



ARSINOE

Climate-resilient regions through systemic solutions and innovations

Legacy Factsheet



The ARSINOE Project

ARSINOE (2021–2025) is a Horizon 2020 Innovation Action that brought together **41 partners from across Europe** with a common goal: to strengthen the climate resilience of European regions and cities. The project combined scientific excellence with practical testing, creating a unique bridge between research, innovation, and policy.

At its core, ARSINOE was designed to **co-develop systemic, innovative and replicable solutions** that address climate risks. Its methodology rested on three pillars: the **Systems Innovation Approach (SIA)** to co-design adaptation pathways with stakeholders, **nine case studies** that served as real-world testbeds across Europe, and the **Climate Innovation Window (CIW)**, a European marketplace for adaptation solutions.

By integrating these elements, ARSINOE has not only delivered new tools and models but also demonstrated how regions can work collaboratively to identify vulnerabilities, design effective adaptation strategies, and accelerate the uptake of innovative solutions. The project's legacy is a portfolio of approaches and innovations that can be **replicated, scaled, and embedded into European climate policy**.



Innovations that shape a climate-resilient future

Over its four years, ARSINOE has produced a **portfolio of systemic innovations** designed to strengthen Europe's ability to adapt to climate change. These innovations do not stand alone: they combine scientific modelling, data management, participatory methods, and financial instruments to support decision-making across sectors. The result is a set of tools and approaches that can be replicated and scaled to different contexts, ensuring that knowledge and solutions tested in one region can benefit many others.



Systems Innovation Framework (SIF)

One of the flagship achievements is the Systems Innovation Framework (SIF), a participatory toolkit that helps regions co-design their pathways to resilience. Rather than imposing ready-made solutions, it brings citizens, businesses, researchers, and authorities into the same room to map vulnerabilities, explore trade-offs, and imagine futures. From Greek ports to German river basins, this approach has proven that ownership of solutions grows when everyone has a voice in shaping them.



ARSINOE Wheel

The ARSINOE Wheel, a multi-system dynamic modelling framework, complements this participatory process. It allows users to analyse interdependencies across water, energy, food, ecosystems, and society, and to test alternative scenarios. This systemic approach helps decision-makers understand how stress in one sector can affect others, and which strategies can preserve resilience at a regional scale.



Innovation Packages (IPs)

Finally, ARSINOE has introduced Innovation Packages (IPs). These combine technologies, governance models, financial mechanisms, and stakeholder engagement approaches into modular, ready-to-implement solutions. Designed for replication, the IPs allow regions to tailor proven approaches to their specific socio-economic and environmental context. These are available on the Climate Innovation Window.



SustainGraph

To support knowledge management, ARSINOE created SustainGraph, a FAIR-compliant open knowledge graph that consolidates data, tools, and case study outputs. It serves as a shared resource for innovators, policymakers, and practitioners, enhancing transparency and facilitating the reuse of results across Europe.



Climate Innovation Window

Scaling and mainstreaming are facilitated through the Climate Innovation Window (CIW), relaunched as a European marketplace for climate adaptation solutions. The CIW makes tested solutions accessible to end-users, provides visibility for innovators, and connects regions with tools relevant to their adaptation needs.

Digital Solutions

At the same time, ARSINOE facilitated the deployment of innovative digital solutions tailored to local needs. Examples include the CLEVER Tool for recording and anticipating climate-related disruptions in Mediterranean ports; digital twins for flood risk assessment in Southern Denmark and Torbay; and real-time water quality monitoring systems such as ENOVA H2O in Bulgaria or the Smart Monitoring Sensors platform in Türkiye. These were complemented by nature-based and community-driven approaches, for instance the Ripple Effects programme in the UK, which engaged citizens in rewilding, rain gardens, and community food hubs as part of local flood resilience strategies.

+30 Concrete Innovations



In addition to these main results, ARSINOE has supported and tested over 30 concrete innovations across its nine case studies, either developed directly within the project or implemented through the Open Tenders. These include high-TRL tools already close to market, such as the CAFlood, a

rapid flood simulation platform, which delivers near real-time assessments of flood impacts, or the MINKA Citizen Science Observatory, which mobilises communities to collect biodiversity and environmental data. In the water domain, the Integrated Water Management Model (IWaMM) has been applied in the Ohrid and Prespa Lakes to balance water use across sectors, while in Sardinia, new durum wheat varieties resilient to heat and drought were selected and tested, demonstrating the potential of crop genetics to safeguard Mediterranean food security.

Altogether, these diverse innovations (spanning agriculture, water management, port operations, flood prevention, biodiversity monitoring, and citizen engagement) demonstrate ARSINOE's capacity to act as an innovation accelerator for climate adaptation. By combining project-developed tools with externally sourced solutions, and validating them in real-world conditions, ARSINOE has delivered a portfolio that regions across Europe can draw upon to strengthen their resilience in the years ahead.

Demonstrating Resilience in 9 European Regions

To test and refine its innovations, ARSINOE worked in nine diverse case studies across Europe, each representing a unique climate challenge and governance context. Together, they demonstrate how systemic approaches can be tailored to local conditions while generating lessons of broader relevance.

Athens



In Athens, ARSINOE addressed extreme heat by supporting the integration of nature-based solutions into the urban fabric, improving biodiversity, thermal comfort, and access to green spaces. The project contributed to building public consensus on climate resilience, in line with the Athens Resilience Strategy 2030, while promoting cleaner urban environments, sustainable mobility, and more inclusive public spaces.

Mediterranean Ports

In the Mediterranean ports of Piraeus, Limassol and Valencia, the project addressed heatwaves, rising energy costs and pollution by co-developing tools such as the CLEVER Tool for climate disruption logging, early warning systems powered by advanced sensors in Limassol, and the DIORAMA platform in Piraeus to monitor air quality from traffic and ferry operations. These innovations helped port authorities anticipate extreme weather impacts, reduce emissions and improve operational resilience.



Main River Basin



The Main River Basin in Germany showcased the importance of managing interdependencies through a Water–Energy–Food–Ecosystems (WEFE) approach. Here, ARSINOE supported both technological and social innovations, from IrriBigData for smarter irrigation planning to the “Tap Water Friendly Cycling Route” along the Main River, which raises awareness of water conservation while promoting sustainable tourism.

Ohrid & Prespa Lakes

In the transboundary Ohrid and Prespa Lakes (North Macedonia, Albania, Greece), water scarcity and declining quality threatened biodiversity and livelihoods. The Integrated Water Management Model (IWaMM) provided a framework for balancing competing demands, complemented by real-time monitoring tools (Water4All and IWRS) to inform joint governance across three countries.



Canary Islands



The Canary Islands focused on the vulnerability of aquifers under agricultural and volcanic pressures. Through Living Labs, ARSINOE introduced the SICMA-Canarias monitoring system, downscaled climate projections at unprecedented resolution (100x100m), and worked with farmers to integrate precision irrigation and climate-smart agriculture.

Black Sea Region

In the Black Sea region, stretching across Romania, Bulgaria, Türkiye and Greece, the project demonstrated how source-to-sea approaches can protect a fragile marine ecosystem. A digital twin of the Aliakmon River in Greece, UAV-based habitat monitoring in Bulgaria, biofiltration pilots in Romania, and a Smart Monitoring Sensors platform in Türkiye were combined with participatory governance to link upstream land uses with coastal health.



Southern Denmark



In Southern Denmark, where Esbjerg and surrounding areas are highly exposed to floods, ARSINOE co-created resilience pathways with municipalities and businesses. Digital flood modelling, a multi-sectoral damage-cost tool, and community engagement platforms supported the design of long-term adaptation measures, including the planned “Green Wedge” that will both protect Esbjerg from storm surges and enhance urban quality of life.

Torbay & Debon County

The Torbay and Devon County case study in England investigated the impacts of floods on critical infrastructures such as hospitals, transport and energy networks. Advanced modelling tools, a flood digital twin, and the ARGOS decision-support system were combined with community-driven solutions like Ripple Effects, which mobilised citizens to restore ecosystems, create rain gardens, and establish community food hubs.



Sardinia



Finally, in Sardinia (Italy), the project tackled the challenge of food security under climate stress. By combining plant breeding for heat- and drought-resistant durum wheat with conservation agriculture, smart irrigation powered by renewable energy, and circular economy practices (bio-stimulants from agricultural waste), ARSINOE demonstrated how Mediterranean agriculture can adapt sustainably. The Sardinian case was also the subject of the documentary “Grains of Change”, highlighting the cultural and socio-economic importance of wheat adaptation.

Together, these nine case studies illustrate ARSINOE’s capacity to integrate science, governance, finance and social innovation into practical solutions. They not only addressed urgent local needs — from floods to food security — but also generated transferable knowledge and tools that can inspire climate resilience strategies across Europe and beyond.

Building a Lasting Community of Practice

Beyond tools and case studies, ARSINOE recognised that **long-term resilience depends on networks of people and institutions who continue to learn from one another**. To this end, the project established the “**Climate Change & Sustainability**” **e-Community of Practice (e-CoP)** in collaboration with ENRICH GLOBAL, creating a permanent platform for exchange among stakeholders working on climate adaptation.

The e-CoP serves as a **knowledge-sharing hub**, bringing together policymakers, researchers, innovators, and practitioners from across Europe and beyond. It facilitates the dissemination of ARSINOE results, provides access to methods and tools such as the Climate Innovation Window, and connects members with opportunities for collaboration and funding. Through webinars, workshops and online forums, it enables continuous dialogue on practical challenges and solutions, helping regions to avoid duplication and accelerate uptake of effective approaches.

Importantly, the e-CoP also acts as a **bridge between projects**. By linking ARSINOE with other Horizon Europe initiatives, regional programmes and international networks, it ensures that innovations tested in one context are visible and available to others. This cross-pollination strengthens Europe’s collective capacity to adapt to climate change and supports the EU’s ambition of becoming a global leader in resilience.

The ARSINOE e-CoP is open to all organisations and individuals interested in climate adaptation. **Join today and connect** with a growing international network of peers, share your expertise, and access the latest tools and opportunities for building climate resilience: <https://egcp.enrich-global.eu/>

Join Today!

<https://egcp.enrich-global.eu>



Policy Recommendations for a Water- and Climate-Resilient Europe

ARSINOE's nine case studies demonstrated that climate adaptation requires not only innovative tools but also policy frameworks that enable their uptake and scaling. Drawing on these experiences, the project developed a set of recommendations that can guide the evolution of EU and national policies towards greater systemic resilience.

Mainstream Systemic Resilience Assessments

First, the project highlights the need to mainstream systemic resilience assessments into the EU water acquis. Current instruments such as River Basin Management Plans (RBMPs) under the Water Framework Directive could be strengthened by integrating cross-sectoral risk indicators and systemic forecasting tools. This would allow regions to capture interactions between water, energy, food and ecosystems, and to plan with a source-to-sea perspective.

1

Integrated WEF E nexus planning

Second, ARSINOE recommends advancing integrated WEF E nexus planning. Investments in infrastructure and land management should reflect trade-offs and synergies across water, agriculture, energy and biodiversity. In practice, this means aligning national energy and climate plans with water management strategies, and embedding nexus considerations into the Common Agricultural Policy's strategic plans.

2

Tailor Water Strategies for Islands & Border Regions

Third, the project underlines the need to tailor water strategies for islands and border regions, where vulnerabilities are particularly acute. Experiences in the Canary Islands and Sardinia showed that outermost regions face unique challenges in water availability, agriculture and food security. Dedicated financing and governance mechanisms are essential to ensure that the EU's water resilience objectives are achievable in these territories.

3



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Nature-Based & Hybrid Solutions

ARSINOE also stresses the value of nature-based and hybrid solutions as cost-effective, multifunctional approaches. From rainwater harvesting in Sardinia to rewilding initiatives in Torbay, the case studies confirmed that nature-based measures can complement traditional infrastructure, delivering benefits for flood protection, biodiversity and community well-being. Their integration into the EU Nature Restoration Regulation and national adaptation strategies is strongly encouraged.

Digital Twins, Serious Gaming Interfaces & Smart Forecasting Tools

Digitalisation emerged as another priority. The project demonstrated how digital twins, serious gaming interfaces and smart forecasting tools can transform adaptation planning and early warning systems. For example, flood modelling in Denmark and England and water quality monitoring in the Black Sea showed that real-time digital tools increase preparedness and foster stakeholder trust. ARSINOE recommends embedding such technologies into the implementation and possible revision of the Water Framework Directive.

5

Inclusive Governance & Sustainable Finance

Finally, ARSINOE points to the importance of inclusive governance and sustainable finance. Participatory methods — from Living Labs to citizen science observatories — enhanced trust and ownership in all case studies. To sustain these processes, the project developed a suite of financial instruments, including a Finance Registry, self-assessment tools and hybrid reporting frameworks, which can help local authorities design bankable adaptation projects. Embedding such tools in the EU's Multiannual Financial Framework and OMNIBUS initiatives would accelerate investment flows into resilience.

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Taken together, these recommendations outline a pathway towards a water-smart and climate-resilient Europe: one that integrates systemic thinking into policy, tailors approaches to diverse regions, leverages innovation and nature, and empowers citizens alongside institutions.



Towards a Climate-Resilient Future

ARSINOE has demonstrated that resilience is not a distant ambition but a practical pathway that can be built today. By uniting science, innovation, governance, and community action, the project has shown how Europe's regions can turn climate challenges into opportunities for sustainable transformation.

The tools, solutions, and networks developed within ARSINOE will continue to empower decision-makers, innovators, and citizens alike. But the journey does not end here — it calls for collective commitment to scale up what works, share knowledge across borders, and keep investing in systemic, inclusive, and nature-positive adaptation.

Be part of this transition. Explore the results:

<https://arsinoe-project.eu/>

and join the growing community of practice here:

<https://egcp.enrich-global.eu/>



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The ARSINOE consortium



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