, French legislation treats non-conventional water reuse as a risk-based, multilevel system involving domestic law (Public Health Code), environmental law (Environmental Code), food safety law, and EU law. Its emphasis is on enabling reuse while safeguarding public health, environmental protection and technical separation from potable water supplies.

The foundation of the current domestic reuse regime for non-conventional water in France is Decree **n° 2024-796 of 12 July 2024**. **This decree introduced a unified regulatory framework**

for the use of eaux impropres à la consommation humaine (EICH)—literally waters unfit for human consumption—for domestic purposes. **EICH include rainwater collected from specific surfaces, greywater from showers, baths and washing machines, fresh groundwater and pool water, provided they are segregated and treated where necessary**. The decree spells out which **uses are permitted when these non-potable waters are used in buildings and structures**, aiming to prevent contamination of drinking water supplies and to manage health risks by imposing technical and sanitary requirements. It also specifies how systems for reuse must be designed, monitored and maintained to ensure separation from potable water networks.

Complementing Decree 2024-796 is a ministerial arrêté of the same date (12 July 2024) which sets **sanitary quality criteria and technical conditions for the implementation** of EICH reuse systems, detailing monitoring, signage and safeguards against cross-contamination. This new regime replaced older rainwater regulations and represented a substantial modernization of domestic reuse law.

Beyond domestic reuse, France's regulatory framework includes comprehensive measures for **rainwater and treated wastewater for non-domestic uses**. **The Decree n° 2023-835 of 29 August 2023** codified in the Environmental Code the conditions under which rainwater and treated wastewater can be used for non-domestic purposes **such as irrigation of green spaces, agricultural uses, industrial applications or urban uses (e.g., street cleaning), often with simplified or no prior authorization for rainwater and a defined authorization process for treated wastewater**. It also continues and remodels the regime that replaced the earlier 2022 decree, making procedural adjustments such as lowering thresholds for small treatment plants and allowing reuse across departmental borders.

In addition to water reuse in buildings and industrial contexts, French law also addresses **reuse within the food industry. The Decree n° 2024-33 of 24 January 2024** created a legal framework for the use of reused water in food businesses, setting rules for how recycled water can be used in preparation, processing and preservation of goods intended for human consumption. This **framework was later clarified and expanded by Decree n° 2024-769 of 8 July 2024**, which authorizes certain recycled water types—including recycled process water and water from raw materials—as ingredients under strict quality controls, accompanied by a corresponding arrêté that details the conditions and monitoring requirements to protect sanitary safety in the agri-food sector. These texts amend the Public Health Code to allow safe reuse in food industry settings under authorized conditions.

To carry out a reuse project in France, it is necessary to comply with the decree and the applicable arrêtés for the specific use, design a treatment chain that achieves the required performance, prepare and keep up to date a risk-management plan, and implement a monitoring and maintenance program.

Table 6 – Key French Regulatory texts on non-conventional water reuse

Decree / Act	Purpose	Scope of reuse
Décret n° 2024-796 (12 Jul 2024)	Defines domestic uses of *eaux impropres à la consommation humaine* and associated technical/sanitary requirements	Domestic reuse of rainwater, greywater, groundwater, pool water under controlled conditions; system design and monitoring rules.
Arrêté (12 Jul 2024)	Sets detailed sanitary quality criteria for EICH reuse	Complements Décret 2024-796 with quality and control standards.
Décret n° 2023-835 (29 Aug 2023)	Regulates rainwater and treated wastewater for non-domestic uses	Non-domestic irrigation, agricultural, industrial and urban uses with simplified authorisation for rainwater.
Décret n° 2025-239 (14 Mar 2025)	Extends and updates reuse provisions for ICPE and INB	Clarifies reuse of non-potable waters in industrial/protected installations and aligns with Environmental Code
Décret n° 2024-33 (24 Jan 2024)	National framework for reused water in food companies	Reuse within food industry under Public Health Code rules.
Décret n° 2024-769 (8 Jul 2024)	Expands food industry reuse	Authorises recycled water as ingredient under quality conditions.

The prefects, Regional Health Agency (ARS), Departmental Directorate of Territories (and the Sea)-DDT(M) and water agencies are respectively responsible for authorization, health monitoring, water policing and financial support, while local authorities and public operators are responsible for project management and operation. In island and Mediterranean territories, this dynamic makes non-conventional waters a strategic complementary resource for local resilience.

Wastewater reuse

The reuse of treated wastewater (REUT) is now one of the main areas of development of French non-conventional water management policy. It aims to recover purified effluents from urban or industrial wastewater treatment plants in order to reduce pressure on natural resources. **For a long time limited to agricultural irrigation**, the REUT **has been gradually extended since 2023 towards urban, industrial and environmental uses**, in line with the compliance of French law with Regulation (EU) 2020/741.

The French system distinguishes between several categories of use according to the purpose of the reuse and the associated health risks. These categories have been specified in the texts published between 2023 and 2024. The current applicable decree is Decree No. 2023-835 of 29

August 2023.

Uses allowed

- **Agricultural uses**: the irrigation of food, fodder or seed crops is authorized subject to compliance with the quality and monitoring criteria defined by national decrees. The choice of water category (A, B, C, or D) depends on the type of crop (whether or not it is in direct contact with the food) and the method of irrigation (sprinkling, drip, pressurized).
- **Urban and landscape use:** the ministerial order of 14 December 2023 opened the reuse of public green spaces, sports fields and roads to watering. These uses are subject to strict conditions: night-time watering schedules, absence of aerosols, minimum distance of 20 meters from areas accessible to the public and "non-drinking water" signage. Category A or B water is generally required depending on the degree of potential exposure to the public.
- **Industrial uses:** the decree of 8 July 2024 and the ministerial order of 24 January 2024 authorizes reuse in industrial processes, in particular in the agri-food industries for washing, cooling or certain technical uses. These applications require water of high sanitary quality, with a specific risk management plan and regular microbiological monitoring. Use in the manufacture of foodstuff or direct contact with it remains prohibited. For non-agri-food industries (refineries, cement plants, cooling towers, thermal power plants) experiments are possible with prefectural authorization.
- **Environmental and experimental uses:** certain projects for groundwater recharge, wetland irrigation or river feeding during low water periods may be authorized on an experimental basis. These operations require an environmental impact assessment and enhanced monitoring, under the joint supervision of the Regional Directorate for the Environment, Planning and Housing (DREAL) and the ARS.

Treatment level requirements

Treatment levels depend on the type of use and the level of risk.

The French decrees now explicitly refer to the four quality classes defined by Regulation (EU) 2020/741:

- Category A: water of the highest quality, intended for the irrigation of crops in direct contact with foodstuffs and for urban watering accessible to the public. It requires secondary biological treatment, clarification, filtration or ultrafiltration, followed by disinfection (UV, chlorination or equivalent).

- Category B: used for crops consumed after cooking, fodder crops or watering green spaces not accessible to the public. It requires at least complete biological treatment and disinfection to ensure the absence of significant fecal pathogens.
- Category C: reserved for the irrigation of industrial crops, energy crops or non-accessible areas. **Secondary treatment and simple disinfection** are sufficient, with light control.
- Category D: for uses with a very low risk of exposure, such as certain forest plantations or the rewetting of non-accessible soils. It requires at least **secondary processing** in accordance with Directive 91/271/EEC and compliance with the microbiological thresholds defined in Regulation (EU) 2020/741.

The microbiological and chemical parameters applicable to treated wastewater are defined by Regulation (EU) 2020/741 and included in recent French regulations. They make it possible to adapt the level of treatment to the intended uses and the degree of exposure to the public. Quality categories A, B, C and D thus correspond to increasing levels of requirements, category A being the strictest for uses involving direct exposure to the public.

Table 7 – Quality categories A, B, C and D and corresponding levels of requirements

Parameters	Category A	Category B	Category C	Category D
TSS (mg/L)	<10	Directive 91/271/EEC	Directive 91/271/EEC	Directive 91/271/EEC
BOD5 (mg/L)	<10	Directive 91/271/EEC	Directive 91/271/EEC	Directive 91/271/EEC
Escherichia coli (CFU/100 mL)	≤ 10	≤ 100	≤ 1,000	≤ 10,000
Coliphages	≤ 10	≤ 100	≤ 1,000	≤ 10,000
Clostridium perfringens	≤ 10	≤ 100	≤ 1,000	≤ 10,000
Turbidity (NTU)	≤5	-	-	-
Legionella spp.	Legionella spp.: less than 1,000 CFU/L for aerosol-generating systems			
Helminth Eggs	Helminth eggs: less than 1 egg per litre.			

Regarding chemical quality, French regulations require compliance with **the discharge standards defined by the Decree of 21 July 2015 on wastewater treatment plants, supplemented by Directive 2008/105/EC on priority substances. Heavy metals (Cu, Zn, Pb, Zn, Cd, Cr, Ni, Hg), pharmaceutical residues and organic micropollutants must be monitored if reuse is likely to result in transfer to soil or the food chain.**

For industrial uses, the decree of 8 July 2024 also sets reinforced thresholds for conductivity, chlorides and volatile organic compounds to prevent corrosion and contamination of products.

The controls of these parameters are carried out according to a monitoring programme adapted to the category of water and the intended use. For category A, monitoring is weekly for microbiological parameters and monthly for chemical parameters, while for categories C and D, a monthly or quarterly frequency is sufficient. All analyses must be carried out by a COFRAC-accredited laboratory, and the results must be kept for five years to guarantee traceability.

Table 8 Monitoring frequency and requirements

Parameters	Category A	Category B	Category C	Category C
TSS	1 time / week	Directive 91/271/EEC	Directive 91/271/EEC	Directive 91/271/EEC
BOD5	1 time / week	Directive 91/271/EEC	Directive 91/271/EEC	Directive 91/271/EEC
Escherichia coli	1 time / week	1 time / week	1 time / 15 days	1 time / 15 days
Coliphages	1 time / week	1 time / week	1 time / 15 days	1 time / 15 days
Clostridium perfringens	1 time / week	1 time / week	1 time / 15 days	1 time / 15 days
Turbidity	Continuous measurement	Not required on an ongoing basis	Not required on an ongoing basis	Not required on an ongoing basis
Legionella spp.	1 time / 15 days	1 time / 15 days	1 time / 15 days	1 time / 15 days
Helminth Eggs	2 times/month or as determined based on input load	2 times/month or as determined based on input load	2 times/month or as determined based on input load	2 times/month or as determined based on input load
Visual inspections	Regular			
Compliance	Immediate suspension in case of overtaking			
Analysis	COFRAC accredited laboratories			
Archiving	5 years			

Permitting procedure

Any operation for the reuse of treated wastewater in France is subject to prefectural authorisation under Articles L.211-2 and R.211-28 and R.211-23 of the Environmental Code. The procedure has been modernised by Decree No. 2023-835 of 29 August 2023 and the Order of 18 December 2023, which specify the content of the file, the consultation of the authorities and the conditions for issuance. The application file includes:

- The technical description of the generating station and the treatment process;

- The justification of the need and compatibility with the SDAGE[1] and the SAGE[2] of the basin concerned. The SDAGE sets strategic objectives at basin scale, while the SAGE implements them at a local level through operational rules and actions;
- The health and environmental risk management plan;
- The monitoring and maintenance program;
- Mapping of uses and location of distribution points;
- The agreement of the sewerage network operator.

The prefect consults the ARS for health advice and may ask the DREAL or the DDTM to assess the environmental impacts. When the application is complete and deemed to be compliant, an authorisation is issued for a maximum period of five years, renewable after evaluation. The operator must submit a follow-up report to the ARS each year. In the event of a health incident, repeated exceeding of the thresholds or a major change in the process, the prefect may suspend or withdraw the authorisation.

For pilot projects or European demonstrators, an experimental authorisation scheme is planned: it allows implementation for two years, renewable once, under enhanced surveillance.
This framework promotes innovation and technical capitalization while guaranteeing the health and environmental safety of reuse operations.

Greywater reuse

The reuse of greywater is an emerging field of French non-conventional water management policy. Greywater is defined as low-laden **domestic effluent from showers, washbasins, bathtubs, washing machines or non-kitchen sinks, as opposed to black water from toilets**. They represent about 50 to 70% of the total volume of domestic wastewater and have significant potential for recovery for uses that do not require drinking water quality, such **as flushing, watering or cleaning**.

The Public Health Code remains the legal basis of reference: Article L.1321-1 prohibits the use of water that does not comply with the quality of drinking water for any domestic use involving contact with the user, unless specifically authorized. This provision has long limited the development of greywater reuse systems to experimental projects.

[1] Schéma Directeur d'Aménagement et de Gestion des Eaux - Master Plan for Water Development and Management
[2] Schéma d'Aménagement et de Gestion des Eaux - Water Development and Management Plan

The first national technical basis is the experimental standard XP P16-603 published by AFNOR in 2011**.** This standard provides a framework for the design, implementation and maintenance of greywater recycling facilities in buildings. In particular, it defines:

- Eligible water sources (washbasins, showers, washing machines);
- Authorized uses (flushing, watering, cleaning the floors);
- The levels of treatment required (decantation, filtration, disinfection);
- Safety requirements (separate networks, signaling, no direct contact).

Today, French regulation, notably Decree No. 2024-796 and its implementing ministerial order, treats greywater reuse as part of a broader policy to valorize "unconventional" water sources—rainwater, treated wastewater and household greywater—to reduce pressure on drinking-water supplies and increase drought resilience.

Uses allowed

The permitted uses depend on the level of risk of contact with the user. The main uses that are currently accepted or tested are:

- **Flushing the toilets;**
- **Floor cleaning and exterior washing;**
- **Watering green spaces close to the public;**
- **In some cases, the cooling of technical equipment**.

Treatment level requirements

The decree of 12 July 2024 establishes France's regulatory framework for the use of non-potable water (EIC) in buildings and technical systems, introducing two quality classes (A and A+) plus safety, monitoring, and permitted-use requirements to protect public health. Operators of EIC systems must ensure compliance through appropriate monitoring and documentation; Article 5 specifies which water-use combinations require defined quality standards, with Table 9 detailing the A+ and A classifications for domestic and technical applications.

Table 9 Class of quality defined in the Art. 5 of the decree of 12 July 2024

Parameters	**Quality A+**	**Quality A**
	Public irrigation, cleaning public areas, uses with aerosols	Toilets, irrigation without public exposure, technical uses
	Medium exposure	Low exposure
Escherichia coli	0 CFU / 100 mL	≤ 10 CFU / 100 mL
Intestinal enterococci	0 CFU / 100 mL	/
Legionella pneumophila	≤ 10 CFU/L	≤ 10 CFU/L
Turbidity	≤ 2 NFUs	≤ 5 NFUs
Total Organic Carbon	≤ 5 mg/L	≤ 10 mg/L
Free chlorine residual (In case of chlorination)	Absence of odour	Absence of odour
pH	Between 5.5 and 8.5	Between 5.5 and 8.5

The minimum performance recommended by XP P16-603 is as follows: 1) BOD5 reduction by at least 90%; 2) Turbidity less than 5 NTU; 3) E. coli less than 200 CFU/100 mL; 4) Absence of detectable Legionella in internal networks.

The inspections must be carried out by an approved service provider at the time of commissioning, then once a year, with monthly maintenance of the treatment system and emptying of the tanks according to the frequency defined by the manufacturer.

The monitoring and control frequencies of reuse facilities are set in accordance with the decree of 12 July 2024.

Uses involving direct contact with the occupants remain strictly prohibited. Greywater recycling systems must comply with strict technical conditions:

- Complete physical separation between the drinking water network and the recycled greywater network;
- Visible "non-potable water" signage at all points of use;
- Storage of less than 24 hours to avoid fermentation;
- Continuous disinfection (chlorination, UV or equivalent);
- Automatic diversion device to the sewerage network in the event of a breakdown.

Table 10 Monitoring and control frequencies in the Decree of 12 July 2024

Parameter monitored	If single-family system	If other systems
Escherichia coli	Once at commissioning	Once per year (A+) / Twice per year (A)
Enterococci intestinalis	Once at commissioning	Once per year (A+) / Twice per year (A)
Legionella pneumophila	Not applicable	Once per year
Turbidity	Once at commissioning	As needed for proper system function (manufacturer's specs)
Total organic carbon (TOC)	Once at commissioning	Once per year (A+) / Twice per year (A)
pH	Once at commissioning	Once per year (A+) / Twice per year (A)
Free chlorine residual (if chlorinated)	Once at commissioning	As needed for proper system function

Parameter monitored	Natural waters	Grey water & pool water
Escherichia coli	Twice per year	Six times per year
Enterococci intestinalis	Twice per year	Six times per year
Legionella pneumophila	Once per year	Once per year
Turbidity	Continuous monitoring or at a frequency suited to proper system operation (manufacturer's specifications), and at least twice per year	Continuous monitoring or at a frequency suited to proper system operation (manufacturer's specifications), and at least six times per year
Total organic carbon (TOC)	Twice per year	Six times per year
pH	Continuous or at a frequency suited to proper system operation	Continuous or at a frequency suited to proper system operation
Free chlorine residual (if chlorinated)	Twice per year	Six times per year

Permitting procedure

In 2013, the Department of Housing, Urban Planning and Landscapes (DHUP) published **a circular** authorizing local authorities and developers to carry out pilot operations subject to temporary prefectural authorization. These experiments are placed under the supervision of the Regional Health Agency and must demonstrate the health compliance of the devices.

The French regulatory framework thus distinguishes three situations:

1. **Experimental systems authorized on a temporary basis,**
2. **Systems installed in public or tertiary buildings under agreement with the State,**

3. **Devices installed at the building or district level as part of research projects or eco-districts**.

Rainwater reuse

In France, the reuse of rainwater is regulated within a legal framework that seeks to reconcile water resource conservation with public health protection. Rainwater is legally classified as non-potable water, meaning it may be reused only for specific purposes and under defined conditions. The regulatory framework is mainly embedded in the French Environmental Code and has been substantially updated in recent years to facilitate reuse while maintaining safety standards.

Rainwater reuse in buildings is primarily governed by the Order of 21 August 2008 and the Public Health Code. More recent reforms, including Decree No. 2023-835 of 29 August 2023, have contributed to clarifying the broader framework for non-conventional water reuse. This decree inserted a new regulatory section into the Environmental Code (Articles R.211-123 to R.211-137) and marked a shift from a restrictive authorisation-based system toward a more flexible, risk-based approach. Article R.211-123 explicitly defines rainwater as a non-conventional water resource, while Articles R.211-124 and R.211-125 set out the principle that reuse is permitted provided it does not pose a risk to human health or the environment.

This decree replaced and relaxed several requirements introduced by Decree No. 2022-336 of 10 March 2022, which had previously imposed stricter authorisation procedures for water reuse projects. Although largely superseded, the 2022 decree remains relevant for understanding the evolution of the legal approach.

In parallel, earlier and complementary texts continue to apply, particularly for technical and domestic uses. These include:

- **the Order (Arrêté) of 21 August 2008**, which historically regulated rainwater collection, continues to apply to rainwater collection systems used in buildings. This order defines **the first authorised domestic uses of rainwater** and explicitly prohibits its use for drinking, food preparation, and personal hygiene (Article 2 of the 2008 Order)
- **the Order of 12 July 2024**, which specifies detailed conditions and quality requirements for non-potable water uses in **domestic contexts**, including rainwater;
- technical reference standards such as NF EN 16941-1, which, while not legally binding, are widely used to ensure safe system design and operation.

Together, these texts form a coherent legal framework that defines what rainwater may be used

for, under which conditions, and with what level of administrative oversight.

Uses allowed

French legislation allows rainwater reuse exclusively **for non-potable purposes**, in accordance with Article R.211-125 of the Code de l'environnement, which states that reuse must be limited to uses compatible with the water's quality and the protection of public health.

In domestic and building contexts, **rainwater collected from suitable surfaces—typically roofs—may be reused for a number of everyday functions**. Article 3 of the Order of 21 August 2008 authorizes rainwater use:

- Inside buildings for toilet flushing, floor cleaning and for supplying heating or air conditioning installations in a closed circuit.
- Outdoor uses such as garden irrigation and external surface cleaning (i.e. vehicles or private roads) are also permitted.

These uses are further confirmed and expanded under Article R.211-126, which allows non-potable uses without prior authorization where risks are deemed low.

Outdoor applications are treated with particular flexibility. Irrigation of private gardens, green spaces, and landscaped areas is generally permitted without administrative formalities, provided that local restrictions (for example, drought measures adopted under Article L.211-3 of the Environmental Code) are respected**.**

Certain indoor uses, such as **supplying washing machines or using rainwater in buildings open to the public**, are also permitted, but only under the conditions specified in Articles R.211-127 and R.211-128, which require compliance with defined quality criteria and, in some cases, declaration to the authorities.

This clear boundary ensures that rainwater reuse remains confined to applications where public health can be effectively protected without requiring full drinking-water treatment.

Under the current legal framework established by Decree No. 2023-835 of 29 August 2023, the reuse **of rainwater for technical and industrial non-potable uses** is explicitly allowed when the use presents a low risk to human health and the environment. Article R.211-126 of the *Code de l'environnement* provides that non-potable water, including rainwater, may be reused without prior authorisation **for uses that do not involve direct human contact or ingestion and that are compatible with the quality of the wate**r. Closed technical devices such as:

- closed-loop cooling systems;

- industrial cleaning processes not involving food contact;
- technical washing or rinsing of equipment.

fall squarely within this category, as long as the system is designed to limit exposure and prevent dispersion of aerosols or contact with users.

Uses involving direct contact with the occupants (washing clothes, personal hygiene, food preparation) remain prohibited. **The installations must include an anti-return system preventing any interconnection with the public network, a filtration device, and a watertight storage tank protected from pollution.**

A mandatory display indicates non-potable water points, and a maintenance booklet guarantees regular monitoring of the device. The reuse of rainwater thus represents a simple and controlled complement to the French water sobriety strategy, particularly suitable for public buildings, collective housing and industrial sites.

The new Arrêté of 12 July 2024 provides that rainwater, as water unfit for human consumption (eaux impropres à la consommation humaine), may be used **for non-potable domestic purposes**, provided that the intended uses are compatible with the associated sanitary risks. The authorised uses and the applicable administrative procedures are defined in detail in Annex I to the Arrêté.

In practice, rainwater may be used for functions such as **toilet flushing, indoor floor cleaning, supply of decorative fountains and, in certain cases, laundry washing**, while uses involving ingestion or personal hygiene (drinking, cooking, bathing, washing) remain strictly prohibited.

Treatment level requirements

Minimum treatment requirements vary according to the intended use, as reflected in the implementation provisions adopted pursuant to Article R.211-127. The logic is risk-based: the closer the use is to human contact, the higher the required level of treatment.

In addition, Article R.211-125 requires that rainwater be collected from surfaces that do not present a significant contamination risk, which in practice limits collection to roofs and similar non-accessible surfaces. Storage and distribution systems must also prevent stagnation, backflow, and accidental cross-connections.

Table 11 - Minimum treatment requirements according to the intended use

Intended Use	**Legal reference**	**Minimum limits and treatment**
Outdoor irrigation and cleaning	Art. R.211-126	Basic filtration to remove debris: disinfection generally not required
Indoor non-potable uses (toilets, floors)	Order of 21 Aug 2008, Art. 3	Filtration and appropriate treatment
Laundry use	Art. R.211-127 and Order of 12 July 2024	Compliance with the quality thresholds (Classe A or A +)

The decree of 21 August 2008 does not impose quality requirements, but a minimum level of treatment aimed at eliminating particles, organic matter and pathogens likely to be present in the water collected from roofs. The Order requires that installations include:

- **a storage tank** that is closed, protected from light and external contamination, to limit biological growth (Article 3);
- devices preventing stagnation, backflow and cross-connection with the potable water network (Article 3 and Article4);
- for systems **enabling the distribution of rainwater inside buildings**, Article 3 sets out specific safeguards for rainwater systems used inside buildings. It requires fine filtration (≤ 1 mm) and opaque, temperature-protected storage tanks to limit deposits and biological growth. Indoor distribution pipes must be non-corrodible and clearly labelled non-potable, and systems connected to the sewer network must measure the volume of rainwater used. To prevent misuse, rainwater taps must be lockable, clearly marked, and kept separate from potable water outlets, with any coloring agents required to be food-grade. Installations supplying collective buildings or establishments open to the public must be inspected once a year by a qualified professional. These requirements ensure that the quality of the reused water is compatible with non-potable uses while avoiding any risk of contamination of the public network.

These more detailed quality-based approaches appear only later, notably in the post-2023 **framework and in the Order of 12 July 2024, which introduces explicit quality requirements for certain non-potable uses** (including some domestic applications). **Article 4 of the Order clarifies that rainwater used for domestic purposes must be collected downstream of surfaces inaccessible to people outside maintenance**, such as roofs not normally accessible for other purposes. Terraces or accessible surfaces with buried buffer storage for irrigation may fall outside the scope of this Order.

The Arrêté requires that systems include treatment processes adapted to the intended use, without causing deterioration of water quality or the formation of harmful by-products. Specific measures must be implemented to limit water stagnation, biofilm development and excessive temperature increases, and to protect storage tanks and pipework from insects and small animals. The use of antifreeze products in storage tanks is prohibited, and any coloring agents used to distinguish water networks must be food-grade. In Table 12 are specified the quality parameters set depending on the class of quality of the water.

Table 12 - Class of quality defined in the Art. 5 of the decree of 12 July 2024

Parameters	**Quality A+**	**Quality A**
	Enhanced	Standard
	Public irrigation, cleaning public areas, uses with aerosols	Toilets, irrigation without public exposure, technical uses
	Medium exposure	Low exposure
Escherichia coli	0 CFU / 100 mL	≤ 10 CFU / 100 mL
Intestinal enterococci	0 CFU / 100 mL	/
Legionella pneumophila	≤ 10 CFU/L	≤ 10 CFU/L
Turbidity	≤ 2 NFUs	≤ 5 NFUs
Total Organic Carbon	≤ 5 mg/L	≤ 10 mg/L
Free chlorine residual (In case of chlorination)	Absence of odour	Absence of odour
pH	Between 5.5 and 8.5	Between 5.5 and 8.5

The monitoring and control frequencies for reuse facilities are set in accordance with the decree of 12 July 2024.

Table 13 - Monitoring and control frequencies in the Decree of 12 July 2024

Parameter monitored	**If single-family system**	**If other systems**
Escherichia coli	Once at commissioning	Once per year (A+) / Twice per year (A)
Enterococci intestinalis	Once at commissioning	Once per year (A+) / Twice per year (A)
Legionella pneumophila	Not applicable	Once per year
Turbidity	Once at commissioning	As needed for proper system function (manufacturer's specs)
Total organic carbon (TOC)	Once at commissioning	Once per year (A+) / Twice per year (A)
pH	Once at commissioning	Once per year (A+) / Twice per year (A)
Free chlorine residual (if chlorinated)	Once at commissioning	As needed for proper system function

Parameter monitored	Natural waters	Grey water & pool water
Escherichia coli	Twice per year	Six times per year
Enterococci intestinalis	Twice per year	Six times per year
Legionella pneumophila	Once per year	Once per year
Turbidity	Continuous monitoring or at a frequency suited to proper system operation (manufacturer's specifications), and at least twice per year	Continuous monitoring or at a frequency suited to proper system operation (manufacturer's specifications), and at least six times per year
Total organic carbon (TOC)	Twice per year	Six times per year
pH	Continuous or at a frequency suited to proper system operation	Continuous or at a frequency suited to proper system operation
Free chlorine residual (if chlorinated)	Twice per year	Six times per year

In addition, installations must be designed to allow inspection, maintenance and complete draining, and must include devices for measuring the volumes of non-potable water used. Compared with the 2008 framework, these provisions reflect a shift from purely technical design rules toward a broader health-risk management and monitoring approach over time.

Permitting procedure

In France, the reuse of rainwater is governed by a simplified declaration regime rather than a formal authorization procedure, unlike the reuse of treated wastewater. Under the decree of 21 August 2008, any installation supplying a building must nonetheless comply with specific technical requirements concerning network separation, storage, and the clear identification of points of use:

- Rainwater must circulate within a dedicated non-potable network, in accordance with Article R.211-124 of the Code de l'environnement and Article 4 of the Order of 21 August 2008, so as to avoid any cross-connection with the potable water system. All rainwater outlets must also be clearly labelled "non-potable water" to prevent improper use.
- The installation must be operated in conditions that do not pose a health risk, particularly regarding microbial proliferation or aerosolization - an aspect of particular concern for cooling systems.
- When the installation is located in a facility open to the public or hosting vulnerable populations, Article R.211-129 may require a declaration to the competent authority and compliance with additional protective measures. The Arrêté of 12 July 2024 further

specifies that, depending on the type of use and the context—particularly in situations involving higher human exposure or buildings open to the public—a declaration to the prefect may be required, while other uses remain exempt from administrative procedures. The Arrêté thus introduces a graduated system linking authorised uses to water quality requirements and the corresponding level of administrative oversight.

No prior authorization is required for outdoor domestic uses (such as watering, washing or cleaning), provided the system remains for private use and presents no risk of interconnection with the public drinking water network. However, when rainwater is used inside buildings, particularly for toilet flushing or cleaning, the owner must declare the installation to the town hall before it is put into service. The local authority may request a technical dossier describing the origin of the water, the treatment devices and compliance with departmental health regulations.

Buildings open to the public or multi-unit residential buildings must also notify the Regional Health Agency (ARS), which may carry out on-site inspections to verify the presence of backflow prevention devices and appropriate “non-potable water” signage. For collective or professional uses (schools, hotels, industrial sites), annual maintenance and inspection by a qualified professional are mandatory.

This declaratory regime is designed to promote rainwater harvesting while ensuring a high level of sanitary protection. It provides administrative flexibility suited to the diversity of installations, while relying on the vigilance of operators and local authorities to prevent any risk of contamination of the drinking water network.

In summary, supplying closed technical devices with rainwater is legally permitted in France, generally without prior authorisation, provided the use is non-potable, technically controlled, and compliant with the separation and safety principles set out in Articles R.211-124 to R.211-126 of the Code de l’environnement.

Local regulatory variations in the pilot project area – Lozzi Municipality

The pilot project deals with the reuse of wastewaters of a WWTP located in the municipality of Lozzi, in the heart of Niolu in Haute-Corse, a mountain micro-region characterised by limited water resources in the summer period and a strong dependence on traditional agriculture, in particular PDO chestnut groves and certain PDO vineyard plots.

The applicable regulatory framework is mainly national, but its operational implementation is ensured locally by the prefecture of Haute-Corse, the ARS Corse, the DREAL Corse and the DDTM. Regional variations are therefore due to territorial conditions, local instruction practices and agri-environmental constraints, rather than to different technical rules.

This technical choice makes it possible to ensure the production of high-quality water, immediately compatible with all current or future agricultural uses on the experimental site. In accordance with the ministerial order of 18 December 2023 on agricultural irrigation, category A water authorizes irrigation:

- Market gardening crops eaten raw or unpeeled;
- Crops in direct contact with the food;
- Processed crops, in particular vines for winemaking;
- Shafts and arboreal species, including chestnut groves.

The OEHC[3]'s Share.MedWATER pilot project consists of the establishment of a containerized, compact and autonomous wastewater treatment plant, intended to produce category A reused water for agricultural irrigation. The parameters regulated, their limits and the frequency of the analysis were already reported in the Table 7 and Table 8 in the corresponding paragraph.

Specific to the viticultural and arboricultural context, the monitoring will include:

- Soil controls (heavy metals, salinity): semi-annual;
- Plant monitoring: annual;
- Salinity control/CEC: monthly if regular irrigation.

If the threshold is exceeded:

- Immediate cessation of the distribution of reused water;
- Declaration to the ARS;
- Resumption possible after double compliant analysis.

The pilot project is part of an experimental prefectural authorization regime, as provided for by Decree No. 2023-835. The authorisation file includes:

- Technical description of the containerized plant;
- Justification of the agricultural need;
- Risk Management Plan (RMP) in accordance with Regulation (EU) 2020/741;
- Monitoring and maintenance program;

[3] Office d'Equipement Hydraulique de Corse : Corsican Hydraulic Infrastructure Agency

- Location of the areas to be irrigated;
- Usage agreement with farmers.

Services consulted include:

- Prefect: decision-making authority
- ARS Corsica: health opinion, validation of the PGS[4] ;
- DDTM: water police, agricultural uses;
- DREAL: environmental impacts, regulatory compliance;
- Collectivity of Corsica/OEHC[5]: territorial coherence.

Incentives and barriers to reuse

The reuse of treated wastewater (REUT) in France has been progressing rapidly since the publication of Regulation (EU) 2020/741 and the 2023-2024 national decrees. However, its deployment remains conditioned by a set of favourable factors and persistent obstacles that strongly influence the feasibility, acceptability and speed of implementation of projects. Pilot projects in rural and island areas, such as the one in Lozzi, are particularly concerned because of their territorial specificities.

Incentives

Increasing pressure on water resources

- Climate change is accentuating the decrease in rainfall, the increase in droughts and the reduction in groundwater recharge, particularly in the South of France and Corsica. REUT is a stable alternative resource, regardless of climatic conditions, and makes it possible to secure agricultural uses exposed to water tensions.

Environmental and economic performance

- Several studies show that REUT can reduce discharges into the natural environment while limiting withdrawals from conventional resources. It makes it possible to transform waste into a resource, in circular economic logic. On the economic front, some sectors are

[4] Plan de Gestion Sanitaire - Sanitary Management Plan
[5] Office d'Equipement Hydraulique de Corse : Corsican Hydraulic Infrastructure Agency

already demonstrating encouraging competitiveness, particularly for the agricultural irrigation of high-value crops (PDO, mountain market gardening).

Policy support and a renewed regulatory framework

- The 2023 Water Plan aims to multiply by ten the reuse of treated wastewater in France by 2030 and explicitly encourages the emergence of territorial projects. Decree No. 2023-835 and the sectoral ministerial orders adopted in 2023-2024 have modernised the legal framework, clarified responsibilities and secured authorisation procedures, which is a strong incentive for local authorities and agricultural stakeholders.
- The prefects, ARS, DDT(M) and water agencies are now better structured to support local approaches, particularly in Mediterranean and island territories where the REUT appears to be a strategic resource together.

Barriers

Social acceptability on the reuse

- Feedback shows that participatory approaches, WWTP visits and transparent communication gradually improve the social acceptability of REUT. Despite these advances, several obstacles continue to hinder the large-scale deployment of REUT in France.

Regulatory complexity and administrative burden

- A REUT remains perceived as a complex procedure, requiring:
  - A Sanitary Management Plan (SMP),
  - Enhanced analytical monitoring,
  - A detailed authorisation file,
  - Several administrative consultations,

  This complexity is particularly difficult to manage for small communities, which have little technical or administrative engineering. However, decision-makers identify several areas for improvement: one-stop shops, pooling of analyses, easing of requirements for small rural projects and accelerated procedures for agricultural uses in dry areas. These changes aim to reduce the administrative burden while maintaining a high level of health safety.

Technical limitations and insufficient infrastructure

- Most French wastewater treatment plants do not yet have suitable tertiary treatment equipment (filtration, ultrafiltration, UV), which is essential to meet the health requirements of categories A and B. Many facilities need to be modernised, which represents a significant investment for small municipalities or rural areas. Logistics is also a major obstacle:
    - Buffer storage management,
    - Synchronization between production and irrigation needs,
    - Large distances between WWTP and plots,
    - Need for dedicated networks to avoid interconnections.

Buffer Storage and Synchronization

- The REUT is hampered by the discrepancy between continuous water production and very seasonal agricultural needs, which requires the implementation of a sufficiently large buffer storage. This constraint often requires the adaptation of existing agricultural facilities (basins, networks, pumping) to absorb out-of-season surpluses and ensure supply during the irrigation period. For small municipalities or farms, these technical adjustments and the management of seasonality constitute a major obstacle to the operational deployment of the REUT.

High operational costs

- The costs related to REUT include:
    - Investment in equipment (CAPEX),
    - Energy Charges and Maintenance (OPEX),
    - Weekly microbiological analyses,
    - Monitoring turbidity, chlorine, pH,
    - Management of non-conformities and health reports.

Limited social acceptability

- There is still some reluctance to use water from the REUT for irrigation, especially for crops in direct contact with water. These reservations are mainly due to a lack of

information on advanced treatment processes, the levels of health safety imposed by regulations and the performance of the sectors used.

- The lack of general communication on the technical guarantees offered by REUT also contributes to these hesitations. In this context, projects must include a structured awareness-raising strategy, aimed at clearly informing residents, elected officials and farmers about the regulatory requirements, the controls carried out, and the sanitary quality of the water produced. A transparency and educational approach make it possible to strengthen understanding, promote local support and ensure positive ownership of the project.

Legislative framework for water reuse in Greece

Although in Greece **there is no specific legislation framework on unconventional water resources**, the utilization of these types of water resources is included within the national legal framework for water resources management. The national legal framework applying to water resources management is summarized in Table 14.

Table 14: Greek legislation framework for water resources management

Legislation	Title	Scope
Law 1650/1986	Environmental protection	Among others, the protection of surface and groundwater as natural resources and ecosystems
Law 192/1997	Measures and definitions for urban wastewater treatment.in accordance with 91/271/EEC	Collection, treatment and discharge of urban wastewater and the treatment & discharge of wastewater from certain industrial sectors.
Law 3199/2003	Water protection and management in compliance with Directive 2000/60	Protection of surface water and groundwater
Presidential Decree No.51/2007	Identification of measures, definitions and procedures for Integrated Water Management	Protection and improvement of water quality
Ministerial Decision 38295/2007	Quality of water intended for human consumption in compliance with Directive EC 98/83 (was repealed by Directive EC 2020/2184)	Definition of quality parameters for the monitoring of water intended for human consumption
Common Ministerial Decision 145116/2011	Identification of measures and procedures for the reuse of treated wastewater	Promotion of reuse of treated wastewater and water sources saving
Approved River Basin Management Plans, 2014	River Basin Management Plans (2000/60/EC)	Description of the characteristics of rivers, lakes, coastal waters, ground waters and water-related protected areas.
Common Ministerial Decision 3282/2017 [	Quality of water intended for human consumption into compliance with Commission Directive (EC) 2015/1787	Definition of quality parameters for the monitoring of water intended for human consumption
Common Ministerial Decision No. 3525/2023	Quality of water intended for human consumption into compliance with Directive EC 2020/2184	Definition of quality parameters for the monitoring of water intended for human consumption

Law 1650/1986 is the fundamental Greek law for environmental protection that established measures and action for prevention from pollution and degradation, for soil, water and air protection, as well as the human health. It also includes requirements for the implementation of Environmental Impact Assessment regarding natural resources including water.

The management of water resources is mainly covered by Law 3199/2003 and the Presidential Decree No. 51/2007. Both these pieces of legislation constitute the harmonization of the Greek legislative framework with Directive 2000/60/EC and define the measures and priorities for the management or water resources through the development and implementation of River Basin Management Plans (RBMPs). According to these RBMPs, **Greece is divided in 14 River Basin Districts** in accordance with European (Directive 2000/60/EC) and National legislation (Law 192/1997 and Presidential Decree No.51/2007). **River Basin Management Plans (RBMPs)** provide a comprehensive overview of surface and groundwater characteristics, including water-related protected areas and the authorities responsible for their management. They summarize the status of water bodies, significant anthropogenic pressures, and the environmental and socioeconomic aspects of water use, while outlining stakeholder consultation processes and the planned programs of measures to achieve sustainable water management objectives.

The main objective of **M.D. 145116/2011 is the promotion of treated wastewater use and the conservation of water resources,** which will contribute significantly to addressing the impacts of:

a) the increasing **water scarcity and drought** in the Mediterranean region, as well as the expected worsening of the problem due to **climate change**

b) the severe decline and/or **salinization of groundwater bodies in certain areas of the country**, caused by overexploitation, progressive water shortage, and seawater intrusion in coastal zones.

Also, it includes **the improvement of the water potential balance through the recharge of groundwater aquifers**.

Apart from the legal framework regarding water resources management and monitoring, special attention should also be given to **New General Construction Code (L. 4067/2012),** which describes all procedures related to the authorization and installation of specific infrastructures on individual or buildings or parts of buildings or building complexes, as well as elements of the surrounding environment and individual elements of urban (urban or rural) equipment.

As the general legal framework has been described, the following sections present how it is adapted to each type of non-conventional water resources.

Wastewater reuse

As information on the percentage (%) of reuse of treated urban wastewater is not available, it should me mentioned that only 20 out of a total of 237 wastewater treatment plants (8,44%) reuse treated wastewater for irrigation and infiltration purposes. Specifically, 13 plants (5,49%) have established systems for the discharge of treated wastewater onto agricultural land for irrigation, while 7 plants (2,49%) utilize it for infiltration. Most of the wastewater treated, however, is discharged into freshwater bodies, estuaries, or coastal waters (EEA, 2020).

Figure 3 illustrates the type of wastewater discharge at national level. The evaluation of the statistics indicates that, although the reuse of treated wastewater for irrigation is not yet widely implemented, its existing application in certain areas demonstrates its feasibility and potential for broader deployment. This finding highlights the capacity of wastewater reuse to be effectively extended to other regions particularly those experiencing water scarcity or drought conditions during the summer months (i.e. Thessaly, Aegean islands). Such practices could contribute significantly to improving water resource management, enhancing agricultural resilience, and supporting sustainable adaptation to the increasing impacts of climate change in water-stressed regions.

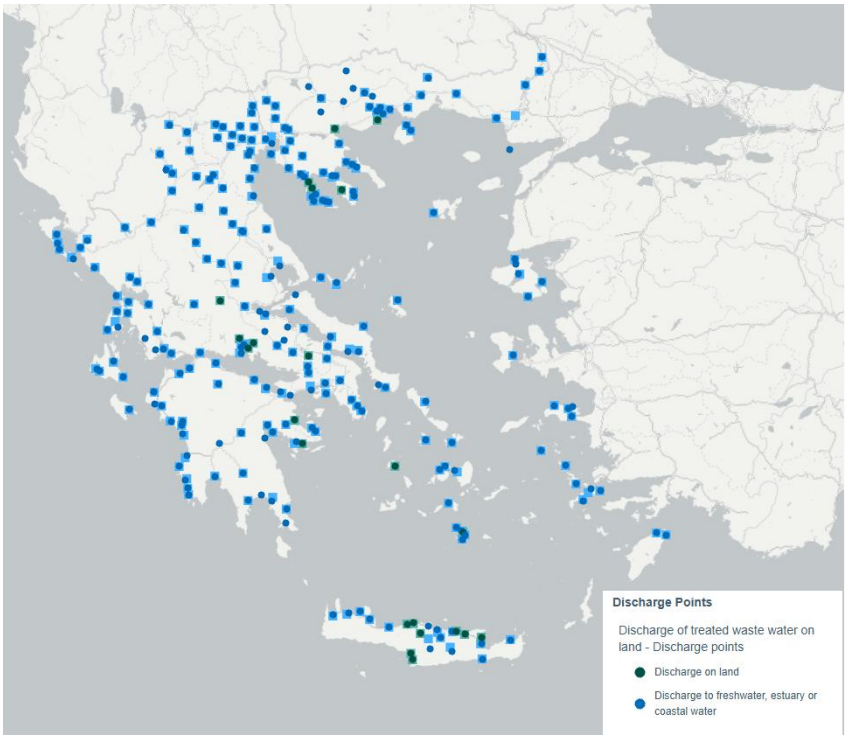


Figure 3: Distribution of wastewater plants and types of discharge in Greece (EEA, 2020)

Uses allowed

Based on M.D. 145116/2011, the reuse of wastewater can be applied to the following cases:

- **irrigation (limited or unlimited)**
- **replenishing of underground aquifers**
- **urban and peri-urban use**
- **industrial use**
- **discharge in water bodies**

Treatment level requirements

The requirements regarding chemical and biological limits, treatment processes, and sampling frequency for each type of use are presented in the tables below.

In the tables, the acronym “PE” stands for population equivalent which means the organic biodegradable load having a five-day biochemical oxygen demand (BOD5) of 60 g of oxygen per day.

Table 15: Limits, treatment requirements and frequency of sampling for limited and unlimited irrigation M.D. 145116/2011

Type of wastewater reuse	**E. coli (EC/100 ml)**	**BOD5 (mg /l O_2)**	**SS (mg/l)**	**N (mg/l)**	**Turbidity (NTU)**	**Type of pretreatment needed before the reuse**	**Minimum frequency of water sampling and laboratory analysis**
Limited irrigation (fodder crops; industrial crops; forest trees)	≤ 200 (mean value)	25	35 -60	15-45	-	Secondary wastewater treatment (biofilters; activated silt; rotating biological contactors)	**Determination of BOD5, SS** For PE <9999: 12 samples/ year For 10000<PE 19999: 12 samples/year For PE>20000: 24 samples/year **Determination of EC:** 365 samples/year **Determination of Residual Cl** (frequently if chlorination system is established)
Unlimited irrigation (fruit trees; vegetables; vineyards and glasshouses)	≤ 5 (for 85% of samples) ≤ 50 (for 95% of samples)	≤ 10 (for 80% of samples)	≤ 10 (for 80% of samples)	2-15	≤ 2 (mean value)	Secondary wastewater treatment followed by tertiary wastewater treatment	**Determination of BOD5, SS** For PE <9999: 12 samples/ year For 10000<PE 19999: 12 samples/year For PE>20000: 24 samples/year **Determination of turbidity** For PE > 50000: 4 samples/ week For PE < 49999: 2 samples/ week **Determination of EC** For PE > 50000: 4 samples/ week For PE < 49999: 2 samples/ week **Determination of Residual Cl** (frequently if chlorination system is established)

Table 16: Limits, treatment requirements and frequency of sampling for industrial use M.D. 145116/2011

Type of wastewater reuse	**E. coli (EC/100 ml)**	**BOD5 (mg /l O_2)**	**SS (mg/l)**	**Turbidity (NTU)**	**Type of pretreatment needed before the reuse**	**Minimum frequency of water sampling and laboratory analysis**
Industrial use (single use water cooling)	≤ 200 (mean value)	25	35 -60	15-45	Secondary wastewater treatment (biofilters; activated silt; rotating biological contactors)	**Determination of BOD5, SS** For PE <9999: 12 samples/ year For 10000<PE 19999: 12 samples/year For PE>20000: 24 samples/year **Determination of EC:** 365 samples/year **Determination of Residual Cl** (frequently if chlorination system is established)
Industrial use (recycled water; production unit water)	≤ 5 (for 85% of samples) ≤ 50 (for 95% of samples)	≤ 10 (for 80% of samples)	≤ 10 (for 80% of samples)	≤ 2 (mean value)	Secondary wastewater treatment followed by tertiary wastewater treatment	**Determination of BOD5, SS** For PE <9999: 12 samples/ year For 10000<PE 19999: 12 samples/year For PE>20000: 24 samples/year **Determination of turbidity** For PE > 50000: 4 samples/ week For PE < 49999: 2 samples/ week **Determination of EC** For PE > 50000: 4 samples/ week For PE < 49999: 2 samples/ week **Determination of Residual Cl** (frequently if chlorination system takes place)

Table 17: Limits; treatment requirements and frequency of sampling for replenishing of underground aquifers M.D. 145116/2011

Type of wastewater reuse	**Total coli (TC/100 ml)**	**BOD5 (mg /l O_2)**	**SS (mg/l)**	**Turbidity (NTU)**	**Type of pretreatment needed before the reuse**	**Minimum frequency of water sampling and laboratory analysis**
replenishing of underground aquifers through filtration	≤ 200 (mean value)	25	35 -60	15-45	Secondary wastewater treatment (biofilters; activated silt; rotating biological contactors)	**Determination of BOD5, SS** For PE <9999: 12 samples/ year For 10000<PE 19999: 12 samples/year For PE>20000: 24 samples/year **Determination of EC:** 365 samples/year **Determination of Residual Cl** (frequently if chlorination system is established)
replenishing of underground aquifers through drilling	≤ 2 (for 85% of samples) ≤ 20 (for 95% of samples)	≤ 10 (for 80% of samples)	≤ 10 (for 80% of samples)	≤ 2 (mean value)	Secondary wastewater treatment followed by tertiary wastewater treatment	**Determination of BOD5, SS** For PE <9999: 12 samples/ year For 10000<PE 19999: 12 samples/year For PE>20000: 24 samples/year **Determination of turbidity** For PE > 50000: 4 samples/ week For PE < 49999: 2 samples/ week **Determination of TC** For PE > 50000:7 samples/ week For PE < 49999: 3 samples/ week **Determination of Residual Cl** (frequently if chlorination system takes place)

Table 18: Chemical and biological limits; treatment requirements and frequency of sampling for urban and peri-urban use M.D. 145116/2011]

Type of wastewater reuse	**Total coli (TC/100 ml)**	**BOD5 (mg /l O_2)**	**SS (mg/l)**	**Turbidity (NTU)**	**Type of pretreatment needed before the reuse**	**Minimum frequency of water sampling and laboratory analysis**
Peri urban use (forests and parks) Urban use (cemeteries, highway embankments, golf courses, public parks), recreational facilities, firefighting, soil compaction, cleaning of streets and sidewalks, decorative fountains)	≤ 2 (for 85% of samples) ≤ 20 (for 95% of samples)	≤ 10 (for 80% of samples)	≤ 10 (for 80% of samples)	≤ 2 (mean value)	Secondary wastewater treatment followed by tertiary wastewater treatment	**Determination of BOD5, SS** For PE <9999: 12 samples/ year For 10000<PE 19999: 12 samples/year For PE>20000: 24 samples/year **Determination of turbidity** For PE > 50000: 4 samples/ week For PE < 49999: 2 samples/ week **Determination of TC** For PE > 50000:7 samples/ week For PE < 49999: 3 samples/ week **Determination of Residual Cl** (frequently if chlorination system takes place)

Table 19: Upper concentration limits of heavy metals M.D. 145116/2011

Heavy metal	**Upper limit of concentration (mg/l)**	**Heavy metal**	**Upper limit of concentration (mg/l)**
Al (aluminium)	5	Mn (Manganese)	0.2
As (arsenic)	0.1	Mo (Molybdenum)	0.01
Be (Beryllium)	0.1	Ni (Nickel)	0.2
Cd (Cadmium)	0.01	Pb (Lead)	0.1
Co (Cobalt)	0.05	Se (Selenium)	0.02
Cr (Chromium)	0.1	V (Vanadium)	0.1
Cu (Copper)	0.2	Zn (Zinc)	2
F (Fluorine)	1	Hg (Mercury)	0.002
Fe (Iron)	3		
Li (Lithium)	2.5		

Table 20: Preferable agronomic characteristics of wastewater for irrigation M.D. 145116/2011

Possible problem during irrigation	**Units**	**Degree of restriction on use**		
		Low	**Moderate**	**High**
Salinity (affects water availability to plants in the soil)				
ECw	dS/m	< 0.7	0.7 – 3.0	> 3.0
TDS (Total dissolved solids)	mg/L	< 450	450 – 2000	> 2000
Permeability				
SAR = 0–3 and ECw =		> 0.7	0.7 – 0.2	< 0.2
3–6		> 1.2	1.2 – 0.3	< 0.3
6–12		> 1.9	1.9 – 0.5	< 0.5
12–20		> 2.9	2.9 – 1.3	< 1.3
20–40		> 5.0	5.0 – 2.9	< 2.9
Specific ion toxicity				
Sodium (Na)				
Surface irrigation (root absorption)	SAR	< 3	3 – 9	> 9
Sprinkler irrigation (leaf absorption)	mg/L	≤ 70	—	> 70
Chloride (Cl)				
Surface irrigation (root absorption)	mg/L	< 140	140 – 350	> 350
Sprinkler irrigation (leaf absorption)	mg/L	< 100	—	> 100
Other effects				
Nitrogen (NO_3–N)	mg/L	< 5	5 – 30	> 30
Bicarbonate (HCO_3) (only for sprinkler irrigation)	mg/L	< 90	90 – 500	> 500
pH		Typical range: 6.5 – 8.5		

Permitting procedure

The authorization procedure for the reuse of treated wastewater is specified on M.D. 145116/2011 (Art. 9-11) and involves the submission of an application to the competent Water Directorate of the Decentralized Administration, accompanied by a technical study describing the design and operation of the reuse system. The procedure includes evaluation by the relevant environmental and health authorities to ensure compliance with the applicable environmental and public health standards.

The reuse permit is issued after the environmental approval of the treatment and reuse installation, and it specifies the conditions, limitations, and monitoring requirements for the intended use. **The entire process is coordinated by the Water Directorate, which also supervises compliance during the implementation and operation phases**.

Greywater reuse

According to World Health Organization (WHO, 2006) greywater is defined the untreated

household wastewater, which has not been contaminated by toilet waste (blackwater). It includes the water from bath, showers, bathroom sinks, laundry tubs, floor waste and washing machines. It does not include waste from kitchen sinks, garbage disposal units or dishwashers. On the Greek market, a lot of enterprises are active in production and sales of water recycling device.



Figure 4: Greywater recycling systems for individual households (left), household compounds, commercial buildings and hotels (middle) and industrial buildings (right), source: https://www.idator.gr/ (Idator S.A., 2024)

Uses allowed

In Greece, as it aforementioned, although there is no distinct legislative framework in the topic of the utilization of greywater, it could nevertheless be stated that the relevant measures, conditions, and requirements regarding the water quality characteristics, as well as the possible uses are covered by the provisions set out in the Ministerial Decision (MD) 145116/2011 which acts in accordance with COM(2007) 414[6]. This is the core Greek regulation in term of reuse, but it does not specifically address a separate, detailed regime for greywater reuse as a distinct category. Greywater treatment and reuse are generally considered under broader wastewater reuse rules rather than a separate legal regime. For this reason, reference is made to the section on wastewater reuse for all specific details.

Permitting procedure

For the installation of water recycling and reuse devices, **no specific licensing procedure is required.** However, for large-scale facilities that involve the implementation of technical or mechanical (reconstructional) works, the procedures set out in the New General Construction Code (L. 4067/2012) should be followed to obtain either a building permit or a small-scale construction permit, depending on the nature and extent of the works.

[6] COM (2007) 414 final: Communication from the Commission to the European Parliament and the Council - Addressing the challenge of water scarcity and droughts in the European Union {SEC(2007) 993} {SEC(2007) 996}

Rainwater reuse

Uses allowed

The installation of rainwater harvesting systems has been a common practice in Greece since ancient times (Yannopoulos et al. 2016). These structures involved water collection and storage of surface water runoff to increase the availability of water mainly for domestic and agricultural uses during dry periods (Angelakis et al. 2014).



Figure 5: water tanks in Phaistos, Crete [22]

In recent decades, the reuse of rainwater has been investigated as an alternative solution, especially in remote villages or islands, where water drilling wells is considered unsustainable due to the terrain. Moreover, the Ministry of Environment and Energy (Hellenic Ministry of Environment and Energy, 2024) promotes actions that are related to water recycling and reuse to meet the challenges of climate change and water resources sustainability. In accordance with recent announcements the Next Action Plan for Water Resources will include measures and instruments for water harvesting.

In addition, it is worth mentioning **that Greece participated in the Non-Conventional Water Resources (NCWR) Program in the Mediterranean** (2008-2018), which was designed and implemented by the regional organization Global Water Partnership – Mediterranean. In the case of Greece, the objective included the revitalizing and reintroducing of traditional rainwater harvesting systems combined with innovative techniques and methods (GWP-Med, 2024). During the project period 68 rainwater harvesting systems were installed in 33 islands. Based on the quality characteristics the collected is intended for secondary uses, such as irrigation and washing purposes.

Treatment level requirements

Since the collected water is not intended for drinking purposes but only for secondary uses (such as washing and irrigation), **the assessment of water quality is carried out based on the parameters listed in the tables referring to wastewater reuse.**

For the design and construction of rainwater harvesting systems, the technical specifications, the treatment procedures, as well as the environmental criteria required are defined by the following legislation:

- Law 3199/2003 and presidential decree No.51/2007 for the sustainable use of water resources;
- Law 4067/2012 regarding the design and construction of rainwater harvesting infrastructures;
- Law 1739/1987, as well as the ministerial decisions 6631/1989 and 8500/1991 for the minimum and maximum demands for irrigation and drinking water respectively.

Permitting procedure

In Greece, rainwater harvesting and reuse systems installed at building level (e.g., rooftop collection and on-site reuse for irrigation or technical uses) do not require a specific permitting procedure under a dedicated national regulatory framework. Such systems are generally considered part of building technical infrastructure.

Local regulatory variations in the pilot project area – Ptolemaida City

Apart from the national legislation which has been described in the previous sections, regional and local authorities have published local regulations and action plans regarding the sustainable use of water resources. These regulations consider the regional and local characteristics (climate, hydrology, topography, water and road network, population, number of buildings etc.) and define the responsibilities and the allowable management practices for proper water use.

Wastewater reuse

At local (municipal) level the responsible authorities for the design, construction, maintenance, operation, and management of wastewater treatment are the Municipal Enterprises for Water Supply and Sewerage (DEYA). At national level there are 129 DEYAs (https://edeya.gr) which within the geographic area are responsible for:

- The production and distribution to citizens of water for human consumption,
- The collection of wastewaters from the approved consumers of the respective Municipality or Municipalities and the production of treated urban wastewater suitable for safe environmental disposal, and
- The design, construction, maintenance, operation, management, and administration of water abstraction works, water treatment facilities, water transmission networks, water supply distribution networks, sewerage networks for wastewater and stormwater, urban wastewater treatment plants, systems for the disposal of the treated wastes, as well as facilities for the treatment and disposal of wastes resulting from the above treatment processes within their area of responsibility.

The project area belongs to the geographical area of Eordaia which is located within the administrative boundaries of the Region of Western Macedonia (RWM). In RWM there are seven DEYA active for the management of water and sewerage systems (Table 18).

Table 21: Municipal Enterprises for Water Supply and Sewerage in the Region of Western Macedonia

Regional unit	Municipality	References
Kozani	Voio	(Hellenic Republic DEYA Voio, 2024; DEYA Eordaia, 2024; DEYA Kozani, 2024; DEYA Grevena, 2024; DEYA Kastoria 2024; DEYA Amynteo; DEYA Florina)
	Eordaia	
	Kozani	
Grevena	Grevena	
Kastoria	Kastoria	
Florina	Amynteo	
	Florina	

Furthermore, there are 14 wastewater treatment plants within the Region of Western Macedonia. According to data provided by the Freshwater Information System for Europe (EEA, 2020), the collection system of all treatment plants complies with the legal requirements, while 85,7% of biological treatment systems meet the legal requirements, and 21,43% of the biological treatment with N and/or P removal meets legal requirements.

Regarding wastewater quality after the treatment and its possible reuses, as it stated above and in accordance with M.D. 145116/2011 (aligns with (91/271/EEC), the wastewater can be reused for irrigation; replenishing of underground aquifers; urban and peri-urban use; industrial use and discharge in water bodies. Both minimum treatment levels and biochemical parameters are described in tables below.

Table 22: Requirements for discharges from urban wastewater treatment plants (Law 192/1997)

Parameters	Concentration	Minimum percentage of reduction	Reference method of measurement
Biochemical oxygen demand (BOD5 at 20 °C) without nitrification	25 mg/l O_2	70-90	Homogenized, unfiltered, undecanted sample. Determination of dissolved oxygen before and after five-day incubation at 20 ° C ± 1 ° C, in complete darkness. Addition of a nitrification inhibitor
Chemical oxygen demand (COD)	125 mg/l O_2	75	Homogenized, unfiltered, undecanted sample Potassium dichromate
Total suspended solids	35-60	70-90	1. Filtering of a representative sample through a 0,45 |im filter membrane. Drying at 105 °C and weighing 2. Centrifuging of a representative sample (for at least five min with mean acceleration of 2800 to 3200g), drying at 105 °C and weighing

Table 23: Requirements for Discharge from Urban Wastewater Treatment Plants into Sensitive Areas (Subject to Eutrophication)

Parameter	Concentration	Minimum Percentage Reduction (%)	Reference Measurement Method
Total Phosphorus (P)	2 mg/L P (10,000 – 100,000 p.e.)	80%	Molecular absorption spectrophotometry
	1 mg/L P (>100,000 p.e.)	80%	Molecular absorption spectrophotometry
Total Nitrogen (N)	15 mg/L N (10,000 – 100,000 p.e.)	70–80%	Molecular absorption spectrophotometry
	10 mg/L N (>100,000 p.e.)	70–80%	Molecular absorption spectrophotometry

Greywater reuse

At regional level, the legislative context governing greywater reuse remains identical to the national framework described above. No regional or local regulations have been adopted to modify or extend the provisions of Ministerial Decision 145116/2011; therefore, all technical and quality requirements concerning greywater reuse are applied uniformly. In RWM, greywater reuse is still at an early developmental and demonstration stage.

Applications are mainly found in research facilities, public buildings, and pilot infrastructures, where they serve to evaluate the technical feasibility and environmental safety of decentralized reuse systems. The treated water as is used for non-potable purposes, such as toilet flushing and irrigation of green areas within the facility premises, thereby reducing freshwater consumption and demonstrating circular water management solutions adapted to semi-arid continental climates. As with treated wastewater reuse, there is no separate licensing framework for greywater systems. The authorization of the pilot facility therefore follows the general procedure outlined in M.D. 145116/2011 and Law 4067/2012.

Rainwater reuse

The same legislative instruments, Law 3199/2003 and Presidential Decree 51/2007 on the sustainable use and management of water resources, together with Law 4067/2012 governing the design and construction of water-collection infrastructures, apply uniformly throughout the country. **Regional authorities, such as the Water Directorate of Epirus-Western Macedonia, are responsible only for supervising the implementation of these provisions and for verifying the compliance of any rainwater collection system with environmental and public health standards**. No additional regional regulations or deviations exist regarding allowable uses, treatment levels, or monitoring requirements.

In the context of the SHARE.MedWATER pilot installation at the CERTH/CPERI facilities in Ptolemaida, the same legal framework applies, while the activity operates under a research-scale permit within CERTH's existing environmental authorization. The pilot system advances beyond conventional non-potable reuse by testing a multi-stage rainwater purification process, including sedimentation, filtration, activated-carbon treatment, microfiltration, and UV disinfection, aimed at achieving potable-quality standards in a controlled and monitored environment. Although such potable applications are not yet formally regulated at regional level, the system's operation is aligned with the national standards for drinking-water quality (Directive (EU) 2020/2184 and is supervised by the competent water and environmental authorities. This ensures that the pilot remains compliant with existing legislation while generating data to inform future updates of Greece's national guidelines for rainwater reuse.

Incentives and barriers to reuse

The transition towards sustainable and climate-resilient water management in Greece is closely linked to the principles of the Green Transition and the Circular Economy, which aim to promote resource efficiency, reduce dependence on freshwater withdrawals, and minimize wastewater discharges. Within this framework, the reuse of treated wastewater, greywater, and rainwater

constitutes a key instrument for closing the urban water cycle and addressing the challenges of water scarcity, seasonal droughts, and groundwater overexploitation, particularly in semi-arid regions such as Western Macedonia. Although the national legal and institutional framework for water reuse is fully harmonized with the EU Water Framework Directive (2000/60/EC), the Regulation (EU) 2020/741 on minimum requirements for water reuse, and the Greek National Circular Economy Action Plan, practical implementation remains limited. The scaling-up of water reuse requires the integration of innovative solutions within regional planning, incentives for investment, and improved governance mechanisms that bridge research, industry, and public authorities. According to national water statistics (2022), total water withdrawal in Greece reached 10,07 km³, with over 80 % used for agriculture and groundwater abstraction (6,22 km³) remaining the dominant source. In contrast, non-conventional water resources, including desalinated water and treated wastewater reuse, account for less than 1% of total supply. This significant imbalance underlines both the urgency and the opportunity to promote water reuse as a core component of the country's green transition and climate adaptation strategy (FAO, 2024) (Table 11).

Table 24: Water withdrawal by sector, source, and use of non-conventional water resources in Greece (2022) (FAO, 2024)

Category	Indicator	Year	Value	Unit
Total Water Withdrawal	Total water withdrawal	2022	10,07	km³
	Total water withdrawal per capita	2022	967,49	m³/inhab/year
By Sector	Agricultural	2022	8,11	km³
	Industrial	2022	0,28	km³
	Municipal	2022	1,69	km³
By Source	Surface water withdrawal	2022	3,83	km³
	Groundwater withdrawal	2022	6,22	km³
Non-Conventional Water Resources	Desalinated water produced	2022	0,01	km³
	Direct use of treated municipal wastewater	2022	—	km³
	Direct use of treated municipal wastewater for irrigation purposes	2022	0,07	km³
	Direct use of agricultural drainage water	2022	—	km³

However, despite clear environmental and economic benefits, several persistent barriers still limit the broader adoption of water reuse practices in Greece:

- **Institutional fragmentation and administrative complexity** in the permitting process, involving multiple authorities (water, environment, health).
- **Insufficient economic incentives**, such as subsidies or differentiated water tariffs, that would make reuse financially competitive with conventional water supply.

- **Infrastructure and technological gaps**, particularly in smaller municipalities lacking tertiary treatment or dual distribution networks.
- **Public perception and trust issues** regarding the safety and acceptability of reused water.
- **Limited regional coordination and monitoring capacity**, hindering consistent implementation and data collection.
- **Low integration of reuse targets** in regional development and energy transition policies (e.g., Just Transition Plan for Western Macedonia).

Building on the above policy drivers and the clear need to increase the share of non-conventional water resources, a pilot rainwater harvesting and treatment system has been designed and installed at the CERTH/CPERI facilities in Ptolemaida (RWM). The treated water will be used to supply an innovative vertical hydroponic unit located on site, creating a closed-loop scheme where local rainfall is transformed into high-quality irrigation water for food production in a controlled environment. This integrated pilot directly supports Greece's green transition and circular-economy objectives, by reducing dependence on groundwater, showcasing decentralized reuse of non-conventional water resources, and demonstrating a replicable model for climate-resilient urban agriculture in water-stressed regions such as Western Macedonia.

Legislative framework for water reuse in Italy

To date, Italy reflects the evolution of the EU directives and regulation (Directive 1991/271/CEE, WFD 2000/60/EC, Regulation 2020/741/EU and the UWWTD 2024/3019) through a dual legislative structure:

- Ministerial Decree 185/2003 covers civil and industrial reuse,
- Law 68/2023 covers agricultural reuse, in line with EU quality classes and Water Reuse Risk Management Plan (WRRMP) obligations.

A regulation concerning the reuse of treated wastewater, which implements EU Regulation 2020/741, has recently passed preliminary examination by the Council of Ministers (on 5 November 2025), and is set to be adopted by decree of the President of the Republic (DPR). This forthcoming DPR (Draft DPR on wastewater reuse) will include detailed rules and authorization procedures for wastewater reuse, as well as risk management and monitoring plans. The measure regulates the criteria, methods and conditions for the safe use of such water, providing an essential regulatory framework to address the water crisis and to support, in particular, irrigation in agriculture. It establishes the obligation to draw up a Risk Management Plan, identifying the roles and responsibilities of operators and end users, with the primary objective of protecting human and animal health and the environment.

The historic Ministerial Decree 185/2003 remains the reference for civil and industrial reuse, though it predates the EU's risk-based approach. More recently, Law 68/2023 initiated the national transposition of Regulation 2020/741, enabling simplified authorizations for agricultural reuse and setting the basis for the forthcoming national implementing decree (DPR).

Wastewater reuse

Uses allowed

The reuse of domestic, urban, and industrial wastewater in Italy is regulated by DM 185/2003, which sets strict environmental and health requirements to prevent negative impacts on ecosystems, soils, and crops. Reclaimed water may be used for:

- Farm irrigation: for food and non-food crops, as well as green areas, sport, and recreational areas.
- Urban use: street cleaning, heating/cooling systems, and dual (non-potable) distribution networks, excluding direct use inside buildings except for toilet flushing.

- Industrial uses: firefighting, process water, washing, and thermal cycles, but not in activities involving contact with food, pharmaceuticals, or cosmetics.

Water reuse for potable purposes is prohibited, and the decree does not cover reuse within the same plant or industrial consortium that generated the wastewater.

The forthcoming DPR will include the rules for direct reuse of the treated urban wastewater in:

- agricultural sector (irrigation) in accordance with EU Regulation 2020/741
- industrial sector (Annex I, Section I, Part A of Draft of DPR on wastewater reuse)
- civil sector (Annex I, Section I, Part B of Draft of DPR on wastewater reuse)
- Environmental use (Annex I, Section I, Part C of Draft of DPR on wastewater reuse)

Moreover, it regulates the direct reuse of domestic wastewater discharged into the sewage network, industrial wastewater, and rainwater runoff, as well as the first discharge of rainwater into the same industrial networks.

In accordance with Art. 2 of the draft DPR on wastewater reuse, in each case of direct reuse the competent authorities may exempt research projects or pilot projects relating to refining plants from the obligations arising from this Regulation (DPR).

According to DM 185/2003, Italian legislation establishes minimum quality requirements (i.e. the limit values for 55 chemical-physical and microbiological parameters at the exit of recovery plants) for agricultural or civil reuse, without any distinction between the two types of reuse (Table 25). Regarding the industrial sector, it is established that interested parties agree on specific limits in relation to the need for the production cycle in which reuse takes place. The limits for industrial reuse must not be less strict than the limits for discharge into surface waters, as defined in Table 3 of Annex 5 of D.gls 152/1999.

Each Region, based on consolidated knowledge acquired for the different uses and methods of reuse, can introduce specific limits for the chemical-physical parameters that exceed those foreseen in the annex of the decree; however, the limits introduced by the regions cannot exceed the limits that regulate the discharge into surface waters. Furthermore, the Regions are allowed to adopt, in compliance with national technical regulations, further rules and measures aimed at encouraging the recycling and reuse of purified wastewater especially with reference to sensitive areas, to cope with permanent scarcity situations of the water resource. These are rules that become an integral part of the Protection Plans of the Waters.

Table 25 – Limit values for water reuse in agricultural and civil sector (Annex D.M. 185/2003)

Parameter	Unit	Value	Parameter	Unit	Value
pH	–	6 – 9,5	Vanadium	mg/L	0,1
SAR	–	10	Zinc	mg/L	0,5
Coarse materials	–	Assenti	Total cyanides (as CN)	mg/L	0,05
Total suspended solids	mg/L	10	Sulfides (as H_2S)	mg H_2S/L	0,5
BOD_5 (as O_2)	mg O_2/L	20	Sulfites	mg SO_3/L	0,5
COD (as O_2)	mg O_2/L	100	Sulfates	mg SO_4/L	500
Total phosphorus	mg P/L	2	Free chlorine	mg/L	0,2
Total nitrogen	mg N/L	15	Chlorides	mg Cl^-/L	250
Ammoniacal nitrogen (NH_4-N)	mg NH_4/L	2	Fluorides	mg F^-/L	1,5
Electrical conductivity	µS/cm	3 000	Animal/vegetable fats and oils	mg/L	10
Aluminum	mg/L	1	Mineral oils[1]	mg/L	0,05
Arsenic	mg/L	0,02	Total phenols	mg/L	0,1
Barium	mg/L	10	Pentachlorophenol	mg/L	0,003
Beryllium	mg/L	0,1	Total aldehydes	mg/L	0,5
Boron	mg/L	1,0	Tetrachloroethylene + Trichloroethylene (sum)	mg/L	0,01
Cadmium	mg/L	0,005	Total chlorinated solvents	mg/L	0,04
Cobalt	mg/L	0,05	Total trihalomethanes	mg/L	0,03
Total chromium	mg/L	0,1	Total aromatic organic solvents	mg/L	0,01
Chromium VI	mg/L	0,005	Benzene	mg/L	0,001
Iron	mg/L	2	Benzo(a)pyrene	mg/L	0,00001
Manganese	mg/L	0,2	Total nitrogenous organic solvents	mg/L	0,01
Mercury	mg/L	0,001	Total surfactants	mg/L	0,5
Nickel	mg/L	0,2	Chlorinated pesticides (each)[2]	mg/L	0,0001

Lead	mg/L	0,1	Organophosphate pesticides (each)	mg/L	0,0001
Copper	mg/L	1	Other total pesticides	mg/L	0,05
Selenium	mg/L	0,01	Escherichia coli[3]	UFC / 100 mL	10 (80% of samples) – max specific value: 100
Tin	mg/L	3	Salmonella	–	Absent (in all samples)
Thallium	mg/L	0,001			

(1) This substance must be absent from recovered wastewater intended for reuse, in accordance with paragraph 2.1 of Annex 5 to Legislative Decree No. 152 of 1999 concerning discharges onto soil. This requirement is considered fulfilled when the substance is present at concentrations not exceeding the detection limits of the reference analytical methods, as defined and updated by a specific ministerial decree pursuant to paragraph 4 of Annex 5 to Legislative Decree No. 152 of 1999. Pending such definition, the detection limits indicated in the table shall apply.

(2) The parameter value refers to each individual pesticide. In the case of Aldrin, Dieldrin, Heptachlor and Heptachlor epoxide, the parametric value is 0.030 mg/l.

(3) For recovered wastewater originating from lagooning or constructed wetlands, the limits of 50 (80% of samples) and 200 CFU/100 ml (maximum point value) apply.

Without prejudice to compliance with the minimum requirements set out in Regulation (EU) 2020/741 for the reuse of treated water for agricultural irrigation, as well as any other requirements or conditions established by the local authority, the forthcoming DPR on water reuse provides the additional quality characteristics of the reclaimed water. The draft DPR, which is expected to be final, was retrieved from the website, and its contents are reported in the following tables.

Table 26 – Water quality characteristics for agricultural reuse (Annex I, Section 2, Table 1 of the Draft DPR on wastewater reuse)

Reclaimed Water Quality Class	**Indicative Technology Target**	**N (mg/L)(1)**	**P_{tot} (mg/L)(1)**	**Salinity (psu)**	**Salmonella spp./L(3)**
A	Secondary treatment, filtration, and disinfection	In accordance with the D. Lgs 152/2006 (Annex 5, Part III, table 2, for N_{tot} where applicable; Annex 5, Part III table 3, for ammonia, N-NO_2, and N-NO_3	In accordance with the D. Lgs 152/2006 (Annex 5, Part III, Table 2 where applicable and Annex 5, Part III, Table 3)	≤ 10	absence
B	Secondary treatment, filtration, and disinfection			≤ 10	absence
C	Secondary treatment, filtration, and disinfection			≤ 10	absence
D	Secondary treatment, filtration, and disinfection			≤ 10	absence

(1) Reference values to be complied with in the case of low-efficiency irrigation techniques such as sprinkler or surface (flood/furrow) irrigation. More stringent values may be defined on the basis of the risk assessment. Reference values for storage in reservoirs and release into permeable irrigation canals are 10 mg/L for total nitrogen and 1 mg/L for total phosphorus, to be assessed in relation to the risk assessment, as well as to their possible classification as significant water bodies and to the potential transfer or discharge of water into other water bodies.

(2) Indicative reference value to be estimated according to soil type and crop within the risk management plan. Alternatively, the conductivity parameter (mS/cm) may be used, to be defined in the risk management plan.

(3) For the parameter *Salmonella spp.*, the limit value applies to 100% of samples.

Table 27 – Monitoring plan of the reclaimed water for agricultural reuse (Annex I, Section 2, Table 2 of the Draft DPR on water reuse)

Reclaimed Water Quality Class	N	P_{tot}	Salinity	Salmonellaspp.
A	Two times per month	Two times per month	Two times per month	Two times per month
B				
C				
D				

Table 28 – Water quality characteristics for industrial reuse (Annex I, Section 3, Table 3 of the Draft DPR on water reuse)

Reclaimed Water Quality Class	**Type of use (Section 1, Part A) [1]**	**N_{tot} (mg/L) [2]**	**P_{tot} (mg/L)[2]**
A	In circuits with a direct risk of ingestion and skin contact	10	1
C	In circuits with a direct risk of skin contact	10	1

(1) The mandatory parameters for the indicated classes refer only to E. coli and Legionella. For BOD_5, TSS and Turbidity, any requirements shall apply following the risk assessment.

(2) Reference values applicable only in the case of discharge into water bodies or onto soil. Different values may be defined on the basis of the risk assessment.

Table 29 – Monitoring plan of the reclaimed water for industrial reuse (Annex I, Section 3, Table 4 of the Draft DPR on water reuse)

Type of use **(Section 1, Part A)**	**E. coli**	**Turbidity [1]**	**Legionella spp**
In circuits with a direct risk of ingestion and skin contact	4 times per year	Continuous	4 times per year
In circuits with a direct risk of skin contact	4 times per year	-	4 times per year

(1) Turbidity may be monitored as an indicator of anomalies in the tertiary treatment system.

Table 30 – Water quality characteristics for civil reuse (Annex I, Section 4, Table 5 of the Draft DPR on water reuse)

Quality Class	**Type of use (Section 1, Part B)**	**N (mg/L)**	**P_{tot} (mg/L)**
A	Street cleaning in urban centers	In accordance with the D. Lgs 152/2006 (Annex 5, Part III, table 2, for N_{tot} where applicable; Annex 5, Part III table 3, for ammonia, N-NO_2, and N-NO_3	In accordance with the D. Lgs 152/2006 (Annex 5, Part III, table 2 and table 3, where applicable
A	Public and private green irrigation		
D	Feeding of heating/cooling systems	-	-
D	Water supply of dual adduction networks		
A	Car washing	In accordance with the D. Lgs 152/2006 (Annex 5, Part III, table 2, for N_{tot} where applicable; Annex 5, Part III, Table 3, for ammonia, N-NO_2, and N-NO_3	In accordance with the D. Lgs 152/2006 (Annex 5, Part III, table 2 and table 3, where applicable
A	Irrigation of green areas in sports facilities		
A	Water supply for ornamental fountains		

(1) The mandatory parameters for the indicated classes refer only to E. coli and Legionella. For BOD_5, TSS and Turbidity, any requirements shall apply following the risk assessment. (2) Reference values applicable only in the case of discharge into water bodies or onto soil. Different values may be defined on the basis of the risk assessment.

Table 31 – Monitoring plan of the reclaimed water for civil reuse (Annex I, Section 4, Table 6 of the Draft DPR on water reuse)

Type of use (Section 1, Part B)	BOD_5	N (mg/L)	P_{tot} (mg/L)	E. coli	Turbidity [1]	Legionella spp
Street cleaning in urban centers	-	-	-	Five times per year	-	Five times per year
Public and private green irrigation	In accordance with D.lgs 152/2006 (Annex 5, Part III)			Five times per year	-	Five times per year
Feeding of heating/cooling systems	-	-		Four times per year	continuous	Four times per year
Water supply of dual adduction networks	-	-	-	Four times per year	continuous	Four times per year
Car washing	-	In accordance with D.lgs 152/2006 (Annex 5, Part III)		Five times per year	-	Five times per year
Irrigation of green areas in sports facilities	-			Five times per year	continuous	Five times per year
Water supply for ornamental fountains	-	-	-	Five times per year	continuous	Five times per year

(1) Turbidity may be monitored as an indicator of anomalies in the tertiary treatment system.

Table 32 – Water quality characteristics for environmental reuse (Annex I, Section 5, Table 7 of the Draft DPR on water reuse)

Reclaimed Water Quality Class[1]	Type of use (Section 1, Part C)	N (mg/L)[2]	P_{tot} (mg/L)[2]
C	wetlands and natural habitats	10.0 In accordance with the D. Lgs 152/2006 (Annex 5, Part III, table 2	In accordance with the D. Lgs 152/2006 (Annex 5, Part III, Table 2 and Table 3)
	Adjustment of watercourses that present a long dry period during the year		
	Recovery of watercourses with a bad quality status		
	Water pond feeding, small ponds with phytoremediation action	-	-
	Recharge of groundwater (aquifer)	6	0.5

(1) The mandatory parameters for the indicated classes refer only to E. coli. For BOD_5, TSS, Turbidity and Legionella, any requirements shall apply following the risk assessment.

(2) Reference values. Different values may be defined based on the risk assessment and the environmental status of the connected water bodies. For the quantitative and qualitative restoration of watercourses, the assessments shall also consider the environmental quality objectives set out in Annex 1, Part III, of Legislative Decree No. 152 of 2006.

Table 33 - Monitoring plan of the reclaimed water for environmental reuse (Annex I, Section 5, Table 8 of the Draft DPR on water reuse)

<table>
<tr><th>Type of use

(Section 1, Part C)</th><th>E. coli</th><th>Turbidity [1]</th><th>TSS</th><th>BOD_5</th><th>N</th><th>P_{tot}</th></tr>
<tr><td>wetlands and natural habitats</td><td rowspan="5">Four times per year</td><td rowspan="3">continuous</td><td colspan="4" rowspan="3">In accordance with D.lgs 152/2006

(Annex 5, Part III)</td></tr>
<tr><td>Adjustment of watercourses that present long dry period during the year</td></tr>
<tr><td>Recovery of watercourses with a bad quality status</td></tr>
<tr><td>Water pond feeding, small ponds with phytoremediation action</td><td colspan="4">-</td></tr>
<tr><td>Recharge of groundwater (aquifer)</td><td>continuous</td><td>-</td><td>-</td><td colspan="2">In accordance with D.lgs 152/2006

(Annex 5, Part III)</td></tr>
</table>

(1) Turbidity may be monitored as an indicator of anomalies in the tertiary treatment system.

Permitting procedure

In line with Regulation 2020/741, Law No. 68/2023 aims to simplify and accelerate authorisation procedures to increase the resilience of the water system, reduce water loss, and increase the capacity of reservoirs. This will be achieved by creating water collection systems that reuse treated wastewater, and by improving the overall efficiency of the government and regions' response to the water crisis.

In accordance with Italian Law 68/2023 and the relevant national and European regulatory framework, the reuse of treated wastewater is subject to a dedicated authorization procedure managed at the regional level. The application for authorization must be submitted by the operator of the wastewater treatment and/or reclamation facility, or by the entity intending to use the reclaimed water.

The authorization is issued by the competent regional or provincial authority, as defined by regional legislation governing environmental permits and water resource management. Notification of the application to the national authority designated under Legislative Decree 224/2003 is also required. The application dossier must include a technical description of the treatment and reclamation processes, the intended uses of the reclaimed water, and a Risk Management Plan consistent with the requirements of Regulation (EU) 2020/741 and corresponding national guidelines. During the assessment phase, the competent authority must acquire mandatory technical opinions from:

- the Regional Environmental Protection Agency (ARPA) regarding environmental compliance and water quality requirements;
- the Local Health Authority (ASL) regarding hygienic and sanitary safety;
- and, where relevant, the River Basin or District Authority concerning potential impacts on water resources and basin management plans.

The final authorization defines the applicable water quality standards for each use, the monitoring and reporting obligations of the operator, and the operational conditions under which reuse activities may be carried out. While regional administrations may adopt specific procedural formats or additional requirements, the overall process—submission of the application, inter-agency technical evaluation, and issuance of an authorization with binding operational conditions - remains harmonized across Italy.

The new Italian Draft Presidential Decree (DPR) on the reuse of treated and reclaimed wastewater introduces several substantial changes to the authorization framework previously regulated by the national legislation (including Law 68/2023) and related regional procedures. The revisions aim

to harmonize the national system with EU Regulation 2020/741, strengthen risk-based management, and streamline administrative procedures.

The DPR explicitly designates the competent regional or provincial authorities as responsible for issuing the authorization for the production and supply of reclaimed water. The authority that currently oversees wastewater discharges under the relevant environmental/water law (D.Lgs. 152/2006, etc.). The procedure is done via a single administrative process involving the regional environmental protection agency (ARPA), the local health authority (Azienda Sanitaria Locale, ASL) and other relevant administrations. Part of the new authorization is integrated into the Autorizzazione Unica Ambientale (AUA) framework (DPR 59/2013). The AUA is issued by the "Sportello Unico per le Attività Produttive" (SUAP) for the applicant, in coordination with the environmental authority (e.g., province or regional ARPA) responsible for environmental permits. A Risk Management Plan, according to EU Regulation 2020/741, must be prepared by the plant operator and submitted to the competent authority.

The DPR establishes a 60-day deadline for the competent authority to issue the authorization once the Risk Management Plan (RMP) has been approved. The authorization is subject to the prior approval of a comprehensive Risk Management Plan, prepared jointly by the treatment/reclamation plant operator and the end users.

It is mandatory to obtain technical opinions of the: Regional Environmental Protection Agency (ARPA) for environmental and analytical assessment; the Local Health Authority (ASL) for hygienic–sanitary evaluation, and the River Basin or District Authority, where relevant, for hydrological and resource-management implications.

Although these entities were typically involved before, the DPR systematizes their participation and links it directly to the RMP evaluation.

The DPR introduces simplified authorization mechanisms for certain categories of wastewater (e.g., small-scale or non-urban domestic systems not connected to the public sewer network). This represents a procedural innovation intended to facilitate local reuse and reduce administrative burden.

The authorization must explicitly define water quality classes, monitoring frequencies, reporting duties, and the conditions under which reuse may occur. These requirements, already present but inconsistently applied, are now standardized in national regulation.

The DPR allows for temporary derogations from some regulatory provisions for pilot or research projects, valid for up to five years. This provides a regulated pathway for innovation while maintaining institutional oversight.

Greywater reuse

In Italy, the main regulations governing the recovery and reuse of treated wastewater are Ministerial Decree No. 185 of 12 June 2003 and Legislative Decree No. 152 of 3 April 2006 – the Environmental Consolidated Act (Testo Unico Ambientale, TUA). However, these regulations do not specifically address the issue of recovery, treatment, and reuse of greywater, to the extent that greywater is not explicitly defined therein.

Ministerial Decree No. 185 of 12 June 2003 specifically concerns the reuse of treated wastewater originating from treatment plants (urban or industrial), and not the local, "in situ" reuse of domestic wastewater. In fact, Article 1, paragraph 3 states: "***This regulation does not govern the reuse of wastewater within the same industrial plant or industrial consortium that produced*** it." However, if, for example, **a condominium treats greywater and intends to use it to irrigate a public park, supply an extended condominium distribution network**, etc., **the reuse—no longer internal and private—falls within the regulatory framework of Ministerial Decree 185/2003**. In such cases, the limits imposed on reclaimed water are fixed for all types of reuses, as reported in Table 25 of the section wastewater reuse.

At the national level, the reuse of wastewater is generally addressed in Legislative Decree No. 152/2006 (Environmental Consolidated Act – TUA). Article 99, paragraph 2, of Legislative Decree 152/2006 establishes that Regions must adopt rules and measures to promote water recycling and the reuse of treated wastewater, in compliance with the principles of state legislation and after consultation with the Authority responsible for oversight of water resources and waste. However, through the application of Article 121, Legislative Decree No. 152/2006 delegates to the **Regions the preparation of Regional Water Protection Plans (Piani di Tutela delle Acque – PTA),** through which—by issuing appropriate regulations—the following objectives are pursued:

- qualitative and quantitative protection of water resources;
- reduction of withdrawals from surface and groundwater resources;
- reduction of impacts on receiving water bodies.

Advanced treatment processes that make wastewater suitable for reuse constitute a measure which, by ensuring the availability of an alternative resource, contributes to achieving the above-mentioned objectives. Nevertheless, this regulation also addresses domestic and urban wastewater in general terms, without specifying the case of greywater.

A Decree of the President of the Republic aimed at defining the new Italian regulatory framework for wastewater reuse is currently at an advanced stage of drafting. This Presidential Decree will

serve to implement a more modern regulatory system, aligned with the new EU rules.

There is an **Italian technical standard (UNI/TS 11445:2012) that provides design, installation, and maintenance specifications for systems for the collection and use of non-potable water** (e.g. rainwater and greywater) in residential buildings. The standard is not a law, but it represents a technical reference for compliant project design.

The new Italian DPR on water reuse, currently pending publication, is expected to introduce an explicit regulatory framework for greywater, integrating it within the broader discipline governing reclaimed water. From a legal-systematic perspective, the Decree adopts a **unitary approach**, whereby greywater reuse is subject to the **same general conditions, procedural requirements, and performance standards** established for wastewater reuse, unless expressly differentiated.

More specifically:

- **Regulatory scope and classification**
  Greywater is formally included among the potential sources of reclaimed waters and its reuse is therefore governed by the same overarching principles of precaution, risk management, and public health protection that apply to treated wastewater.
- **Applicable quality standards and treatment obligations**
  The DPR provides that greywater intended for reuse must comply with the **quality parameters, treatment levels, and monitoring frequencies** already defined for wastewater reuse. This alignment ensures regulatory coherence and avoids the creation of parallel or fragmented regimes.
- **Risk assessment and operational controls**
  Operators are required to conduct a **site-specific risk assessment**, implement appropriate treatment technologies, and adopt operational controls consistent with the obligations set out for wastewater reuse systems. The Decree reinforces the need for traceability, maintenance of treatment units, and verification of compliance.
- **Permitting and administrative procedures**
  The authorization process for greywater reuse follows the **same procedural pathway** applicable to wastewater reuse, including documentation requirements, technical specifications, and oversight by competent authorities.
- **Consistency with EU Regulation 2020/741**
  The DPR ensures alignment with the EU framework by applying the same safety

objectives, minimum requirements, and risk-based approach to both greywater and wastewater reuse, thereby promoting harmonization and legal certainty.

In summary, the new DPR does not establish a distinct regulatory regime for greywater; instead, it **subsumes greywater reuse under the general discipline of wastewater reuse**, applying identical conditions, safeguards, and compliance obligations.

Rainwater reuse

Rainwater harvesting in Italy is regulated by a range of national, regional, and municipal provisions aimed at promoting the sustainable management of water resources and reducing the consumption of potable water.

The Environmental Act (Testo Unico Ambientale – T.U.A., Legislative Decree No. 152/2006), although it does not contain detailed technical specifications for rainwater harvesting systems, establishes the general principles for water resource management. Regarding **rainwater, Article 113 governs the authorization regime for stormwater runoff and first-flush waters, while Article 98 promotes water saving and reuse, including rainwater.**

As for the authorization framework, Article 113, paragraph 1 of the T.U.A. provides that: *"For the purposes of preventing hydraulic and environmental risks, **the Regions**, subject to the opinion of the Ministry of the Environment and the Protection of Land and Sea, **regulate and implement:***

- ***a. forms of control over discharges of stormwater runoff from separate sewer systems;***
- ***b. cases in which it may be required that the discharge of stormwater runoff, carried out through other separate conduits, be subject to specific requirements, including possible authorization."***

Furthermore, paragraph 3 of the same article provides that the **Regions shall also regulate:**

*"the **cases in which it may be required that first-flush waters and waters used for washing external areas be collected and appropriately treated in wastewater** treatment plants, under particular conditions in which, in relation to the activities carried out, there is a risk of runoff from uncovered impermeable surfaces of hazardous substances or substances that could hinder the achievement of water body quality objectives."*

It is therefore necessary, on a case-by-case basis, to refer to the specific regional legislation enacted by the territorially competent Region **to determine whether runoff waters may be subject to discharge authorization**. Outside the cases indicated above, meteorological waters

are not subject to a specific authorization or control regime, since paragraph 2 of the same Article 113 of the T.U.A. provides that:

"Meteorological waters not regulated pursuant to paragraph 1 are not subject to constraints or requirements deriving from Part Three of this decree."

Finally, paragraph 4 ***prohibits "the discharge or direct infiltration of meteorological waters into groundwater."***

In 2007, the Italian Supreme Court (Corte di Cassazione), with judgment No. 33839 of 4 September 2007, held that runoff waters from surfaces **that may contain polluting substances used in an industrial plant, as well as first-flush waters, must be considered equivalent to "industrial wastewater**" as defined in Article 74, paragraph 1, letter h) of Legislative Decree No. 152/2006, and are therefore subject to the relevant regulatory and authorization regime. This position was subsequently consolidated in later case law, requiring such waters to be subjected to adequate treatment systems.

By contrast, second-flush waters, as well as rainwater collected from roofs, unless proven otherwise, are not considered contaminated and may generally be discharged into the receiving body without any treatment or collected in storage basins for free use for irrigation or other compatible purposes (firefighting, street washing, etc.).

Technical standards

The technical standards for harvesting rainwater are incorporated into various sector-specific technical regulations. These technical standards are essential to ensure that rainwater harvesting systems are properly designed, installed, and managed, guaranteeing their efficiency and safety.

Below is an overview of the main **UNI Standards** (Italian National Standards Body – Ente Italiano di Normazione), which include technical specifications for the design, construction, operation, and maintenance of systems for the collection, treatment, and use of rainwater.

National technical specification
UNI/TS 11445:2012 – Systems for the collection and use of rainwater for purposes other than human consumption – Design, installation, and maintenance, published in 2012 and currently in force (UNI Technical Committee UNI/CT 033).

This technical specification is referenced in several Building Regulations and in Ministerial Decree No. 11 of 11 October 2017 as the standard to be followed for the adoption of rainwater harvesting systems. The specification defines the general requirements for the design, construction, operation, and maintenance of systems intended for rainwater harvesting for uses other than human consumption, in residential and similar contexts. It applies to rainwater harvesting systems

for domestic uses other than human consumption, provided they are equipped with an internal distribution network that is separate from the potable water distribution network. The rainwater referred to may be collected and reused for garden irrigation, WC flushing, surface washing systems for appurtenant areas, and other non-potable uses permitted by current legislation.

European standard adopted as a national standard
UNI EN 16941-1:2024 – On-site non-potable water systems – Part 1: Systems for the use of rainwater, published on 18 April 2024 and currently in force. It adopts EN 16941-1:2024 and replaces UNI EN 16941-1:2018 (UNI Technical Committee UNI/CT 033, UNI/CT 033/GL 28).

This standard specifies requirements and provides recommendations for the design, sizing, installation, identification, commissioning, and maintenance of rainwater harvesting systems for on-site use of such water as non-potable water. It also specifies minimum requirements for these systems. The standard does not cover:
– use as potable water or for food preparation;
– use for personal hygiene purposes;
– decentralized attenuation;
– infiltration.

European standard adopted as a national standard
UNI EN 12056-3:2001 – Gravity drainage systems inside buildings – Roof drainage systems, layout and calculation, published on 30 September 2001 and currently in force. It adopts EN 12056-3:2000 and replaces UNI 9184:1987 and UNI 9184 FA 1:1993, SS UNI U32.06.205.0:1990, and SS UNI U32.06.206.0:1990 (UNI Technical Committee UNI/CT 033, UNI/CT 033/GL 28).

This standard is the official Italian-language version of European Standard EN 12056-3 (June 2000 edition). It applies to gravity-operated wastewater drainage systems. It is applicable to drainage systems within residential buildings, commercial buildings, public buildings, and industrial buildings. Part three of the standard describes a method for calculating hydraulic adequacy for non-siphonic roof drainage systems and provides performance requirements for siphonic roof drainage systems.

European standard adopted as a national standard
UNI EN 805:2002 – Water supply – Requirements for systems and components outside buildings, published on 1 June 2002 and currently in force. It adopts EN 805:2000 (UNI Technical Committee UNI/CT 033 and UNI/CT 033/GL 27).

This standard is the official Italian-language version of European Standard EN 805 (January 2000 edition). It specifies general requirements for water supply systems outside buildings, general requirements for components, installation requirements, and on-site testing. The standard applies to the design and construction of new water supply systems, the extension of significant areas of existing systems, and the modification or renewal of existing systems.

Local regulatory variations in the pilot project area – Cervia Municipality

Wastewater reuse

At present, there are no specific municipal regulations adopted by the Municipality of Cervia that independently govern wastewater reuse; the municipality mainly implements and enforces higher-level rules. The core regulatory framework is therefore national and regional. Under Ministerial Decree 185/2003 (see section above referred to National Regulation on wastewater treatment), Regions are responsible for identifying suitable wastewater treatment plants and for defining the conditions and procedures for reuse, in compliance with national legislation.

The Emilia-Romagna Region has adopted regulatory measures that complement and specify national rules, particularly concerning the use of treated wastewater and effluents, with a strong focus on environmental protection.

- The **Regional Water Protection Plan (Piano di Tutela delle Acque)** identifies **wastewater reuse** as a priority measure for quantitative water protection and for improving water-use efficiency.
- The Region has adopted Regional Regulation No. 2/2024 on the agronomic use of effluents, including use of wa**stewater generated by agricultural holdings and small agri-food enterprises** for agricultural purposes, in line with Legislative Decree 152/2006 and the EU Nitrates Directive (91/676/EEC).

As far as concern **the municipality of Cervia**, the ***Municipal Building Regulation*** (approved by City Council Resolution No. 67/2018) establishes clear provisions concerning the management of runoff, stormwater, and wastewater discharges. Article 87 (Regulation of Wastewater Discharges) sets out the **rules for wastewater and stormwater management in buildings**, requiring the **separation of rainwater and sewage systems**. Wastewater must be discharged into the **appropriate public sewer network**, where available, subject to **authorisation from the service operator**. The use of dispersal systems for wastewater is prohibited within urban areas. Any new sewer connection or modification to existing discharges requires a new authorisation. Drainage systems must comply with **national, regional, and municipal regulations**.

In the Municipality of Cervia, located in the Emilia-Romagna Region, local water reuse practices have historically included the use of treated wastewater for agricultural irrigation. Since the early 2000s, when the Municipality was still directly managing the Milano Marittima wastewater treatment plant, treated effluents were supplied to the *Cooperativa Agricola Braccianti* (CAB) for irrigation purposes. The water was conveyed through a pumping and distribution system managed by CAB and operated by the local Reclamation Consortium (*Consorzio di Bonifica*). This

arrangement, though semi-formal, represented one of the first local examples of circular water reuse for agriculture.

The practice was discontinued in recent years due to excessive salinity (high chloride concentrations) in the treated water, which rendered it unsuitable for irrigation use. However, discussions have recently resumed between the Municipality, Hera S.p.A. (the Integrated Water Service Manager), and the *Consorzio di Bonifica* to assess the technical feasibility of reinstating the reuse system. A dedicated monitoring campaign on water salinity and chloride content has been underway to evaluate potential mitigation strategies. At present, irrigation remains the only feasible reuse option. Alternative applications—such as industrial reuse or non-potable urban uses—would require the installation of advanced treatment units (e.g., reverse osmosis or potabilization systems), which are currently unavailable in the municipal area.

Greywater reuse

There is currently no specific local regulation for greywater reuse within the Municipality of Cervia.

Rainwater reuse

At Regional level, the DGR 922/2017 requires municipalities to align their building regulations with the established regional provisions, including those on rainwater management, so that technical rules are consistent throughout the region, referring to DGR 286/2005, DGR 1860/2006, and DGR 1053/2003. **In the regional legal framework of Emilia-Romagna concerning the management of first-flush rainwater (per DGR 286/2005 and 1860/2006), there is no explicit regime for *reusing rainwater as a resource*** (for example, for irrigation or technical use). **Instead, the focus is on proper disposal, separation, and control of discharges to prevent environmental pollution**.

DGR 286/2005

- Establishes mandatory regional guidelines for the management of first-flush rainwater and wash water from external areas.
- Its objectives include the separation and control of first-flush discharges, especially from impermeable surfaces where there may be pollution risks.

DGR 1860/2006

- Provides technical guidelines on how to design and manage systems for the collection, treatment, and discharge of stormwater and first-flush rainwater.

- Offers definitions and calculation criteria (such as runoff coefficients) for managing these waters.

DGR 1053/2003

- It is a framework resolution providing regional direction for the implementation of the National Water Pollution Control Legislative Decree; it serves as the general basis to which the other regional measures are linked.

As far as concern **the municipality of Cervia**, the ***Municipal Building Regulation*** (approved by City Council Resolution No. 67/2018) establishes clear provisions concerning the management of runoff, stormwater, and wastewater discharges.

- Article 87 (Regulation of Wastewater Discharges) sets out the **rules for wastewater and stormwater management in buildings**, requiring the **separation of rainwater and sewage systems**. Stormwater should preferably be **infiltrated on-site or reused**, while wastewater must be discharged into the **appropriate public sewer network**, where available, subject to **authorisation from the service operator**. Drainage systems must comply with **national, regional, and municipal regulations**. Finally, **stormwater detention tanks** are required to ensure hydraulic invariance, with the possibility of **financial compensation (monetisation)** in designated areas.
- **Article 88** (Stormwater and First Flush Management) refers to the Regional Resolution DGR 922/2017, which consolidates the rules on managing stormwater and first flush discharges, building upon DGR 1053/2003, DGR 286/2005, and DGR 1860/2006. These establish regional standards for water pollution prevention, including the collection, storage, and reuse of stormwater for non-potable purposes.

Incentives and barriers to reuse

In **Italy**, the **reuse of water** (especially **treated wastewater**) offers potential benefits for agriculture, industry, and water scarcity resilience — but its uptake has been shaped by a mix of **incentives and barriers**.

Incentives

- Italy is about to implement the **EU Regulation 2020/741**, which sets **minimum requirements for safe reuse of treated urban wastewater in agriculture**. This creates a legal basis and clearer quality and risk monitoring standards for reuse projects.
- Several regions are actively implementing reuse projects, showing practical benefits: in

Piemonte and Lombardia, treated wastewater is reused for industrial cooling and agricultural irrigation. In **Emilia-Romagna and Toscana**, treated water is used for urban irrigation and crop production while in **Puglia**, reuse supports horticultural and orchard irrigation. These projects demonstrate demand and feasibility in real contexts.

- There is political discussion about **incentive mechanisms** such as *"blue certificates"* and funds to support efficient water use, rainwater harvesting, and treated wastewater reuse as part of **water savings and circular economy strategies**. While not yet widely implemented, such proposals indicate growing interest in supportive policy tools.

Barriers

Economic Barriers

- **High cost of reclaimed water**: Treatment and distribution systems can be more expensive than conventional freshwater extraction, making reuse economically less competitive without support.
- Seasonal demand (e.g., in agriculture) can make investment in treatment facilities less attractive because revenue is uneven throughout the year.

Regulatory Complexity

- Until full national implementation of the EU Regulation 741/2020 is completed, **different rules apply in different regions**, creating uncertainty and administrative complexity.

Technical and Infrastructure Barriers

- Existing infrastructure often does **not connect treatment plants to reuse sites** (e.g., irrigation fields), limiting practical use of treated water even when it is available.
- Planning, building, and operating distribution networks for reclaimed water requires significant investment and coordination between utilities, farmers, and local authorities.

Social and Organizational Barriers

- There is **limited awareness and understanding** of the benefits and safety of water reuse among stakeholders and the public, which can slow adoption (Canaj and Mehmeti, 2024)
- Institutional fragmentation and lack of coherent support frameworks across regions and sectors can reduce incentives for utilities and farmers to invest in reuse solutions.

Despite potential, Italy currently **reuses only about 4-5 % of treated wastewater**, most reuse in Italy occurs in **agriculture (~83 %)**, with some industrial applications (~9 %), and only limited urban reuse.

Legislative framework for water reuse in Malta

The national legislation on water reuse in Malta is primarily aligned with the requirements of related EU legislation, with the main legislative instruments being the transposition of the EU UWWTD and the EU Regulation on Water Reuse.

The **old UWWTD** (Dir. 91/271/EEC) was **transposed to national legislation through Subsidiary Legislation S.L. 549.22** – Urban Wastewater Treatment Regulations whilst the transposition to national legislation of the recast of the UWWTD (Dir. EU 2024/3019) is still in progress. Competence for the implementation of the Urban Wastewater Treatment Directive lies with the Environment and Resources Authority[7].

Regulation EU 2020/741 on minimum requirements for water reuse (for agricultural irrigation), being a regulation, becomes applicable as national legislation on its entry into force on 26 June 2023. The competent authority for this regulation has, however, still not been established.

The management of wastewater is furthermore regulated through national legislation including:

- Government Notice 110 of 1934, construction of houses and drain regulations;
- Technical guidance document F issued as part of the implementation of Legal Notice 134 of 2020 Energy Performance of Buildings Regulations. The competent authority for this legislation is the Buildings and Construction Authority.

Wastewater reuse

Uses allowed

Municipal wastewater reuse is allowed primarily for **agricultural uses** but may also be used for **landscaping purposes and specific industrial uses** and will be regulated according to the terms of the EU Water Reuse Regulation. **Only centralized wastewater treatment and reuse is allowed**, and hence all reclaimed water is treated up to Class A requirements of the EU Regulation, through the installation of additional polishing plants in the existing urban wastewater treatment plants.

In case water is used by industry or for civil uses (landscaping or street washing), then the quality requirements of Class A under the EU Regulation will indirectly apply; since the only source of reclaimed water is that provided through the central supply network operated by the Public

[7] www.era.org.mt

Utility–Water Services Corporation.

Treatment level requirements

The polishing plans installed within the UWWTP entail a quaternary (further) treatment phase to the effluent produced from the Urban Wastewater Treatment Plants through a three-barrier approach of **Ultrafiltration, Reverse Osmosis and Advanced Oxidation.** This additional treatment level enables the **achievement of the requirements of Class A** reclaimed water under the EU Water Reuse Regulation.

As noted above, **the microbiological parameters achieved through the additional polishing step comply with the requirements under Class A** of the Directive EU 2020/741. The current legislative framework **does not outline specific chemical parameters**, although the reverse osmosis step in the additional treatment process guarantees a high chemical quality of the effluent.

Monitoring and testing frequencies are still not defined at national level, although regular monitoring is undertaken by the operator (public utility) and monitoring frequency depends on the type of parameter. However, monitoring requirements established under the EU Water Reuse regulation will be adopted as part of the ensuing licensing framework.

Permitting procedure

The polishing plants were authorized by the Food Safety Commission (established under the Food Safety Act), since they entered operation before the entry into force of the EU Water Reuse Regulation.

A permitting procedure based on the risk assessment requirements of the EU Regulation will be established once the competent authority for this Regulation is identified.

Greywater reuse

Existing legislation does not include a definition of greywater or greywater Reuse. However, a recent internal consultation document issued by Government defines Greywater recycling as the reuse of **drain water generated from residential, commercial and industrial bathroom sinks, bathtubs and shower drains, and other household equipment such as washing machines**.

Uses allowed

The application of greywater reuse systems **is still technically prohibited under existing**

legislation, since Art. 97(h) of the Code of Police Laws of the 10th June 1854 and Art. 24 of Government Notice 110 of 1934 entitled Construction of Houses and Drains Regulations require that all drain water from baths and handwashing basins be discharged to the sewers through an open gulley trap. This is true unless a specific authorization is obtained from the Superintendent of Public Health.

Treatment level requirements

Since existing legislation still considers permits for greywater reuse on an ad-hoc basis, n**o minimum treatment levels or quality standards are established for the treated greywater to meet before use.** A public consultation exercise will, however, soon be launched by Government to start a legislative reform on greywater reuse.

Permitting procedure

As outlined under Art 97(h) of Cap 10 - Code of Police Laws a specific and ad-hoc permit is required from the superintendent of Public Health.

Rainwater reuse

Uses allowed

Reference is made to Technical Guidance F which outlines the uses for which the use of harvested rainwater is allowed: "*A separate water circulation system together with associated draw off points is to be provided to use collected rainwater for non-potable uses. Such uses include all or any of the uses listed below:*

a) ***Irrigation***

b) ***Flushing of toilets***

c) ***Laundry***

d) ***Washing of floor areas***"

Treatment level requirements

Technical Guidance Document F does **not outline any minimum treatment levels**, limit or monitor requirements.

Permitting procedure

The installation of rainwater harvesting cisterns for rainwater harvesting and reuse is required by law (Technical Guidance F) and therefore forms part of the Development Planning Permit.

Local regulatory variations in the pilot project area

Malta adopts a **national approach** in the application of water management and building policies, and therefore there are **no variations to the legislative instruments quoted above both at the regional and local level**.

Incentives and barriers to reuse

The adoption of Non-Conventional Water Resources (NCWR) technologies such as the reuse of greywater and rainwater harvesting come with challenges of their own, which limit the adoption of these technologies on a wider scale. The graph in Figure 6 shows the primary factors that would constrain consumers in Malta from investing in water saving technologies.

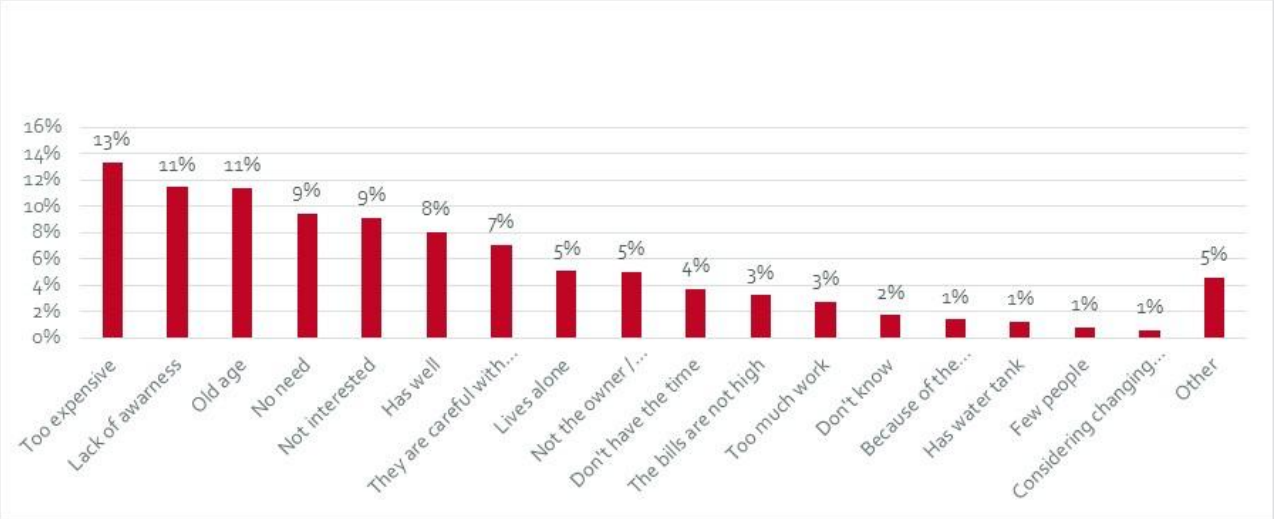


Figure 6 – The primary factors that would constrain consumers in Malta from investing in water efficient technologies (EWA 2021)

Seven key barriers to the adoption of NCWR technologies have been identified. These barriers are listed below.

- **Availability of affordable technologies:** the low availability of NCWR technologies in the local market (technologies and services) is an important barrier to their adoption by users. Household bio-mechanical grey-water treatment systems are still making their market entry, whilst suppliers of green-walls and constructed wetlands are limited. Hence consumers with an interest of investing in such NCWR technologies find accessibility as an important barrier to the eventual uptake of these technologies.
- Building type and space availability: the dense urban nature of cities limits the opportunities for the application of NCWR technologies due to limited space for their installation. The prevailing dense urban fabric limits the use of traditional wetland type applications, whilst the increased use of multi-story buildings also limits the opportunities for rainwater harvesting installations. Furthermore, the demand for parking spaces for vehicles, generated in dense urban environments, provides also a conflict with land availability for NCWR installations. Constructed wetlands (reed-beds) are a tried and tested solution for the treatment of grey-water. But such systems require land-area (challenge in urban areas) and a higher level of maintenance/attention. Also, such "open" systems – present a more difficult safety certification framework.
- **Perceptions of Users:** the perceptions of consumers with respect to non-conventional water resources are generally negative, with the cost, safety and management of these installations featuring strongly as barriers for the uptake of decentralized NCWR installations. Users' perceptions need to be addressed through the provision of clear information on NCWR technologies, given that lack of awareness on these technologies also features strongly as a concern.
- **Lack of regulations**: lack of specific regulations on the reuse of harvested rainwater and/or reclaimed greywater in most of the participating countries. Specific legislation is required which also sets acceptable water quality standards for greywater reuse – which ensure safety. This situation is further compounded by a weak regulatory framework resulting from the fragmentation of the regulatory responsibilities of different Ministries and Public Institutions with a role in regulating the effective implementation of non-conventional water resources applications. Effective regulatory frameworks need joint and cohesive involvement from the Health, Environment, Resources, Development and Finance sectors, which is generally difficult to attain, leading to separate and sometimes unaligned sectoral policy frameworks.
- **Separate plumbing systems (plumbing codes):** plumbing safeguards are important control mechanisms against contamination. First, the mains supplied water should be kept separate from any other water that is supplied from a private source of non-potable

water. Therefore, reclaimed greywater and rainwater should be kept separate from the municipal water supply within the domestic distribution system. No cross connections should be provided within an installation, e.g. from a supply pipe (service pipe up to tank) to a distribution pipe (portion of pipe from tank to faucets). In this manner potentially contaminated water in a distributing system cannot reach the supply pipe. Similarly, no pump or any other device should be connected to cause water to flow back into the supply pipe. A specific Plumbing Code and training/certification of plumbers would be a pre-requisite to the introduction of greywater treatment systems – to ensure the safety of installations.

- **Cost-effectiveness (pay-back period):** the payback period of any investment for the installation of NCWR technologies considers both the capital and the recurrent costs. Capital costs include the costs related to the equipment and the works required for the installation of the technology, whilst the recurrent costs include all the costs related to the operation of the technology including costs of electricity, chemicals and maintenance. Additionally, the pay-back period depends also on the actual cost of municipal water – namely the water being replaced by the harvested rainwater or the recycled greywater. The higher the cost of municipal water contributes to a shorter pay-back period. Ideally one should aim to a short pay-back period in the region of a less than 5-years – to make the installation financially feasible for consumers.

  Lack of financial support schemes: the relatively high payback periods for greywater recycling and rainwater harvesting systems can be mitigated through financial support schemes. Such schemes have been widely used, even in participating countries, to support the uptake of renewable energy and energy efficient technologies such as photovoltaic cells (PVs), solar water heaters and heat pumps. However, currently, there is limited support for new rainwater harvesting or greywater recycling systems intended to support consumers in addressing the additional capital and/or operational costs. The introduction of any such scheme would need to be effectively marketed with both suppliers and consumers. Support schemes would also give due recognition to the economic externalities generated through the adoption of such schemes.
  Lack of knowledge on Non-Conventional Water Resources: the lack of technical knowledge on Non-Conventional Water Resources applications limits the availability of "service offers" for their installation. Capacity requirements need to be addressed at the planning level (the integration of NCWR installations in the urban fabric), the technical and implementation level (the design of NCWR installations and their actual implementation) as well as the regulatory frameworks for ensuring the safe use of NCWR installations.

Legislative framework for water reuse in Spain

Spain's regulatory framework for unconventional water resources — including regenerated, desalinated, and reused water — is strongly aligned with the European Union's water policy framework. National legislation integrates the main EU directives and regulations aimed at ensuring the protection, sustainable use, and circular management of water resources.

Although water reuse in Spain is primarily governed by the **national Regulation on Water Reuse (Royal Decree 1085/2024)**, its implementation forms part of a broader environmental and water management framework at the state level. Several **national instruments remain applicable—such as the Regulation of the Public Hydraulic Domain (Royal Decree 849/1986), the Environmental Quality Standards established under Royal Decree 60/2011, and the Environmental Impact Assessment Law 21/2013**.

Together with the Water Framework Directive, these state-level regulations ensure that reuse activities are consistent with environmental protection objectives and with the ecological status requirements of water bodies.

The table below summarizes the main EU directives and regulations on water reuse and their transposition or alignment within the Spanish legal framework.

Table 34 EU directives and regulations on water reuse and their corresponding implementation in Spanish law.

Spanish Regulation	Scope and Content	EU Directive / Regulation Aligned With
Royal Decree 1085/2024 (Spanish Water Reuse Regulation)	Establishes the legal regime for water reuse in Spain: quality requirements, monitoring, risk management plans, authorisations, and permitted destinations.	- **Regulation (EU) 2020/741**: directly aligned. Spain expands the scope beyond reuse in agriculture. - **Directive 2000/60/EC (Water Framework Directive)**: reuse must comply with environmental objectives for water bodies. - **Directive 2006/118/EC (Groundwater Directive)**: requires prior assessment for aquifer recharge and infiltration. - **Directive 91/271/EEC (Urban Wastewater Treatment Directive)**: provides the basis for treated wastewater feeding reuse schemes. - **Directive 2008/105/EC (Environmental Quality Standards Directive)**: ensures reuse does not compromise EQS in surface waters. - **Directive (EU) 2020/2184 (Drinking Water Directive)**: aligned with public health protection and cross-connection control.
Spanish Water Law – Legislative Royal Decree 1/2001 (TRLA)	Defines core principles of water policy, public hydraulic domain, concessions, discharge permits, and the new reuse chapter (added in 2023).	- **Water Framework Directive 2000/60/EC**: Spain's main transposition instrument. - **Groundwater Directive 2006/118/EC**: incorporated through water planning and groundwater protection rules. - **EU Regulation 2020/741**: integrated after the 2023 reform (RD-law 4/2023) and RD 1085/2024.
Royal Decree 849/1986 (Regulation of the Public Hydraulic Domain – RDPH)	Implements the Water Law: procedures for permitting, discharges, control of activities in the public hydraulic domain.	- **Water Framework Directive 2000/60/EC**: ensures consistency with river basin planning and environmental objectives. - **Urban Wastewater Directive 91/271/EEC**: regulates discharge authorisations and control systems.
Royal Decree 60/2011 (Environmental Quality Standards)	Establishes environmental quality standards for priority substances in surface waters.	- **Directive 2008/105/EC (EQS Directive)**: this decree is its direct transposition.
Royal Decree 3/2023 (Drinking Water Quality)	Updates rules on drinking water, monitoring programmes, and materials in contact with drinking water.	- **Directive (EU) 2020/2184 (Drinking Water Directive)**: full transposition.
Environmental Impact Assessment Law 21/2013	Regulates environmental impact assessment for projects affecting water resources, including large reuse schemes.	- **Directive 2011/92/EU (EIA Directive)**: transposed into Spanish law.
Royal Decree 487/2022 (Legionella Prevention)	Defines risk management obligations in water systems, including non-potable networks using reclaimed or alternative waters.	- Based on **WHO health risk guidelines** and aligned with EU risk-management principles indirectly linked to Regulation 2020/741.

Wastewater reuse

Royal Decree 1085/2024 classifies reclaimed water according to both the type of use and the required quality class.

Each use category is identified by a specific letter - A (agricultural), U (urban), I (industrial), Ia (food industry), O (other uses), and R (environmental) - followed by a quality level (A+, A, B, C or D) that reflects the degree of treatment and sanitary or environmental protection required.

Uses allowed

Within the same type of use, there are specific applications that require different quality levels, depending on the level of risk associated with each activity. When reclaimed water is intended for multiple uses, the most stringent quality conditions shall apply.

Urban use:

- Irrigation of private gardens – U. A+ quality
- Flushing of sanitary devices (e.g. toilet cisterns) – U. A+ quality
- Ornamental ponds and circulating decorative streams accessible to the public– U. A quality
- Street cleaning (road washing) – U. B quality
- Irrigation of urban green areas (parks, public gardens and similar spaces) – U. B quality
- Fire-fighting systems – U. B quality
- Industrial vehicle washing – U. B quality
- Ornamental ponds and circulating decorative streams not accessible to the public – U. C quality

Agricultural use

- Food crops eaten raw where the edible part is in direct contact with reclaimed water. – A. A quality
- Root crops eaten raw. – A. A quality
- Food crops eaten raw where the edible part is produced above ground and not in contact with reclaimed water. – A. B quality
- Processed food crops. – A. C quality

- Non-food crops, including crops used to feed livestock (meat- or milk-producing animals). – A. C quality
- Woody crops where contact between reclaimed water and edible fruit is prevented. – A. C quality
- Ornamental flowers, nurseries and greenhouse crops without direct contact between reclaimed water and the plant products. – A. A quality
- Industrial crops not intended for food use. – A. C quality
- Energy crops. – A. C quality
- Seed production crops. – A. D quality

Industrial (non-food industry)

- Cooling towers and evaporative condensers (as make-up water). – I. A+ quality
- Process water (in contact at some stage with raw materials, intermediates, or final products). – I. C quality
- Cleaning water (for equipment, objects, materials, pipes, and surfaces in industrial areas, excluding food industry). – I. C quality
- Other industrial uses. – I. C quality

Food industry

- Cleaning water for raw materials, and for surfaces, materials, and objects intended to come into contact with food. – Ia. A+ quality
- Cleaning water for purposes other than the cleaning of food-contact surfaces, materials, or objects, if it does not constitute a source of contamination for food. – Ia. A quality
- Process water used during food manufacturing for cooling, or to produce steam or hot water in a closed circuit, if it does not come into contact with food. – Ia. B or C

Other uses

- Livestock farming: cooling systems in animal farms. – O. A+ quality
- Aquaculture (Includes the cultivation of aquatic animal and plant species, except filter-feeding molluscs). – O. A quality
- Recreational use: irrigation of golf courses or other sports fields. – O. B quality

- Livestock farming: cleaning water for equipment, objects, materials, pipes, and surfaces in livestock facilities. – O. C quality
- Forestry – O. D quality

Environmental uses

- Artificial recharge of aquifers through direct injection. – R. A+ quality
- Artificial recharge of aquifers through localized percolation through the soil. – R. C quality
- Supply of water resources to wetlands and other aquatic ecosystems. – quality to be defined

Treatment level requirements

The indicative treatment requirements are associated with the quality class of the reclaimed water and serve as guidance rather than mandatory processes; however, they represent the level of treatment necessary to ensure compliance with the minimum quality parameters established for each class.

The Royal Decree 1085/2024 distinguishes five main quality classes of reclaimed water based on the concentration of *E. coli*: A+, A, B, C and D. Each class corresponds to a specific level of sanitary protection and must be applied according to the intended use or destination of the reclaimed water.

Table 35 - Quality classes of the reclaimed water in Spanish Royal Decree 1085/2024

Quality class	**Indicative treatment**
A+, A	Secondary treatment, filtration, ultrafiltration and desinfection
B	Secondary treatment, filtration and disinfection
C, D	Secondary treatment and disinfection

When the reclaimed water produced does not reach the quality class required for the intended use, **additional barriers may be implemented to ensure that the same level of sanitary and environmental protection** is achieved. These additional barriers may consist of technical, physical, or management measures — such as supplementary disinfection, advanced filtration, restricted public access, or enhanced operational control — which effectively reduce the overall level of risk.

The use of such barriers is allowed as long as the final risk level is equivalent to that obtained with the required quality class. The combinations of quality classes and additional barriers that provide an acceptable risk reduction are established in Annex III, Part D of Royal Decree 1085/2024, and must be defined and justified in the Risk Management Plan approved by the competent authority.

Urban use

Table 36 - Quality classes and requirements of reclaimed water for urban use in Spanish Royal Decree 1085/2024

Quality Class	E. coli (CFU/100 mL)	Turbidity (NTU)	Suspended Solids – SS (mg/L)	Intestinal Nematodes (eggs/10 L) (2)	Bacteriophages (PFU/100 mL) (3)	Legionella spp. (CFU/L)	Contaminants
Quality U.A+	Absence (> 1UFC/100mL)	5	10	1	100 when aerosolization risk exists	(4)	(5)
Quality U.A	10	5	10	1	100 when aerosolization risk exists	(4)	(5)
Quality U.B	100	–	35 mg/l (1)	–	–	(4)	(5)
Quality U.C	1	–	35 mg/l (1)	–	–	–	(5)

(1) Optional: according to Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment.

(2) At least the genera *Ancylostoma, Trichuris* and *Ascaris* shall be monitored. Monitoring of intestinal nematodes is not required when the treatment includes ultrafiltration.

(3) The monitoring of total coliphages is recommended. However, if their analysis is not feasible, at least one type (F-specific or somatic coliphages) shall be analysed.

(4) The concentration of the parameter shall comply with the quality requirements established in Royal Decree 487/2022 of 21 June, which sets out the sanitary requirements for the prevention and control of legionellosis. See in the corresponding section of this document.

(5) In general, contaminants limited in the wastewater discharge permit shall be monitored to ensure that the production and supply of reclaimed water do not cause deterioration of the receiving environment, in accordance with Royal Decree 817/2015 (surface water) and Royal Decree 1514/2009 (groundwater protection).

Agricultural use

For agricultural use, the permitted irrigation method is established according to the crop category, as detailed in the following table.

Table 37 - Quality classes and irrigation methods for agricultural use in Spanish Royal Decree 1085/2024

Minimum Quality Class	Irrigation Method	Crop category
Quality A.A	All irrigation methods	– Food crops eaten raw where the edible part is in direct contact with reclaimed water. – Root crops eaten raw.
Quality A.B	All irrigation methods	– Food crops eaten raw when the edible part grows above ground and is not in direct contact with reclaimed water. – Processed food crops. – Non-food crops, including crops used to feed meat- or milk-producing animals. – Woody crops where the reclaimed water does not come in contact with fruits intended for human consumption. – Ornamental flowers, nurseries, and greenhouses without direct contact between reclaimed water and the produce.
Quality A.C	Drip irrigation or other irrigation methods avoiding direct contact with the edible part of the crop.	
Quality A.D	All irrigation methods	– Crops intended for non-food industry, energy production, or seed production.

The following table presents the maximum allowable concentrations of microbiological and physicochemical parameters for each reclaimed water quality class, as established in Royal Decree 1085/2024.

Table 38 - Quality classes and requirements of reclaimed water for agricultural use in Spanish Royal Decree 1085/2024

Quality Class	***E. coli* (CFU/100 mL)**	**Turbidity (NTU)**	**Suspended Solids – SS (mg/L)**	**BOD_5 (mg/L O_2)**	**Intestinal Nematodes (eggs/L) (3)**	***Legionella spp.* (CFU/L) (4)**	***Taenia saginata* and *Taenia solium* (eggs/L)**	**Contaminants**
Quality A.A	10	5	10	10	1 for pasture or forage irrigation	< 1,000 when aerosolization risk exists	–	(5)
Quality A.B	100	–	35 mg/l (1)	25	1 for pasture or forage irrigation	< 1,000 when aerosolization risk exists	1 for pastures of meat-producing animals	(5)
Quality A.C	1	–	35 mg/l (1)	25	1 for pasture or forage irrigation	< 1,000 when aerosolization risk exists	1 for pastures of meat-producing animals	(5)
Quality A.D	10	–	35 mg/l (1)	25	1 for pasture or forage irrigation	< 1,000 when aerosolization risk exists	–	(5)

(1) Optional: according to Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment.

(2) According to Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment.

(3) At least the genera *Ancylostoma, Trichuris* and *Ascaris* shall be monitored. Monitoring of intestinal nematodes is not required when the treatment includes ultrafiltration.

(4) Where applicable, compliance with the provisions of Royal Decree 487/2022 of 21 June also be required. See in the corresponding section of this document.

(5) In general, contaminants limit in the wastewater discharge permit shall be monitored to ensure that the production and supply of reclaimed water do not cause deterioration of the receiving environment, in accordance with Royal Decree 817/2015 (surface water) and Royal Decree 1514/2009 (groundwater protection).

Industrial use

- Non-food industry

Table 39 - Quality classes and requirements of reclaimed water for non-food industry use in Spanish Royal Decree 1085/2024

Quality Class	E. coli (CFU/100 mL)	Turbidity (NTU)	Suspended Solids – SS (mg/L)	Legionella spp. (CFU/L)	Contaminants
Quality I.A+	Absence (>1 UFC/100Ml)	5	10	(2)	(3)
Quality I.C	1	–	35 mg/l (1)	(2)	(3)

- Food indusrty

Table 40 - Quality classes and requirements of reclaimed water for non-food industry use in Spanish Royal Decree 1085/2024

Quality Class	E. coli (CFU/100 mL)	Turbidity (NTU)	Suspended Solids – SS (mg/L)	Legionella spp. (CFU/L)	Contaminants
Quality Ia.A+	The Ia.A+ quality in the food industry shall comply with the provisions of Article 65 of Royal Decree 3/2023.				
Quality Ia.A	10	5	10	(2)	(3)
Quality Ia.B or Ia.C	100 or 1,000	–	35 mg/l (1)	(2)	(3)

(1) Optional: according to Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment.

(2) The concentration of the parameter shall comply with the quality requirements established in Royal Decree 487/2022 of 21 June, which sets out the sanitary requirements for the prevention and control of legionellosis. See in the corresponding section of this document.

(3) In general, contaminants limited in the wastewater discharge permit shall be monitored to ensure that the production and supply of reclaimed water do not cause deterioration of the receiving environment, in accordance with Royal Decree 817/2015 (surface water) and Royal Decree 1514/2009 (groundwater protection).

Other uses

Table 41 - Quality classes and requirements of reclaimed water for other uses in Spanish Royal Decree 1085/2024

Quality Class	E. coli (CFU/100 mL)	Turbidity (NTU)	Suspended Solids – SS (mg/L)	Intestinal Nematodes (eggs/10 L) (2)	Bacteriophages (PFU/100 mL) (3)	Legionella spp. (CFU/L)	Contaminants
Quality O.A+	Absence (>1 UFC/100Ml)	5	10	–	–	(4)	(5)
Quality O.A	10	5	10	1	–	(4)	(5)
Quality O.B	100	10	20	1	100 when aerosolization risk exists	(4)	(5)
Quality O.C	1	–	35 mg/l (1)	–	–	(4)	(5)
Quality O.D	10	–	35 mg/l (1)	–	–	(4)	(5)

(1) Optional: according to Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment.

(2) At least the genera *Ancylostoma, Trichuris* and *Ascaris* shall be monitored. Monitoring of intestinal nematodes is not required when the treatment includes ultrafiltration.

(3) The monitoring of total coliphages is recommended. However, if their analysis is not feasible, at least one type (F-specific or somatic coliphages) shall be analysed.

(4) The concentration of the parameter shall comply with the quality requirements established in Royal Decree 487/2022 of 21 June, which sets out the sanitary requirements for the prevention and control of legionellosis. See in the corresponding section of this document.

(5) In general, contaminants limited in the wastewater discharge permit shall be monitored to ensure that the production and supply of reclaimed water do not cause deterioration of the receiving environment, in accordance with Royal Decree 817/2015 (surface water) and Royal Decree 1514/2009 (groundwater protection).

Environmental use

Table 42 - Quality classes and requirements of reclaimed water for environmental use in Spanish Royal Decree 1085/2024

Quality Class	**E. coli (CFU/100 mL)**	**Turbidity (NTU)**	**Suspended Solids – SS (mg/L)**	**Intestinal Nematodes (eggs/10 L) (2)**	**Bacteriophages (PFU/100 mL) (3)**	**Contaminants**
Quality R.A+	Absence (>1 UFC/100Ml)	5	10	1	100 only when the aquifer is used for water supply	(4)
Quality R.C	1	–	35 mg/l (1)	–	–	(4)
Quality – To be defined (Contribution of water resources to wetlands and other aquatic ecosystems)	Case-by-case assessment					

(1) Optional: according to Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment.

(2) At least the genera *Ancylostoma, Trichuris* and *Ascaris* shall be monitored. Monitoring of intestinal nematodes is not required when the treatment includes ultrafiltration.

(3) The monitoring of total coliphages is recommended. However, if their analysis is not feasible, at least one type (F-specific or somatic coliphages) shall be analysed.

(4) In general, contaminants limited in the wastewater discharge permit shall be monitored to ensure that the production and supply of reclaimed water do not cause deterioration of the receiving environment, in accordance with Royal Decree 817/2015 (surface water) and Royal Decree 1514/2009 (groundwater protection).

The following table specifies the quality requirements for *Legoinella spp*., according to the Royal Decree 487/2022 of 21 June.

Table 43 - Quality requirements for Legoinella spp., according to the Royal Decree 487/2022 of 21 June.

Type of Installation	**Aerobic Count (CFU/mL) (1)**	**pH (2)**	**Temperature (°C)**	**Turbidity (NTU)**	**Total Iron (mg/L)**	**Conductivity**
Domestic water systems	As established in Royal Decree 140/2003		Cold water: preferably < 20 °C Hot water: > 50 °C Storage tank: > 60 °C	< 4	≤ 0.2	–
Cooling towers and evaporative condensers	100	Variable depending on the biocide	–	< 15	< 2	(3)
Heated water systems or systems with similar temperatures (≥ 24 °C) and aerosolization with or without agitation and with or without recirculation (e.g. high-speed jets, air injection, multi-purpose pool tanks, splash pads, play fountains, waterfalls, etc.)	100	Variable depending on the biocide	As established in Royal Decree 742/2013	≤ 5	–	–
Evaporative cooling devices by spraying (aerosolization systems)	As established in Royal Decree 140/2003	–	Preferably < 20 °C	< 5	–	–
Other installations that may produce aerosolization	–	Variable depending on the biocide	Preferably < 20 °C	–	–	–

(1) Analysis method: Standard UNE-EN ISO 6222:1999 – Water quality. Enumeration of culturable microorganisms: Colony count by inoculation in nutrient agar medium.

(2) When the effectiveness of the disinfectant depends on pH.

(3) It must remain within the limits that allow for the water composition (hardness, alkalinity, sulphates, and others) to avoid scaling and corrosion.

The competent authority, following the guidance of the health authority, is responsible for defining the monitoring and control programmes for reclaimed water. These programmes must be consistent with the Risk Management Plan of the reclaimed water system and, unless otherwise authorised, must at least comply with the minimum requirements established in the annexes of the Royal Decree.

The monitoring frequencies indicated in the annex apply to the point of compliance, that is, the location where the quality of the reclaimed water is verified before it is supplied or used. However, the quality criteria, indicators, monitoring frequencies and control points may be modified according to the level of risk, with prior authorisation from the competent and/or health authority, as stated in Article 18.3 of the Royal Decree. The health authority may also establish additional or alternative control points and define their frequency, depending on the risk associated with the intended use of the reclaimed water. In all cases, sampling must be carried out in accordance with recognised national or international standards that ensure analytical quality and reliability, such as EN ISO 19458 for microbiological analysis or equivalent standards. The Royal Decree establishes the following:

Table 44 – Monitoring requirements for each intended use and different classes of reclaimed water

Use	**Quality**	**Turbidity**	**Flow**	***E. Coli***	**Suspended Solids (SS)**	**Intestinal Nematodes**	**Bacteriophages**	**DBO5**
Urban	U.A+	Continuous	Continuous	weekly	weekly	semestral	weekly	-
	U.A	Continuous	Continuous	monthly	monthly	semestral	monthly	-
	U.B	Continuous	Continuous	monthly	monthly	-	-	-
	U.C	Continuous	Continuous	monthly	monthly	-	-	-
Agricultural	A.A	Continuous	Continuous	weekly	weekly	fortnightly/conditional (2)	-	weekly

	A.B	Continuous	Continuous	weekly	according to DARU (1)	fortnightly/conditional (2)	-	according to DARU (1)
	A.C	Continuous	Continuous	fortnightly	according to DARU (1)	fortnightly/conditional (2)	-	according to DARU (1)
	A.D	Continuous	Continuous	fortnightly	according to DARU (1)	fortnightly/conditional (2)	-	according to DARU (1)
Industrial (except food-industry)	I.A+	Continuous	Continuous	weekly	weekly	-	-	-
	I.C	Continuous	Continuous	monthly	monthly	-	-	-
Food industry	Ia.A			monthly	monthly	-	-	-
	Ia.B			monthly	monthly	-	-	-
	Ia.C			monthly	monthly	-	-	-
Golf/sport fields	O.B	Continuous	Continuous	monthly	monthly	Semestral (3)	monthly	-
Aquaculture	O.A	Continuous	Continuous	monthly	monthly	Semestral (3)	-	-
Forestry	O.D	Continuous	Continuous	monthly	monthly	-	-	-
Livestock	O.A+	Continuous	Continuous	weekly	weekly	-	-	-
	O.C	Continuous	Continuous	monthly	monthly	-	-	-
Artificial aquifer recharge	R.A+	Continuous	Continuous	weekly	weekly	Semestral (3)	weekly	-
	R.C	Continuous	Continuous	monthly	monthly	-	-	-

(1) According to Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment, that depends on the size of the installation

(2) Fortnightly or depending on the number of eggs in the influent wastewater to the reclamation plant

(3) After two years of monitoring and based on historical absence data, the frequency may be gradually reduced from semi-annual to annual.

In the case of ***Legionella spp.,*** the sampling frequency is specified in Royal Decree 487/2022 of 21 June (Table 45).

Table 45 – Monitoring requirements for Legoinella spp., according to the Royal Decree 487/2022 of 21 June.

System / Installation	Legionella spp. (CFU/L)	Aerobic count (CFU/mL)	pH (1)(2)	Temperature (°C)(2)	Turbidity (NTU)(2)	Biocide (3)	Total Iron (mg/L) (4)	Conductivity
Domestic water systems	Quarterly	Quarterly	Daily	Daily, rotating	Weekly	Daily, where applicable, with continuous automatic reading	Quarterly	–
Cooling towers and evaporative condensers	Monthly	Quarterly	Daily	Daily	Weekly	Daily, where applicable, with continuous automatic reading	Monthly	Monthly
Heated water systems or systems with similar temperatures and aerosolization through agitation and recirculation (5)	Monthly	Monthly	Daily	Daily	Daily	Daily, where applicable, with continuous automatic reading	–	–
Evaporative cooling devices by spraying (aerosolization cooling systems)	Semi-annual	Semi-annual	Monthly	Monthly	Monthly	Monthly	–	–
Installations or equipment using mineral-medicinal and/or thermal water	Monthly	Quarterly	Weekly	Weekly	Weekly	–	–	–
Other installations that may produce aerosolization with storage and recirculation (6)	Annual	Semi-annual	Monthly	Monthly	Monthly	Monthly	–	–
Other installations that may produce aerosolization without recirculation	Annual	–	Monthly	Monthly	–	Monthly	–	–

(1) Depending on the biocide used.

(2) In the case of pH, temperature and turbidity, on-site monitoring may be carried out, preferably with continuous automatic readings.
(3) When physical disinfection treatments are used, the biocide control shall be replaced by monitoring parameters that ensure the proper functioning of the disinfection system.
(4) In domestic water systems, total iron shall only be analysed if the system contains metal components with iron in their composition.
(5) For installations covered by Royal Decree 742/2013 of 27 September, which establishes the technical and sanitary criteria for swimming pools, the provisions of that regulation shall apply, unless otherwise determined by the health authority.
(6) If necessary, additional parameters may be included when considered useful for assessing water quality or the effectiveness of the water treatment programme. However, the health authority may exempt the facility operator from analysing certain parameters if, based on the type of installation, their presence in the water is unlikely to pose a health risk.

Permitting procedure

Procedure for Obtaining a Reclaimed Water Use Concession (Articles 13–15, Royal Decree 1085/2024)

The use of reclaimed water in Spain requires a concession granted by the competent water authority, following the procedure set out in the Regulation of the Public Hydraulic Domain (RDPH).

1. Application

The procedure begins with the submission of an application through the electronic headquarters of the competent authority. The application must include:

- Identification of the reclamation plant and its authorization holder;
- Reference to the Reclaimed Water Risk Management Plan, if available;
- A commitment to comply with this plan.

If the plant has not yet been authorized, the concession is conditional upon obtaining that authorization.
When the applicant already holds a valid water use concession, a modification rather than a new concession may be granted, provided it is compatible with the river basin management plan and third-party rights.

2. Evaluation Procedure

Once the application is accepted, the authority initiates the project competition process and notifies affected parties.
Reports are requested from:

- The Health authority;
- The Ministry of Agriculture, when the use is agricultural.

The documentation is subject to public consultation for one month, and the evaluation follows the procedures defined in the RDPH.

3. Concession Resolution

The final decision must confirm that the reuse activity:

- Is compatible with water planning;
- Ensures a high level of protection for human and animal health and the environment, and
- Maintains ecological flows and existing uses.

The concession specifies:

- Authorized uses and quality requirements (as per Annex I);
- Volumes and flow rates allowed;
- Delivery points and control measures;
- Obligations for risk management and monitoring.

Where applicable, operation may be conditional on the approval of necessary works or installations.

Groundwater recharge, wetland and aquatic ecosystem use permits

Under Royal Decree 1085/2024, environmental applications such as groundwater recharge, wetland restoration or the release of regenerated water into rivers are classified as a specific "destination", rather than a conventional reuse category. However, the decree does not regulate the permitting procedure for these destinations.

The legal obligation to obtain authorisation is set out in the Spanish Water Law (Legislative Royal Decree 1/2001), particularly Article 101, which requires that any discharge into the public hydraulic domain meet environmental objectives and water quality standards. The administrative procedure itself—documentation, technical assessment, monitoring obligations and renewal conditions—is detailed in the Regulation of the Public Hydraulic Domain (Royal Decree 849/1986). In practice, the Water Law determines when authorisation is required, while the RDPH regulates how it must be granted by the competent water authority.

This autorisation applies in all cases where the activity involves:

- Introduction of water into a river, channel, lake, lagoon or wetland;
- Infiltration of water into the soil or a groundwater body for recharge purposes;
- Modification of natural water levels in wetlands or other aquatic ecosystems;
- Any intervention capable of altering the hydrological or ecological conditions of a water body.

The authorisation process typically requires the submission of:

- A technical project, describing the objectives of the intervention, expected volumes, origin and characteristics of the water, and the hydraulic design of the discharge or infiltration system;

- Water quality characterisation, confirming compliance with the requirements applicable to the water supplied (e.g. regenerated water under RD 1085/2024) and demonstrating suitability for the intended environmental destination;
- An environmental and hydrological assessment, showing that the activity will not deteriorate the ecological or chemical status of the receiving water body and is compatible with the relevant River Basin Management Plan and Environmental Quality Standards;
- A monitoring and control plan, specifying sampling points, analytical parameters, operational checks and reporting obligations.

Based on this documentation, the competent basin authority evaluates the proposal, may request additional technical or environmental reports, and sets the conditions under which the activity may be carried out. Authorisations are granted for a maximum of five years and must be renewed upon expiry, subject to verification that the activity continues to meet all applicable environmental objectives and operational requirements.

Pilot and research projects

Pilot and research projects are partially exempt from the full requirements of Royal Decree 1085/2024, provided that a responsible declaration is submitted to the competent water authority, which will in turn notify the regional health authority. This exemption applies only if the pilot does not take place in water bodies used for drinking-water abstraction or their protected areas, remains subject to appropriate monitoring, is limited to a maximum duration of five years, and does not result in placing agricultural products on the market when regenerated water is used experimentally for irrigation. Authorities may also impose additional environmental or sanitary conditions.

Importantly, the exemption applies only to the reuse regulation itself. If the pilot project involves the discharge or infiltration of water into the environment—such as to rivers, wetlands or groundwater bodies—it must still obtain a discharge authorisation under the Water Law (Legislative Royal Decree 1/2001) and the Regulation of the Public Hydraulic Domain (Royal Decree 849/1986). In other cases, when the water remains within a closed system and does not enter the public hydraulic domain, no hydraulic authorisation is required.

Reclaimed Water Risk Management Plan

As part of the permitting procedure, the responsible parties must prepare a Reclaimed Water Risk Management Plan in accordance with Royal Decree 1085/2024.

This plan is a mandatory document that identifies and evaluates the risks associated with the production, supply, and use of reclaimed water, and defines the necessary control measures to ensure its safe use for human health, the environment, and animal health.

The plan must be agreed upon by all responsible parties — including the producer, supplier, and end users — and submitted together with the application for the authorization or renewal of reclaimed water use. It is subject to review and approval by the competent water authority, following the assessment of the health authority.

Greywater reuse

Uses allowed

Although Spanish legislation does not define greywater as a separate regulatory category, the **technical and safety principles established in Royal Decree 1085/2024 on water reuse can serve as a reference framework for its safe application**.

Greywater originating from **showers, washbasins, and washing machines** may be reused for non-potable uses—**such as irrigation, cleaning, or toilet flushing—**when appropriately treated and when it meets comparable technical, sanitary and monitoring requirements to those applied to regenerated water.

Treatment level requirements

No national regulation specifies mandatory treatment levels for greywater. However, RD 1085/2024 provides a robust technical benchmark for minimum treatment processes for non-potable reuse.

Therefore, treatment requirements may be established by analogy using the criteria of:

- Appropriate physical, biological, and disinfection step;
- Ensuring microbial reductions equivalent to the intended use;
- Preventing pathogens, odors, turbidity, and solids.

Since greywater is not explicitly regulated at national level, there are no legally binding quality parameters.

However, for safety and consistency, the microbiological and chemical parameters defined in RD 1085/2024 may be used as a reference standard. In the previous section, related to wastewater reuse, there can be found the microbiological and chemical parameters according to RD

1085/2024. In some cases, quality parameters may be set by municipal ordinances and/or defined in UNE-EN 16941-2:2021 about on-site non-potable water systems.

RD 1085/2024 may be used as a reference standard also for the monitoring and testing frequency. In some cases, monitoring and texting frequency may be set by municipal ordinances and/or defined in UNE-EN 16941-2:2021 about on-site non-potable water systems.

Permitting procedure

As the installation is located in a space with public access, although in private property if there are areas where the public may have access, the operator must notify or request authorization from the competent regional or local sanitary authority.

In general, private use with no access has not the necessity of this authorisation/notification, except local municipal ordinance impose additional requirements.

This authority may require:

- Documentation on treatment performance;
- Operation and maintenance procedures;
- Risk-management measures (e.g. avoiding aerosol exposure, preventing cross-connections);
- Monitoring schedules.

The installation must comply with national technical standards, including:

- CTE HS4–HS5 (water supply safety and wastewater separation);
- UNE-EN 1717 (backflow protection);
- UNE-EN 16941-2:2021 (greywater systems in buildings).

If the greywater system discharges any effluent into the public sewer network, the operator must comply with:

- Water Law (RDL 1/2001);
- RDPH (RD 849/1986): which regulate discharge authorisations and control conditions, regulated by the competent authority.

When municipal ordinances are in place, they may establish their own specific permitting procedure for greywater or rainwater reuse systems.

Rainwater reuse

Uses allowed

Rainwater reuse is not explicitly regulated under Spanish national water reuse legislation, as Royal Decree 1085/2024 applies only to regenerated (treated wastewater) and industrial reclaimed water. Nevertheless, the same technical and sanitary principles provide a useful benchmark for ensuring the safe use of harvested rainwater.

When collected from suitable surfaces—typically rooftops—and adequately treated, rainwater may be reused for non-potable purposes such as irrigation, toilet flushing, cleaning, or supplying technical building systems. The suitability of each use depends on the level of treatment applied, the potential exposure of users, and local sanitary requirements.

Treatment Level requirements

There is no national regulation defining mandatory treatment processes for rainwater reuse. However, rainwater systems generally follow the criteria established in the technical standard UNE-EN 16941-1:2018, which sets out the design and operational requirements for rainwater harvesting systems.

Treatment requirements may be established by analogy with the approach used in RD 1085/2024, applying:

- Adequate physical treatment (filtration, first-flush diversion);
- Additional biological or disinfection steps where required by the intended use;
- Measures to prevent microbial growth, odours, turbidity and sediment accumulation.

Municipal ordinances may also establish minimum treatment measures depending on the planned application.

Because rainwater is not regulated as a reuse water category under national law, there are no binding microbiological or chemical parameters. In practice, reference values are taken from:

- UNE-EN 16941-1:2018, which provides guidance on quality considerations for non-potable uses;
- Municipal ordinances, which may specify additional thresholds for rainwater used in public space;
- By analogy, the microbiological and chemical parameters in RD 1085/2024, when a higher degree of public exposure exists.

For consistency, operators often adopt the parameter ranges used for non-potable reclaimed water, which are presented in the previous section of this report.

There is no national monitoring schedule for rainwater reuse installations. Monitoring frequency is therefore determined by:

- The recommendations in UNE-EN 16941-1:2018;
- The risk assessment for the intended use;
- Requirements established by municipal ordinances;
- Or, by analogy, the monitoring principles of RD 1085/2024 for non-potable applications.

Permitting procedure

Permitting procedure is the same as wastewater reuse.

Local regulatory variations in the pilot project area – Ebro valley

The national framework is set by the **Royal Decree (RD) 1085/2024**, which establishes the minimum quality requirements and monitoring frequencies. Regional authorities, such as the *Agència Catalana de l'Aigua* (ACA), define specific application, authorization, and control procedures based on local water management plans and risk assessment, often imposing stricter control measures.

Spain distinguishes between intra-regional and inter-regional river basins. Autonomous Communities manage only the basins that lie entirely within their territory. In Catalonia, this means that the Agència Catalana de l'Aigua (ACA) is responsible for water reuse authorisation and control in all internal basins.

In contrast, inter-regional basins, such as the Ebro River Basin, are managed by the Spanish State through its River Basin Authorities. As a result, any water reuse activity in the pilot project area — located within the Ebro Basin — falls under the jurisdiction of the C**onfederación Hidrográfica del Ebro (CHE).** Regional bodies like ACA or the Catalan Public Health Agency may provide technical or sanitary input, but final approval rests with the CHE.

Thus, water reuse projects in Catalonia follow different administrative procedures depending on whether they are in an ACA-managed basin or within the Ebro Basin under CHE competence.

- **Regulation of the Public Water Domain – RD 849/1986**
  It is the regulation that implements the Water Law and defines how concessions,

discharges, hydraulic works, and aquifer recharge are processed. Without it, the administrative authorization procedure is incomplete.

- **RD 60/2011 – Environmental Quality Standards (EQS)**
  It regulates the limits of pollutants and priority substances in water bodies. Essential to ensure that water reuse does not deteriorate rivers, wetlands, or aquifers—especially in the Ebro Delta.
- **Law 21/2013 – Environmental Impact Assessment (EIA)**
  Any reuse project involving works, pipelines, recharge, or interventions in protected areas requires an EIA. In the Ebro Delta, which includes Natura 2000 sites, this law is almost always mandatory.
- **Sanctioning Regime of the Water Law (TRLA, Title VII)**
  It defines responsibilities, infringements, and penalties for failing to comply with concession conditions or water quality standards. It completes the framework from a compliance and governance perspective.
- **Technical Building Code (CTE) – DB HS4 and HS5**
  It regulates indoor installations, separate networks, water reuse in buildings, and stormwater management. Key for small-scale reuse projects such as hotels, campsites, or public buildings in the Delta.
- **UNE-EN 1717 – Protection Against Backflow**
  It sets sanitary safety requirements to prevent cross-contamination between drinking water and reclaimed water. Essential for urban uses, hotels, facilities, and any dual-network system.
- **Hydrological Plan of the Ebro River Basin 2022–2027**
  It establishes environmental objectives, ecological flows, and conditions for water use in the basin. Any project in the Delta must be compatible with this plan.
- **Law 42/2007 – Natural Heritage and Biodiversity**
  It regulates the protection of natural areas, species, and habitats. The Ebro Delta is a ZEPA, an SCI, and a RAMSAR site. Any intervention in these areas must comply with this law.

Wastewater reuse

Section	Details of Regional Regulation (ACA)	Legal Reference / Alignment
Uses allowed	ACA promotes the use of reclaimed water as a strategic alternative for non-potable uses (industrial, environmental, and agricultural), particularly in water-stressed areas like the Ebro Delta (e.g., rice paddy irrigation - *arrossars*).	Aligned with RD 1085/2024, Category A (Agricultural Use) [1.1, 2.1].
Treatment level requirements	Water must undergo complementary regeneration treatment (*Estació de Regeneració d'Aigua* - ERA) after the wastewater treatment plant (EDAR). The required level must meet the quality class defined by the national RD for the specific use.	Defined by the quality class (e.g., A, B, C) associated with the specific agricultural use in the project context [1.4].
	The *Generalitat de Catalunya* (via ASPCAT) explicitly adopts and references the tables in Annex I of the national RD 1085/2024. No specific regional microbiological parameters are added.	Adoption of RD 1085/2024 Annex I [1.4, 2.5]. Research projects (e.g., SUGGEREIX) control for Trace Organic Contaminants (TrOCs) within the self-control plan [1.6].
	The frequency is defined by the RD 1085/2024 and specified in the **Quality Control Plan** (*Pla de control de qualitat*) submitted to ACA for authorization. This plan must include a Risk Assessment and define the Critical Control Points (CCP).	Based on the RD 1085/2024 requirements, adapted by the specific risk assessment validated by Confederación Hidrogràfica del Ebro (CHE)
Permitting procedure	Reutilization is subject to an administrative concession (*concessió administrativa*) from the competent hydraulic authority (ACA for the *Internal Basins of Catalonia*). The procedure requires: 1. Concession Application to ACA. 2. Presentation of requirements (data, flow rates, uses). 3. Presentation of the Quality Control Plan and maintenance program. 4. Health Guarantee ensuring continuous disinfection and residual disinfectant, as required by the RD 1085/2024.	Governed by Confederación Hidrogràfica del Ebro (CHE)

Greywater reuse

In Catalonia, decentralized greywater reuse (at the building level) is typically governed by local/municipal regulations and technical standards, rather than single ACA law.

Section	Details of Regional/Local Regulation (ACA/Municipalities)	Legal Reference / Alignment
Uses allowed	Decentralized systems (in buildings or complexes) are generally authorized for non-potable uses: toilet flushing (*omplerta de cisternes*), surface cleaning, and garden irrigation.	Local/Municipal Ordinances [2.2, 2.3].
Treatment level requirements	Minimum treatment includes filtration and disinfection (e.g., with Membrane Bioreactor - MBR, or chemical treatment). Quality requirements reference technical standards (UNE-EN 16941-2:2021) and assimilate to the strictest non-potable parameters of RD 1085/2024 (e.g., Class U.A+ for toilet flushing).	Technical Standards (UNE-EN 16941-2:2021) and reference to RD 1085/2024 [2.2].
	No specific regional parameters for greywater are defined. Quality is ensured by technical standards compliance and assimilation to the most restrictive non-potable parameters of the RD 1085/2024.	Reference to RD 1085/2024 [2.2], local ordinances or technical standards (UNE-EN 16941-2:2021)
	Monitoring and analysis frequency (recommended at least annually) are established in the facility's maintenance and self-control plan, in line with technical standards (UNE-EN 16941-2:2021).	Reference to RD 1085/2024 [2.2], local ordinances or technical standards (UNE-EN 16941-2:2021)
Permitting procedure	Permitting is managed at the local/municipal level through building licenses. Large installations or those requiring aquifer recharge need specific CHE authorization.	Local Ordinances and Building Codes.

Rainwater reuse

Like greywater, rainwater harvesting and reuse are primarily governed by local Ordinances and technical standards.

Section	Details of Regional/Local Regulation (ACA/Municipalities)	Legal Reference / Alignment
Uses allowed	Non-potable uses such as toilet flushing, irrigation, and exterior cleaning.	Local Ordinances [2.2].
Treatment level requirements	Simple treatment typically involves filtration and sedimentation to remove debris and turbidity.	Based on technical standards (UNE-EN 16941-1:2021) or local ordinances [2.2].
	Reference is made to technical standards (UNE-EN 16941-1:2021) and local health regulations to ensure absence of contamination and contact with the potable network.	Technical Standards (UNE-EN 16941-1:2021) or local ordinances [2.2].
	Monitoring is based on maintenance requirements defined by the responsible technician and applicable standards.	Technical Standards (UNE-EN 16941-1:2021) or local ordinances
Permitting procedure	Covered by building permits and local ordinances.	Local Ordinances.

Incentives and barriers to reuse

Policy and regulatory incentives

- National framework promoting reuse: Royal Decree 1085/2024 establishes a unified national framework for reclaimed water, providing legal certainty and encouraging operators to invest in reuse.
- Alignment with EU policies: EU Regulation 2020/741 and climate adaptation strategies prioritise water reuse as a key measure to address drought and water scarcity

Financial incentives and funding opportunities

- National level fundings: National funding programmes, such as the PERTE for the Digitalisation of the Water Cycle, support improvements in monitoring, control and optimisation of water systems. These investments help create the conditions needed for future integration of reclaimed water in urban, industrial and agricultural networks.

- Regional funding (Catalonia): The Catalan Water Agency issues periodic grants for installing rainwater harvesting systems, improving SUDS, and upgrading municipal water efficiency.
- Also, specific grant schemes have been established to support water-saving and reuse projects in tourist accommodation establishments. These programs, regulated by Order EMT/265/2023 and subsequent calls, provide direct financial support for measures such as water reuse, demand reduction and efficiency improvements in hotels, campsites and other lodging facilities.

Tariff and cost-based incentives

- Tariff and fee incentives for reclaimed water: the Spanish legal framework explicitly enables economic incentives for users who replace conventional water sources with reclaimed water. The reform of the Water Act through Royal Decree-law 4/2023, further developed by Royal Decree 1085/2024, allows both the exemption of the reused volume from the discharge control levy and the exemption from additional tariff costs associated with changing the water source, provided certain conditions are met. Together, these provisions create a clear basis for river basin authorities and water utilities to design financial incentives that make reclaimed water more attractive than conventional abstractions, especially in water-stressed regions. Although the detailed tariff structures are defined at basin or municipal level, national legislation explicitly opens the door to such economic advantages.

Operational and strategic incentives for end users

- Reduced dependency on freshwater during droughts: for agriculture, tourism and industry, using greywater, rainwater or reclaimed wastewater can reduce dependence on conventional freshwater supplies and limit the impact of drought restrictions on operations.
- Improved sustainability performance and market positioning
- Reuse project can help tourism sector, agriculture sector and industry to meet sustainability criteria and environmental certification requirements, strengthening their reputation and competitiveness.

Regulatory and administrative barriers:

- Dual administrative complexity (ACA & CHE): even though the new national regulation provides a clearer framework for water reuse, the authorization process remains complex due to the number of permits required and the lack of coordination between

administrations. This is particularly evident in shared river basins such as the Ebro, where management by the Ebro River Basin Authority (CHE) must align with regional authorities in Catalonia, creating additional procedural and coordination barriers.

- Strict authorization requirements for reclaimed water: for wastewater reuse, under the RD 1085/2024, reclaimed water reuse requires: formal permit, risk management plan, detailed quality monitoring and technical documentation. This might represent a significant bureaucratic burden, especially for small agricultural users or municipalities.
- Lack of specific and clear regulations for greywater and rainwater reuse: Greywater and rainwater reuse within private property are not covered by national reuse legislation, but their use in semi-public or public spaces (gardens, hotels, campsites…) often lacks a clear regulatory protocol. This regulation ambiguity can make authorities and operators more cautious and can slow down approvals.

Economic and financial barriers

- High initial investment: installing treatment units, separated pipelines, storage tanks, and monitoring systems can be costly. In the Ebro Delta, where farms and touristic facilities may be small or seasonal, return on investment is not always clear.
- Operational and maintenance costs: especially for reclaimed wastewater, water quality monitoring requirements (e.g. microbiological tests) increase annual operating costs. Many small users lack the capacity to manage such systems sustainably.
- Limited financial incentives: although funding exists, it is competitive and project based. The absence of direct subsidies or tariff reductions for using reclaimed or alternative water sources limits uptake.

Social and organisational barriers

- Public perception concerns: some farmers, tourists, or residents may have negative perceptions of wastewater reuse, particularly for irrigation or contact uses.
- Fragmented responsibilities: multiple agencies (CHE, ASPCAT, ACA, local councils, environmental bodies) may be involved. Without a unified coordination mechanism, projects can encounter administrative inertia.
- Lack of technical expertise at local level: many small municipalities or community operators in the Delta do not have dedicated staff trained to manage reuse systems, impairing long-term sustainability.

Challenges in Harmonization

Analysis of national legal frameworks on water reuse of the project countries

The analysis of national legal frameworks on water reuse in the project countries is a crucial step for understanding the level of regulatory maturity, the differences between legislative approaches, and the opportunities for harmonization. Examining existing regulations makes it possible to identify both common elements and critical gaps that may hinder the adoption of safe and efficient reuse practices, providing a solid basis for developing shared strategies and operational recommendations at the transnational level.

In the following paragraphs, the legislation of each project country will be examined for each specific type of water—wastewater, greywater, and rainwater—and subsequently compared. For every category, the analysis will outline the national regulatory frameworks, highlight their key provisions, and identify similarities and differences across countries.

Overview of legislation on wastewater reuse and SWOT analysis

The Table 46 offers a concise comparative overview of national approaches to treated wastewater reuse across the seven countries involved in the project, summarising permitted end-uses, the treatment/quality classes applied, key monitoring parameters and the prevailing permitting regimes.

Table 46 Overview of national legislation on treated wastewater reuse in the project countries

Country	Allowed uses	Treatment / quality class	Key parameters & Monitoring	Permitting
Albania	Allowed but limited formal deployment	No comprehensive national law	No parameters for the reuse of wastewater are in place	Case by case authorizations
Cyprus	Agricultural and urban irrigation; aquifer recharge; industrial uses	Applies EU classes A–D; tertiary treatments in all WWTP ensure compliance with Class A	Parameters according to EU 2020/741; Monitoring: Class A weekly microbiological and monthly chemical parameters; Class B–D reduced frequency based on risk assessment	Formal authorisation issued/overseen by Water Development Department (WDD) and WRRMPs required

France	Agriculture; landscape/urban irrigation; industrial uses: environmental uses	Aligns with EU A–D classes	Parameters, limits and monitoring according to EU 2020/741 with additional parameters (Coliphages Clostridium perfringens); conductivity, chlorides and VOC added for industrial uses	Authorisation and commissioning controls under Decree n°2023 835 and Order of 18 December 2023
Greece	Irrigation (limited or unlimited); replenishing of underground aquifers; urban and peri-urban use; industrial use	Based on M.D. 145116/2011 and depending on use, partially aligned to EU	Parameters regulated are E. coli, BOD5, SS, Turbidity, heavy metals with limits depending on the final use; type of pretreatments are also indicated; preferable agronomic characteristics of wastewater for irrigation.	Authorization requires application Water Directorate of the Decentralized Administration, technical study, environmental and health approvals
Italy	In the draft Decree agricultural, industrial, civil and environmental use	New DPR for aligns with EU classes; regional implementation details	In the new draft Decree parameters, limits and monitoring according to EU 2020/741 for agricultural reuse (plus N, P, salinity, salmonella); set parameters and limits for industrial, civil and environmental use	Regional permitting for production/supply; WRRMPs required for authorization
Malta	Agriculture, landscaping purposes and specific industrial uses	National strategy references EU classes; the polishing plans installed in the UWWTP entail a quaternary treatment phase to the effluent achieving Class A quality	Parameters, limits and monitoring according to EU 2020/741	A permitting procedure based on the risk assessment requirements of the EU Regulation will be established once the competent authority for this Regulation is identified
Spain	Urban use, agricultural use, industrial use, food-industry use, environmental use, other uses	Royal Decree 1085/2024; five main quality classes of reclaimed water based on the concentration of E. coli: A+, A, B, C and D.	Parameters, thresholds and monitoring are set according to use and class of quality (same parameters included in EU Regulation plus Bacteriophage or Taenia for some uses)	Authorisation, monitoring and commissioning under updated Royal Decree; WRRMPs required

The shows a clear trend of alignment among EU Member States with the principles and class-based approach of Regulation (EU) 2020/741 — several countries (Cyprus, France, Malta, Spain and, increasingly, Italy and Greece) have translated the EU classes into national frameworks, established class-specific monitoring regimes and tied authorisations to approved Water Reuse

Risk Management Plans (WRRMPs) and commissioning controls.

At the same time, national adaptations are evident: some states add precautionary parameters for sensitive uses (e.g., viral indicators, VOCs, conductivity or salinity limits for industrial or food-industry applications), and Spain's A+/A class distinction and France's additional microbiological and chemical checks illustrate more prescriptive national layers.

By contrast, Albania is still trying to align to EU main Directive to ensure safe water access and wastewater treatment: reuse is permitted but formal deployment is limited, there is no comprehensive national law or standardised parameter set, and authorisations are handled on a case-by-case basis, creating regulatory uncertainty and constraining scale-up. Overall, the table highlights both convergence around EU minimum requirements and important national variations in technical detail, monitoring intensity and permitting practice that will influence the pace and safety of reuse implementation.

The Table 47 summarises a comparative SWOT snapshot of national approaches to treated wastewater reuse across seven countries, highlighting each jurisdiction's strengths, weaknesses, opportunities and threats in relation to policy, technical capacity and market conditions.

Table 47 - SWOT analysis of national framework on wastewater reuse of the project countries

Country	Strengths	Weaknesses	Opportunities	Threats
Albania	Strategic national strategies and alignment goals; growing policy interest; existing wastewater laws provide a base.	No reuse classes or standardised parameters and monitoring; weak enforcement.	EU-alignment process; pilot potential	Institutional gaps; slow harmonization; limited monitoring capacity
Cyprus	Strong national tertiary treatment mandate; high reuse rate (>90%)	Limited harmonisation for non-agricultural uses; High salinity in some plants; storage limits	Scale up aquifer recharge; tourism/agriculture resilience	Climate extremes increasing demand; infrastructure costs; Seasonal storage overflow; public acceptance issues
France	Recent transposition and clear national rules; monitoring framework.	Implementation complexity for small utilities.	Large-scale reuse targets, economic competitiveness of some sectors such as agricultural irrigation	Regional rollout delays; High CAPEX for tertiary upgrades; public acceptance issues
Greece	Existing ministerial decisions and River Basin Management Plans; pilot experience.	Low current reuse share; fragmented implementation	Strengthen national permitting and training. Island and agricultural pilots; aquifer recharge potential	Institutional capacity gaps; seasonal demand peaks; limited funding
Italy	Established legal base (DM 185/2003 + Law 68/2023)	Full transposition is still pending (awaiting the publication of the new DPR on water reuse that aligns with EU regulation); regional fragmentation.	New DPR can harmonise standards and boost reuse.	Slow regulatory completion; funding for upgrades.
Malta	Centralised Class A production; integrated with desalination strategy.	Implementing acts and authority designation incomplete.	Island-wide reuse for agriculture/landscaping; tourism resilience.	Market and permitting uncertainty; small market size
Spain	Comprehensive national RD 1085/2024; clear classes and permits	Complex multi-authority procedures in interregional basins	Lead EU best practice; expand agricultural reuse. Strong national incentives; tariff options; pilot exemptions	Inter-administrative friction; variable local capacity.

Overall, EU Member States show a clear trend toward alignment with the class-based approach of Regulation (EU) 2020/741: several countries (Spain, France, Cyprus, Malta and increasingly Italy

and Greece) combine formal legal instruments or national strategies with class-specific treatment and monitoring regimes and WRRMP-linked permitting, which strengthens regulatory certainty and public-health safeguards. Country profiles differ in emphasis: Spain and France present the most prescriptive, commission-oriented frameworks and clear permitting pathways; Cyprus and Malta demonstrate strong operational practice (high reuse rates and Class A polishing) but face practical constraints such as salinity, storage and authority designation; Italy's legal base exists but full transposition awaits the new DPR, while Greece shows useful pilot experience yet fragmented rollout. Albania stands out as an outlier where reuse is permitted but lacks standardised classes, parameters and monitoring, leaving authorisations ad hoc and scale-up constrained. Common opportunities include expanding aquifer recharge, agricultural resilience and tourism-sector synergies, while shared threats are high CAPEX for tertiary upgrades, seasonal demand peaks, institutional fragmentation and public acceptance challenges. The table therefore reveals convergence around EU minimums but also important national variations in technical detail, enforcement capacity and permitting practice that will determine how quickly and safely reuse can be scaled.

Overview of legislation on greywater reuse and SWOT analysis

The Table 48 provides a comparative overview of the regulatory landscape governing **greywater reuse** across selected European and Mediterranean countries. It highlights how greywater reuse is addressed—or, in several cases, not explicitly regulated—within national legal frameworks, and how this affects allowed uses, treatment requirements, quality standards, monitoring approaches, and permitting procedures. Overall, the table illustrates the fragmented and heterogeneous nature of greywater governance in the region, reflecting different levels of regulatory maturity, public health protection strategies, and policy ambition.

The table is structured around five main dimensions:

- **Allowed uses**, describing whether and for which purposes greywater reuse is permitted (e.g. domestic non-potable uses, irrigation, public buildings).
- **Treatment requirements and quality classes**, indicating whether minimum treatment levels or formal quality classes are defined.
- **Key parameters and monitoring**, focusing on microbiological, physical, and chemical indicators and how compliance is verified.
- **Permitting**, outlining the administrative procedures required to authorize reuse systems.

Across countries, several recurring patterns emerge:

- In **Albania, Cyprus, Greece, Italy, and Spain**, greywater reuse is generally *not regulated as a distinct category*. Instead, it is assessed under broader wastewater reuse, water pollution, or building regulations.
- **France** stands out as the only country in the table with a **recent, explicit and binding framework** for non-potable water reuse (Decree of 12 July 2024), including defined quality classes (A and A+) and detailed health-based monitoring requirements.
- **Malta** currently maintains a **de facto prohibition** on greywater reuse, although policy reform is anticipated.
- In several countries (e.g. **Cyprus, Italy, Spain**), **technical standards** such as EN or UNI norms provide design and operational guidance, but these standards are not legally binding unless referenced in permits or local ordinances.
- Monitoring approaches are often **risk-based and project-specific**, particularly where no national parameter limits are established.

Table 48 Overview of national legislation on greywater reuse in the project countries

Country	Allowed uses	Treatment / quality class	Key parameters & Monitoring	Permitting
Albania	Reuse of greywater is not listed in one binding national regulation. Acceptability is determined case-by-case	No treatments or quality class are defined	Parameters are primarily controlled through wastewater treatment/discharge requirements (es. 2024 technical regulation), with additional focus where public health risks are elevated	Case by case permits
Cyprus	No specific standalone legislation in Cyprus has no dedicated legislation for greywater reuse. Applications are regulated under the general water pollution and wastewater reuse framework, with implementation limited to voluntary and pilot-scale projects for non-potable uses in domestic and public buildings.	No national standards. Usually treatment include: screening pretreatment, biological treatment, filtration and disinfection. Technical standards (e.g., CYS EN 16941-2:2021) offer detailed design and operation guidance but are not themselves binding laws.	No national binding parameter: however low E. coli, low turbidity levels and chemical safety are the targets. Monitoring is risk-based and project-specific	Local permits/approvals for installation; Department of Environment oversees compliance with general environmental and water conservation laws. Implementation is mainly supported through incentive schemes and awareness-raising initiatives (e.g. Mission Water and NCWR projects).
France	Can be included in the decree of 12 July 2024 for the use of non-potable water (EIC). Toilet flushing; floor cleaning and exterior washing; watering green spaces close to the public; in some cases, the cooling of technical equipment	The decree of 12 July 2024 for the use of non-potable water (EIC) introduce two quality classes (A and A+) plus safety, monitoring, and permitted-use requirements to protect public health	A+ and A classes include limits and monitoring for: Escherichia coli, Intestinal enterococci, Legionella pneumophila, Turbidity, TOC, Free chlorine residual (In case of chlorination), pH	Technical conditions for recycling systems; pilot operations subject to temporary prefectural authorization and operate under supervision of Regional Health Agency
Greece	Ministerial Decision (MD) 145116/2011 is the core regulation in term of reuse but it	Ministerial Decision (MD) 145116/2011 is the core regulation in term of reuse	Microbiological limits and operational criteria aligned with wastewater reuse	No specific licensing procedure is required. If involve the implementation of technical or

	does not specifically address a separate, detailed regime for greywater reuse as a distinct category	but it does not specifically address a separate, detailed regime for greywater reuse as a distinct category		mechanical (reconstructional) works, the procedures in the New General Construction Code (L. 4067/2012) apply.
Italy	No dedicated reglation. Domestic non-potable uses; public building reuse in selected cases. New Decree is about to be published and will harmonize the reuse of greywater for irrigation and for civil, industrial and environmental uses.	No uniform national greywater law; Regional guidelines; case-by-case classification.	Wastewater reuse legislation applies when reuse is carried out in a building different from the one where greywater is generated. In the new Decree, greywater reuse is subject to the same conditions and parameters as wastewater reuse..	Italian technical standard (UNI/TS 11445:2012) provides design, installation, and maintenance specifications for systems for the collection and use of non-potable water in residential buildings
Malta	Greywater reuse systems is still technically prohibited under existing legislation; reform on greywater reuse is about to be started by the Government	no minimum treatment levels are established	no parameters and monitoring targets	As outlined under Art 97(h) of Cap 10 - Code of Police Laws a specific and ad-hoc permit is required from the superintendent of Public Health
Spain	Spanish legislation does not define greywater as a separate regulatory category, Royal Decree 1085/2024 on water reuse can serve as a reference framework for uses	Spanish legislation does not define greywater as a separate regulatory category, Royal Decree 1085/2024 on water reuse can serve as a reference framework for classes	Spanish legislation does not define greywater as a separate regulatory category, Royal Decree 1085/2024 on water reuse can serve as a reference framework for classes and parameters/limits. In some cases, quality parameters may be set by municipal ordinances and/or defined in UNE-EN 16941-2:2021 about on-site non-potable water systems	If used in areas where the public may have access, notify or request authorization from the competent regional or local sanitary authority. The installation must comply with national technical standards: CTE HS4–HS5; UNE-EN 1717; UNE-EN 16941-2:2021

The comparison shows that **greywater reuse remains an underdeveloped and weakly harmonised policy area** across the countries examined. Most regulatory systems still treat greywater as a subset of wastewater, rather than recognising its distinct risk profile and reuse potential. This has several implications:

- **Regulatory uncertainty**: Case-by-case permitting (e.g. Albania, Italy) and the absence of clear national standards can discourage investment and large-scale implementation.
- **Uneven public health protection**: While France applies a precautionary, parameter-driven approach, other countries rely on indirect controls or general wastewater rules, which may be either overly restrictive or insufficiently tailored.
- **Limited deployment**: In countries such as Cyprus and Malta, greywater reuse is confined to pilot projects or remains prohibited, indicating that legal barriers, rather than technical feasibility, are the main constraint.
- **Trend towards alignment with wastewater reuse frameworks**: Italy and Spain explicitly reference existing wastewater reuse decrees as interim solutions, and upcoming reforms (e.g. the new Italian decree) suggest a move toward harmonisation rather than the creation of a fully separate greywater regime.

Overall, the table suggests that while awareness of greywater reuse as a water-saving measure is increasing, **only a few countries have translated this awareness into clear, enforceable, and scalable regulatory frameworks**. Future policy development is likely to focus on bridging the gap between flexible, risk-based approaches and the need for legal certainty, especially in the context of water scarcity and climate adaptation strategies.

Here's a clear, discursive **introduction, description of contents, and commentary on results** based on the SWOT table you provided, written in formal but readable English and using bullet points only where they add value.

The Table 49 presents a **SWOT analysis** of **greywater reuse governance** in selected European and Mediterranean countries. By identifying strengths, weaknesses, opportunities, and threats, it provides a strategic perspective on how current regulatory, technical, and institutional conditions may support or hinder the wider adoption of greywater reuse systems. This qualitative assessment complements legal and technical comparisons by highlighting not only what exists today, but also the structural challenges and future pathways for policy development.

Across the countries analysed, several common features emerge. Most jurisdictions rely on **general wastewater reuse frameworks or technical standards**, rather than dedicated greywater legislation. Pilot projects, research initiatives, and non-conventional water reuse (NCWR) strategies play an important enabling role, particularly in Cyprus, Greece, France, and Spain. At the same time, public perception, monitoring capacity, and regulatory complexity recur

as cross-cutting challenges.

Table 49 - SWOT analysis of national framework on greywater reuse of the project countries

Country	Strengths	Weaknesses	Opportunities	Threats
Albania	Practical case-by-case handling possible	No specific greywater regulation or standards.	Local decentralized solutions for rural areas; Create simple national rules to enable safe household reuse.	Legal uncertainty; public health risk if unmanaged; Limited technical capacity and monitoring resources.
Cyprus	Technical guidance and pilot projects exist; NCWR promotion	No binding national standards; limited uptake	Domestic water savings; school/public building pilots; develop national standards and incentives for decentralised systems.	Lack of monitoring rules; low public awareness
France	Decrees/arrêtés include greywater provisions; monitoring rules.	Pilot focus; complexity for small-scale domestic systems.	Reduced potable demand; promote certified small-scale solutions and market standards.	Liability and maintenance issues for homeowners.
Greece	Technical standards referenced; research pilots; NCWR experience on islands	Absence of a separate greywater legal framework.	Integrate greywater into national reuse policy and building codes; decentralized systems for remote islands	Fragmented local rules hinder uptake; limited monitoring and public trust
Italy	UNI standards and regional rules provide technical basis. New Decree will harmonise regulation on water reuse including graywater.	No uniform national greywater regulation; regional disparity	New Decree sets national greywater uses and monitoring rules.	Inconsistent enforcement across regions; Liability and plumbing separation issues
Malta	Greywater currently restricted; emerging policy discussion	Greywater technically prohibited by older laws	Introduce safe decentralized greywater regulations for buildings.	Public resistance; perceived health risks.
Spain	RD 1085/2024 provides technical benchmark; UNE standards adoption	No single national greywater statute; local variability.	Encourage municipal pilot programmes and standard certification.	Inconsistent municipal rules limit scale-up.

The SWOT analysis highlights a **shared imbalance between technical readiness and regulatory clarity**. In many countries, technical know-how, standards, and pilot experience already exist, but these are not consistently translated into clear, enforceable national rules.

Several trends stand out:

- **Regulatory gaps are the main limiting factor**. Albania, Greece, Italy, and Spain lack a uniform, dedicated greywater framework, leading to case-by-case authorisations or fragmented local rules that constrain scaling-up.
- **France represents a more advanced but complex model**, where greywater reuse is formally regulated and monitored, yet administrative and operational complexity may discourage small-scale domestic applications.
- **Emerging reforms create significant opportunities**, particularly in Italy and Malta, where policy changes could shift greywater reuse from marginal or prohibited practices to recognised components of water management strategies.
- **Decentralised systems are a recurring opportunity**, especially for rural areas, islands, and water-stressed regions, but their success depends on simplified rules, clear liability allocation, and reliable monitoring.
- **Threats are largely institutional and social rather than technical**, including inconsistent enforcement, limited monitoring resources, and low public trust or acceptance driven by perceived health risks.

Overall, the table suggests that the future development of greywater reuse in these countries will depend less on new technologies and more on **regulatory simplification, harmonisation, and confidence-building measures**. Establishing proportionate, risk-based national rules—supported by technical standards, incentives, and awareness campaigns—appears essential to move from isolated pilots to widespread, safe implementation.

Overview of legislation on rainwater reuse and SWOT analysis

Table 50 offers a comprehensive comparative overview of **rainwater reuse regulation and practice** across selected European and Mediterranean countries. By consolidating legal provisions, technical guidance, quality approaches, monitoring practices, and permitting procedures, it illustrates how rainwater reuse is addressed within national water management and building regulatory frameworks. The table reflects differing levels of regulatory maturity and policy ambition, as well as varying interpretations of rainwater as a resource, a runoff to be managed, or a potential public health concern.

The table is organised around four key dimensions that together define the governance of rainwater reuse:

- **Allowed uses**, ranging from unrestricted private use (within volume limits) to explicitly defined non-potable applications such as irrigation, toilet flushing, cleaning, and technical uses in buildings.
- **Treatment and quality classes**, indicating whether countries define mandatory treatment levels or quality classes, or rely instead on technical standards and risk-based approaches.
- **Key parameters and monitoring**, describing the presence or absence of microbiological, chemical, and physical quality limits, as well as monitoring frequencies.
- **Permitting**, outlining how rainwater reuse systems are authorised, whether through specific permits, declarations, integration into planning processes, or general environmental legislation.

Table 50 Overview of national legislation on greywater reuse in the project countries

Country	Allowed uses	Treatment / Quality class	Key parameters & Monitoring	Permitting
Albania	Law No. 29/2024 on water resources recognises the right to freely use rainwater on private property, if it is not collected in artificial installations with a storage capacity exceeding 20 m³.	Guidance under development; pilot systems apply basic treatment and storage rules. Minimum treatment depends on intended uses	Pilot projects use EU-style microbiological/turbidity checks where applied	related to the law on environmental protection and law on permits; development of Preliminary Environmental Impact Assessment
Cyprus	Non-potable uses (irrigation, toilet flushing), public buildings (schools, sports centres), limited agricultural pilots, groundwater recharge.	Risk-based quality tiers; No national standard; recommended: first-flush diversion, filtration, covered storage, disinfection for indoor uses; optional advanced treatment for sensitive irrigation.	Risk-based monitoring. Non-potable uses: Microbiological (E. coli absent, coliforms, enterococci, Legionella risk-based) and chemical (pH 6.5–8.5, EC < 2,500 µS/cm, turbidity < 5 NTU, nitrates < 50 mg/L) parameters. For irrigation water quality standards (EU-aligned): Domestic: occasional checks; institutional: periodic testing.	No single permit; falls under integrated water management. Compliance with Water Pollution Control Law; possible EIA for large systems; coordination with Water Development Department and Department of Environment.
France	Non-potable uses only: toilet flushing, indoor floor cleaning, decorative fountains, some laundry uses; closed technical devices (cooling loops, industrial cleaning) allowed without prior authorisation	Risk-based treatment: basic filtration (outdoor), fine filtration/UV/activated carbon (indoor), enhanced filtration for laundry. 2024 Arrêté introduces two quality classes (A+ and A) with defined microbiological and physico-chemical limits.	Parameters include E. coli, enterococci, Legionella, turbidity, TOC, pH, chlorine odour. Monitoring varies by system type and class: commissioning tests for single-family systems; annual or biannual monitoring for A/A+ systems; stricter frequencies for collective installations.	Declaration regime (not full authorisation). Outdoor domestic uses: no authorisation. Indoor uses: declaration to town hall. Public buildings/ higher-risk uses declaration to prefect + ARS oversight. Mandatory network separation, signage, storage protections, and annual inspections for collective

				systems.
Greece	Rainwater is used only for secondary, non-potable purposes, mainly irrigation and washing. Widely applied in remote areas and islands. Under the NCWR Programme, 68 systems were installed for irrigation and washing uses in 33 islands.	No dedicated rainwater quality classes. Treatment and quality assessment follow wastewater-reuse parameters, since rainwater is not intended for drinking. Technical and design requirements are defined by Law 3199/2003, PD 51/2007, Law 4067/2012, and Law 1739/1987 with related ministerial decisions.	Quality checks rely on wastewater-reuse parameters for irrigation and washing. No national monitoring schedule for rainwater systems.	No specific permitting procedure for rainwater reuse is described. Systems fall under general water resources and construction legislation, not a dedicated rainwater-reuse permit.
Italy	Rainwater may be reused for non-potable purposes such as garden irrigation, WC flushing, surface washing, firefighting, and other compatible uses. Roof-collected rainwater and second-flush waters are generally considered non-contaminated and may be reused freely. First-flush and runoff from potentially polluted surfaces are treated as industrial wastewater and require treatment.	No dedicated national quality classes for rainwater. Treatment requirements depend on whether water is classified as industrial wastewater (first-flush, polluted runoff) or clean rainwater (roof runoff). Technical standards (UNI/TS 11445:2012; UNI EN 16941-1:2024) define design, installation, and maintenance requirements for non-potable rainwater systems.	The text does not specify numerical quality parameters. Monitoring and treatment obligations apply only when rainwater is classified as industrial wastewater (first-flush or polluted runoff), which must be treated before discharge. Clean roof runoff used for irrigation or non-potable uses does not require treatment unless regional rules impose it.	Authorization depends on regional regulations under Article 113 of the Environmental Act (T.U.A.). Polluted runoff and first-flush waters may require discharge authorization and treatment. Clean meteorological waters not covered by Art. 113(1) are not subject to authorization. Direct infiltration into groundwater is prohibited.
Malta	Rainwater may be used for non-potable purposes only, as listed in Technical Guidance F: irrigation, toilet flushing, laundry, and floor washing.	Technical Guidance F does not specify any minimum treatment levels, quality limits, or monitoring requirements for harvested rainwater.	No parameters or monitoring obligations are defined in the guidance. There is no national quality framework for rainwater reuse.	Installing rainwater harvesting cisterns is mandatory by law (Technical Guidance F) and forms part of the Development Planning

				Permit process.
Spain	Rainwater is not explicitly regulated under national reuse law. When collected from suitable surfaces and adequately treated, it may be used for non-potable purposes such as irrigation, toilet flushing, cleaning, and technical building systems. Suitability depends on treatment level, exposure risk, and local sanitary rules.	No national mandatory treatment requirements. Systems generally follow UNE-EN 16941-1:2018. Treatment may include filtration, first-flush diversion, and disinfection depending on use. Municipal ordinances may impose additional requirements.	No binding national parameters. Reference values come from UNE-EN 16941-1:2018, municipal ordinances, or—by analogy—the microbiological and chemical parameters of RD 1085/2024 for higher-exposure uses. No national monitoring schedule; monitoring depends on risk assessment, UNE-EN guidance, and municipal rules.	The permitting procedure follows the same framework as wastewater reuse.

Across the countries examined, rainwater reuse is consistently restricted to **non-potable uses**, but the degree of formalisation varies widely. Some countries, such as France, apply structured risk-based quality classes and monitoring obligations, while others rely on technical norms, pilot practices, or indirect regulation through wastewater or construction law. In several cases, rainwater reuse is embedded within broader water resource or environmental protection frameworks rather than governed by a dedicated reuse law. The comparison reveals a **highly heterogeneous regulatory landscape** for rainwater reuse, with significant implications for implementation and scaling. Several key trends emerge:

- **Risk-based regulation is unevenly applied**. France represents the most advanced model, with defined quality classes, parameters, and monitoring obligations proportionate to exposure risk. Cyprus follows a softer risk-based approach through guidance and pilot projects, while most other countries lack binding national frameworks.
- **Technical standards often substitute for legislation**. In Italy and Spain, national or European standards (UNI, UNE-EN) play a central role in system design and operation, compensating for the absence of explicit legal quality classes or monitoring rules.
- **Permitting is frequently indirect or fragmented**. Rainwater reuse is commonly authorised through building permits, environmental laws, or wastewater regulations rather than through a dedicated reuse permit, leading to variability across regions and municipalities.
- **Monitoring requirements are generally limited or absent**, particularly where rainwater is considered inherently low-risk (e.g. roof runoff). This may reduce administrative burden but also creates gaps in health protection and legal certainty.
- **Mandatory collection does not imply regulated reuse**. Malta exemplifies a system where rainwater harvesting infrastructure is compulsory, yet quality, treatment, and monitoring requirements are not defined, leaving reuse practices largely unmanaged.

Overall, the table suggests that rainwater reuse is widely recognised as a valuable non-conventional water resource, but **regulatory clarity lags behind technical feasibility** in many countries. Future policy development would benefit from proportionate, harmonised frameworks that combine risk-based quality requirements, clear permitting pathways, and alignment with building regulations, while avoiding excessive complexity for small-scale domestic systems.

The Table 51 **presents a comparative SWOT analysis** of rainwater reuse frameworks across project countries. It highlights the diversity of regulatory maturity, technical standards, and implementation capacity in the region, offering a structured overview of where each country stands in terms of strengths, weaknesses, opportunities, and threats. This comparative lens is particularly valuable for understanding both the fragmentation and the emerging convergence

trends in rainwater reuse governance.

Table 51 - SWOT analysis of national framework on rainwater reuse of the project countries

Country	Strengths	Weaknesses	Opportunities	Threats
Albania	Legal allowance for small-scale collection	No national treatment or monitoring rules	Household and rural irrigation potential	Lack of standards; limited technical capacity
Cyprus	Existing technical guidance and pilot projects; risk-based approach; integration within integrated water management and NCWR strategy	No binding national standards; fragmented permitting; limited large-scale uptake	Expand domestic and public building reuse; formalise risk-based standards; incentives for decentralised systems	Lack of clear monitoring obligations; low public awareness; regulatory uncertainty may slow scaling
France	Clear legal framework for non-potable uses; Simplified declaratory regime; risk-based quality classes (A/A+); defined monitoring and permitting rules; strong public health protection	Regulatory complexity; administrative burden for small-scale domestic systems; focus mainly on non-potable indoor uses	Reduce potable water demand; promote certified small-scale systems; market development for compliant technologies	Liability and maintenance responsibilities for users; risk of low adoption due to complexity
Greece	Experience with rainwater use in islands; integration into broader water and building legislation; NCWR pilot programmes	No dedicated rainwater reuse framework; reliance on wastewater reuse parameters; lack of monitoring schedules	Formal integration of rainwater reuse into national reuse policy; decentralised systems for islands and remote areas	Fragmented implementation; limited monitoring capacity; low regulatory visibility may hinder trust
Italy	Clear distinction between clean rainwater and polluted runoff; strong technical standards (UNI/TS, EN); regional experience; alignment with building systems	No dedicated national rainwater reuse law; authorization varies by region; case-by-case rules; lack of explicit quality parameters	Harmonisation through national guidance with the new Decree; wider adoption in buildings; integration with climate adaptation policies	Inconsistent enforcement; liability issues; complex classification between clean and polluted runoff
Malta	Clear list of allowed non-potable uses	No treatment, quality, or monitoring requirements; absence of a national quality framework	Introducing proportional quality and safety rules; strengthen reuse beyond mere collection; public awareness event	resistance if regulation is perceived as too strict; space constraints due to high density constructions

Spain	National technical reference (UNE-EN 16941-1); flexibility through municipal ordinances; alignment with wastewater reuse law (RD 1085/2024)	No explicit national rainwater reuse legislation; local variability; lack of binding parameters	Municipal pilots; harmonisation via standards; integration into urban water resilience strategies	Regulatory fragmentation; inconsistent local requirements; uncertainty for system designers and users

Overall, the table shows a landscape characterised by:

- **Heterogeneous legal frameworks**, ranging from well-defined national rules (France) to contexts where rainwater reuse is allowed but largely unregulated (Albania, Malta).
- **Strong technical foundations** in countries with established building standards (Italy, Spain), even when national legislation is incomplete.
- **Common weaknesses**, especially the absence of binding quality parameters, monitoring obligations, and harmonised permitting procedures.
- **Significant opportunities** for integrating rainwater reuse into broader water resilience and climate adaptation strategies.
- **Cross-cutting threats**, including regulatory uncertainty, low public awareness, and limited institutional capacity for monitoring and enforcement.

A closer reading of the comparative SWOT analysis reveals a Mediterranean landscape marked by both diversity and convergence in the governance of rainwater reuse. Although each country presents its own institutional history, regulatory culture, and technical capacity, several cross-cutting patterns emerge that help explain the current state of play and the challenges ahead.

One of the most evident insights is the **contrast between countries with mature regulatory frameworks and those where rainwater reuse remains largely unregulated or only partially addressed**. France stands out for its structured, risk-based approach, complete with quality classes, monitoring obligations, and a clear declaratory regime. Italy and Spain, while lacking dedicated national legislation, compensate through strong technical standards and consolidated building-sector practices that provide a degree of predictability for designers and users. In these contexts, the challenge is less about creating rules from scratch and more about simplifying procedures, reducing administrative burdens, and ensuring consistent enforcement across regions.

At the opposite end of the spectrum, countries such as Albania, Malta, and—though to a lesser extent—Greece still operate with **minimal or fragmented regulatory frameworks**, where rainwater reuse is allowed but not supported by binding quality parameters, monitoring

schedules, or harmonised permitting procedures. This regulatory vacuum creates uncertainty for households, municipalities, and system providers, and often results in low uptake despite the evident potential for decentralised solutions, especially in rural or water-scarce areas.

A second insight concerns the **role of technical standards and building regulations**, which often act as de facto governance tools even in the absence of national laws. Italy's UNI/TS and EN standards, or Spain's UNE-EN 16941-1, illustrate how the building sector can drive implementation and provide operational clarity. However, reliance on standards alone also risks creating uneven adoption, as municipalities or regions may interpret or apply them differently.

Another recurring theme is the **importance of risk-based approaches**, which are increasingly recognised as essential for ensuring safety while avoiding disproportionate burdens. Cyprus and France already integrate risk assessment into their frameworks, and this trend is likely to expand as countries seek to balance public health protection with the need to promote non-conventional water resources. The table suggests that countries without such approaches may struggle to scale up reuse safely and efficiently.

A further insight relates to **public awareness and institutional visibility**, which appear as weaknesses or threats in several countries. Even where technical solutions exist, uptake remains limited if citizens and local authorities lack confidence in system safety or are unaware of potential benefits. This highlights the need for communication strategies, demonstration sites, and transparent monitoring practices.

Finally, the table underscores a broader structural issue: **regulatory fragmentation**, whether between regions (Italy, Spain), between sectors (Cyprus, Greece), or between policy levels (national vs. municipal). Fragmentation complicates implementation, increases costs for system designers, and can discourage innovation. At the same time, it also reveals opportunities for harmonisation and cross-country learning.

Taken together, these insights depict a region in transition. Rainwater reuse is increasingly recognised as a strategic component of water resilience and climate adaptation, yet its regulatory foundations remain uneven. The diversity of approaches offers a rich laboratory for experimentation, but also calls for greater coherence, capacity building, and shared methodologies to ensure safe and effective deployment across the Mediterranean.

Bridging Governance Gaps: SHARE.MedWATER Pilot Contributions

The comparative analysis shows recurring gaps across wastewater, greywater and rainwater reuse, and these gaps can be illustrated with concrete country and pilot examples.

For wastewater reuse, regulatory fragmentation and uneven transposition of EU minimum requirements are evident in countries such as Albania and Greece, where national rules are incomplete or still being aligned with Regulation (EU) 2020/741; by contrast, France and parts of Italy and Spain benefit from clearer technical standards and risk-based approaches, which makes permitting and implementation more predictable. Technical and economic barriers are also place-specific: many territories lack modular tertiary polishing and district storage capacity to manage seasonal surpluses, a problem that is particularly visible in island and touristic contexts such as Cyprus and Malta. SHARE.MedWATER pilots respond directly to these realities by testing district-scale storage and distribution solutions and developing permit dossiers that can be adapted by municipalities like Gjirokastër (Albania) and Lozzi (France).

Greywater reuse exposes a different set of gaps that are both technical and social. Several partners, including Albania and Greece, do not yet have harmonised technical specifications or monitoring protocols for domestic and institutional greywater systems, and responsibilities for maintenance and liability are often undefined in multi-occupancy buildings. SHARE.MedWATER's community and building-level pilots—for example the household and public-building demonstrations planned in Larnaca will produce simple, risk-based operational protocols, maintenance checklists and user-tested system specifications. These demonstrations are paired with outreach and user feedback to reduce perceived health risks and to provide contractual templates that clarify operator duties and liability for local authorities and building owners.

Rainwater reuse is similarly uneven: in some partner countries small-scale rooftop collection is permitted with minimal oversight, while in others larger systems face permitting uncertainty and divergent treatment expectations depending on the intended use. Guidance on first-flush diversion, storage hygiene and pathogen control is often insufficient where rainwater is used for indoor non-potable applications. SHARE.MedWATER will validate low-cost, maintainable rainwater designs in urban and heritage contexts and produce hydro-economic evidence to support planning instruments; pilots in the Ebro valley (Spain), Maltese sites, Cervia municipality (Italy), West Macedonia in Greece and Albania will test combined systems that integrate rainwater in different scenarios to demonstrate resilience gains and reduced freshwater demand for domestic, civil, environmental and agricultural uses.

Across all water types, the core harmonisation challenge is institutional and procedural as much as technical. Fragmentation between national and regional rules, between sectors, and among permitting authorities increases costs for designers and discourages innovation.

SHARE.MedWATER's transnational comparative work and its living-lab pilots convert local evidence into interoperable monitoring protocols, modular WRRMP templates and data-sharing practices that are directly transferable across partner contexts. By producing standardised technical specifications and monitoring templates—and by piloting governance experiments such as community water-sharing arrangements and public-private operating models in concrete locations the project reduces uncertainty for regulators and investors, accelerates public acceptance through demonstrated safety and benefits, and creates practical models that partner countries can adapt to their legal and institutional settings.

Conclusions

The comparative analysis of national legal frameworks governing the reuse of treated wastewater, greywater and rainwater across the project countries reveals a heterogeneous landscape, marked by significant progress in some jurisdictions and persistent regulatory gaps in others. Overall, a gradual convergence is emerging toward risk-based approaches, quality-class systems and the adoption of Water Reuse Risk Management Plans, in line with the principles of Regulation (EU) 2020/741. Yet this convergence is uneven, and the resulting differences continue to influence the pace, safety and scalability of water reuse practices.

With regard to **treated wastewater reuse**, EU Member States show a clear alignment with the European regulatory model, supported by structured authorisation systems, defined quality classes and specific monitoring regimes. Several countries (Cyprus, France, Malta, Spain and - in the near future - Italy, partially Greece) have translated the EU classes into national frameworks and have introduced class-specific monitoring regimes and WRRMPs to ensure public health protection and regulatory certainty. Nevertheless, national variations remain: France and Spain have added additional microbiological or chemical parameters, Italy still faces regional fragmentation, and Greece continues to rely on a partially aligned ministerial decision. Albania stands apart, with reuse formally permitted but implemented "case by case", without standardised parameters or a comprehensive national law, which limits predictability and scale-up.

The **situation is markedly different for greywater reuse**, which remains the least developed and most fragmented area. In most countries, greywater is not regulated as a distinct category but is instead treated as a subset of wastewater, resulting in legal uncertainty and inconsistent public-health safeguards. Greywater reuse remains an underdeveloped and weakly harmonised policy area, with France representing the only country that has recently adopted a binding, parameter-based framework. Elsewhere, greywater reuse is governed by voluntary standards, pilot-project rules or, in the case of Malta, remains effectively prohibited. The national SWOT analyses confirm that the main barriers are institutional and social rather than technical, including the absence of clear standards, limited monitoring capacity, complex administrative procedures and low public awareness.

The governance of **rainwater reuse** appears more mature but still lacks harmonisation. Many countries allow rainwater reuse for non-potable purposes and integrate it into building codes or water-resource legislation, yet only a few define binding quality requirements or monitoring obligations. France has introduced "two quality classes (A+ and A) with defined microbiological and physico-chemical limits", while other countries rely on risk-based approaches or technical standards that are not legally binding. This regulatory diversity limits the wider deployment of decentralised systems, despite their potential contribution to urban water resilience and climate

adaptation.

Across all three domains, **pilot actions emerge as an essential bridge between regulatory ambition and practical implementation.** In contexts where legislation is incomplete, fragmented or still evolving, pilot initiatives provide concrete evidence of feasibility, help test monitoring approaches and support institutional learning. These pilots also play a strategic role in informing future regulatory reforms, offering real-world insights into risk management, user acceptance and system performance that cannot be derived from legislation alone.

Taken together, **the findings of the report point to three overarching dynamics: a clear trend toward alignment with EU principles in the field of treated wastewater reuse; a persistent regulatory vacuum in the field of greywater reuse; and a relatively widespread but unevenly regulated practice of rainwater reuse**. These dynamics underscore the need for coordinated action to reduce fragmentation and strengthen institutional capacity.

Several strategic priorities emerge from the analysis that could guide a coherent and progressive harmonisation process across the project countries. The first concerns **the establishment of minimum common standards for greywater and rainwater reuse**. The absence of dedicated national rules—highlighted in the report, which notes that in many countries "greywater reuse is generally not regulated as a distinct category"—creates uncertainty for designers, operators and authorities. Developing proportionate, risk-based standards aligned with the logic of Regulation (EU) 2020/741 would help ensure consistent levels of public-health protection while enabling the safe deployment of decentralised systems.

A second priority relates to **strengthening institutional capacity and monitoring systems**. Several countries report "limited monitoring capacity" or "institutional gaps", particularly where authorisations are issued on a case-by-case basis. Addressing these weaknesses requires targeted training for environmental and health authorities, clearer operational guidance on risk-based monitoring, improved data-collection tools and reliable laboratory accreditation schemes. Without such institutional reinforcement, even well-designed regulations may remain difficult to implement.

A third priority involves **promoting integrated governance tools**. The experience of countries that have already adopted Water Reuse Risk Management Plans demonstrates the value of structured, preventive approaches that link design, operation and oversight. Extending the use of WRRMPs to greywater and rainwater systems—appropriately adapted to their risk profiles—would help create a shared methodological foundation across jurisdictions and facilitate dialogue between regulators, operators and end users.

A fourth priority concerns **administrative simplification and the creation of incentives for decentralised system**s. The SWOT analyses repeatedly highlight the burden of complex permitting procedures and the lack of clear responsibilities for operation and maintenance.

Simplified authorisation regimes for low-risk uses, combined with financial incentives and clear rules for network separation and system upkeep, would support the uptake of small-scale solutions, particularly in rural areas, islands and water-stressed regions.

A fifth priority is the **strengthening of transnational coordination and the exchange of good practices**. The diversity of national approaches—while challenging—also represents a valuable reservoir of experience. Establishing platforms for sharing regulatory models, technical guidelines and case studies, as well as developing joint pilot projects, could accelerate convergence and support the progressive alignment of technical requirements through European and national standardisation bodies.

Finally, the analysis highlights the importance **of communication and public engagement**. Several countries identify "public acceptance issues", "low public awareness" and "perceived health risks" as major threats. Building trust requires transparent information campaigns, educational initiatives in schools and public buildings, and clear labelling and signage for dual networks and non-potable water points. Social acceptance is not a secondary issue: it is a precondition for the long-term success of any reuse strategy.

Water reuse—whether of treated wastewater, greywater or rainwater—offers a concrete opportunity to enhance water security, support climate-adaptation strategies and reduce pressure on conventional resources. Yet unlocking this potential requires more than technological readiness: it demands regulatory clarity, institutional capacity, and public confidence. The strategic priorities identified in this report provide a solid foundation for guiding future harmonisation efforts and for fostering a coherent, safe and scalable approach to water reuse across the project countries.

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