



LIQUIDICE – SIOS success story

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GLOBAL CONTEXT

The accelerating retreat of glaciers, permafrost thaw, and snowpack loss in high-altitude and polar regions — including Greenland, the Himalayas, the Arctic, and the European Alps — is transforming the cryosphere's role in regulating freshwater availability and sea level rise. These changes disrupt regional hydrology, intensify climate extremes, and impact infrastructure, ecosystems, and livelihoods - from Arctic permafrost towns to Alpine and Himalayan communities.

In regions like Greenland and High Mountain Asia, altered snow and ice dynamics reshape water supplies for billions. In Svalbard, the local community relies on melting snow and glaciers for its city are increasingly at risk. Yet current models often fail to capture the complex interactions between snow cover, glaciers, ice sheets, and permafrost across spatial and temporal scales.

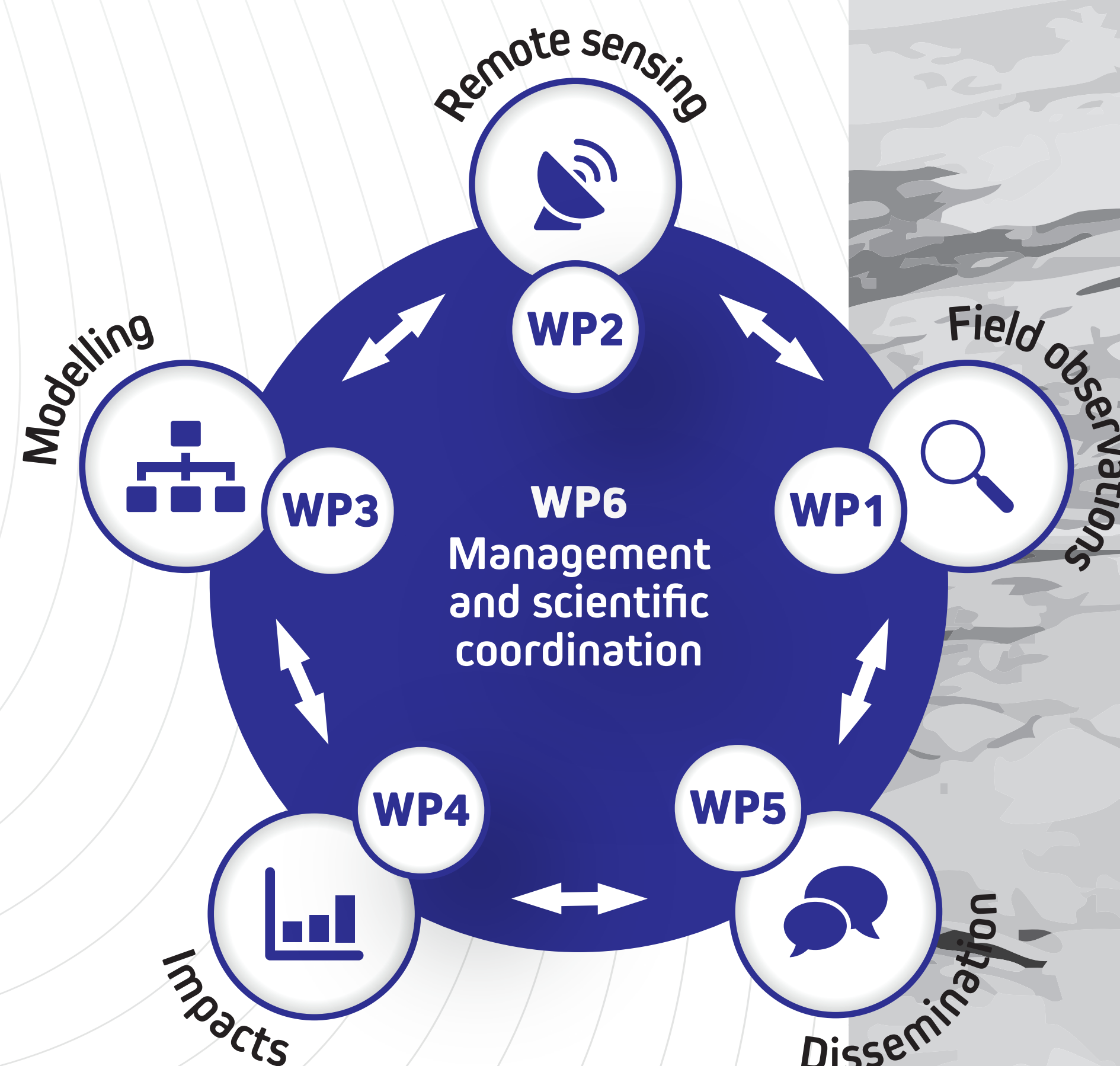
LIQUIDICE addresses this gap by integrating Earth observations, advanced climate and cryosphere modelling, and social vulnerability assessments to develop actionable climate services that connect inland ice dynamics to societal impacts across Europe and Asia's most fragile cold regions.

EXPECTED OUTCOMES

1. FAIR-principled new multi-decade data catalogues of multi-regional snow water equivalent and a 44-year EO-derived albedo record
2. assessments of impact of model resolution and degree of coupling on results
3. refined past and future glacier, ice cap and Greenland ice sheet freshwater fluxes to oceans and global sea level rise with indirect constraint on Antarctica
4. new hydrological simulations for High Mountain Asia
5. a new framework for Water Discharge Impact Assessments
6. socio-economic integrated risk and adaptation assessments

PROJECT OVERVIEW

LIQUIDICE explores the coupled glacier–snow–permafrost–hydrology–climate system across five climate-vulnerable cryosphere “super-sites”: the Greenland Ice Sheet, Norwegian glaciers (Jostedalsgreen), the Italian Alps (Monte Rosa), Svalbard, and the Indian Himalayas. By integrating cutting-edge ground observations, remote sensing products, and high-resolution models, LIQUIDICE links ice evolution to freshwater availability, hydropower potential, and societal risks under climate change.



1. Italian Alps: Monte Rosa Glacier System

The Monte Rosa glacier system is one of Italy's largest glacier networks. These catchments are crucial for hydroelectric power production, winter tourism and agriculture, both of which are at risk due to diminishing snow and ice cover caused by climate change.

2. Norway: Jostedalsgreen Glacier System

Jostedalsgreen, Norway's largest glacier, is vital for the country's hydroelectric power, with up to 15% of the exploited water flow sourced from glacier melt. Predicting the impacts of climate change on energy production and water resources is essential here.

3. Greenland: Ilulissat and Kangerlussuaq Ice Sheet Catchments

The Ilulissat catchment supports hydropower production for Ilulissat, Greenland's third-largest town. Meanwhile, the Kangerlussuaq catchment provides invaluable open-access river discharge data. Both sites illustrate the dual local and global significance of Greenland's melting ice sheets.

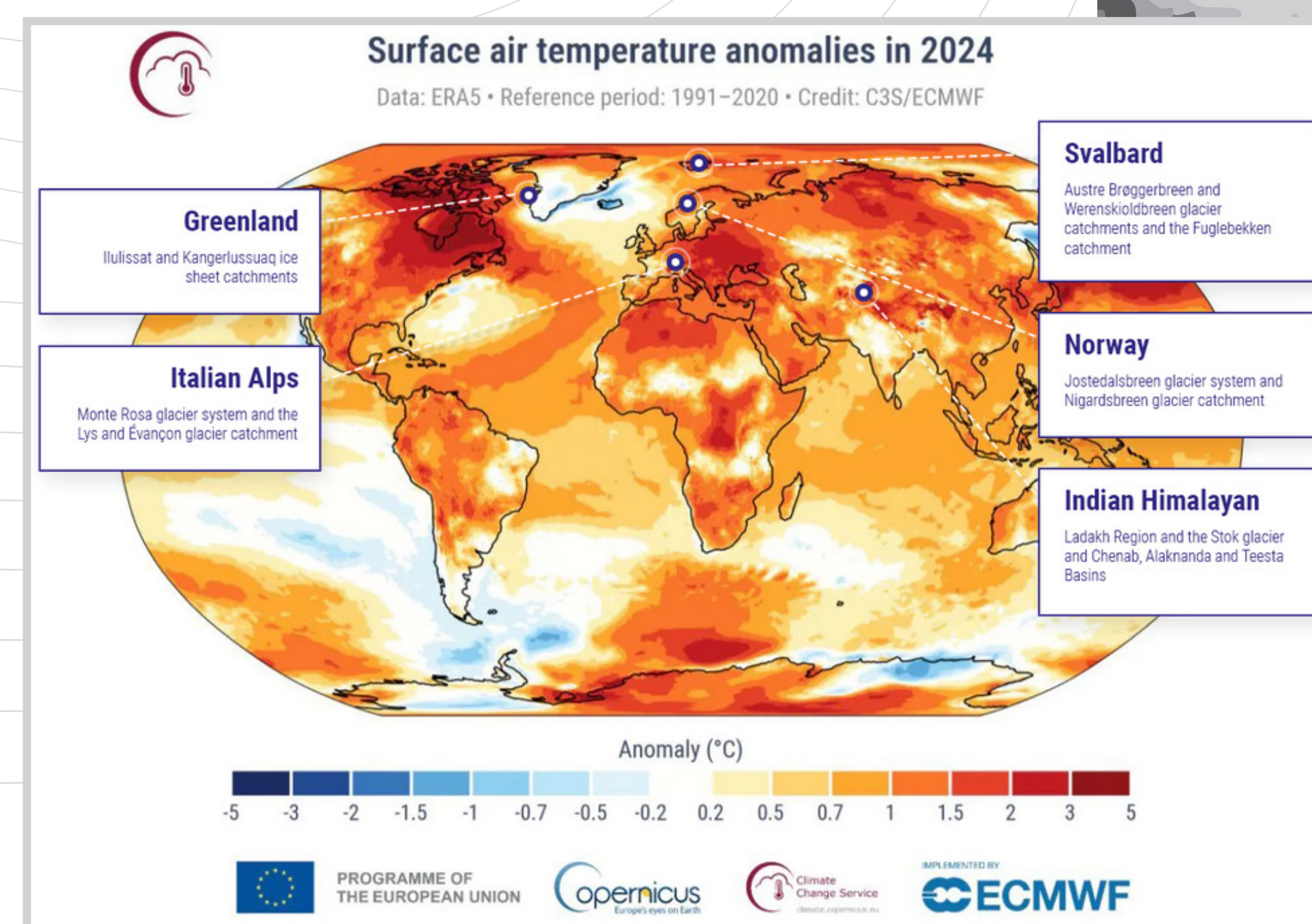
4. Svalbard: Austre Brøggerbreen, Werenskioldbreen, and Fuglebekken Catchments

In Svalbard, communities rely on glacier melt for water resources, with significant concerns about infrastructure stability due to permafrost thawing and landslides. Collected critical data on meltwater discharge and mass loss will provide insights into the evolving interplay between permafrost and hydrological processes.

5. Indian Himalayas: Ladakh Region and Major River Basins

The Ladakh region and Chenab, Alaknanda, and Teesta basins are critical for hydropower and water resources, serving over 240 million people in the Himalayan region and 1.65 billion downstream. They are central to energy generation and agriculture, yet face risks from glacial retreat and changing precipitation.

With 18 partners across 9 countries, LIQUIDICE develops advanced cryosphere–hydrology models, harmonized datasets (including 44-year SWE and albedo time series), and coupled Earth system simulations. These are used to co-design tailored decision-support tools and climate services for local stakeholders—hydropower managers, Arctic communities, tourism operators, and water authorities—aimed at improving resilience and informing adaptation.



CONSORTIUM

Consortium includes 7 SIOS members:

1. IG PAS
2. SIOS KC
3. CNR
4. NORCE
5. USil
6. UiO
7. AWI



IN NUMBERS

- EU Budget Contribution: **€7,499,965.25**
- Duration: **48 Months** (Feb 2025 – Jan 2029)
- Countries: **9**
- Partners: **18**



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