Centro Euro-Mediterraneo sui Cambiamenti Climatici

CMCC's views on the Water Resilience Research and Innovation Strategy

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Executive Summary

CMCC welcomes a dedicated R&I strategy for water resilience to be joined into a single integrated Ocean and Water R&I Strategy covering the entire source-to-sea continuum. As water is the medium through which climate change is most directly experienced, Europe's water knowledge base will determine its adaptive capacity.

The central challenge is to **support breakthrough research and, at the same time, transfer its result to users at scale**. The former alone yields excellence upstream of decision-making; the latter optimises a system calibrated on conditions no longer valid. The **Strategy's added value resides in enabling methods to reach operational use by competent authorities at the basin, coastal and local levels**.

CMCC proposes the **systemic approach as organising principle**, in five dimensions: **across domains**, with continuous modelling chains from atmosphere to sea including green water; **across time horizons**, from nowcasting to long-term projections; **from driver to socio-economic outcome**, traversing impact chains in reverse from the decision; **across sectors**, extending the WEFE nexus in the wider socio-economic and health domains; and **in digitalisation**, addressing interoperability, rebound effects and data centers water demand.

While water constitutes a **systemic enabler** for agriculture, energy, industry, health, ecosystems, as well as a geopolitical driver, its **governance remains anchored** to historical records and an assumption of hydrological stationarity that no longer applies. The requisite transition is therefore **from predict-then-act to anticipatory planning**, with the **Euro-Mediterranean** treated **as a forward-looking laboratory**. In this context, two conditions are decisive enablers: **non-project-based support for long-lived observation and modelling infrastructure**s, sequenced **coherently across programmes**; and **consolidation of the living-lab network**, to remove institutional constraints on knowledge and technology deployment by users.

1. Introduction

The Euro-Mediterranean Center on Climate Change (CMCC) welcomes the Commission's decision to develop a dedicated Research and Innovation Strategy for water resilience, and to bring it together with the ocean strand into a single Ocean and Water Research and Innovation Strategy along the source-to-sea continuum. CMCC considers the initiative timely, and well founded, and supports its stated aim of reducing fragmentation across the Union's R&I instruments and improving coherence between EU, national and regional programming. Water is the medium through which climate change is most directly experienced by European citizens, economies and ecosystems, and the quality of the knowledge base underpinning water decisions will shape Europe's adaptive capacity, competitiveness and cohesion for decades. CMCC supports the initiative fully and is ready to contribute to its design, implementation and evaluation in whichever modality the Commission considers most useful.

We offer this as a contribution in support of the definition of what a European R&I agenda on water should prioritise. In particular, we are of the view that a credible R&I agenda must sustain three functions. The first is frontier research that extends capability in Earth-System and hydrological modelling, observation and artificial intelligence; the second is incremental cumulative research whose values lies in delivering results to user reliably and at scale; the third is the transfer function i.e the science-for policy interface through which evidence from either of the first two becomes a defensible decision. CMCC recommends that the Strategy gives this third function the same relevance as the other two. In the Union's own terms, this relates to knowledge valorisation[1], and it is both a research object and an institutional capability with precise objective of uptake by a competent authority. The quality of that transfer is not a communication problem. Evidence aids a decision only when it is simultaneously **salient**, **credible** and **legitimate** to the authority obliged to act on it. CMCC positions itself as an instrument of this function, along with the **European Water Academy** (JRC-led) and the **EIT Water KIC**, loci at which **frontier and incremental research are raised to operational readiness across the full spectrum, technological, regulatory, organisational and social**. What the Strategy shall focus on is not only research but the instruments that carry a method from proof of concept to routine use by a basin, coastal or local authority.

A single thread runs through the priorities we set out below, and we would encourage the Commission to make it explicit in the Strategy itself: the systemic approach. It

[1] Council Recommendation (EU) 2022/2415 of 2 December 2022. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022H2415

has five dimensions, across domains, across time horizons, from driver to socio-economic outcome, across sectors, and in the digital transformation, which converge on a single object, the usable decision taken under non-stationary conditions, and which rest on two enabling conditions: continuity of support and the valorisation of living labs.

Across domains. The source-to-sea framing is exactly the right one, and it is welcome. Its value is that it obliges the freshwater and marine communities to join not only their narratives but their models, their observation systems and their digital twin developments, which have so far advanced in parallel worlds with different data models, different resolutions and different user communities.

Across time horizons. Water decisions are taken at every horizon at once, from the reservoir release decided each week to the infrastructure designed for the next fifty years. R&I should therefore support seamless assessment chains that connect nowcasting, sub-seasonal and seasonal forecasting, decadal prediction and long-term projection within a single, consistent framework rather than through separate product families.

From the driver to the socio-economic outcome. Impact chains should be built and, crucially, also traversed in reverse, starting from the decision and from the socio-economic consequence and working back to the hydroclimatic conditions that would affect it. This bottom-up reversal is what turns climate information into well-grounded, defensible decisions.

Across sectors. The Water-Energy-Food-Ecosystems framework and its extensions (for example including Planetary Health dimension) is well established in the literature and should be extended with an explicit socio-economic dimension, applied not only to the analysis of problems but to the identification of solutions. Non-conventional water resources illustrate the point: their assessment has to include residual management, energy demand and social acceptance, not only technical yield.

Digital transformation. Digitalisation offers extraordinary possibilities, and machine learning and artificial intelligence are already transforming forecasting, monitoring and early warning. Without a systemic frame, however, efficiency gains risk being absorbed by expanded consumption, a Jevons effect that is well documented in water as elsewhere, and the resource footprint of the digital infrastructure itself, including the water demand of HPC and data center facilities, becomes part of the problem the Strategy is trying to solve.

Two further conditions seem to us decisive for the Strategy's success. The first is putting the various **sources of support into a coherent system**. Continental initiatives, Water4All, the EIT Water KIC, cohesion instruments, national programmes

and the external action instruments each contribute, and the Strategy's stated aim of reducing fragmentation across them is well founded. We would add that this is not only a matter of avoiding duplication: it is the precondition for long-lasting initiatives. Observation networks, reanalyses, model infrastructures, long-term experimental catchments and data platforms are long-lived assets, and when they depend on successive short projects they advance in fits and starts and lose continuity between cycles. Stable, non-project-based support for research infrastructure and sustained observation is the enabling condition for everything else proposed here, and one of the most valuable things this Strategy can secure.

The second is the **systematic valorisation of living labs**. Europe has built, through successive framework programmes, a remarkable network of living labs, experimental catchments, demonstration sites and pilot territories, and their potential remains under-exploited. They are the natural place where breakthrough and incremental research meet, where technology readiness is raised alongside societal, organisational and legal readiness, and where local knowledge, utility expertise and social science insight enter the design rather than the dissemination phase. The priority is therefore not primarily to create more of them, but to organise those that exist: to harmonise protocols, variables and data standards so results are comparable and transferable across sites; and to align the network deliberately with the resilience challenges that matter most. We would encourage the Strategy to treat this network as a strategic European asset to be connected, sustained and expanded, and to make living labs a structural element of the R&I agenda rather than a project-level option.

2. Water as a systemic enabler under non-stationary conditions

The premise underlying the five dimensions set out above is that water is not a self-contained policy domain, but a **cross-cutting enabler** across much of the *acquis*. Agricultural production, energy generation and cooling, industrial and digital infrastructure, public health, ecosystem integrity, inland navigation, territorial cohesion and the EU's external action all depend on the availability, quality and predictability of water. The return on R&I in this field is therefore realised only in part within the water sector itself, and an agenda designed around water's enabling function will deliver more than one designed around water as an isolated object of management. CMCC recommends that the Commission make this enabling function the organising principle of the Strategy, and to require of every priority that it specify which decisions, in which sectors, it is intended to improve.

The conditions under which this enabling function is exercised are no longer stationary. European water management remains procedurally anchored to historical records: river basin management plans, abstraction permits, environmental flow standards, design return periods and ecological status thresholds are, in most Member States, derived from observed series under an implicit assumption of hydrological stationarity. That assumption was reasonable when adopted, and the instruments built upon it have served European water policy well. The difficulty is one of institutional fit, as a governance architecture calibrated on a stable climate is still applied to a moving one. An environmental flow threshold derived from a changing flow regime becomes progressively harder to interpret, and a water balance computed on the last thirty years of records becomes progressively less informative about the next thirty. The effect propagates to infrastructure sized on outdated return periods, to insurance priced on outdated hazard and to allocation regimes whose reference conditions have moved.

Geography sharpens the point. The **Euro-Mediterranean region** is consistently identified in the scientific literature as one of the world's most pronounced climate change hotspots: it is warming appreciably faster than the global average and faces declining precipitation and runoff, longer and more severe droughts, more intense convective extremes, accelerating aquifer depletion and salinisation, and a rising sea level that interacts with inland abstraction to compromise coastal supply. In several Southern European basins, the **enabling function of water is already under structural stress**, and **non-conventional water resources**, meaning reuse, desalination, managed aquifer recharge and water harvesting, have ceased to be exceptional and form part of the baseline supply. The Mediterranean is therefore both the part of Europe where the systemic approach is most urgently required and the part where anticipatory practice is most advanced, and the Strategy has a clear interest in treating it as a forward-looking laboratory rather than a peripheral case.

Taken together, these elements define the Strategy's central opportunity as **one of knowledge and translation rather than as a technology gap**. Europe has strong modelling, observation and processing capabilities. What deserves reinforcement is the chain connecting hydroclimatic science to the decisions authorities are legally required to take: how much water may be abstracted, at what price, under what conditions and with what residual risk borne by whom. The corresponding shift is f**rom predict-then-act planning to anticipatory planning**, which **tests decisions for robustness across a range of plausible futures**. The sections that follow specify what this requires, following the five systemic dimensions in the order introduced above.

3. Systemic priorities for the research and innovation agenda

3.1 Systemic across domains: the source-to-sea continuum, blue water and green water

Making the source-to-sea principle operational calls for modelling chains that are continuous from atmospheric circulation through precipitation, soil moisture, groundwater recharge, river routing and coastal and marine systems, rather than sectoral models joined at their boundaries. The distinction has practical consequences. Saltwater intrusion driven jointly by sea level rise and inland over-abstraction is difficult to represent in any framework treating freshwater and marine domains separately, and it is precisely the compound process that will determine drinking water security in Mediterranean coastal aquifers and the viability of managed aquifer recharge as a response.

Within this chain, the **green water cycle**, meaning soil moisture, evapotranspiration and land-atmosphere moisture recycling, is less well represented in both policy and R&I than the blue water held in rivers, aquifers and infrastructure[2]. We raise this for an operational reason. The effectiveness of nature-based solutions, sponge landscapes, soil management and land-use measures is mediated almost entirely through green-water processes and cannot be demonstrated with blue-water accounting alone. Funding these measures together with the means to verify their hydrological effect is what will allow results to be demonstrated and the expenditure justified. Slow-onset groundwater depletion in parts of Central Europe makes the same argument from the other end of the system, since it is a recharge question before it is an abstraction question. Recharge, in turn, is governed within the layer that **Earth Critical Zone**, where precipitation is partitioned into evapotranspiration, runoff and the slow percolation that replenishes aquifers, and therefore where green-water and blue-water pathways are physically coupled. Yet it remains the least instrumented compartment of the source-to-sea continuum. Sustained, co-located observation of the Critical Zone, for which Europe already has the eLTER[3] research infrastructure is the condition for attributing the hydrological effect of land-based measures and for detecting groundwater decline early enough to act on it. This **dimension also serves the implementation of environmental policy** most directly. Deriving basin-scale, governance-relevant indicators covering both the blue and green components of freshwater change would strengthen all three simultaneously

[2] Wang-Erlandsson et al. (2022), Nature Reviews Earth & Environment; Porkka et al. (2024), Stockholm Resilience Centre.

[3] eLTER: Integrated European Long-Term Ecosystem, Critical Zone and socio-ecological Research Infrastructure; on the ESFRI Roadmap, ~250 sites, in preparation toward ERIC status. https://elter-ri.eu/

and give the Commission a coherent metric base for the enabling function of water across policy files.

3.2 Systemic across time horizons: from seamless prediction to anticipatory decision

Seamless assessment chains connecting nowcasting, sub-seasonal and seasonal forecasting, decadal prediction and long-term projection are a legitimate object of breakthrough research, and Europe is well placed to lead on them.

Robustness cannot be established top-down from scenario ensembles alone. It also requires **starting from the decision**, whether a reservoir operating rule, an allocation regime, a permit or a design standard, and identifying the hydroclimatic **conditions under which that decision would no longer hold**. This is the established field of **Decision Making under Deep Uncertainty**: decision-scaling and bottom-up stress-testing, and adaptive policy pathways defined by adaptation tipping points, signposts and triggers rather than fixed end-state plans.[4] These methods are well developed in the scientific literature yet rarely operational in European basin practice. Closing that gap between method and use is, in our view, where R&I investment would yield the highest return.

Concretely, the Strategy could usefully support **standardised stress-testing protocols applicable** to river basin management plans and abstraction regimes; methods for characterising deep uncertainty that basin authorities can defend in administrative and judicial proceedings; seamless estimation of water balances across seasonal, decadal and multi-decadal horizons; and adaptive pathway approaches specifying decision points and monitoring triggers rather than fixed end-state plans. The scientific constituents for this work largely exist and have already been applied at national and European scale. What remains to be built is the operational and institutional layer that makes them usable season after season.

3.3 Systemic from the driver to the socio-economic outcome

The analytical chain that gives water its enabling value runs from atmospheric and hydrological conditions through infrastructure performance to economic, distributional and institutional outcomes. Traversing it in reverse, **from the outcome to be protected back to the conditions that would compromise it**, is more demanding still, and is what allows a public authority to justify a decision rather than merely to inform it. CMCC recommends treating these composite chains as research

[4]Decision Making under Deep Uncertainty: Dynamic Adaptive Policy Pathways — Haasnoot, M. et al. (2013), Global Environmental Change 23(2); and decision scaling — Brown, C. et al. (2012), Water Resources Research. https://www.sciencedirect.com/science/article/pii/S095937801200146X

objects in their own right, requiring technical and socio-economic competences to work jointly rather than sequentially.

Two consequences follow. The first is that the chain must be validated against knowledge that does not reside in models: the **operational experience of water utilities and irrigation consortia**, the **local knowledge** of farming and coastal communities, and the **social science** understanding of acceptance, legitimacy and behaviour. The second is that the **human** and **institutional segment** of the chain deserves to be funded as research and not only as training. The European water sector faces an ageing technical workforce, difficulty in attracting hydrological, data and modelling skills, and a widening distance between the sophistication of available tools and the capacity of the authorities expected to use them. **Co-design methods**, **decision-support usability**, **institutional absorption capacity** and the social science dimensions of water governance, including legitimacy, distributional impact, participation and the acceptance of demand-side measures and of reuse, determine whether research outputs are used at all.

This is also where the Strategy's contribution to societal well-being becomes concrete. **Water scarcity and infrastructure failure have distributional consequences**, and pricing, allocation and restriction measures fall unevenly across territories and social groups. Research anticipating those effects, rather than documenting them afterwards, is what allows resilience measures to be adopted and sustained, and CMCC would gladly contribute on this basis to the European Water Academy and related capacity-building instruments.

3.4 Systemic across sectors: the WEFE nexus, efficiency and non-conventional water resources

The 10% efficiency objective is sound in intent, but efficiency is not a single quantity, and the target's operational meaning depends on choices left open: whether it is understood in engineering or in economic terms, and whether it is measured at plant, farm, scheme or basin scale, levels at which the result can differ or even reverse. It also rests on a distinction that is easily blurred, between water use (abstraction), water consumption (the share not returned to the system) and water demand (its economic sense). A first R&I contribution is therefore to **make the target operational**: to specify the metric, the scale and the accounting convention on which any percentage is to be assessed. The hydrology reinforces the point. **Efficiency gains** at farm, network or plant level **do not translate automatically into basin-scale savings**, since recovered water is frequently reallocated to expanded use, well-documented rebound effect, and primarily a **management/governance question**. In basins with substantial reuse of return flows, moreover, high aggregate efficiency can coexist with low on-site efficiency, so that a rigid "efficiency-first" rule can be

counterproductive where those flows already sustain downstream users or protected ecosystems.

R&I should therefore treat **efficiency measures and their safeguards as a single object**: allocation and permitting frameworks capable of retaining savings; water accounting that closes on net consumptive use and recoverable return flows at basin rather than user scale, consistent with the cost-effectiveness and basin-wide logic already embedded in the Water Framework Directive; and WEFE-nexus modelling that makes cross-sectoral trade-offs explicit. This matters particularly in agriculture, which, in many areas, accounts for the largest share of EU freshwater use, and in energy and digital infrastructure, where cooling demand is growing rapidly.

The same logic applies with greater force to non-conventional water resources. Reuse, desalination, managed aquifer recharge and water harvesting are described as non-conventional only against a temperate and stationary baseline. In the Mediterranean they are already standard practice, and under intensifying scarcity a growing share of the EU will depend on them structurally, so that the category is itself a moving target and a further expression of non-stationarity. The research question is therefore less whether to advocate additional capacity than how to update accounting, allocation and status frameworks so that **structural reuse and recharge are treated as baseline supply** rather than emergency measures, and how to represent them within basin water balances, environmental flow assessments and Water Framework Directive status classification.

Here the Mediterranean functions as a two-way laboratory: decades of operational experience with reuse, desalination and managed recharge across the basin's southern and eastern rim is directly relevant to EU practice, and cooperation through the Union for the Mediterranean, PRIMA and the EU's southern-neighbourhood partnerships would let that knowledge travel in both directions.

Mainstreaming should not, however, normalise externalities away, and this is where the socio-economic extension of the nexus framework becomes indispensable. We would therefore **prioritise decision-support tools** capable of screening options for net water, energy, ecological and social gain within a diversified portfolio, assessed jointly with demand-side measures and environmental flow requirements rather than option by option, and would encourage the Strategy to make the Mediterranean experience with these resources a European asset rather than a regional specialisation.

3.5 Systemic in the digital transformation: interoperability, digital twins and artificial intelligence

Digitalisation is an enabler of the enabler, and its value depends on how it is designed and governed rather than on the number of tools deployed. Two failure modes recur: tools that **monitor or report without supporting an end-to-end decision chain** of the kind described in section 3.3, and digital water infrastructure kept separate from energy, agri-food and biodiversity data, which by construction cannot **support the trade-off analysis resilience** planning requires. We therefore suggest that interoperability by design become a structural condition of R&I support, based on open standards, open interfaces and shared semantics; that **cross-domain interoperability** be built into calls rather than encouraged; that co-design with utilities, basin authorities and local administrations be structural rather than a dissemination activity; and that long-term governance be secured for the digital infrastructures on which adaptation policy will rely.

Within this frame, we suggest the Strategy supports the development of Digital Twin capabilities for the water sector, designed from the outset in interoperability with the Digital Twin Ocean. We would encourage the Commission to build this upon the substantial investment Europe has already made rather than alongside it. Destination Earth provides the high-resolution Earth system engine and the digital twin engineering framework; Copernicus, through its Climate Change, Land, Marine and Emergency Management services, provides the observational and reanalysis backbone; the European Open Science Cloud and EuroHPC provide the computational environment; and the Green Deal Data Space provides the semantic layer. A **water digital twin** should be conceived as a thematic, decision-oriented configuration of this existing architecture, sharing data models, spatial and temporal referencing, uncertainty representation and access protocols across the land, coast and ocean interface. Two design conditions appear essential: that it be built for use by basin, coastal and local authorities and not only by research communities, which implies user interfaces, what-if scenario functions and **human-in-the-loop** operation from the outset; and that its governance and funding be secured for the long term.

Furthermore, machine-learning methods have demonstrated clear value in forecasting, gap-filling, anomaly detection, downscaling and early warning, and their rate of progress is such that the Strategy should expect capabilities that do not yet exist. Two research priorities follow. The first concerns the **behaviour of data-driven models outside the observed range**, which is precisely the regime non-stationarity imposes: hybrid, physics-informed approaches and rigorous evaluation of extrapolation performance deserve priority over general capability claims. The second concerns the resource footprint of the digital transformation itself, including

the water demand of data centres and of large-scale model training, which belongs within the same nexus analysis as any other water-intensive sector.

3.6 Water as an enabler of preparedness, security and external action

The Commission has already established, in the 2023 Joint Communication on the climate and security nexus, that water scarcity, together with desertification, extreme events and sea level rise, belongs among the drivers of displacement, instability and conflict, and that evidence-based analysis and foresight constitutes the first pillar of the EU's response. That framing has since hardened into instruments: water now falls within the Critical Entities Resilience and NIS2 Directives, and the Council has cast water resilience as a matter of security, crisis preparedness and strategic autonomy.[5] The R&I Strategy should make this connection explicit, while using the security frame instrumentally rather than adopting it wholesale, since securitisation tends to privilege exceptional measures and can crowd out the distributional and environmental objectives that resilience also serves.[6] The Water Resilience Strategy carries the same theme internally through its preparedness dimension. We consider that the R&I Strategy should make this connection explicit, for two reasons.

First, water is the medium through which climate change most often becomes a security matter, by way of food production, energy generation, cooling, navigability and critical infrastructure, and the analytical requirements are specific: compound and cascading risk assessment, cross-border impact chains, and foresight at horizons longer than electoral cycles but shorter than century-scale projections. These are research problems, and they are not yet adequately served.

Second, transboundary basins and the EU's neighbourhood make the connection unavoidable, and the Mediterranean is once again the decisive theatre: a semi-enclosed basin whose riparian countries differ markedly in water stress trajectory, demographic pressure and cooperation capacity, and where the non-conventional resources discussed above are being deployed at scale on both shores. Here the R&I Strategy can align with instruments already in place. The **Global Gateway Initiative** has made water, climate and energy a priority of the EU's investment partnerships, and comparable engagement runs through different initiatives. R&I support for shared observation, joint modelling, cooperative early warning and common capacity building in these settings would give those investments a scientific foundation and serve resilience and external policy objectives simultaneously.

[5] Water has been brought within the Critical Entities Resilience and NIS2 Directives; the Council has framed water resilience as a matter of security, crisis preparedness and strategic autonomy (conclusions, October 2025). https://www.consilium.europa.eu/en/press/press-releases/2025/10/21/council-pushes-for-a-holistic-water-strategy-to-safeguard-water-resources-and-boost-resilience/

[6] Buzan, Wæver & de Wilde (1998), Security: A New Framework for Analysis.

4. The two enabling conditions

4.1 Continuity and coherence of the support architecture

Of everything set out here, the condition we would emphasise most strongly is continuity. The **systemic approach** described above **is, by construction, cumulative**: seamless prediction chains, reverse impact chains, nexus models, digital twins and long-term observation acquire value through sustained development, repeated validation and progressive institutional uptake. None can be delivered by a sequence of short term projects with discontinuous funding, changing consortia and no custodian between cycles. Where continuity is absent, capability is rebuilt rather than advanced, trained staff disperse, data series are interrupted at exactly the points where the record becomes most valuable, and authorities that have begun to rely on a tool find it unsupported.

We would therefore encourage the Commission to **treat the continuity of support as a design objective of the Strategy** in its own right enabling non-project-based support for long-lived assets, meaning observation networks, instrumented catchments, reanalyses, model and data infrastructures and operational decision-support platforms, with explicit custodianship and periodic scientific review in place of repeated re-competition. The second is coherence of programming, so that the different European and national programmes are sequenced along a single trajectory rather than accessed opportunistically. The third is continuity across the innovation cycle, so that a promising method can progress from proof of concept to operational use without a change of funding logic mid-course, while low-TRL research remains protected as the source of future breakthroughs. The fourth is sustained funding of post-deployment monitoring, since the effectiveness of water innovations, and of non-conventional water resources in particular, is revealed only under stress conditions such as multi-year drought or competing demands, which may arise well after a project has closed.

4.2 Living labs and readiness across the full spectrum

The barrier to deployment is frequently not technological readiness but institutional readiness: a method may be scientifically mature and still unusable because no regulatory procedure accepts its output, no procurement category exists for it and no authority is staffed to operate it. We suggest the Strategy address this directly, by funding regulatory maturation and standardisation alongside the science, and by treating uptake by a public authority, rather than publication or prototype, as the completion criterion for the relevant instruments.

Living labs and pilot territories are the natural instrument for this purpose, because they raise readiness across the whole spectrum simultaneously,

technological, societal, organisational and legal, and the European portfolio of water projects has shown that the last three are the binding constraints. We would encourage the Strategy **to connect and consolidate the existing network of living labs**, experimental catchments and demonstration sites rather than working in isolation; to extend it to full-scale, basin-level demonstration of decision-support systems and governance arrangements, and not only of hardware and treatment technologies, since the decision procedure is as much an object of testing as the device; to ensure adequate representation of Mediterranean and semi-arid conditions, where non-conventional water resources, reuse governance and drought risk transfer can be tested at scale; and to keep these sites accessible to researchers, utilities, authorities and SMEs throughout the innovation cycle.

About CMCC Foundation

The CMCC Foundation – Euro-Mediterranean Center on Climate Change (CMCC) is a leading European multidisciplinary research center dedicated to studying the interactions between climate change and society, economy and environment. Its mission is to produce rigorous and advanced science that supports sustainable development, environmental protection, and evidence-based strategies for climate adaptation and mitigation.

CMCC serves as Italy's National Focal Point for the Intergovernmental Panel on Climate Change (IPCC), and it contributes to the Integrated Carbon Observation System (ICOS) ERIC as coordinator of the Ecosystem Thematic Center. CMCC is one of the institutions selected by the World Meteorological Organization (WMO) to produce seasonal climate forecasts, and works with a network of over 700 partner organizations across 71 countries.

At a time of rapid change, CMCC is deepening its focus on the nexus between climate science and socio-economic transformation, powered by advanced machine learning and data science. Water resilience is a core pillar of this agenda: through an integrated, source-to-sea approach, CMCC's three research institutes cover the full water cycle - from climate projections and water balance assessments to impacts induced by drought, flood, and coastal risks, and the identification of adaptation options. CMCC coordinates the EEA's European Topic Centre on Climate Change Impacts, Vulnerability and Adaptation (ETC/CCA) and contributed to the European Climate Risk Assessment (EUCRA). CMCC's digital tools translate Earth observation and climate data into operational decision support for water managers, while its contributions to Copernicus C3S support monitoring at EU scale. In parallel, CMCC brings experience in water-related finance and investment instruments, nature-based solutions in urban and coastal settings, as well as advanced capacity-building capabilities, combining scientific depth with a track record of translating research into actionable tools for practitioners and policymakers.

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