NATIONAL LEGISLATION

- **Reinforce Regulatory Enforcement and Technical Support :** Strengthen controls on non-compliant sanitation systems and provide technical and financial assistance to households transitioning to compliant or alternative systems.

- **Facilitate Access to Financing for Households :** Introduce subsidies, tax credits or low-interest loans for households required to upgrade their sanitation systems, particularly in isolated or economically vulnerable areas.

LOCAL LEVEL

- **Prioritise the Public Sewer Expansion in Densely Populated Areas :** It is imperative to channel investment towards collective sanitation initiatives, particularly in coastal regions where the majority of the population resides.

- **Promote Decentralised Solutions in Rural Zones :** Encourage the use of domestic constructed wetlands and wastewater treatment plant systems in less accessible or sparsely populated areas.

- **Improve Public Awareness and Stakeholder Engagement :** Launch educational campaigns on the environmental impact of inadequate sanitation and the benefits of improved systems, fostering behavioural change and collective ownership.

Follow us

@InnWater

@InnWater_EU

https:/www.innwater.eu/

contact.innwater@oieau.fr

UK Research and Innovation

Funded by the European Union

PRESENTATION

About InnWater

InnWater aims to foster sustainable multi-level and cross sector water governance through social innovation. To this end, InnWater is developing a set of tools and services adapted to local needs for the benefit of water stakeholders, including a governance assessment matrix, guidance for stakeholders' engagement, as well as simulations linking water resources management and economic activities. To achieve its goals, InnWater engages with pilot site communities, co-developing tools to address specific water challenges like pricing policies, water quality, and infrastructure investment.

Figure 4: InnWater pilot sites maps

InnWater is coordinated by the International Office for Water and run from 2023 to 2026.

References

[1] LES CHRONIQUES DE L'EAU n°143 (Décembre 2024) - Office de l'Eau Réunion

[2] Economic Valuation of the Lagoon Ecosystem in La Réunion (April 2025) – Policy Brief InnWater

[3] Aquatiris - Jardin d'Assainissement® ROSEAUX (FV) - Guide de l'usager - 09/2023

Realisation

- Authors: Lou-Anne Wolf (Université de la Réunion)
- Graphic design: Ananda Rohn & Elisa Bezier (OiEau)
- Date: July 2025

OiEau, Université de La Réunion, eurecat, ETIFOR, Université de Rouen Normandie, SIWI, REKK, WAREG European Water Regulators, EUI, Ajuntament de Figueres, Westcountry Rivers Trust

INN WATER

Cost-benefit analysis of wastewater management solutions in La Réunion

WASTEWATER AND REEF DEGRADATION

Coral reefs are known to provide a number of ecosystem services, including the protection of coastlines, the provision of food security, and the maintenance of biodiversity. In the context of La Réunion, the reef constitutes a pivotal economic and environmental asset; however, it is increasingly threatened by domestic wastewater pollution. Inadequate sanitation infrastructure, particularly in the island's western catchment area, results in nutrient-rich discharges that contribute to the proliferation of algal blooms and accelerate coral degradation. Given that nearly half of households in La Réunion are not connected to the public sewer system [1] and that many septic tanks do not comply with the relevant regulations (Non-compliance rate estimated at 85%), urgent action is required to improve wastewater management to protect this vulnerable ecosystem.

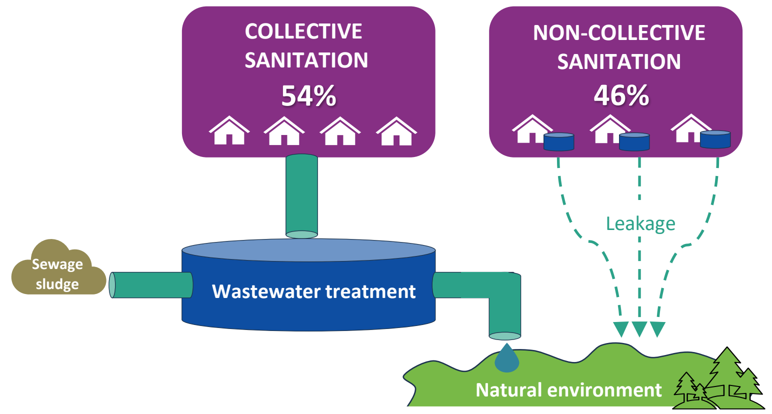

Figure 1: Graphic representation of the sewage network in La Réunion

MANAGING WASTEWATER : WHAT ARE THE OPTIONS ?

This policy brief presents a cost-benefit analysis (CBA) of six wastewater management scenarios for the western and southern regions of Réunion Island (from Saint-Paul to Saint-Pierre).

The first scenario entails the full connection of all affected households to the existing public sewer network.

The second involves replacing non-compliant septic tanks with modern, watertight plastic tanks.

The remaining four are hybrid scenarios that combine multiple wastewater management solutions, including sewer network connections, septic tank replacements, domestic constructed wetlands (which use aquatic plants to naturally filter wastewater), and compact domestic wastewater treatment units.

Each scenario is evaluated based on its implementation and maintenance costs for households, as well as the environmental benefits it generates, and then compared to the status quo to support evidence-based decision-making

Policy relevant learnings

Université de La Réunion

The overall objective of InnWater Policy Brief is to highlight how InnWater solutions can support water related policies implementation and formulate recommendations for their update. This document presents the highlights of the full version of the Policy Brief #2.

Three Policy Briefs will be delivered over the course of the project with different focuses:

#1 Water governance challenges overview, Europe at a fork in the River A changing water context, with a general approach to set the water governance scene.

#2 Effective citizen engagement strategies, addressing international policies.

#3 Synthesis of policy relevant learnings from the all the project's results, focussing on European water related policies (this one).

Box #1
Definition of concepts

Cost-benefit analysis

A cost-benefit analysis (CBA) is a decision-support tool that is utilized for the evaluation and comparison of policy options based on their anticipated costs and benefits. It assigns a monetary value to both the expenditures required to implement a solution and the benefits it is expected to generate, including but not limited to environmental improvements, health outcomes, or avoided damage. By comparing these values, the CBA helps identify which option provides the greatest net benefit to society.

THE SOLUTIONS : INVESTMENT, MAINTENANCE, AND BENEFITS

Our target population is located within the areas of Saint-Paul and Saint-Pierre, where approximately 75,000 households are not connected to the public sewerage network and rely on non-collective sanitation systems (NCS). Among these, an estimated 85% are non-compliant, meaning that around **60,000 households** are concerned by this issue.

1. Public Sewer Network Connection requires heavy infrastructure investment and connection works. The average upfront cost per household is around **€12,000**. While effective in reducing pollution through centralized treatment, it generates recurring costs of approximately **€260 per year** for households through annual wastewater charges linked to water bills.

This scenario generates two main types of benefits.
First, reducing wastewater pollution helps preserve the coral reef, whose ecosystem services have been valued using two economic methods, as detailed in a separate policy brief [2]. The contingent valuation method (CVM) estimates the value of La Réunion's reef ecosystem at **€59 million per year**, while the travel cost method (TCM) yields an estimate of **€69 million per year**
Second, households that previously used septic tanks no longer pay for emptying services, representing an individual saving of approximately **€320 every 4 years**.

2. Plastic Septic Tank Replacement involves significant upfront costs for installation and compliance, estimated at around **€9,730** per household. Although these systems improve watertightness and reduce pollution risks, they also require regular maintenance and periodic emptying, with a cost of about **€320 every 4 years**, which adds to household expenses over time. However, these costs were already being paid by households with their old septic tank, so this is not an additional cost for this project.

As pollution pressure is reduced, this option contributes to the preservation of the coral reef, with an estimated benefit of **€59 million per year** with the contingent valuation method (CVM),while the travel cost method (TCM) yields an estimate of **€69 million per**. However, since households still use septic tanks, they must continue to pay for emptying services, meaning no direct savings are achieved compared to the current situation.

3. Domestic Constructed Wetlands present moderate to high initial costs, estimated at **€9,000** per household, mainly depending on space availability. However, they operate without many electricity or mechanical parts, requiring minimal maintenance (estimated at **300€ every 10 to 15 years** [3]). They provide strong ecological benefits through natural filtration and are a low-cost long-term option.

Constructed Wetland provides environmental benefits similar to other improved sanitation solutions, with an estimated reef preservation benefit of **€59 million per year** with the contingent valuation method (CVM),while the travel cost method (TCM) yields an estimate of **€69 million per**.
In addition, as these systems fully replace septic tanks, households save approximately **€320 every 4 years** in avoided emptying costs.

4. Domestic Wastewater Treatment Plant deliver efficient treatment at the household level, with high installation of approximately **€9,000** per system. They require electricity and emptying services (with an annual cost of around **€500 per year**) and technical maintenance (with a cost of around **€60 every 5 years**, **€200 every 7 years**, and **€260 every 15 years**) but offer a viable solution where public connection is not feasible.

This scenario also delivers environmental benefits through improved treatment quality, resulting in an estimated reef preservation benefit of **€59 million per year** with the contingent valuation method (CVM),while the travel cost method (TCM) yields an estimate of **€69 million per**.
Furthermore, households switching from traditional septic systems avoid emptying costs of around **€320 every 4 years**, representing a direct financial gain.

	Scenario 1	**100%** of the target population is connected to the collective wastewater treatment system.
	Scenario 2	**100%** of the target population replaces their septic tanks with compliant and more efficient ones.
Hybrid scenarios	Scenario 3	**70%** of the target population is connected to the sewer network, while **30%** replaces their septic tanks.
Hybrid scenarios	Scenario 4	**70%** is connected to the sewer network, **15%** replaces their septic tanks, **15%** installs constructed wetlands
Hybrid scenarios	Scenario 5	**70%** is connected to the sewer network, **15%** installs wastewater treatment units, **15%** installs constructed wetlands
Hybrid scenarios	Scenario 6	**70%** is connected to the sewer network, **15%** replaces their septic tanks, **7.5%** installs wastewater treatment units, **7.5%** installs constructed wetlands

NET PRESENT VALUE (NPV) ANALYSIS

$$NPV = \sum_{t=0}^{n} \frac{NCF_t}{(1+r)^t}$$

NCF_t = Net Cash Flow during the period t
r = Discount Rate
t = number of time periods
n = the total number of periods

Box #2

Net Present Value (NPV)

The Net Present Value (NPV) is a key economic indicator used to assess the long-term viability of investment scenarios. It represents the difference between the total discounted benefits and the total discounted costs of a project over a defined time horizon. A positive NPV indicates that the solution generates more benefits than costs over time, making it economically desirable.

The analysis is based on a 20-year time horizon and applies a discount rate of 2.5%

For each scenario, benefits were weighted using an efficiency percentage: 90% for connection to the wastewater network, 30% for septic tank replacement, and 20% for other alternative solutions.

	NPV (with CVM)	NPV (with TCM)
1	€299 327 724	€439 967 859
2	€63 864 181	€110 744 226
3	€392 374 865	€504 4886 973
4	-€56 430 109	€53 737 997
5	-€103 502 854	€4 321 249
6	-€72 021 436	€38 146 669

Net present values (NPVs) were estimated using two methods for assessing the benefits associated with the reefs and lagoon of Réunion: contingent valuation (CVM) and the transport cost method (TCM). The NPVs derived from the TCM are generally higher than those obtained with the CVM, suggesting that the benefits revealed by actual uses of the lagoon exceed the declared benefits.
Scenarios 1 and 3 show highly positive NPVs with both methods, making them the most economically robust options. Conversely, scenarios 4, 5 and 6, based on alternative solutions such as constructed wetlands and domestic micro-treatment plants, show more contrasting results, with negative NPVs in CVM and positive NPVs in TCM. Although these alternatives may be attractive, they are less environmentally effective than connection to the public sewer network, resulting in lower benefits for the reefs, and are also more difficult to implement in the field.
Ultimately, the most effective solution, both economically and environmentally, remains connecting the population (scenario 1), or connecting almost the entire population (scenario 3), with targeted replacement of septic tanks in areas where connection is too complex, particularly in high-altitude areas for geographical reasons.

POLICY RECOMMENDATIONS

EU LEVEL

- **Encourage Harmonised Economic Evaluation Tools :**
Promote the integration of cost-benefit analysis (CBA) as a standardised decision-support tool across Member States to evaluate water-related infrastructure investments

- **Strengthen Funding Mechanisms for Water Infrastructure :**
Expand EU financial instruments (e.g., Cohesion Fund, LIFE Programme) to better support wastewater infrastructure projects in territories facing structural constraints like La Réunion, prioritising solutions with strong environmental and economic returns.

- **Support Nature-Based Solutions and Innovation :**
Increase R&D funding for decentralised and nature-based sanitation systems (e.g., constructed wetlands), to improve their scalability and technical maturity.