COPERNICUS THEMATIC WORKSHOP ON WATER

Executive Summary & Minutes

WORKSHOP DETAILS

Date: Monday, December 1, 2025

Location: Brussels and online

Start: 09:30

End: 17:00

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EXECUTIVE SUMMARY

The Copernicus Thematic Workshop on Water was conceived as an event to assess how existing Earth Observation capabilities can support European water policy implementation and operational water management**.** Rather than introducing new services, the workshop aimed to consolidate the various water-related EO offerings**,** to align them with regulatory frameworks such as the Water Framework Directive and identify pathways to improve uptake across Member States.

The workshop gathered a broad spectrum of participants, including European Institutions and agencies representatives, national water authorities, research institutions, and EO service providers. Participation showed a strong engagement from national public authorities and operational users.

Discussions made clear that, while Copernicus provides extensive water-related data catalogues across multiple services, no single, coherent entry point for water users currently exists. This fragmentation places an operational effort on users, particularly public authorities with limited EO expertise. In this context, the concept of a Copernicus Water Thematic Hub emerged prominently as a potential unifying solution. The workshop therefore served as a strategic moment to reflect on how Copernicus can evolve from a data-rich ecosystem into a more user-oriented and policy-aligned system.

1. Key observations

The workshop was structured around four thematic blocks:

- Policy context
- User needs
- Copernicus water-related products across services
- Forward-looking opportunities and solutions.

Across these themes, participants discussed how to advance technical capability address gaps in guidance, interoperability, standardisation, and trust as well as ways forward.

National and institutional perspectives provided insights into how EO is currently used to support water management, including monitoring of lakes, rivers, reservoirs, floods, droughts, and coastal waters. Examples from Member States showed that EO is most effective when it complements in-situ data, helping to target measurements, scale observations, and reduce monitoring costs. It was made clear that the availability of sufficient, harmonised, and fit-for-purpose in-situ data remains critical for the effective operational use of EO. Participants stressed that limitations in in-situ observations directly affect product validation, standardisation, and the legal robustness of EO-based outputs for regulatory reporting. In this context.

Discussions also emphasised the importance of establishing a Water Thematic Hub as a “one-stop shop” for Copernicus water-related information. They underlined its potential role not only

in streamlining access to services, but also in systematically capturing, structuring, and responding to user needs across Member States.

Additionally, participants revealed uneven maturity across domains. While flood and drought monitoring benefit from established EO-based services, inland water quality and small water bodies remain challenging**,** particularly due to resolution limits and lack of harmonised methodologies.

The interactive sessions confirmed that users are primarily eager to see how EO data can be translated into actionable metrics, reporting units, and decision-support outputs aligned with legal obligations and operational realities.

2. Identified gaps and needs

The workshop clearly identified several systemic gaps:

- Policy–service misalignment, where EO products do not map cleanly onto regulatory indicators.
- Technical fragmentation, with data distributed across multiple platforms and services.
- Capacity gaps, particularly among administrative staff expected to use EO outputs.
- Engagement gaps, especially for online participants and non-technical stakeholders.

During the interactive session participants identified ten **user needs** that should be considered of primary interest for the water community, reflecting shared priorities for improving the operational use of Copernicus Earth Observation services[1]:

- Dedicated datasets to calculate metrics for the Water Framework Directive (WFD), Nitrates Directive, and Green Deal.
- Downscaled or aggregated products to national reporting units rather than just continental tiles.
- Easy integration of Copernicus data into existing national legacy monitoring systems.
- High-resolution data (<10m) to monitor the small water bodies (<50ha) that the law requires to manage.
- Mechanism to co-create services with providers to ensure they fit operational workflows.
- Pre-filtered and quality data ready to use by administrative staff (without scientific vetting).
- User-friendly visualization tools that summarize complex data for ministers and the public.
- Decision-support systems that interpret data (e.g., "Alert: Water level critical") rather than just displaying values.

[1] The results of the final discussion and Murals are available in Section 4.2. The results from the survey shared with online participants is available in section “Survey 3”.

- “One-Stop-Shop" to access all water-related Copernicus data and services in a single location.
- Clear, practical guidelines on how to use Earth Observation for operational water management tasks.

Survey results reinforced these points, with participants prioritising needs such as a one-stop shop for water data, decision-support outputs instead of raw values, comprehensible operational guidelines, and clear institutional coordination roles. These needs highlight that the challenge is not innovation, but translation and integration.

3. Recommendations

The workshop showed that the main challenge for Copernicus water applications is not data availability, but operational uptake. Participants called for a shift from fragmented service offerings toward simplified, user-oriented solutions that directly support water management and policy implementation. Products should be explicitly aligned with frameworks such as the Water Framework Directive, delivering ready-to-use metrics, aggregations, and decision-support outputs.

To enable uptake, participants highlighted the need for clear practical guidelines, pre-processed datasets, and intuitive visualisation tools suitable for non-specialist users. At the same time, validation and standardisation mechanisms are essential to build trust and legal confidence in EO-based products. In this context, participants highlighted the key role of the Copernicus Knowledge Centre for Earth Observation (KCEO) as a central coordination point. The KCEO was seen as instrumental in ensuring coherence across services, supporting thematic hubs such as the Water, and facilitating structured dialogue between users, service providers, and policy actors.

In that perspective, a key priority is the development of the Copernicus Water hub, designed with users and organised around operational needs and regulatory requirements. Participants concluded by proposing the organisation of a follow-up Copernicus Thematic Workshop on Water by the end of 2026. This future event was framed as an opportunity to assess progress in the development of the Water Thematic Hub and to continue structured dialogue.

MINUTES

WELCOME & INTRODUCTION

Hugo Zunker, DG DEFIS, European Commission

Mr. Zunker welcomed participants and highlighted the upcoming European water resilience strategy set for June release. He explained the Water Framework Directive and Marine Strategy directive work across six thematic services using satellite and in-situ data. Mr. Zunker stressed that water data policy enables digitisation across policy areas, though no single dedicated water service currently exists. Services operate independently, including climate change services (C3S) and emergency service (CEMS) which include numerous products on water. Additionally, the Copernicus Land Monitoring Service provides data on inland surface water layers and seasonal dynamics. He explained that ground subsidence monitoring with EO data can enhance city resilience against extreme rainfall and flooding. Mr. Zunker emphasised challenges from different communities with varying priorities and legislation. Finally, he described the workshop as user-driven, designed to centralise access to Copernicus water services and strengthen partnerships between institutional programmes and policy users.

Claudia Olazabal, DG ENV, European Commission

Ms. Olazabal characterised the relationship between communities as an onboarding and growing process, with the Water Thematic Hub (TH) playing a particularly prominent role in the discussion as a central framework for structuring engagement and collaboration around water-related challenges. She also highlighted the water-resilience strategy, explaining that it serves as a key entry point for Member States and shows how vital water is for the EU's overall well-being and long-term sustainability.

Ms. Olazabal noted that all Member States will face climate change challenges. She underlined that Earth Observation (EO) represents a major assistance mechanism, though Member States face significant implementation gaps due to funding constraints. Ms. Olazabal emphasised that EO is essential for water management practitioners, though not all professionals involved in daily operations can interpret EO data. She stressed the need for EO to become a routine tool alongside in-situ instruments.

Ms. Olazabal called for growing dialogue with DEFIS colleagues to enable innovation, emphasising the importance of understanding stakeholder needs through two-way dialogue to build trust and strengthen partnerships.

In addition, Ms. Olazabal made an important forward-looking remark by proposing the organisation of another workshop on the same topic towards the end of 2026. By that time, she noted, there should ideally be further developments around the Water TH, and such a follow-up event could form part of a broader strategy for sustained stakeholder engagement and long-term collaboration.

SESSION 1 – SETTING THE SCENE

1.2 PRESENTATIONS

Moderator: **Tobias Biermann**, DG DEFIS, European Commission

Jenny Attila, *Finnish Environment Institute*, ***Use of EO Tools in Support of the WFD***
Ms. Attila expressed the desire to increase EO support towards the Water Framework Directive. She noted Working Group ECOSTAT developed a Statement of Purpose for Ecological Status monitoring, with outcomes in a JRC report published the previous summer. Ms. Attila reported many countries successfully apply EO tools, primarily over lakes and coastal waters. She identified challenges: absence of common guidelines, legal conflicts with national monitoring guidelines, and authorities poorly informed about EO datasets. Ms. Attila outlined objectives including surveying Member States ECOSTAT representatives to assess readiness and identify gaps. She noted plans for guidelines on supporting assessment with EO for overlooked WFD parameters. Training and workshops will support EO and in-situ tools use, with a special issue encouraging contributions.
More information can be found in the presentation here.

Bertrand Vallet, *DG RTD*, European Commission, ***Overview of Existing Projects***
Mr. Vallet presented portfolio analysis for the water resilience R&I strategy within Horizon 2020 and early Horizon Europe projects. He noted three reports would be published December 8th, focusing on EO solutions. Mr. Vallet reported 16 Horizon 2020 projects funded with a total budget of 52 million euros: 10 research and innovation actions, 5 innovation actions, and 1 coordination action. He outlined themes including combining in-situ and EO data for modelling and hydrological forecasting, water management for agriculture, extreme event forecasting, and water quality monitoring. Regarding Horizon Europe, Mr. Vallet noted 10 projects with a total budget of 72 million euros, highlighting LIQUIDICE for improving snow and ice modelling. He emphasised developing water system models for ecological services, promoting resilience across Member States, and enhancing water use efficiency. Mr. Vallet concluded that combining EO and in-situ data improves knowledge and supports more effective and advanced decision-making, although interoperability requires further improvement.
More information can be found in the presentation here.

Carmen Cillero, *Estonian University of Life Sciences*, ***Water-ForCE Roadmap***
Ms. Cillero presented Water ForCE (A Roadmap for Copernicus Water Services), offering a roadmap for the European Commission to meet goals: identifying business opportunities for downstream applications, Copernicus supporting European policies, and analysing biogeochemical products. The project worked across five thematic areas, conducting workshops with over 800 stakeholders. Ms. Cillero identified bottlenecks: lack of dedicated in-situ component with limited trust, lack of compatibility between EO and EU directives, fragmentation

of services, Sentinels being suboptimal for inland waters, lack of funding mechanisms, and insufficient recognition of water domain within Copernicus. She outlined priority actions for Copernicus: first supporting downstream applications, then becoming a product provider for stakeholders, followed by a service provider role, and finally evolving into a data provider. She concluded ESA, EUMETSAT, and European Commission should agree on providing analysis-ready data for stakeholders and on harmonising input used to study water as a continuum.
More information can be found in the presentation here.

SESSION 2 – USER NEEDS

2.2 PRESENTATIONS

Moderator: **Mark Dowell**, EC JRC, European Commission

Mr. Dowell emphasised that enabling the uptake of Earth Observation (EO) in policy areas is a main priority, with the Knowledge Centre for Earth Observation (KCEO) playing a central role as the EU's focal point for coordinating EO knowledge and engagement across institutions. He noted that the JRC is developing the KCEO in close collaboration with 15 Directorates-General to increase references to Copernicus within EU legislation and policy frameworks.
Mr. Dowell stated that Copernicus is increasingly recognised as a value-adding asset within sectoral policy DGs, with the KCEO acting as a key interface between policy needs and EO capabilities. The Knowledge Centre carries out targeted assessments across different policy areas, reviewing legislation to identify where Copernicus can effectively support implementation and where EO can contribute.
He highlighted assessments focusing on compliance, reporting, monitoring, enforcement, and early-warning systems, noting the broad potential for EO to support and strengthen the application of EU legislation across all policy domains.

Yurena Lorenzo, *EEA*, ***Policy Needs***
Ms. Lorenzo described EEA and EIONET's role providing objective, reliable information at European level. The EEA-Eionet strategy 2021-2030 feeds into regulations, directives, and plans including indicators, dashboards, reports, and Copernicus products. Ms. Lorenzo outlined current uses including the Climate Impacts and Preparedness Portal for floods, droughts, and water resources assessment. She described EU-Hydro 2.0 as a pan-European reference dataset expected in first half of 2026. Ms. Lorenzo emphasised its potential as the go-to dataset providing common language for different users, integrating multiple layers. The product provides one trusted data network for consistent reporting, informing water policy and restoration. Ms. Lorenzo concluded that CLMS has potential to monitor water needs across Europe, with EU Hydro 2.0 delivering information to support diverse policy requirements when it comes to the integration of water data.
More information can be found in the presentation here.

Aurore Delahayes, *French Ministry for Ecological Transition, Biodiversity and International Negotiations on Climate and Nature - Research Department*, ***National Perspectives - FR***
Ms. Delahayes described the convergence of state levers through national strategy to strengthen monitoring tools, developing tools for policymakers through France 2030 programme. She identified barriers: limited knowledge, technical and language barriers, insufficient training time, lack of confidence in satellite data versus in-situ data, fear of costs, and insufficient precision and resolution. Ms. Delahayes outlined tools being developed including the satellite applications plan, applisat.fr platform, and France 2030 space projects investing in French businesses developing tools for government actors adaptable to local needs. The France 2030 Space for

Hydrology project consulted 120 public stakeholders to collect their needs, resulting in the development of decision support tools for local-level water management. These are already being tested with relevant stakeholders. The hydrology project monitors water volumes in dam reservoirs, lake dynamics, water quality of rivers and lakes, and irrigated agricultural plots.
More information can be found in the presentation here.

Bjorn Baschek, *Federal Institute of Hydrology, BfG (Germany)*, ***National Perspectives – DE***
Mr. Baschek noted that Germany had supported and developed a plethora of applications for Copernicus and EO projects for water over 20+ years. CEMS is actively used in Germany, with EO topping up ground monitoring services. Mr. Baschek highlighted institutional certifications and validation reports build trust and legal confidence in satellite data. He emphasised strong communication between users and federal institutions ensuring user needs are built upon. Commercial tools and public authorities' combinations are established to better target in-situ measurements, with EOused with in-situ data to complement rather than replace. Mr. Baschek identified data uncertainty as a big challenge, with demonstration under development through the Algenmonitor project. He noted different perspectives exist, with most usage based on data rather than services. Products should build on existing national capabilities and scale to European level.
More information can be found in the presentation here.

Marwan Shamekh, *OIEau, **Water Resource Management Needs***
Mr. Shamekh described collaboration with international and European partners for water information systems and data management. Data and information are needed for various purposes, with EO helping water managers as it complements in-situ measurements. Mr. Shamekh emphasised both satellite and in-situ data are necessary, with in-situ calibrating Earth Observation. He described the Spongescapes project to enhance resilience to floods and droughts, utilising harmonised EU-wide EO datasets for selected nature-based water retention measures. They provide national and basin authorities with data visualisation, time-series analysis, and comparison for monitoring and planning. Mr Shamekh noted that water planners' needs are now much better understood, and that combining EO data with in-situ measurements can fill information gaps and allow local observations to be scaled up to the European level, especially since relying on in-situ data alone would be too costly. He stressed the need for more training to build capacity and knowledge.
More information can be found in the presentation here.

Jose Miguel Rubio Iglesias, *EEA*, ***In-Situ Water Data***
Mr. Rubio Iglesias noted that EEA is the entrusted entity for the Copernicus In-Situ Component. He outlined key water-related in-situ requirements, including river discharge, water levels, soil moisture, snow water equivalent, and reservoir and dam data. He stressed that while in-situ observations are a critical backbone for hydrological monitoring and for supporting EO products, there is currently an insufficient volume of in-situ data that is specifically designed to be fit-for-purpose for EO applications. Much of the existing in-situ data was not originally collected with EO integration in mind, which limits its effectiveness for model validation, operational monitoring, and decision-making. He explained that ongoing efforts to harmonise in-situ data and validate

hydrological models involve a wide range of data providers and observation networks at national, regional, and global levels. However, despite these efforts, significant gaps remain in the availability, coverage, and suitability of in-situ observations, making the effective combination of in-situ and EO data challenging. Key recommendations therefore include expanding and strengthening fit-for-purpose in-situ monitoring networks, alongside improving coordination and accessibility of hydrological datasets, to better support water management and policy implementation. More information can be found in the presentation here.

2.3 Interactive Discussion including Potential Use Case Presentations

Moderator: *Question: How do In-Situ and EO data complement each other for water monitoring?*

- **Answer from Bjorn Baschek:** He highlighted the idea of using EO data to better target and tailor in-situ sampling, helping decide where and how to place monitoring stations, such as along the Mosel and Rhine. This approach is important because it is not feasible to monitor all lakes using in-situ measurements alone.
- **Answer from Aurore Delahayes:** In-situ data comes from diverse public and private actors, encompassing various types and formats. During crises, stakeholders must debate and arbitrate which water resources to prioritise. Ms. Delahayes noted the challenge of selecting a reliable in-situ reference amid these many options, suggesting EO could independently guide water management decisions without relying on specific in-situ providers.

Moderator: *Question: Can generic capacity building measures be implemented together for water monitoring, or must specificities be addressed at national or local level?*

- **Answer from Bjorn Baschek:** He noted European level discussions have started within ECOSTAT and through workshops. Similar discussions occur at German national level with federal states. German legislation differs from European but must adapt for remote sensing implementation. Both top-down and bottom-up approaches are needed, but they must be connected. A common way of using EO is required while maintaining exchange between both approaches.

Moderator: *Question: What are the main challenges and solutions for effectively using EO data in water monitoring programmes?*

- **Answer from Marwan Shamerkh**: He insisted that increased knowledge sharing of projects and activities across Europe expands opportunities for implementing EO products and services. For effective capacity building, it is essential to use accessible language and provide concrete examples. This approach helps non-technical policymakers and stakeholders better understand and be open to the tools.
- **Answer from Bjorn Baschek:** He highlighted that there are errors in satellite data - including the size of errors and whether error assessment serves reporting or scientific goals. There is a need for a common approach to deciding when to combine or aggregate data, as well as which seasons to consider. Regarding capacity building, there is ongoing discussion at national, state, and European levels about whether generic aspects can be built or if specific local needs must be addressed. European legislation will need to adapt, with a common way of using EO data required, and both generic and tailored approaches must be connected.

Moderator: *Question: Does the recent Water Framework Directive update open doors for member states to systematically engage with EO in reporting?*

- **Answer from Bjorn Baschek:** He stated it's a start but not complete. Satellite data contains errors and uncertainties from atmospheric correction and other factors. Understanding which water body types provide accurate data and error margins is essential. Scientific analysis of exact chlorophyll levels differs from reporting water status for WFD. A common approach is

needed on when to use earth observation, when not to, and when to combine with in-situ data, which ECOSTAT will develop over coming years.

Moderator: *Question for **Ms. Carmen Cillero**: What should be the additional national to the Water Framework Directive?*

- **Answer from Carmen Cillero**: She highlighted that products derived from inland and coastal waters need to be comparable, but currently they are not, which undermines user trust. Addressing this issue requires stronger cooperation among stakeholders and a shared responsibility to improve and evolve Copernicus coastal data offerings, possibly within water quality hub.

SESSION 3 - COPERNICUS WATER PRODUCTS

3.2 PRESENTATIONS

Moderator: **Usue Donezar**, EEA

Ms. Donezar noted horizontal activities across Copernicus services, with lack of ownership for water domain making it difficult for external users to differentiate products and services being developed. She emphasised the need to change scope from the user perspective.

Chiara Cagnazzo, *ECMWF (Online)*

Ms. Cagnazzo highlighted the need for science-based information to manage water-related climate risks, noting decision-makers lack accessible, consistent integrated hydrological climate data and tools, especially across timescales. Users need operational actionable information for water management, planning, and adaptation. Ms. Cagnazzo described C3S-CEMS energy integration with global and European flood awareness systems. She outlined seasonal hydrological forecasts based on seasonal climate models through reference climate data for Europe and the globe. Ms. Cagnazzo described hydrological climate challenge projects including the Copernicus interactive climate atlas, hydrological model framework, and interactive web app providing accessibility of data. She noted development of the water service via the water service website and applications, emphasising user requirements at the heart of the service.
More information can be found in the presentation here.

Peter Salamon, *EC JRC*

Mr. Salamon outlined CEMS applications and products for water: European and Global Flood Awareness Systems, European and Global Drought Observatories, and Global Flood Monitoring and On-Demand Mapping. Forecasting model-based products require enormous amounts of in-situ and EO data. Mr. Salamon described Earth observation-based water products from CEMS, including Sentinel-1 based CEMS Global Flood Monitoring providing user-defined AOI for coverage and availability typically short time periods (days to weeks). He highlighted use cases for CEMS water-related products, including looking at future seasonal outlooks using water storage layers as part of long-term strategy.
More information can be found in the presentation here.

Lorenzo Solari, *EEA*

Mr. Solari outlined water products available at CLMS used for mapping water presence, assessing water status, and water in the ground. He described water presence through land cover products and mapping water in protected areas. Biophysical products purely map water and wetness such as HR Water Layer and Water Cover Duration providing different time series to meet different user needs. Mr. Solari described EU Hydro mapping hydrological network, coastline, and water bodies. He explained assessing water status through JRC products for water quality covering Europe and global areas. He noted that on top of water quality layers, the water level product and the river water level product measure lake and river water levels with more than 23,000 virtual stations monitored worldwide with satellite altimetry data. Mr. Solari described water in the ground

through direct and indirect measurements including soil moisture and subsidence. He noted CLMS establishing an Inland Water Working Group to define user requirements with implementation roadmap.
More information can be found in the presentation here.

Laurence Crosnier, *Mercator Ocean International*
Ms. Crosnier noted the Copernicus marine service has 300 scientifically validated products with 120,000 registered users, using a user-driven approach with 1.5 million web portal visits annually. She outlined the data offer including blue (ranging from temperature salinity and currents to sea surface elevation and wind), green (which could be nekton to optics), and white (covering sea ice concentration & thickness to ice surface temperature) ocean data variables. Ms. Crosnier explained delivering data from in-situ, Earth observation, and ocean models, with products combining datasets to give full capability. Products deliver high resolution data (100m) daily and produced monthly over Europe, enabling users to assess biodiversity, bathing waters, and water quality. Ms. Crosnier described global freshwater plumes delivering data for aquaculture, desalination plants, and land-sea interactions. This gives specialised users ability to map EU basins water quality through Oceancolour Sentinel-2 and 3. Ms. Crosnier highlighted the FOCCUS EU Project working to enhance coastal extension of the marine service.
More information can be found in the presentation here.

Marc Paganini, *ESA*
Mr. Paganini described R&D activities for sustainable water resource management. He noted working with organisations such as UNEP (UN Environment Programme) and Ramsar Secretariat, providing Earth observation-based solutions. Mr. Paganini explained integrating EO data flows into national monitoring systems while following UNEP guidelines. He highlighted ESA's Climate Change Initiative, harnessing 40 years of ESA, Copernicus, and other EO data. Mr. Paganini described cluster projects to enable cross-sectoral collaboration and sharing learnings. He noted co-creating new water quality and biodiversity management products from Sentinel expansion mission data, providing experience and user readiness for future missions. Mr. Paganini highlighted ESA Global Development Assistance programme where water is one covered domain, supporting international financial institutions, scaling EO capabilities globally, working with Copernicus services and promoting these at UN level.
More information can be found in the presentation here.

3.3 Q&A

Moderator: *Question for **Ms. Chiara Cagnazzo**: What is the focus and scope of the water service being developed? Is it only ECMWF products or broader? Is it focused on EU policies or global scope?*

- **Answer from Chiara Cagnazzo:** She explained the multi-modal product considers not only ECMWF models but models from other hydrological services including UFZ Institute, SMHI, and UK Centre for Ecology and Hydrology. Experts are creating multi-modal products across different timescales by combining different models. Outputs will be

completely open and free. Reference climate forcing products will be consistent, homogeneous, and ready for hydrological exercises, offered to anyone. Experts can run their own models with the same forcing and contribute to multi-modal products later.

Moderator: *Question for **Mr. Lorenzo Solari**: What would be or could be the future evolution of inland water products provided by CLMS and where should the focus be?*

- **Answer from Lorenzo Solari:** He noted Water ForCE collected evidence showing hundreds of products exist for water mapping but fewer than ten for water quality. Inland water quality should be a focus, though capabilities are constrained by available satellites. At European scale, Sentinel 1 and Sentinel 2 are heavily utilised with known capabilities. Longer term, after this contribution agreement, products could incorporate contributing missions and differentiate between global and European portfolios regarding final resolution.

Moderator: *Question for **Mr. Peter Salamon**: Where can water-related data from the Emergency Management Service be found and what is the best way to access them?*

- **Answer from Peter Salamon:** He explained there are two access methods catering to different users. Key users like emergency responders and civil protection want ready-made, easily accessible, fast digestible products through map viewers for quick visualisation of forecast states and specific details. Users creating downstream products need actual data, accessible through the Early Warning Data Store for model data. For satellite data, APIs and data catalogues like the STAC catalogue for Global Flood Monitoring provide access to large data sources.

Moderator: *Question for **Mr.** **Marc Paganini**: Could you explain how the research activities you have presented are made operational?*

- **Answer from Marc Paganini:** Mr Paganini noted that the focus of the activities is to exchange knowledge with R&D projects, they are trying to develop the environment for scientists to share their knowledge. He also explained that the activities are working with UN in different policy domains, and that the UN looks for solutions that are free of charge or low cost. Mr. Paganini explained that the projects are done with co-design way with end users, with ESA maintaining the tools at the end of the projects, which are then made available on the data platform – openeo - https://openeo.cloud/.

Question from audience ***(Mr. Andy Shawn)***: *Real-time forecasting, modelling, and dedicated water quality instrumentation needs, noting the growing UK community on coastal water quality with agencies interested in catchment-to-coast connectivity. Should real-time monitoring and modelling should be of concern to the group and does guidance or advice exists?*

- **Answer from Peter Salamon:** He stated real-time forecasting is already part of CEMS offerings. Ocean models deliver forecasts every 10 minutes up to 10 days ahead depending on the area, and are very sensitive to freshwater inputs as important boundary conditions. CEMS is involved in Horizon Europe projects addressing these needs. The FOCUS project specifically aims to improve boundary conditions between coastal and regional models in both directions.

- **Answer from Laurence Crosnier:** She explained the FOCUS Horizon Europe project aims to improve representation of fresh water inputs into ocean models. The project has wide focus worth exploring on its website. It looks at improving coastal and regional model boundary conditions and addresses near real-time forecasting using CEMS data to examine water quality indicators, particularly nutrient influxes into oceans. A previous completed project called "Water Quality for Emergency Services" looked at integrating these services into emergency management responses to environmental issues.

Moderator: *Question: How can the different Copernicus services better differentiate and explain their water products to external users given the lack of single service ownership for the water domain?*

- **Answer from Peter Salamon:** He agreed water is cross-service and cross-topic across Copernicus services. Synergies exist today but need improvement, particularly regarding water mapping products. The thematic hub could bring elements together helping users understand Copernicus offerings. He emphasised most products, despite different nuances, have very specific user requirements. For flood monitoring, users want products in minutes or hours, while near real-time elsewhere might mean days. Clear requirement differences must be considered when developing products.

- **Answer from Lorenzo Solari:** He emphasised differentiating by what requirements are addressed rather than just data characteristics. Products may eventually link directly to specific regulations, working only for those purposes. This would clarify for users what is being targeted. Making distinctions obvious outside the technical community is important - Sentinel 2 versus Sentinel 3 differences aren't equally obvious externally.

- **Answer from Laurence Crosnier:** She made two points: First, better addressing full Copernicus offerings without silos is needed. Different data catalogues exist but are hard to access for those seeking user-friendly layers. Second, stronger collaboration between entrusted entities is crucial. Collaboration already exists - Marine products are used by Emergency, Land, and Climate services and vice versa. Collaboration is key for learning and evolving offerings long-term. Demand is now transversal, requiring strengthened collaboration between entities.

- **Answer from Chiara Cagnazzo:** She agreed existing horizontal synergies should continue where meaningful and useful for users. More can be done, driven by content meaningful to users rather than politically. Some overlaps will always exist because water is cross-topic. Water for renewable energy differs from water for other sectors, but water remains the same. Separation should be from the user's point of view - users don't care about product sources, only about products meeting their specific application needs. Coordination effort is needed rather than ownership, maintaining service specificities and different user requirements while coordinating.

SESSION 4 – CREATING OPPORTUNITIES

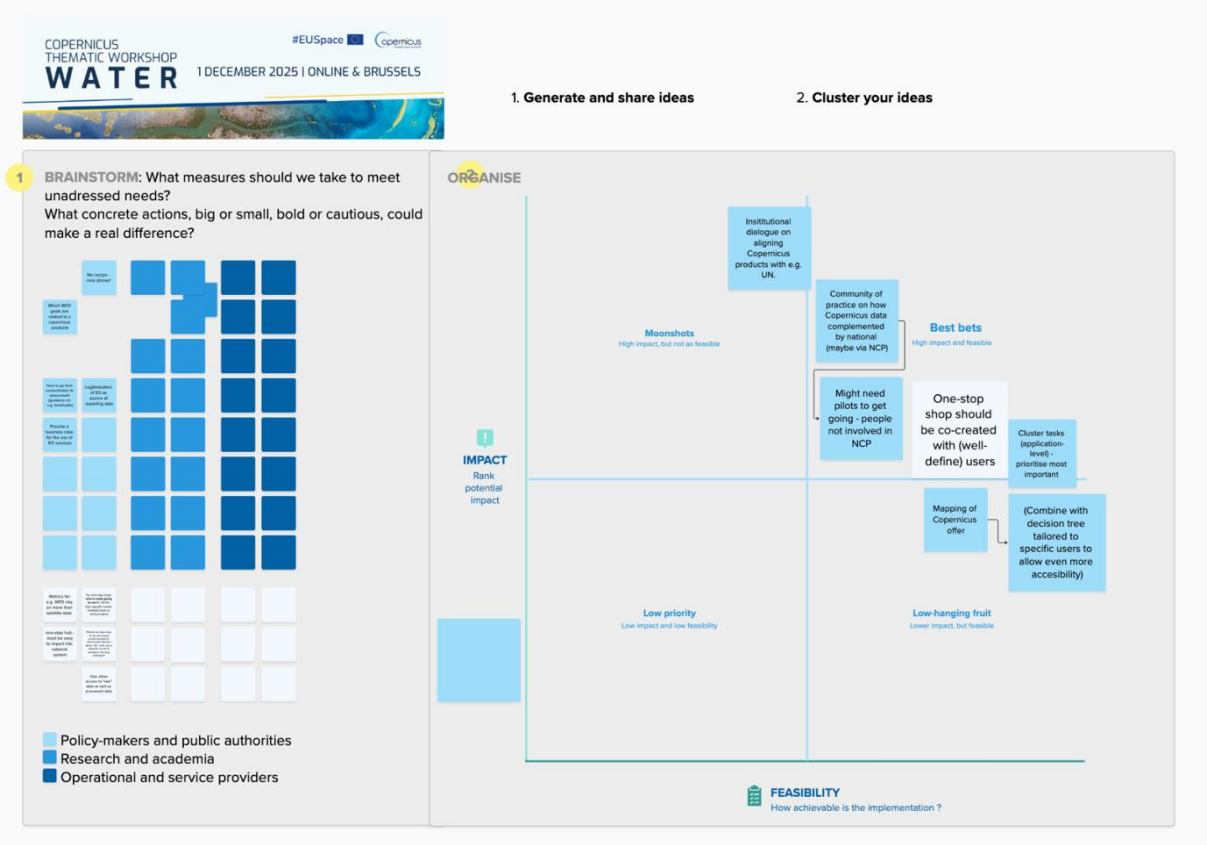
4.2 INTERACTIVE SESSION

Moderator: **Eduard Escalona Zorita,** *EUSPA*

The interactive session was introduced by the moderator where participants were divided into three groups to discuss and prioritize measures for improving EO for water. Groups worked with a mural tool to classify measures into a matrix identifying "best bets" and "low hanging fruits" based on impact and feasibility. Each group reported back through designated rapporteurs.

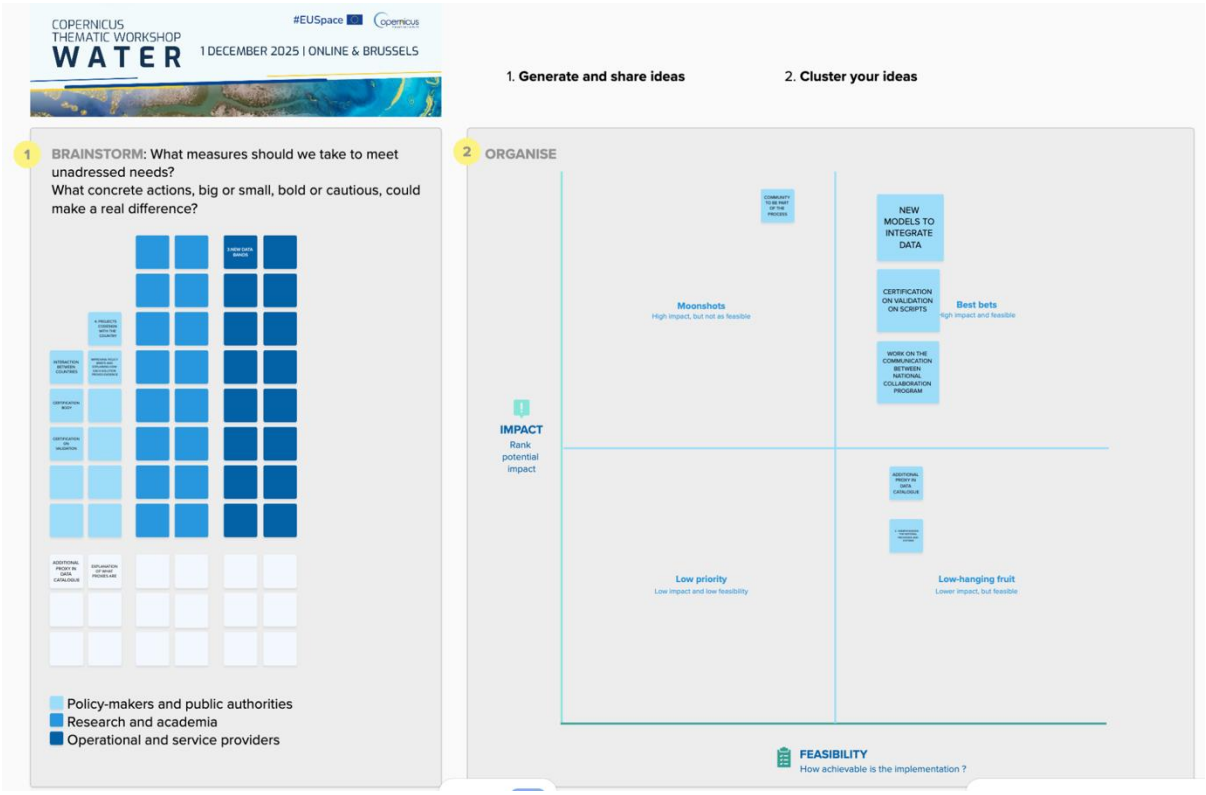
Group 1: The rapporteur reported that most of their discussions centred on mapping user requirements to match needs with Copernicus offerings. They discussed establishing a community of practice on how EO data complements national data, particularly through national collaboration programs. The one-stop shop for Copernicus water data/water hub should be co-created with users to influence design from user needs perspective. Another high-impact measure involved aligning products with large-scale institutional frameworks like UN to meet requirements such as SDG indicators.

Mural 1:



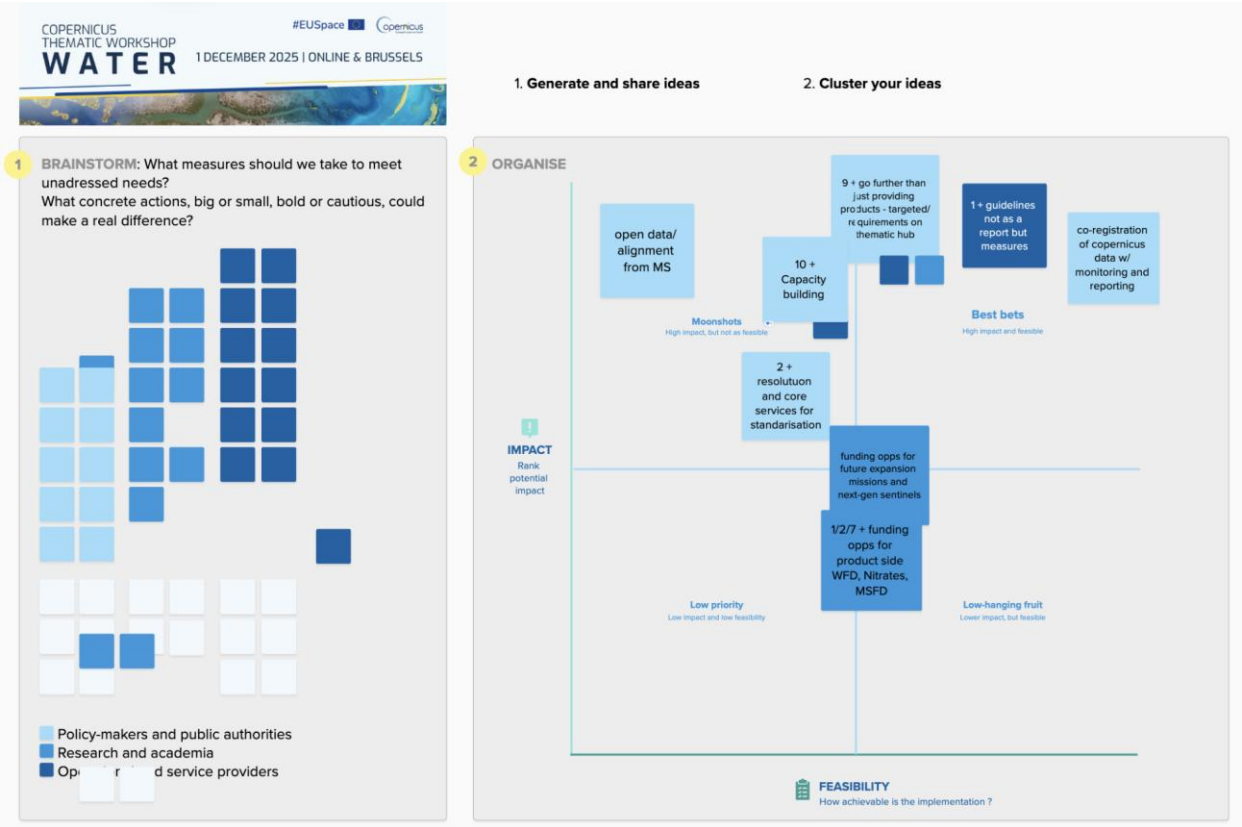
Group 2: The rapporteur shared that discussions quite difficult with no easy conclusions. The most obvious high-impact, high-feasibility measure was working on new models to integrate data relevant for Water Framework Directive monitoring. Another difficult but important measure was certification and validation of models, establishing standardised approval accepted by policymakers as foundation for wider adoption. Better use of national collaboration programmes was recommended for bringing countries together on horizontal topics like water quality monitoring, not just vertical service-focused approaches. The National Collaboration Programme is recommended as vehicle for better impact of the new water hub. Many more measures were discussed but weren't ranked or had lower priority.

Mural 2:



Group 3: The rapporteur reported that the highest priority was clear practical guidelines, which the group split into two components: guidelines as measures combined with capacity building. Guidelines not just as reports but as actionable measures were considered high impact and feasible. Capacity building had slightly lower feasibility. Water Framework Directive requirement-driven dedicated products with standardisation using Copernicus core services products were identified as high impact. Funding opportunities for future expansion missions and products related to WFD, nitrates directive, and other frameworks received medium impact and feasibility ratings. The highest impact measure overall was establishing a targeted thematic hub focused specifically on Water Framework Directive, doing everything foreseen by WFD beyond just listing products. This had high impact with medium feasibility.

Mural 3:



SESSION 5 - CLOSING REMARKS

Tobias Biermann, DG DEFIS

Mr. Biermann stated that effective water management requires accurate, timely data that can come from space. He noted 70+ onsite and 200+ online participants, with strong dialogue between policymakers and end users. Mr. Biermann emphasised bringing EO and water communities together to address implementation gaps. Finland showcased its pioneering role. He noted many barriers exist for users due to different water bodies and structures, as user requirements differ strongly - products can be the same with very different frequency needs, some users want to simply follow legislation while others want to innovate. How to use space data is not clear for water management users. Reliability and confidence in Copernicus products are incredibly important. EO is not the Swiss army knife for water. He concluded with the political mandate to create a water hub, improving EO integration into real-world workflows.

Joachim Maes, DG ENV

Mr. Maes noted that while many products are available from the supply side, the main challenge lies in effectively connecting these with the demand side, a role in which the Water Thematic Hub emerged prominently in the discussion as a key interface between users and service providers.

At EU-level, Copernicus delivers harmonised, spatially explicit data to support policy monitoring; however, the gap between what Copernicus services offer and what's necessary to implement water policy still exists.

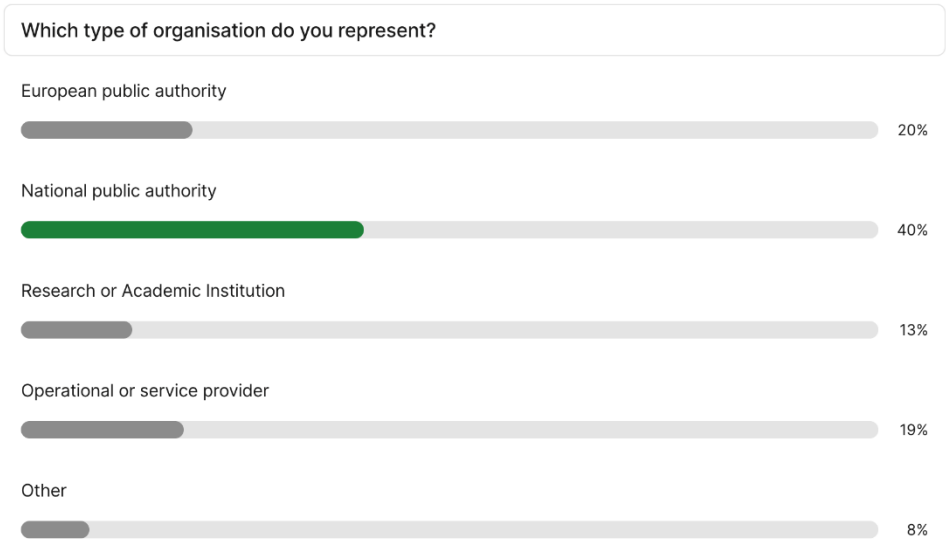
This long-standing 20-year gap was highlighted as an area where the community, and in particular the Water Thematic Hub, can play a crucial role in translating user needs into service development, with hope that AI can help close it.

The water resilience strategy represents a significant shift in EU thinking. Tools exist for local, regional, and EU level management, but further digitalisation is needed for water management.

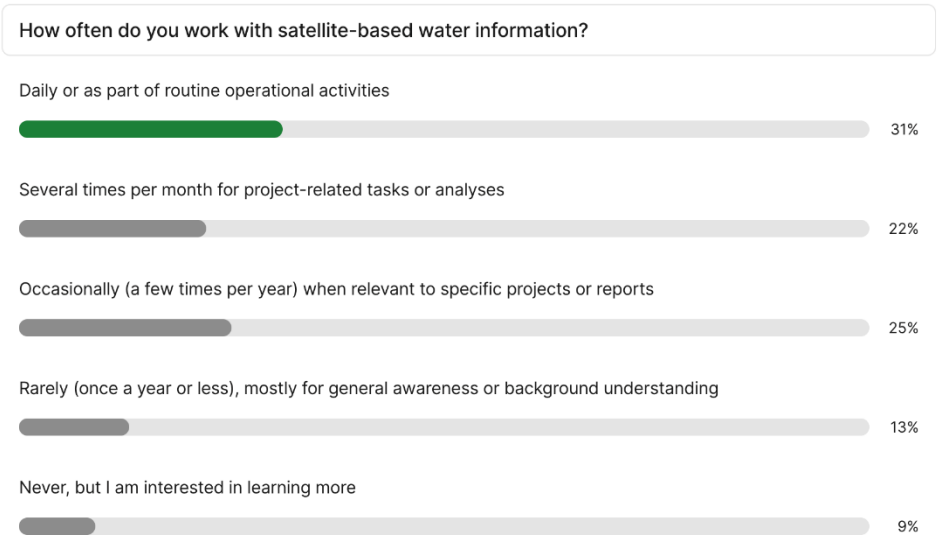
POLLS

SURVEY 1

This survey was completed at the start of the workshop to identify the background of the participants. 87 people answered this survey.



Question 1 of Survey 1



Question 2 of Survey 1

SURVEY 2

This survey was completed by on-site participants and it aimed at allowing the group to choose 10 needs and discuss them in Session 4. 48 people answered this survey.

The chosen 10 needs were:

1. Dedicated datasets to calculate metrics for the Water Framework Directive (WFD), Nitrates Directive, and Green Deal. (71% of votes)
2. Downscaled or aggregated products to national reporting units rather than just continental tiles. (44% of votes)
3. Easy integration of Copernicus data into existing national legacy monitoring systems.
4. High-resolution data (<10m) to monitor the small water bodies (<50ha) that the law requires to manage. (58% of votes)
5. Mechanism to co-create services with providers to ensure they fit operational workflows. (46% of votes)
6. Pre-filtered and quality data ready to use by administrative staff (without scientific vetting). (46% of votes)
7. User-friendly visualization tools that summarize complex data for ministers and the public. (53% of votes)
8. Decision-support systems that interpret data (e.g., "Alert: Water level critical") rather than just displaying values. (46% of votes)
9. "One-Stop-Shop" to access all water-related Copernicus data and services in a single location. (69% of votes)
10. **Clear, practical guidelines on how to use Earth Observation for operational water management tasks. (73% of votes)**

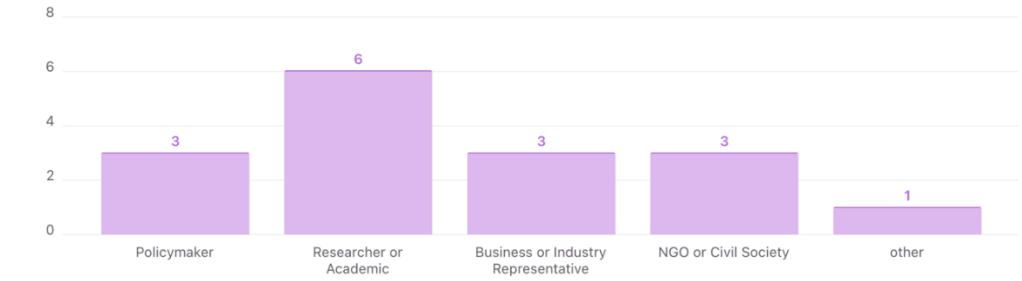
SURVEY 3 - SURVEY FOR ONLINE PARTECIPANTS (SESSION 4)

The following survey was created for online participants as they could not attend the discussion in session 4. 16 people answered this survey.

Question 1

1 Which of the following best describes your role?

16 out of 16 people answered this question.



Question 2

2 Please describe how you currently use Copernicus data for water-related work or analysis.

14 out of 16 people answered this question.

Search responses

As an agronomist, I always seek to optimize irrigation water use and monitor drainage conditions.	6 days ago
We have been using EO imagery to try and understand the local agriculture and try and estimate agricultural water demand	6 days ago
Research investigations	6 days ago
Validation and Copernicus datasets and services Dissemination	6 days ago
I am a CLMS lake water product provider and also use Copernicus data in other projects (e.g., monitoring lake restoration).	7 days ago
Not yet	7 days ago
I would like use, but I have no skills.	7 days ago
Comparing global in situ water quality data with remote sensing data to promote EO as a tool to fill monitoring gaps.	7 days ago

Floods and water level monitoring. We have created an operational monitoring service that uses Sentinel data.	7 days ago
I have used to map water mapping using RS, also i have been using in my research project to see ET variation and also crop classification	7 days ago
As input for processing and for training machine learning models related to water quality	7 days ago
I want to star using for groundwater quantity	7 days ago
Sentinel-1 data for water extent; soil moisture for drought analysis	7 days ago
Create training	14 days ago

Question 3

3 What unmet needs do you have/have you observed regarding Copernicus water data or services? Please be as specific as possible.

14 out of 16 people answered this question.

Search responses

Microplastics pollution and its effects on aquatic environment

6 days ago

Excessive cloud cover reduces the frequency of high-quality imagery; integrating optical and radar sensors could improve the estimation of indices.

6 days ago

the main issue for MT is that the resolution is too small for our country

6 days ago

Spatial coverage and temporal revisiting

6 days ago

Relation beetween EU-Hydro and other data sets with high quality oficial national hydrographic datasets and de WFD codes

6 days ago

It is an annual obligation for CLMS product providers to validate our products, but we find it difficult to get validation (in situ) matchup data. E.g...

7 days ago

snow water equivalent; surface water level

7 days ago

I am interested in groundwater quantity.

7 days ago

Limited parameters available (no nutrients or oxygen). I am focusing on inland water bodies, for which Copernicus services are restricted to large lak...

7 days ago

More frequent overpasses. :) But also more advanced services for assessing the condition of water bodies.

7 days ago

Well I feel being water resources managers will be keen in seeing volumetric details with extent

7 days ago

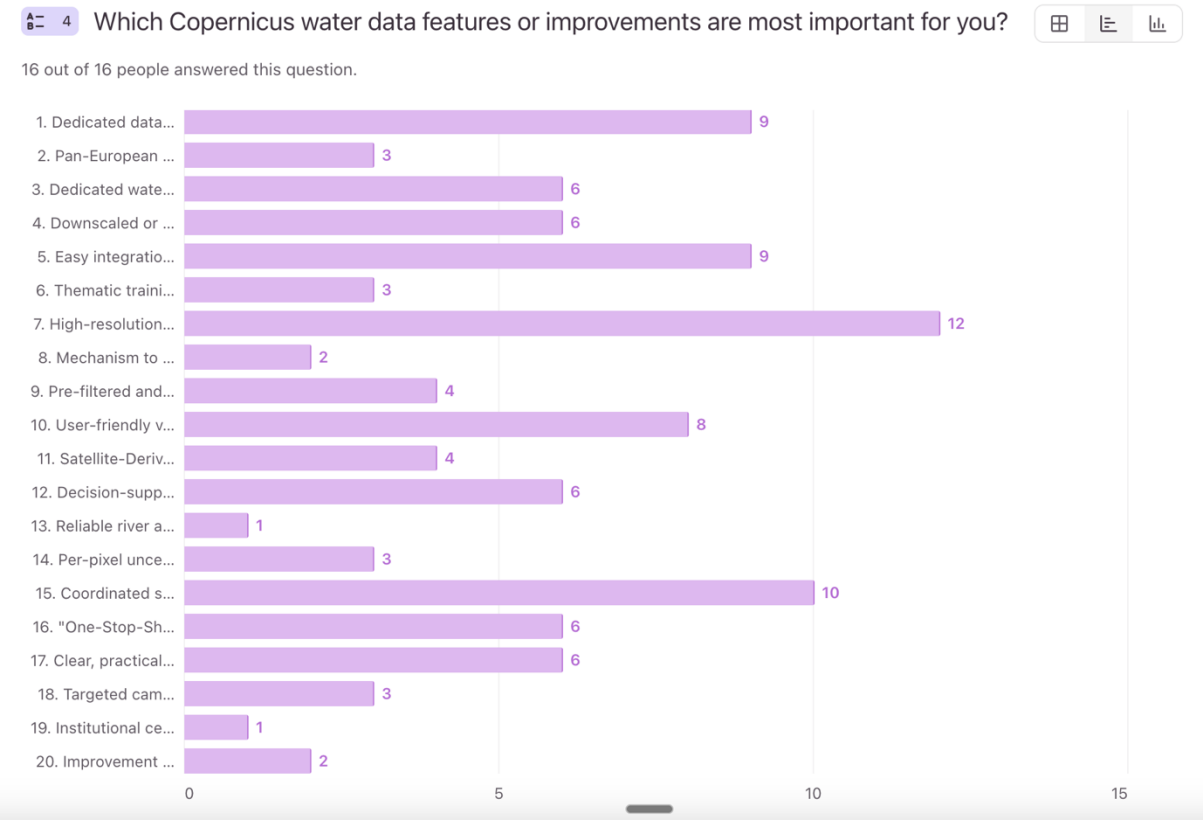
More frequent passes (increased temporal resolution), atmospheric correction algorithms that can satisfy water related parameters

7 days ago

I don't use it but I want to learn how to use for groundwater quantity

7 days ago

Question 4


4
Which Copernicus water data features or improvements are most important for you?
16 out of 16 people answered this question.
1. Dedicated data... 9
2. Pan-European ... 3
3. Dedicated wate... 6
4. Downscaled or ... 6
5. Easy integratio... 9
6. Thematic traini... 3
7. High-resolution... 12
8. Mechanism to ... 2
9. Pre-filtered and... 4
10. User-friendly v... 8
11. Satellite-Deriv... 4
12. Decision-supp... 6
13. Reliable river a... 1
14. Per-pixel unce... 3
15. Coordinated s... 10
16. "One-Stop-Sh... 6
17. Clear, practical... 6
18. Targeted cam... 3
19. Institutional ce... 1
20. Improvement ... 2
0
5
10
15

Question 5

5 What measures, tools, or improvements would you like to see provided at the EU level to better address your needs for Copernicus water data?

12 out of 16 people answered this question.

Search responses

NA
6 days ago

In the agricultural context, determining water deficit, water excess, or related curves with higher spatial resolution, using indices that are more se...
6 days ago

resolution improvements
6 days ago

Water quality, water volume
6 days ago

Inclusion of suitable validation data for CLMS lake water quality products to increase trust in these products.
7 days ago

In terms of quality, how to establish the link between earth observation and water quality standards. How to report on water quality and quantity moni...
7 days ago

Satellite missions providing data with higher spatial resolution. Expert groups to evaluate the status of EO services at frequent intervals and plan f...
7 days ago

High resolution data.
7 days ago

Crop water productivity.. water availablity details
7 days ago

Provision of Pan European water related in situ measurements, frequently updated
7 days ago

About groundwater quantity and WFD
7 days ago

Question 6

6 Select the best measure in terms of feasibility

6 out of 16 people answered this question.

Search responses

Measure 3
6 days ago

Measure 1. Indices as CWSI, TVDI
6 days ago

1
6 days ago

Downscaled/aggregated products to national reporting level
7 days ago

measure 2
7 days ago

in situ data
7 days ago

Question 7

7 Select the best measure in terms of impact

6 out of 16 people answered this question.

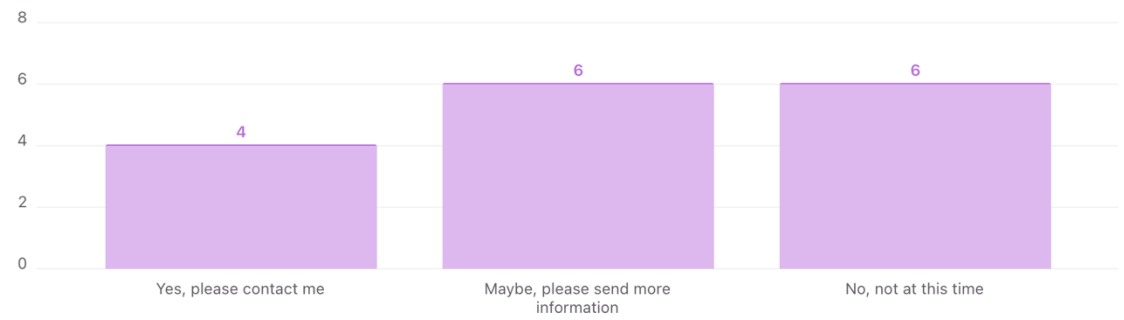
Search responses

Measure 5 6 days ago	Measure 2: NDWI, NDMI 6 days ago	1 6 days ago
User-friendly vis tools for the public and ministries. 7 days ago	measure 1 7 days ago	in situ data 7 days ago

Question 8

8 Would you be willing to participate in consultations or user groups to help shape future Copernicus water data services?

16 out of 16 people answered this question.



Question 9

9 Please share any additional feedback, suggestions, or comments related to Copernicus water data.

8 out of 16 people answered this question.

Search responses

NA

6 days ago

It is a powerful tool that enables us to model and estimate different indices or serve as a reference data for building models. Having the required fr...

6 days ago

providing uncertainty is key to exploit water-related measurments

6 days ago

As a product provider, I do not know who uses our products, and would be interested to know the: (1) type of user; (2) country and which lake(s); (3) ...

7 days ago

Develop a tool for quantity and quality within the scope of the DQA

7 days ago

I would recommend quicker reflexes in responding to user/market feedback

7 days ago

It was very important to integrate the data with WFD in a pratical way, mainly with groundwater quantity assessment at a EU level

7 days ago