



ARSINOE

Sustainable Ecological transition & Vulnerability of aquifers in the Canary Islands

A Case Study of Canary Islands,
Spain



Background



The **Canary Islands** are undergoing a crucial environmental transition due to the **vulnerability of their aquifers** and the **interdependence between water and agriculture**. The agricultural sector, the largest user of water in the archipelago, relies on efficient water management to sustain key crops such as **wine, potatoes and tomatoes**. In addition, the European economic and financial context has driven policies for sustainable growth, as reflected in the **Canary Islands' Smart Specialisation Strategy (RIS3)**, which prioritises a low-carbon economy, eco-innovation and the integration of renewable energy.

Key Challenges

Unique regional context:

- Volcanic archipelago with fragile and highly vulnerable aquifers.
- Strong dependency on limited water resources for both agriculture and tourism, increasing pressure on availability.

Recent challenges:

- The La Palma volcanic eruption highlighted the urgent need for resilient and adaptive solutions in territorial and resource management.

Strategic commitment:

- The Canary Islands integrate sustainability into their **Smart Specialisation Strategy (RIS3)**.
- Priorities include water management, renewable energy integration, and climate adaptation.

Role as a testing ground:

- Ideal laboratory for innovative solutions in water efficiency and environmental transition.
- Aim to position the archipelago as a regional leader in sustainable agriculture, particularly in water and energy saving.

Regional impact:

- Lessons learned are intended to benefit the broader Macaronesia region (Azores, Madeira, Cape Verde, Canary Islands).



Why was this Case study selected for ARSINOE ?

The Canary Islands were selected as a case study for ARSINOE because of the **region's unique challenges in water management, agriculture and environmental transition**. As a volcanic archipelago with highly vulnerable aquifers, the islands face increasing pressure on water resources, particularly from agricultural and tourism sectors. The **recent volcanic eruption in La Palma** further underlines the need for resilient and adaptive solutions. In addition, the Canary Islands' commitment to sustainability, reflected in their **Smart Specialisation Strategy (RIS3)**, makes them an ideal testing ground for innovative approaches to water management, renewable energy integration and climate adaptation. In this way, the Canary Islands seek to **lead the way in water and energy saving** in the agricultural sector, within the **Macaronesia region** (formed by the Azores, Madeira, Cape Verde and the Canary Islands).

Main goals

The ARSINOE project focused on **fostering the ecological transition and addressing the vulnerability of aquifers in volcanic islands**, particularly in the Canary Islands. The initiative prioritised **improving primary production sectors** such as agriculture, forestry, fisheries, aquaculture, water management, and clean energy infrastructure. A key goal of the project was to **address the interdependence between water and agriculture**, recognising the agricultural sector as the largest consumer of water in the archipelago. By enhancing water management practices, the project aimed to **promote sustainability within the water sector**, which, in turn, benefits both agriculture and the broader water and energy systems of the islands. The project also focused on establishing a baseline assessment of the vulnerability of insular aquifers and the energy impact of this nexus, enabling informed strategies for sustainable development.

Expected outcomes, benefits and legacy

The ARSINOE project was aiming to deliver tangible outcomes that improve both the sustainability and resilience of the Canary Islands' water, agricultural, and energy sectors. The project generated **critical data on the vulnerability of insular aquifers** due to agricultural and livestock practices, **setting clear boundaries for sustainable water use** in the islands. Additionally, it established a **framework for reducing emissions** linked to agriculture, contributing to both water conservation and energy efficiency. By enhancing water management and energy-saving practices, the project not only improved the agricultural sector's sustainability but also positioned the Canary Islands as a leader in water and energy conservation within the Macaronesia region. This **serves as a model for other islands** facing similar environmental challenges, driving the region toward a more sustainable future.

Methodology & Approach

Stakeholder engagement and participatory processes: Living Labs and Governance Analysis and other workshops and activities at local, regional, national and international level

Open Tender for Innovation solution selected and used: SICMA-Canarias

Key results & Achievements

The ARSINOE project has reached important milestones in promoting climate resilience and sustainable water management in the Canary Islands. The successful completion of the **third and final Living Lab workshop**, together with **ongoing engagement activities**, has strengthened stakeholder collaboration. The governance analysis carried out in **Tenerife, El Hierro and La Palma** has provided valuable insights into regional water policies. In addition, the innovation call led to **the first implementation of climate data downscaling** in the Canary Islands, achieving a 100x100 meter resolution based on the 6th IPCC report. Scientific contributions include the publication of key research on groundwater and sea level rise in La Palma and El Hierro, improving knowledge of climate impacts in the region.

Impact on local communities

The project's outcomes and initiatives have had a direct impact on local communities and ecosystems by **improving water resource management** and **promoting sustainable agricultural practices**. Stakeholder engagement through the **Living Labs** has facilitated collaborative decision-making, ensuring that **proposed solutions meet local needs**. The downscaling of climate data provides more accurate projections, helping policymakers to develop targeted adaptation strategies. In addition, research on groundwater and sea level rise provides critical information to protect freshwater resources and coastal areas, contributing to long-term environmental sustainability and resilience

Lessons learned

Key lessons from ARSINOE highlight the **importance of stakeholder engagement** and **interdisciplinary collaboration** in addressing climate challenges. The **Living Lab** approach proved effective in fostering local participation and co-developing solutions tailored to regional needs. The governance analysis highlighted the need for adaptive policies that **integrate scientific evidence into decision-making**. In addition, the downscaling of climate data demonstrated the value of high-resolution projections in improving climate adaptation strategies. These findings reinforce the need to combine technological innovation with participatory approaches to ensure the success and replicability of climate resilience initiatives.





Replicability & Scalability

The ARSINOE case study in the Canary Islands offers valuable insights that can be applied to other regions facing similar challenges in water management, agriculture and climate resilience. The entire Macaronesia region and other island and coastal areas around the world share problems such as **water scarcity, dependence on fossil fuels for water treatment and the need for sustainable irrigation solutions**. By integrating water footprint analysis, carbon footprint assessments and natural purification systems, the approaches tested in the Canary Islands can serve as a model for regions seeking to improve water sustainability and reduce environmental impact.



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The success of the ARSINOE case study relies on **strong collaboration between researchers, policy makers and stakeholders** to ensure solutions are practical. **Integrating innovative technologies**, such as natural water purification and efficient irrigation, enhances sustainability. **Data-driven decision-making**, including vulnerability mapping and footprint analysis, provides a solid basis for targeted action. In addition, **knowledge dissemination** through publications and conferences, as well as **alignment with international sustainability strategies**, increases scalability and policy support.

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However, several challenges need to be addressed. **High initial investment costs** and **resistance to changing traditional agricultural practices** can slow down adoption. **Lack of supportive regulatory frameworks** can hinder implementation, while **regional differences** in climate and socio-economic conditions require tailored approaches. **Limited technical expertise** in some areas further complicates replication. Addressing these barriers is essential to ensure the long-term impact and adaptability of ARSINOE strategies.

Next steps

The results of ARSINOE will be sustained through continued stakeholder collaboration, policy integration and knowledge dissemination. Lessons learned from the Living Lab and governance analysis will support the **development of adaptive policies** that remain relevant beyond the project. Scientific publications and publicly available data, including high-resolution climate projections, will **serve as long-term resources** for researchers and policy makers. In addition, the involvement of local institutions and decision-makers will ensure that water management and climate adaptation strategies continue to evolve, **promoting resilience** in the Canary Islands and serving as a model for other regions.

Future collaborations or follow-up initiatives: NATALIE Project, GENESIS Project,...



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The ARSINOE consortium



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