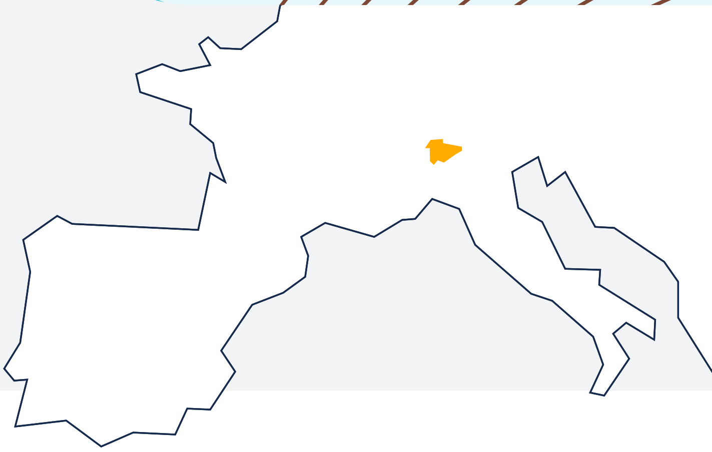
GoNEXUS

FACTSHEET

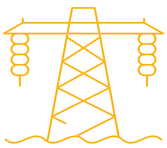
Lake Como
NORTH OF ITALY

BRIEF OVERVIEW



Located in the southern Alpine belt, Lake Como is **one of the deepest Italian lakes** with an average depth of 161 meters. It ranks third in the country for both surface area (145 km^2) and volume (23 km^3).

Its hydrological regime is **snow-rainfall dominated**, characterised by scarce winter and summer inflows, and snowmelt peaks in late spring and autumn.



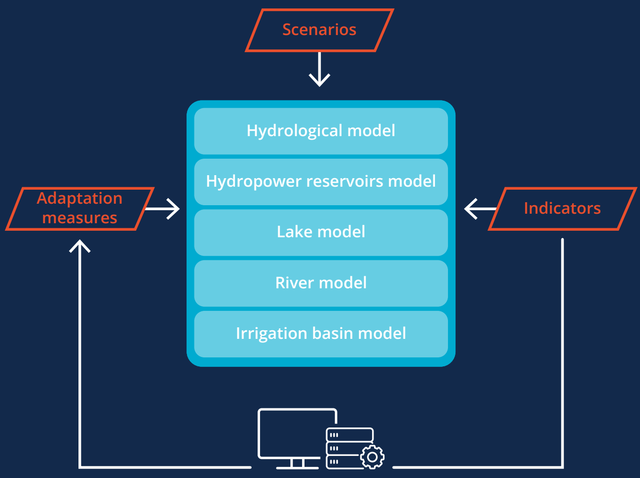
Lake Como is an integral part of the Po Valley. It is **a complex water system** with multiple objectives to balance diverse demands —primarily for agriculture and hydropower, as well as tourism, urban water supply, and fishing—and to support functions such as flood control and ecological flow maintenance.

IDENTIFIED WEFE CHALLENGES & PROSPECTED SOLUTIONS

- **Conflicts over seasonal allocation of water** across the WEFE nexus, increase in drought events new management strategies to cope with water scarcity.
- The effect of climate change is expected to **reduce water availability in summer** in the Alpine catchment, where snow and glacier dynamics play an important role.
- **Lake inflows are projected to decrease** by mid-century challenging the reliability of the irrigation supply.
- An increase in temperature and in the frequency and magnitude of heat waves will contribute to **crop failure risk.**

MODELLING TOOLS

The modelling framework begins with **creating climate scenarios (AWE-GEN-2d)** to serve as input for a hydrological model (Topwatch). This model calculates water availability for each Alpine basin within the Lake Como watershed and estimates residual inflow into the lake itself.
Major hydropower groups, such as Cancano-San Giacomo, Alpe Gera-Campo Moro, and Frera, are managed through dedicated operational models, as is Lake Como. Downstream from the lake, a river/canal model distributes water to hydropower users and various irrigation districts. This simulation calculates WEFE (Water- Energy-Food-Ecosystem) sector performance indicators, and an optimisation tool (MORDM) is used to **identify effective adaptation measures.**



SCENARIOS

Supported by the GoNexus partners, stakeholders discussed two local policy scenarios: **hydropower maximisation and risk management,** with the Business-as-Usual (BAU) scenario serving as the reference point. They suggested evaluating the feasibility of scenario 1 in relation to its impacts on the food and environmental dimensions of the WEFE nexus.

Scenario 1 - Hydropower maximisation

This scenario focuses on **increasing hydropower production, flexibility, and storage** to maximise the green energy transition and strengthen renewable energy self-sufficiency.

Potential actions include:

- enhancing **self-sufficient renewable power production**
- renewing energy concessions and **maximising storage capacity**
- supporting **flexible energy storage** solutions

Scenario 2 - Risk management

This scenario focuses on **strengthening water management strategies** to better respond to more frequent and intense extreme weather events (e.g. floods, droughts).

Potential actions included:

- establishing **new lamination basins**
- improving the **efficiency of irrigation systems,** introducing adapted and resilient crops and varieties
- enhancing **risk management tools** (such as risk insurance)

BAU:
Reference scenario

- Changes in rainfall patterns: higher inflows in the first six months of the year, and consistently lower between June and September (corresponding to the irrigation period)
- This will likely be reflected in an increase in winter-spring floods, and an increase in the deficit and low summer levels.

PS1:
Hydropower maximization

TARGET: Increase hydropower production, flexibility, and storage to ensure green energy transition

- Exponential energy growth not predicted, but efficiency could increase
- Large hydroelectric concessions have already expired or will expire by 2029

One dimension is prioritied, the rest need to be adapted

PS2:
Risk management

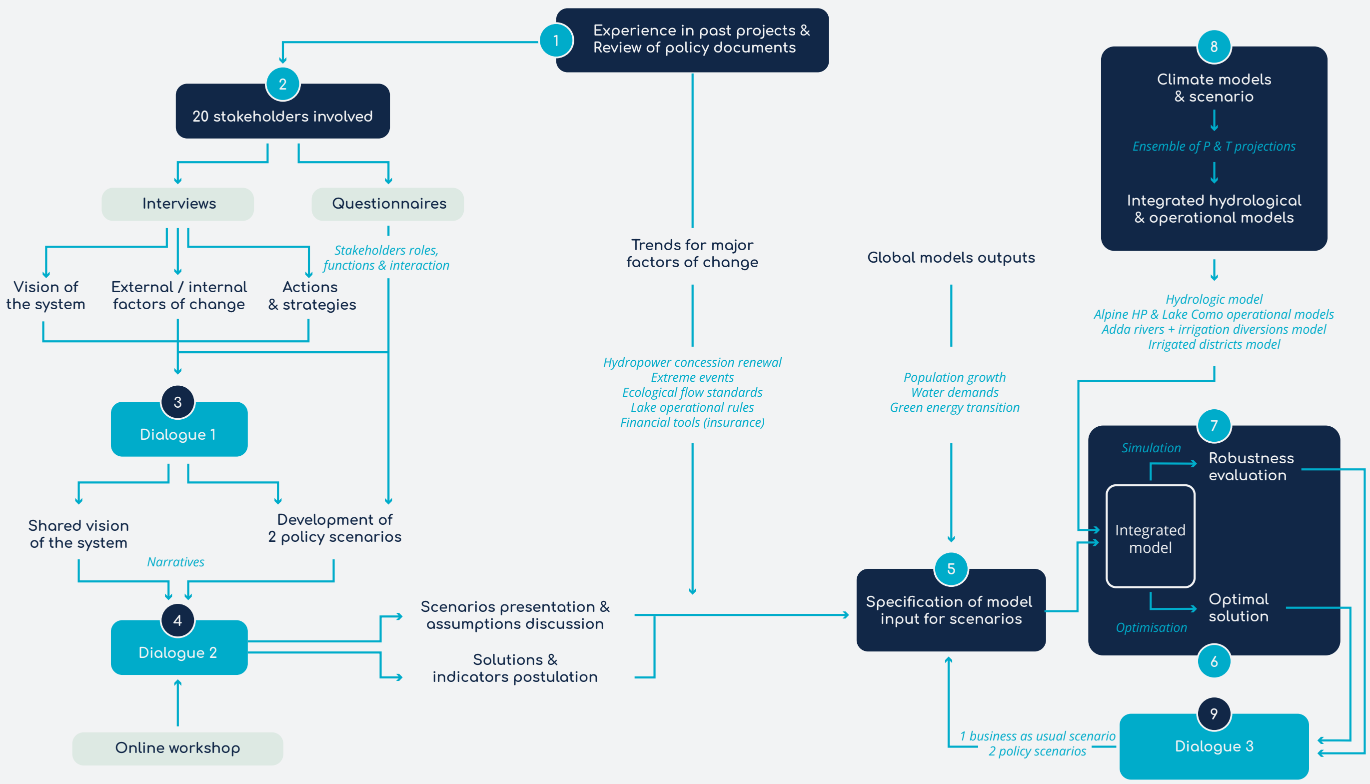
TARGET: Reinforce water management to better respond to extreme events (floods, droughts)

- More frequent and intense extremes
- Water insecurity

No priorization, all dimensions need to adapt (all affected, almost seasonaly)

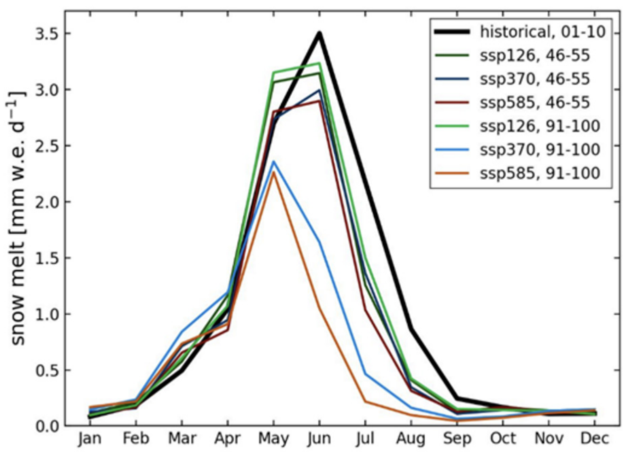
DIALOGUES

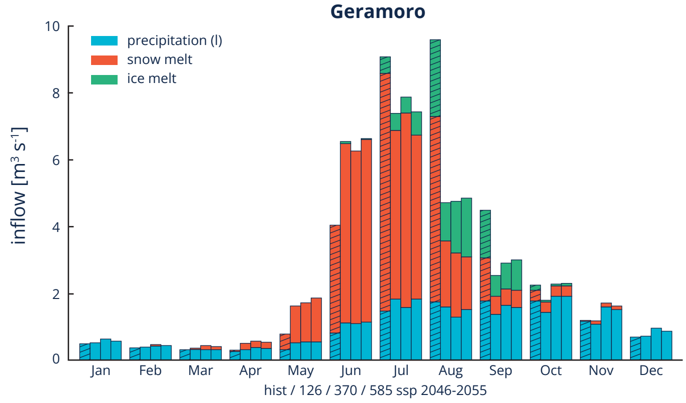
A multifaceted and participatory approach was adopted to create and assess the proposed policy scenarios. This encompassed incorporating knowledge from previous research projects (e.g., ADDAPT, INWOP or SO-WATCH), as well as highlighting inputs from interviews, questionnaires, and workshops with stakeholders.

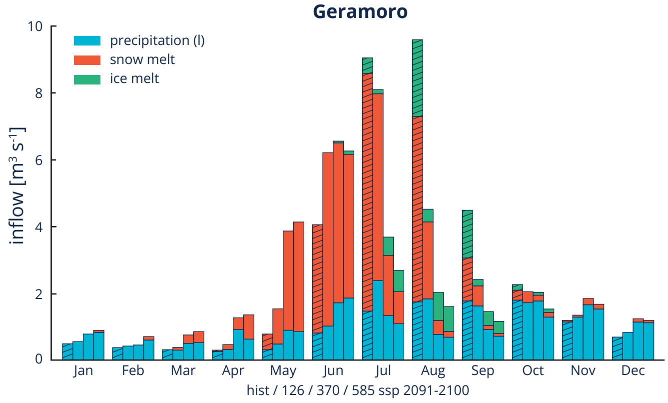


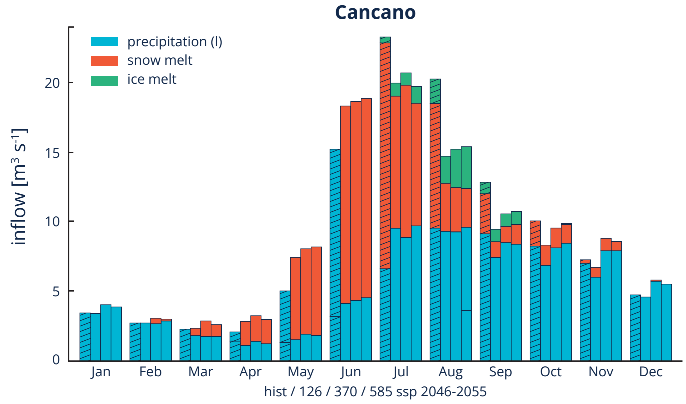
EVIDENCE

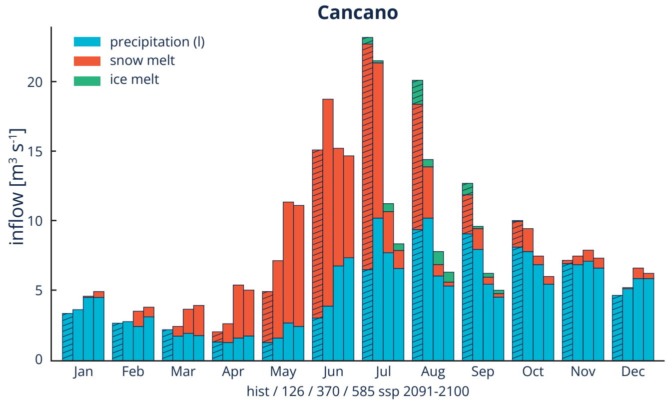
The GoNexus analysis shows an expected general trend towards **a reduction in water availability from snow and ice melt** largely driven by increasing temperatures, which worsens towards the end of the century.
The results also indicate **a change in the seasonal timing of available water** caused by the earlier onset of snowmelt. This impact is significantly lower for the Frera reservoir complex, as the proportion of inflows derived from snowmelt is considerably less than that of the Alpe Gera-Campo Moro and Cancano-San Giacomo complexes. The extended evidence gathered from the downstream impact models will be included in the upcoming deliverable D5.7, along with proposed solutions.

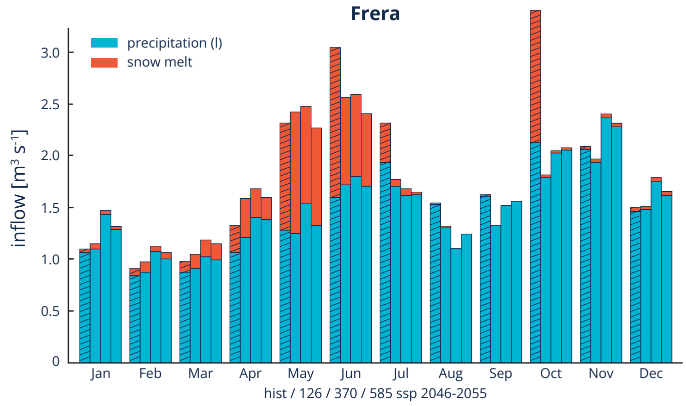


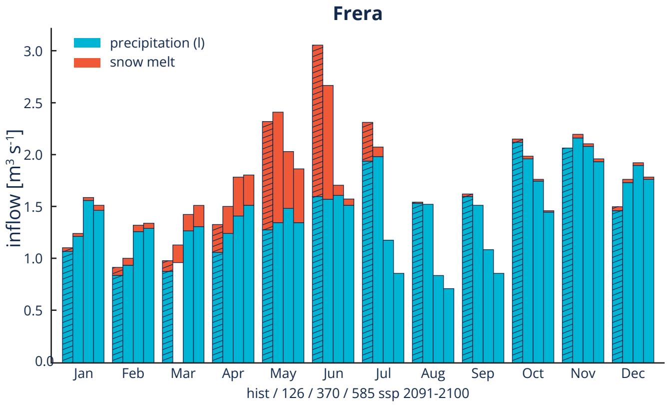












SOLUTIONS

- **Updating the licenses that govern water release** from upstream hydropower dams.
- **Adjusting the operating parameters** for the lake.
- **Evaluating various scenarios** for the minimum ecological flow downstream of the lake.
- **Implementing forecast-based strategies** for reservoir management.
- **Developing insurance schemes** based on weather indices for various sectors.

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