CETAQUA
WATER TECHNOLOGY CENTRE

Solucions digitals transferibles al sector de l'aigua

V Congrés de l'Aigua a Catalunya

Joana Tobella

RESEARCH
COLLABORATION
THINKING FORWARD

Pioneering public-private partnership model

We are the result of a unique public-private partnership model, aimed at proposing **new RDI solutions to ensure the sustainability and efficiency of the water cycle**, considering local needs.

The model has become a benchmark for the application of academic knowledge to water management and the environment. In fact, it has been replicated in 4 independent centres that replicate the structure, share strategy and work in collaboration.

With more than 150 years of experience, the Agbar Group is one of the main Spanish environmental service providers for water and environmental management.

CSIC is the largest public research institution in Spain and the third largest in Europe (over 11,000 people). CSIC's main goal is to promote and carry out research to generate scientific and technological progress for society.
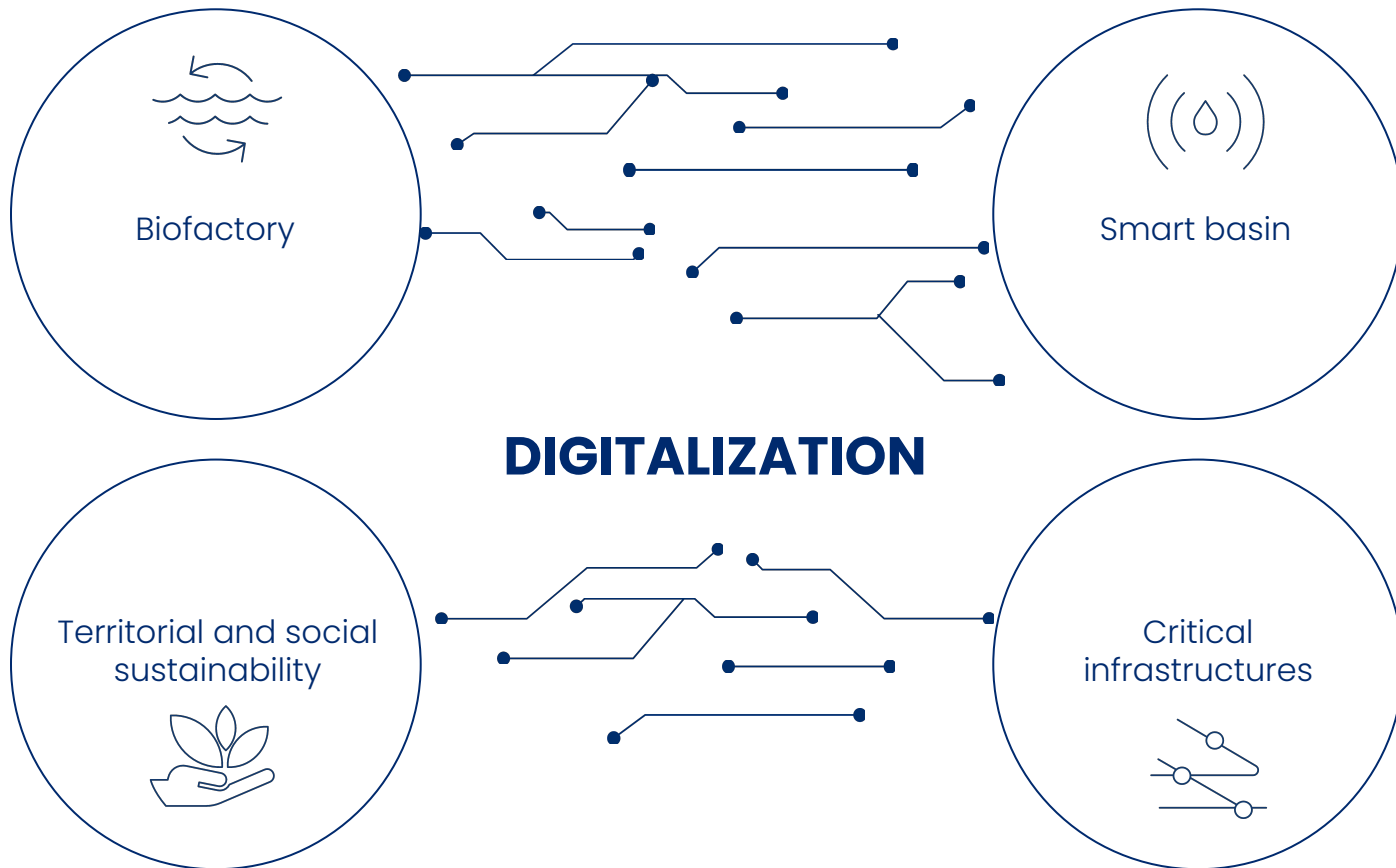
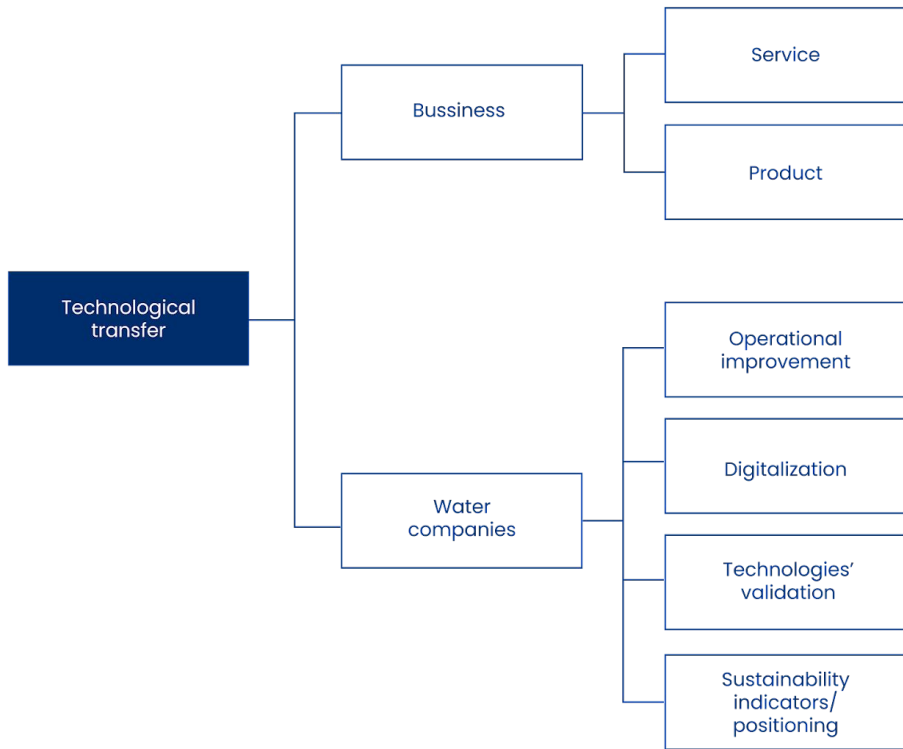# Over 15 years turning strategy into applicable results

We anticipate the needs of water cycle management companies, the different productive sectors, government, the environment and society as a whole to offer solutions with a positive impact, taking the **generation of knowledge and its transfer as the pivotal centre of our strategy.**
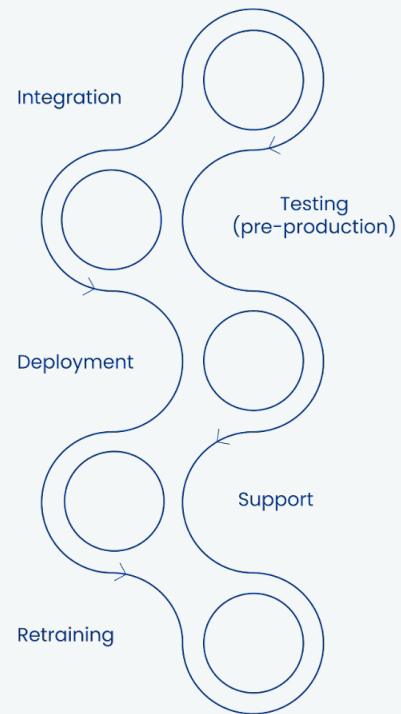
- Public administration
- Environment
- Water companies
- Society
- Productive sectors

Challenges & roadmaps

Research programmes

Projects

Transfer of results

Biofactory

Smart basin

DIGITALIZATION

Territorial and social sustainability

Critical infrastructures

Technology transfer

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                              ┌──────────────────┐
                    ┌─────────┤     Service      │
    ┌────────────┐  │         └──────────────────┘
    │  Bussiness ├──┤
    └─────┬──────┘  │         ┌──────────────────┐
          │         └─────────┤     Product      │
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┌─────────┴────────┐
│  Technological   │
│     transfer     │          ┌──────────────────┐
└─────────┬────────┘     ┌────┤   Operational    │
          │              │    │   improvement    │
          │              │    └──────────────────┘
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          │              │    ┌──────────────────┐
    ┌─────┴──────┐       ├────┤  Digitalization  │
    │    Water   ├───────┤    └──────────────────┘
    │  companies │       │
    └────────────┘       │    ┌──────────────────┐
                         ├────┤  Technologies'   │
                         │    │    validation    │
                         │    └──────────────────┘
                         │
                         │    ┌──────────────────┐
                         └────┤  Sustainability  │
                              │   indicators/    │
                              │   positioning    │
                              └──────────────────┘
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Process for digital results:

Integration

Testing (pre-production)

Deployment

Support

Retraining

Digital solutions
for transfer

Computer vision for plants

Application

Early warning on anomalous episodes in water tanks and processes: foaming, spills, algae in DWTPs inlet, solids and wipes in pumping stations.

Tech

Cameras: visible, infrared and hyper-spectral spectrum, edge computing processors, deep learning for computer vision, data augmentation.

Impact

Intelligent remote operation: reduction in detection and response times on anomalies, increased monitoring of plant operation (24x7), optimization of chemical dosage via closed loop integrations (in progress).

Virtual sensing

Application

Water quality assessment via inferred measurement of complex parameters and emerging compounds in drinking and reclaimed water: e.g. pfTHM.

Tech

Inference and correlation models based on Deep Learning and Machine Learning, Transfer Learning, Edge computing, data augmentation.

Impact

Increased capability in water quality assessment: new and complex parameters, online measurement. CAPEX and OPEX reduction by developing software sensors based on common parameters.
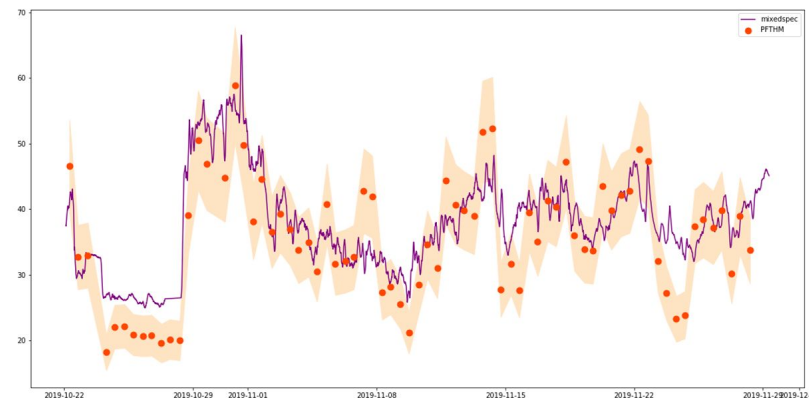
Digital twins for water networks operation

Aigües de Barcelona | INNovació

Application

Monitoring and optimization of critical asset operation in water networks: early warning on malfunctions and failures, OPEX optimization. Developed for pumps and valves in distribution networks.

Tech

Physics informed Machine Learning (combination of physics and ML modeling process modeling), Decision technologies (agents, recommender systems...), Data Management.

Impact

Reduction of detection and response times in case of malfunctions, OPEX reduction by reducing downtimes and maintenances, optimization of the asset life cycle.
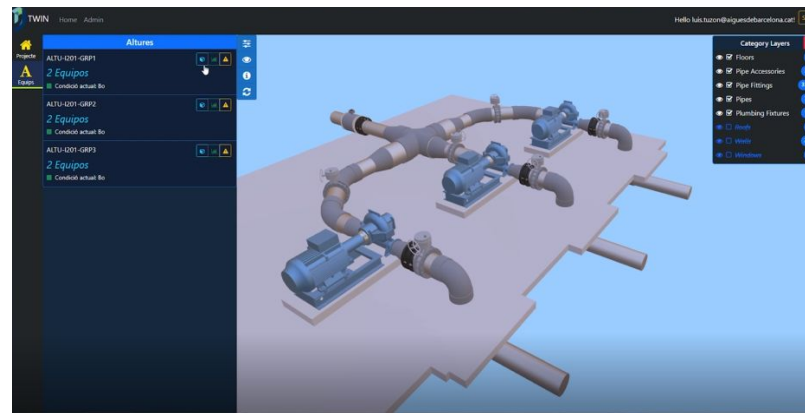
Vulnerability areas identification

Application

Detection and mapping of previously undetected vulnerable population by analyzing changes in behaviour regarding the payment of water bills together with socioeconomic contextual information.

Tech

Time-series analysis, data normalization, clustering and classification, anomaly detection, expert system, geospatial clustering

Impact

Increased insight on vulnerable customer segments, increased efficiency of social policies by focusing on geographical areas with higher vulnerable population, improvement of debt recovery procedures, novel services for public-private collaboration involving social entities.

Segmentació de clients AMB sense el Segment 1

Segment ● Segment 3 ● Segment 5 ● Segment 6 ● Segment 7
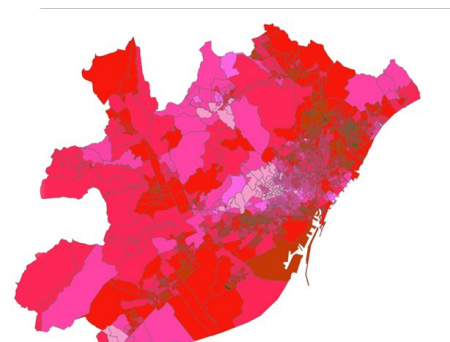
Perfil de rendes per secció censal

● 1 - Pobresa severa ● 2 - Pobresa relativa ● 3 - Baixa ● 4 - Mitjana-Baixa ● 5 - Mitjana-Mitjana baixa ● 6 - Mitjana-Alta ● 7 - Alta ● 8 - Molt alta

Algae bloom detection

Application

The system provides information to water supply companies: detect cyanobacteria bloom by using satellite data and anticipate episodes by using real-time monitoring and data models.
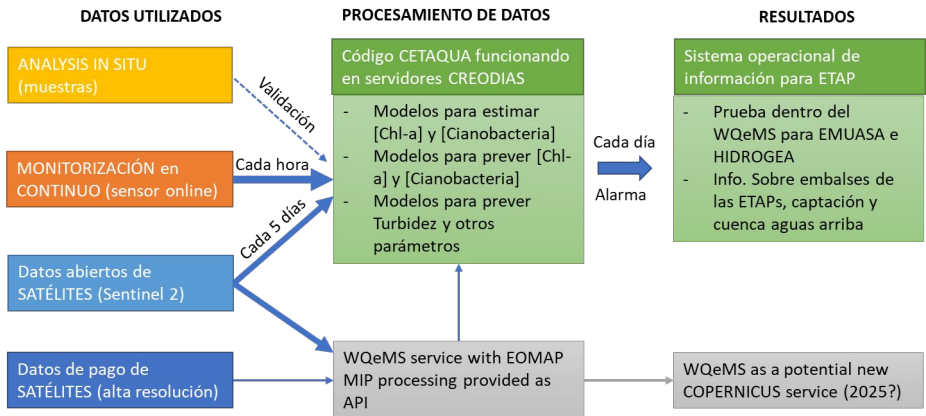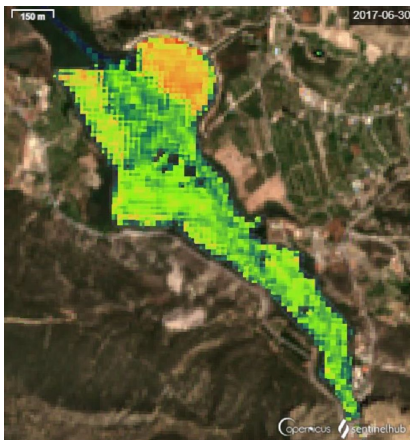
Tech

Satellite image acquisition, infrared data processing, time-series analysis, geospatial analysis

Impact

Ability to anticipate algae bloom episodes and to reduce its impact on drinking water supply, scale-up of water quality sensing by using satellite data

DATOS UTILIZADOS

ANALYSIS IN SITU (muestras)

MONITORIZACIÓN en CONTINUO (sensor online)

Datos abiertos de SATÉLITES (Sentinel 2)

Datos de pago de SATÉLITES (alta resolución)

PROCESAMIENTO DE DATOS

Código CETAQUA funcionando en servidores CREODIAS
- Modelos para estimar [Chl-a] y [Cianobacteria]
- Modelos para prever [Chl-a] y [Cianobacteria]
- Modelos para prever Turbidez y otros parámetros

Validación

Cada hora

Cada 5 días

WQeMS service with EOMAP MIP processing provided as API

RESULTADOS

Sistema operacional de información para ETAP
- Prueba dentro del WQeMS para EMUASA e HIDROGEA
- Info. Sobre embalses de las ETAPs, captación y cuenca aguas arriba

Cada día

Alarma

WQeMS as a potential new COPERNICUS service (2025?)

Prediction of water resource availability

Application

To improve river basin governance practices by providing added-value predictions on key operational attributes such as reservoirs volumes and piezometric levels considering weather forecasts.
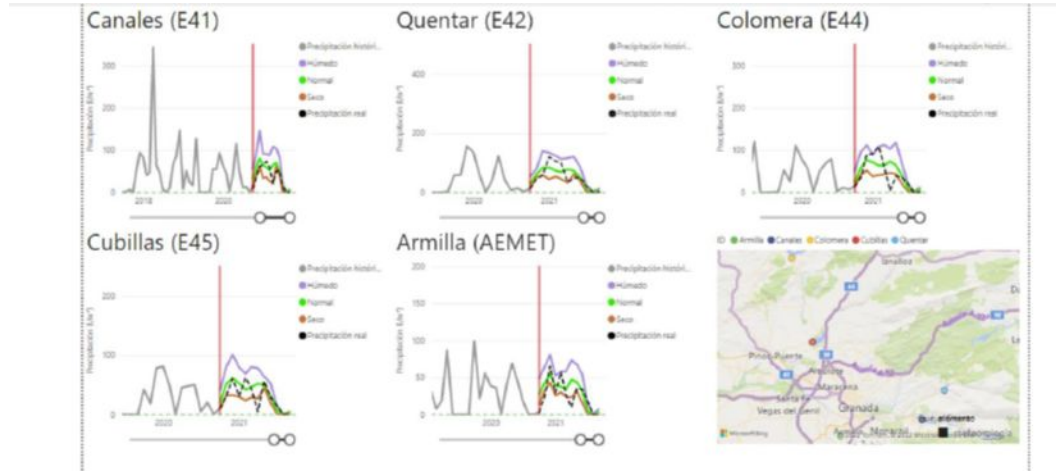
Tech

Time-series analysis, Machine Learning (regression and prediction), Data Management (cleaning and imputation), context data processing (rainfall, snow coverage)

Impact

Enhancement of available information for water basin operators, integration of predictive insight into water basin governance

Sewer cleaning optimisation

Agbar

Application

Automated inspection of sewer networks. Fully integrated into the Agbar product for wastewater network maintenance.

Features

- Computer Vision model trained to classify the level of obstruction in wastewater networks.

- Training and inference using inspections footage from wastewater maintenance application in Spain (Galia).

- Solution scalable to all the networks in Spain, fully integrated and deployed as a service.

- Reduces dramatically the video validation time by providing automatic detection of highly obstructed points.

UF membranes' operation

VEOLIA
Water Technologies & Solutions

Application

Data-driven optimization of ultrafiltration membrane life-cycle. Implemented as a feature in Insight (WTS).

Features

- Optimization based on the online monitoring of two indicators to check fouling slopes and time to reach maximum permeability

- Provides actionable recommendations for performance optimization based on decision trees, including the estimated. savings resulting from the optimization

- Tested both for drinking water and wastewater treatment applications

Lessons learned
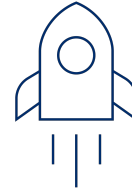
Identification of acceptance criteria (product mindset) and execution in Agile mode
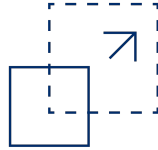
Simplification of developments to ensure their scalability and automation

Accelerate the transition from training to testing mode

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