



**AUSTRALIAN END-USERS WORKSHOP:
HAB'S EARLY WARNING TOOLS**

THURSDAY 20TH APRIL 2023 | 11:30 AM –
2:30 PM AEST
DEP. OF CIVIL ENG., MONASH UNIVERSITY,
MELBOURNE

Organized by:



**TOOLS FOR HYDRO-ECOLOGICAL HAZARDS EXPOSURE AND
VULNERABILITY REDUCTION**

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In collaboration with:
Monash University &
CSIRO





COMBINE

satellite data with proprietary data and hydro-ecological models

GENERATE

operational forecasts of water quantity and quality changes such as turbidity and algae blooms

INTEGRATE

forecasts into industry specific downstream services

DELIVERING HIGH RELIABILITY WATER QUALITY FORECASTS FOR THE WATER INDUSTRY



Hydrological Modelling.

Attributes: **River discharges** in upstream catchments, **Diffuse loads** (e.g. sediments, nitrogen, phosphorus).

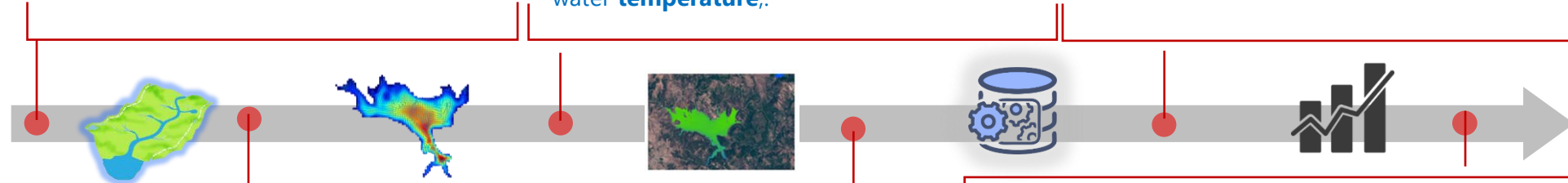
Earth Observations.

Satellite imagery: **Sentinel 2A/B** and **Landsat 7/8, PRISMA**

Attributes: **Turbidity, chlorophyll-a**, surface water **temperature**.

Data Assimilation.

Automatic real-time **assimilation of EO** to **improve forecasting skill**, (Ensemble Kalman Filter, 4dVAR, Weighted Average).



Hydrodynamic Modelling.

Attributes: **Velocity field** and **circulation pattern** of the reservoir.

Water Quality Modelling.

Attributes: **Algae growth, nutrients, sediments and dissolved oxygen**.

Operational Forecast production.

PrimeWater service line **integrates** operationally multiple scientific components & produces **short term forecasts** (up to 10 days) of **hydrological and ecological parameters** of the reservoir,

Machine Learning Models.

Machine Learning algorithms (random Forests, Gaussian Process Regression, Quantile regression forests) are used for **Water Quality predictions, assessment of prediction uncertainty** and systematic **errors correction** in forecasting systems,

Data used: **Satellite imagery, in situ monitoring data, meteorological and hydrological forecasts**

...for generating real time, short to medium range water quantity and quality forecasts for reservoirs.

A multi-model chain for hydro-ecological forecasting

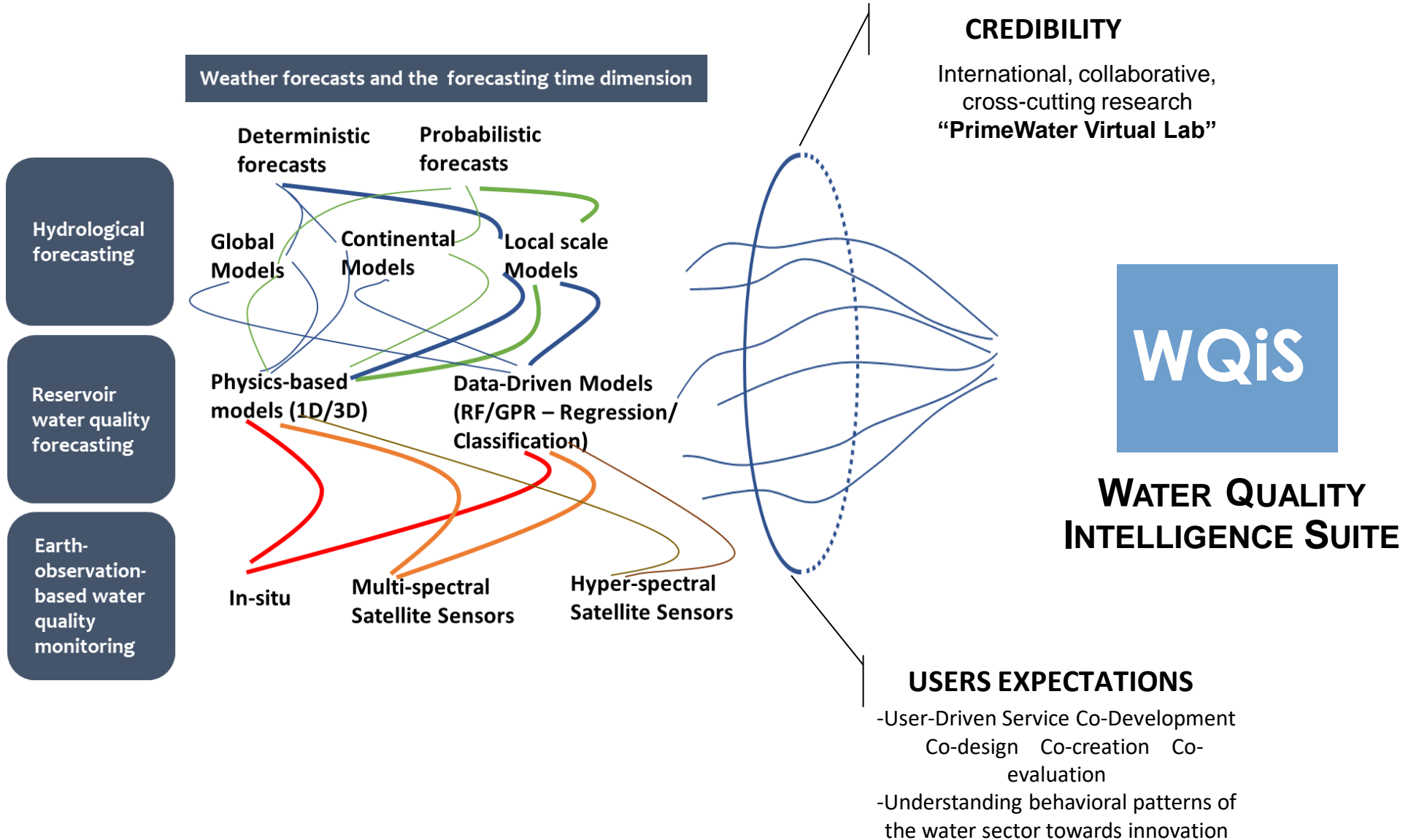
...from Satellites Imagery to high reliability water forecasts

DELIVERING HIGH RELIABILITY WATER QUALITY FORECASTS FOR THE WATER INDUSTRY



Intelligent Services Value Model

From Science to Operational Services for the Industry





WQIS facilitates Water Industry to identify Hydro-ecological Risks at an early stage and...

Key features

Connect

Bring into your decision-making data from any sensor, anytime, anywhere

Monitor

Filling in Water Quality information gaps in time and space with satellite-based measurements

Predict

Get Hydro-ecological forecasts just like weather forecasts

Pro-act

Get advantage of the time lead with downstream services for preventive management of WQ threats

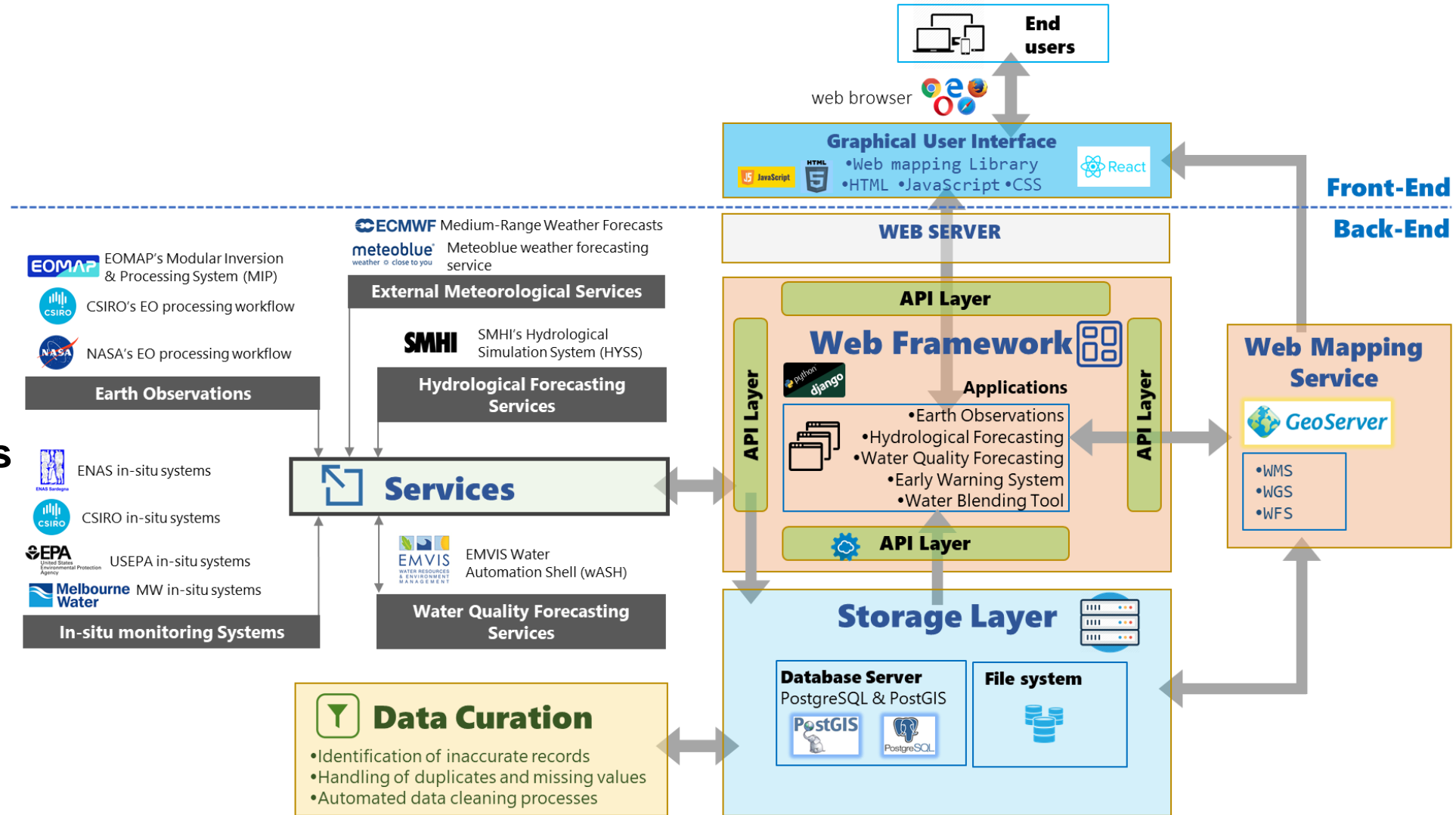
...Pro-act instead of Re-act





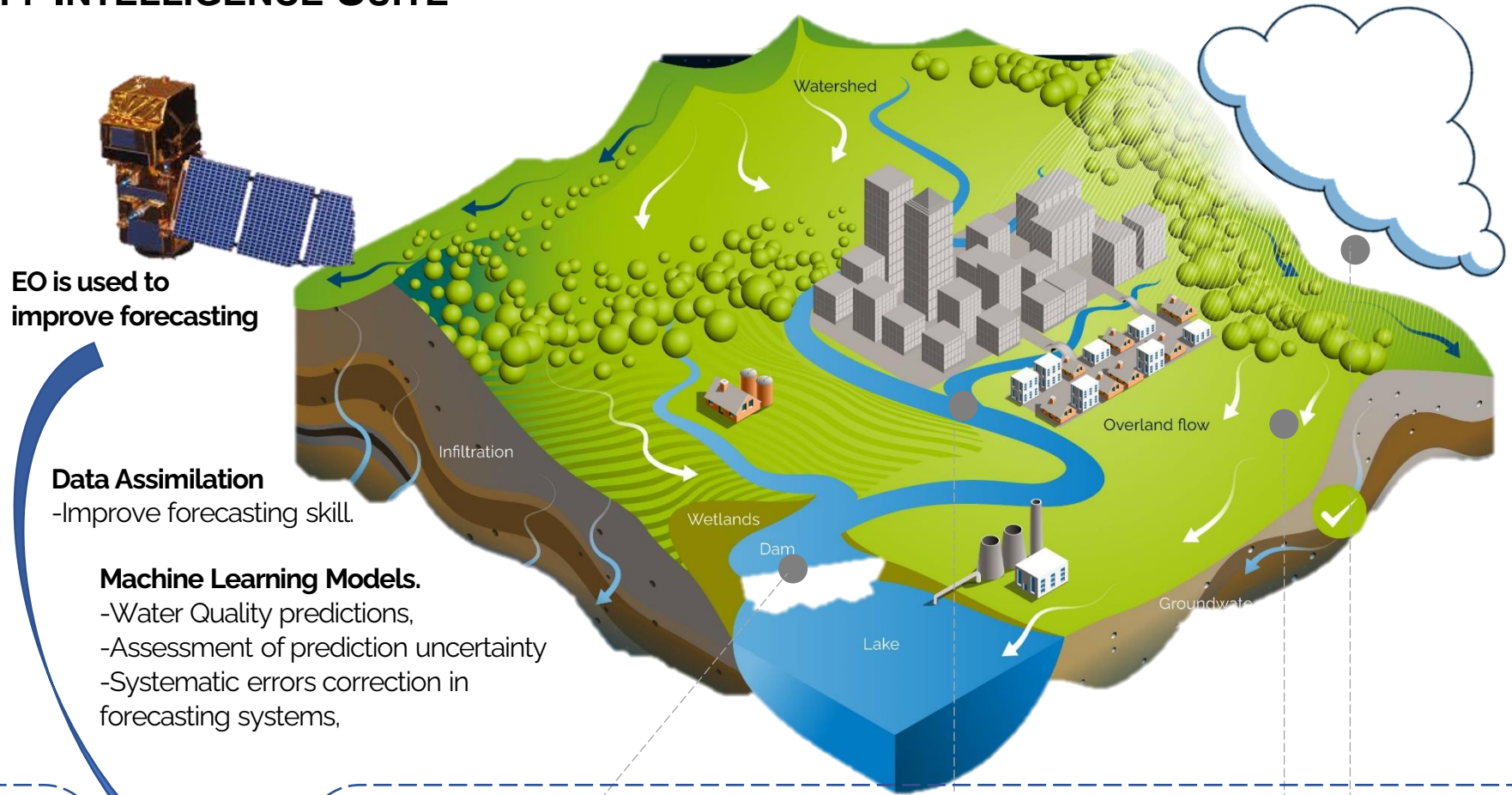
WATER QUALITY INTELLIGENCE SUITE

Automated Scientific workflows
Operationalizing the science





WATER QUALITY INTELLIGENCE SUITE



EO is used to improve forecasting

Data Assimilation
-Improve forecasting skill.

Machine Learning Models.
-Water Quality predictions,
-Assessment of prediction uncertainty
-Systematic errors correction in forecasting systems,

Watershed Digital Twin

From Science to Operational Services for the Industry

Downstream applications

- Early warning systems
- Proactive in-lake management of water-related hazards (e.g. algal blooms)
- Optimization of water operations (e.g. treatment plants, aquaculture, energy production)

In-lake hydrodynamics

Forecasts of the water temperature, lake mixing and circulation patterns

In-lake water quality

Forecasts of chlorophyll-a, nutrients, sediments and dissolved oxygen

River flow forecasting

Forecasts of water depth and velocity

Hydrologic forecasting

Forecasts of river discharges, water temperature, sediment and nutrient loads into downstream lakes

Weather forecasts

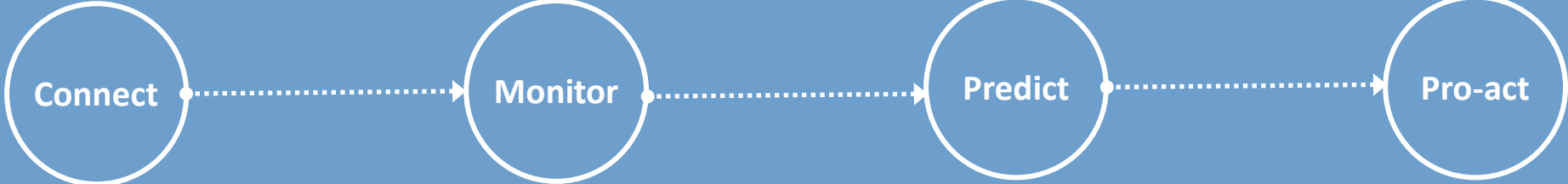
Forecasts of wind, rainfall and other atmospheric variables



Hindsight

Insight

Foresight



Bring into your decision-making data from any sensor, anytime, anywhere

Filling in Water Quality information gaps in time and space with satellite-based measurements

Get Hydro-ecological forecasts just like weather forecasts

Get advantage of the time lead with downstream services for preventive management of WQ threats

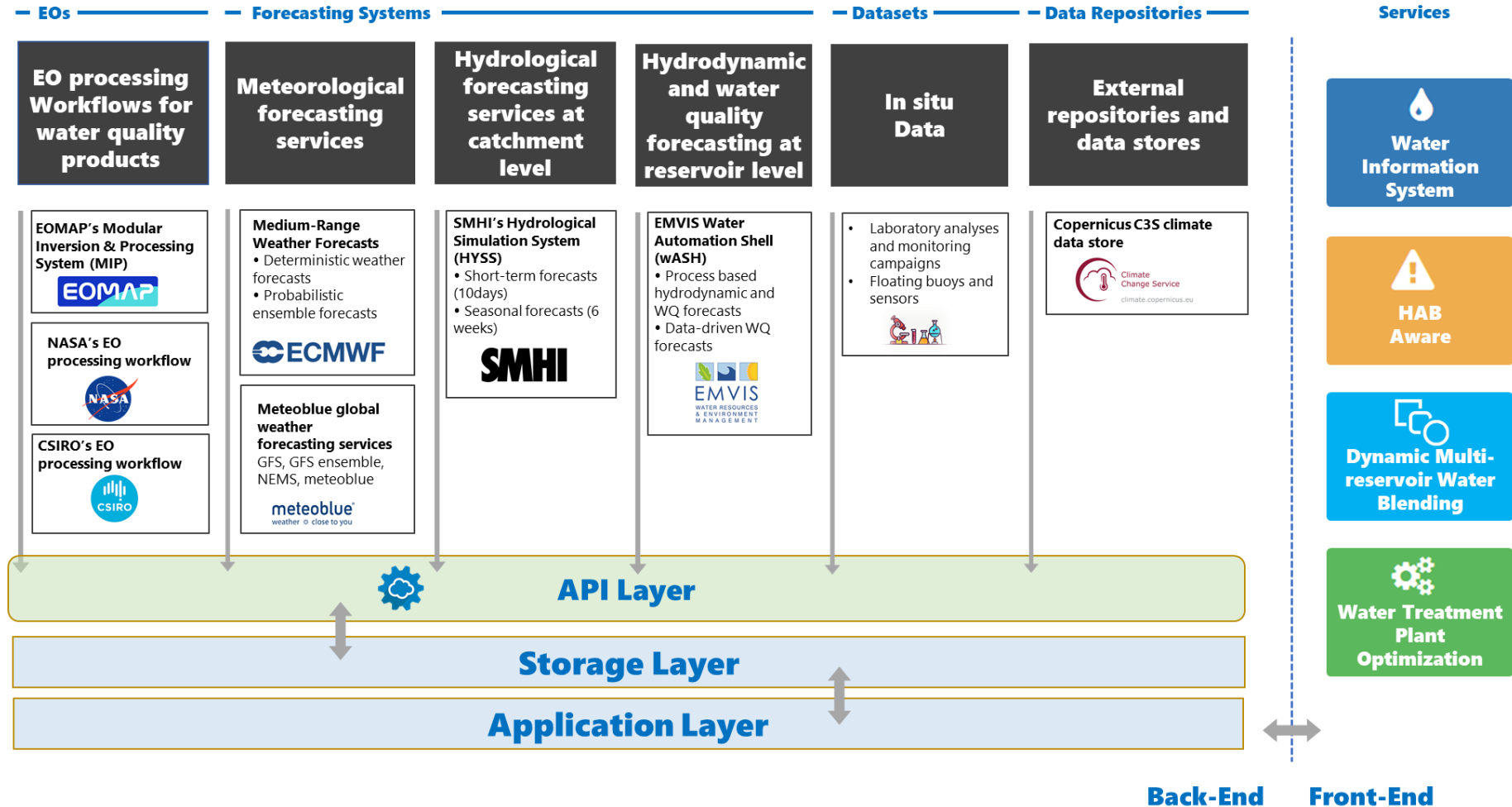
WATER QUALITY INTELLIGENCE SUITE



Capitalize on intersections of data

Bridging the data silos

Connect your proprietary data with near real-time, satellite-based water quality data and other remote sensing data and simplify environmental reporting and hydro-ecological hazards risk assessment.

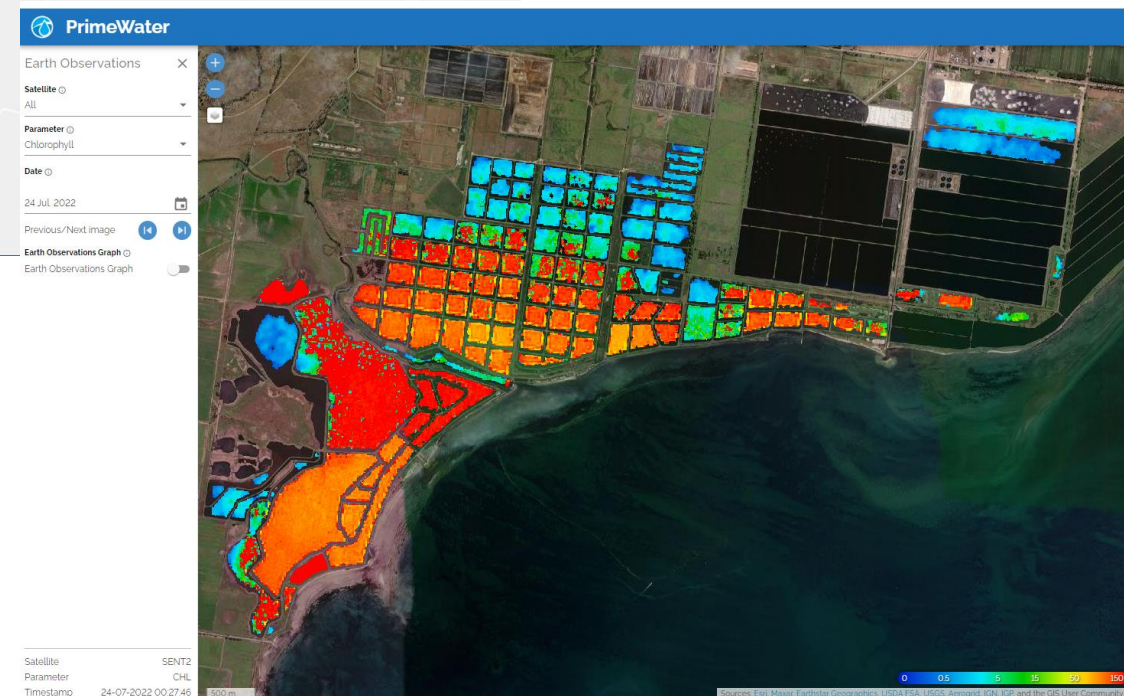
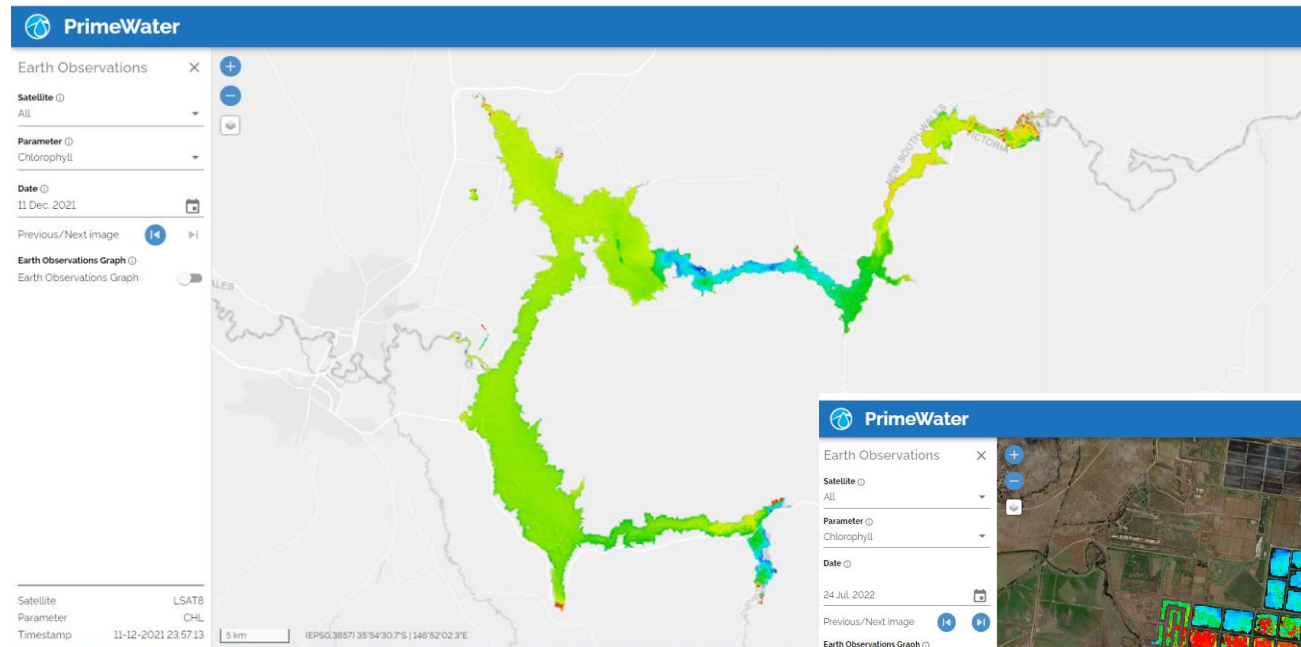




Water Quality Data from Space

Making intelligent decisions

Filling in Water Quality information gaps in time and space and increase your efficiency, save costs and lower operations risks



Sentinel-2A/B and Landsat 8 imagery processed by EOMAP Modular Inversion and Processing System (MIP)

WATER QUALITY INTELLIGENCE SUITE

Delivering operational medium range hydrological forecasts

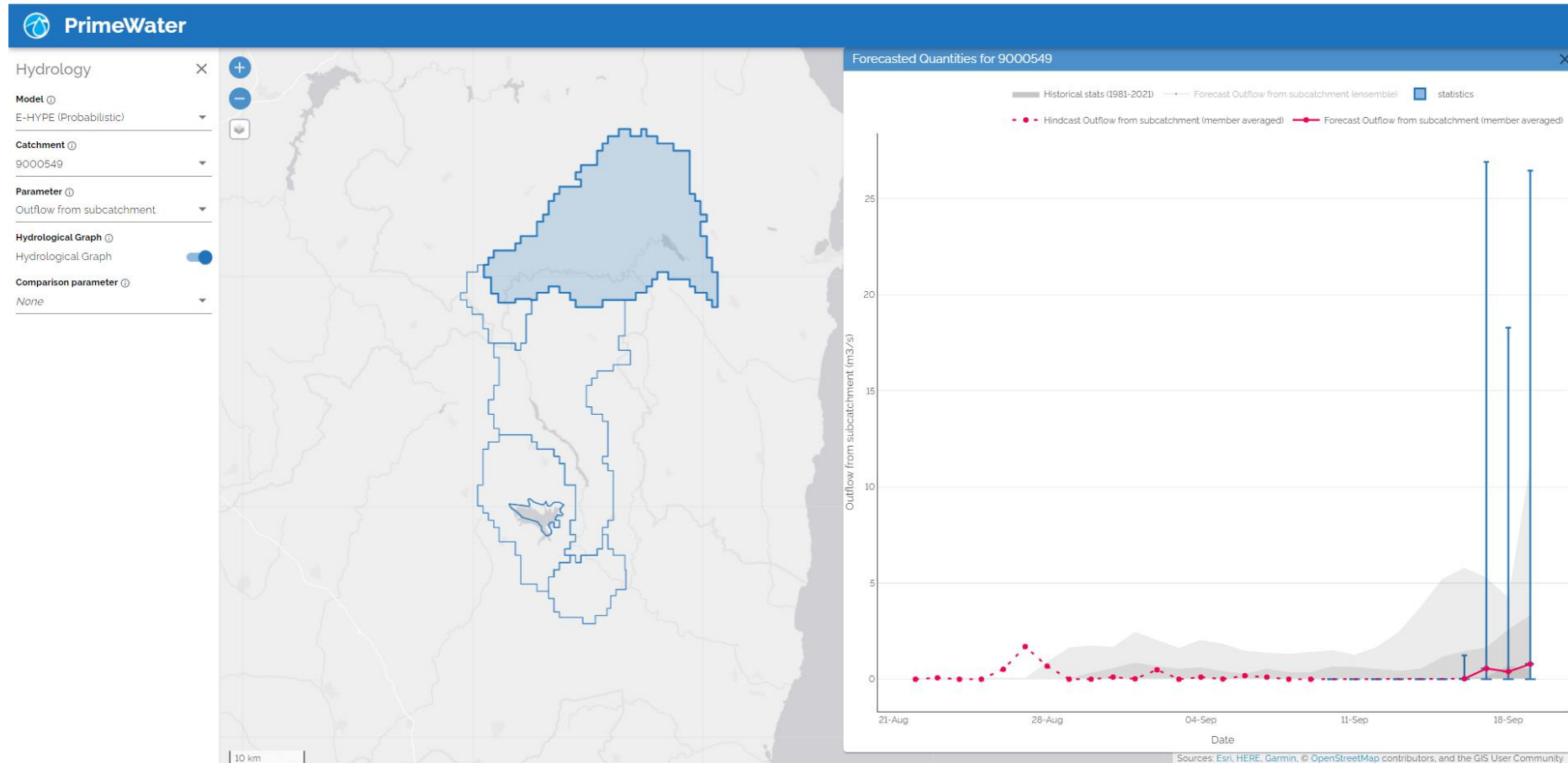


Predict

Hydrological Forecasts as a Service

Transform weather forecasts into river flows in your watershed

Forecast river discharges, water temperature, sediment and nutrient loads for up to 10d ahead.



Hydrological forecasts provided by SMHI
HYPE Model

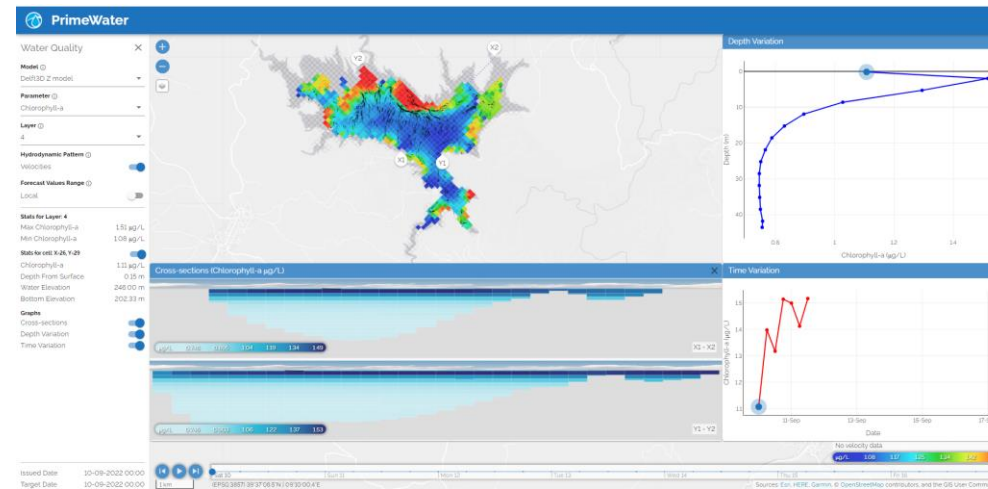


WATER QUALITY INTELLIGENCE SUITE

Delivering high reliability water quality forecasts for the water industry



Water Quality Forecasts as a Service



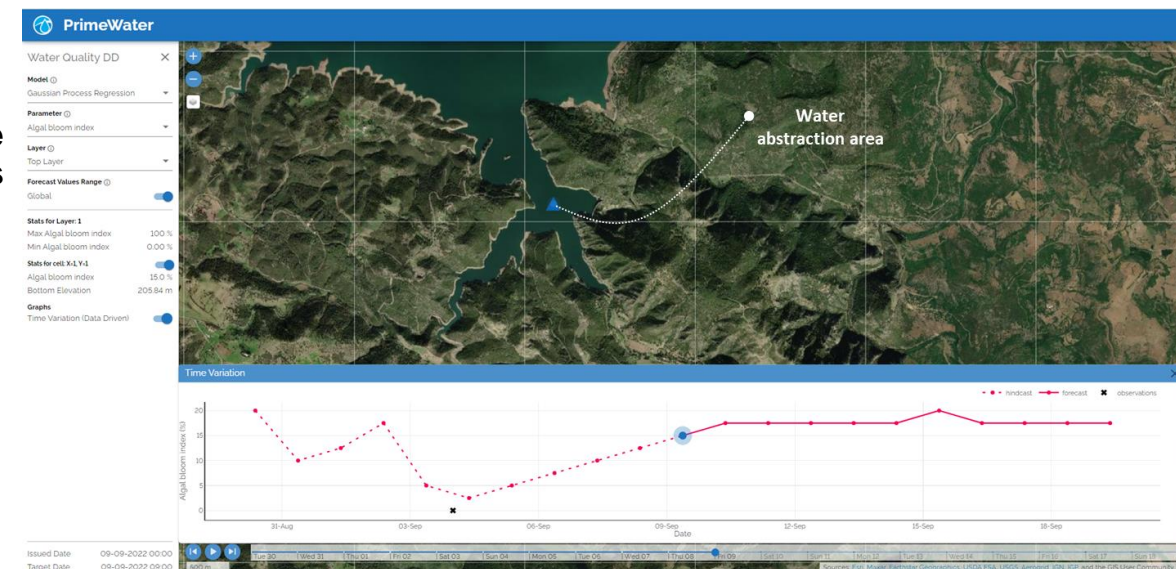
Process-Based Water Quality Forecasting

Get Hydro-ecological forecasts just like weather forecasts

Forecast key attributes for water quality in lakes and reservoirs to promote safety and drive efficiency. Identify risks so you can mitigate exposure to water related hazards at an early stage.

ML Water Quality Predictive Models

Process-Based hydrodynamic and WQ forecasts & Data – Driven WQ forecasts are provided by EMVIS Water Automation Shell (WASH)



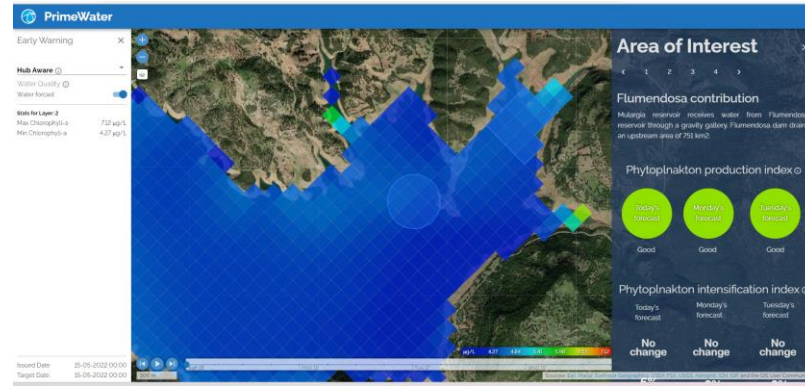


WATER QUALITY INTELLIGENCE SUITE

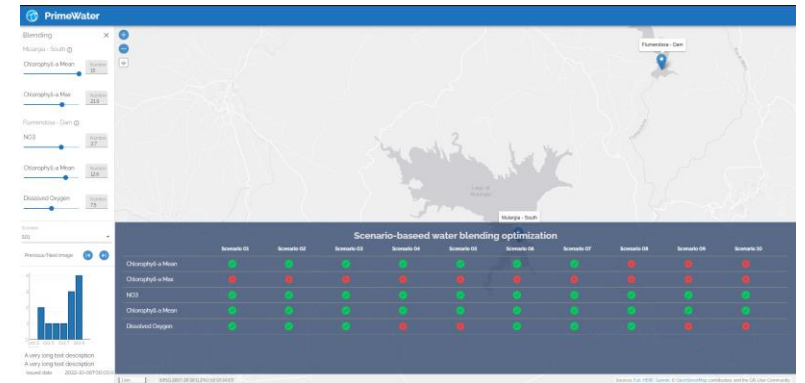
Repurposing forecasts into specific, tailor-made industry services



HAB Aware



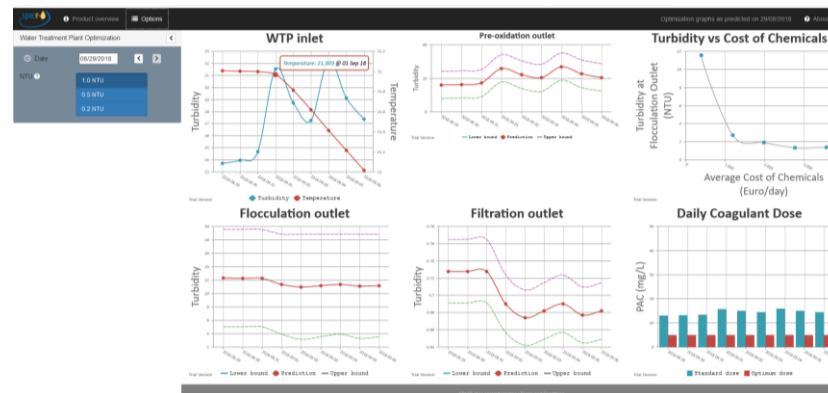
Dynamic Multi-reservoir Water Blending as a Service



Proactive Management of HAB impacts

Get advantage of the time lead in predicting the response of highly complex and dynamic systems

Forecast-based Water Treatment Plants Performance optimization



In-lake preventive management of hydro-ecological threats



Aeration



Chemical assisted algae control



Mixing/De-stratification



Biologically Derived Control



UV Lighting Algae Control



IDENTIFY YOUR NEEDS IN OUR SHOW CASES

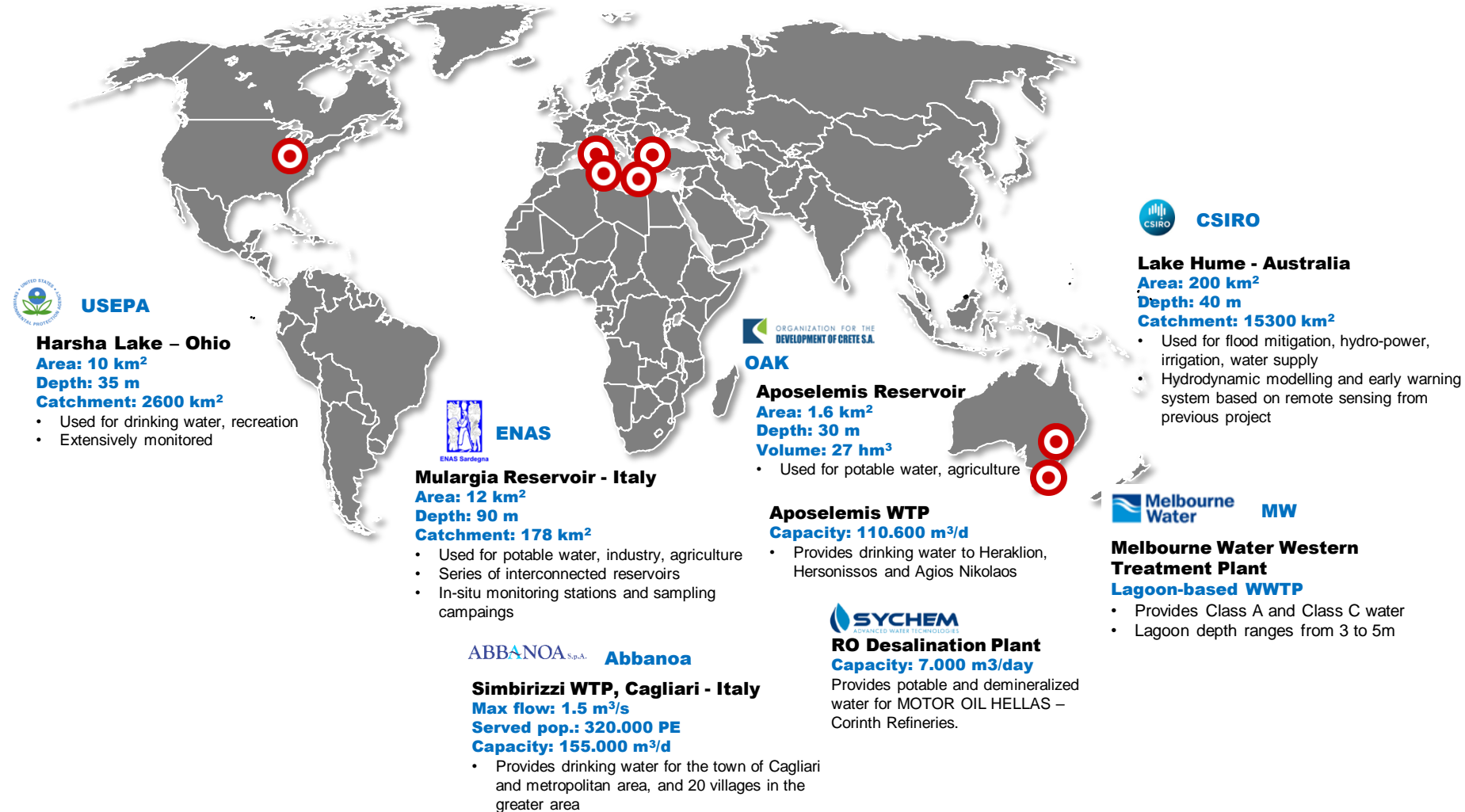
WQiS is deployed in freshwater and coastal waters across Europe, United States and Australia

Advanced services for the Water Sector

Demonstrating the capabilities of cross-cutting, data-driven applications

Discover our Operational Show Cases at:

<https://www.primewater.eu/operational-platform/>





PrimeWater

Thank you for attending!

PrimeWater Team:



The project has received funding from the European Union's Horizon H2020 Research and Innovation Programme under Grant Agreement No 870497