



# AquaNES

## ICT for MAR/SAT optimization & water reuse An Information System for better management

BLUE PLANET - Berlin Water Dialogues  
9<sup>th</sup> of April 2019

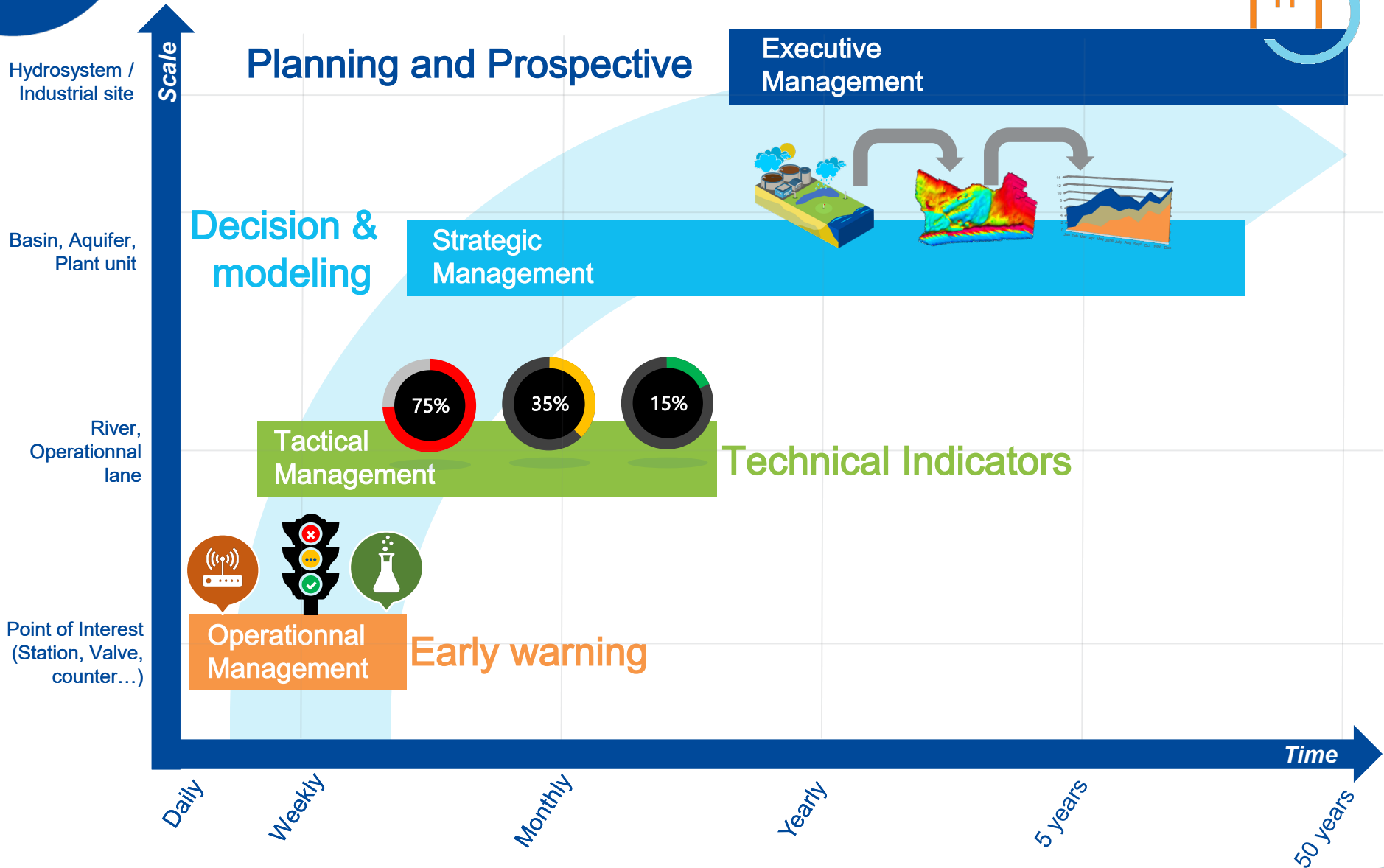
Loïc THOMAS & Axel AUROUET – **ANTEA Group/ Géo-Hyd**  
Marie PETTENATI & Géraldine PICOT – **BRGM**





# ICT for MAR/SAT optimization & water reuse

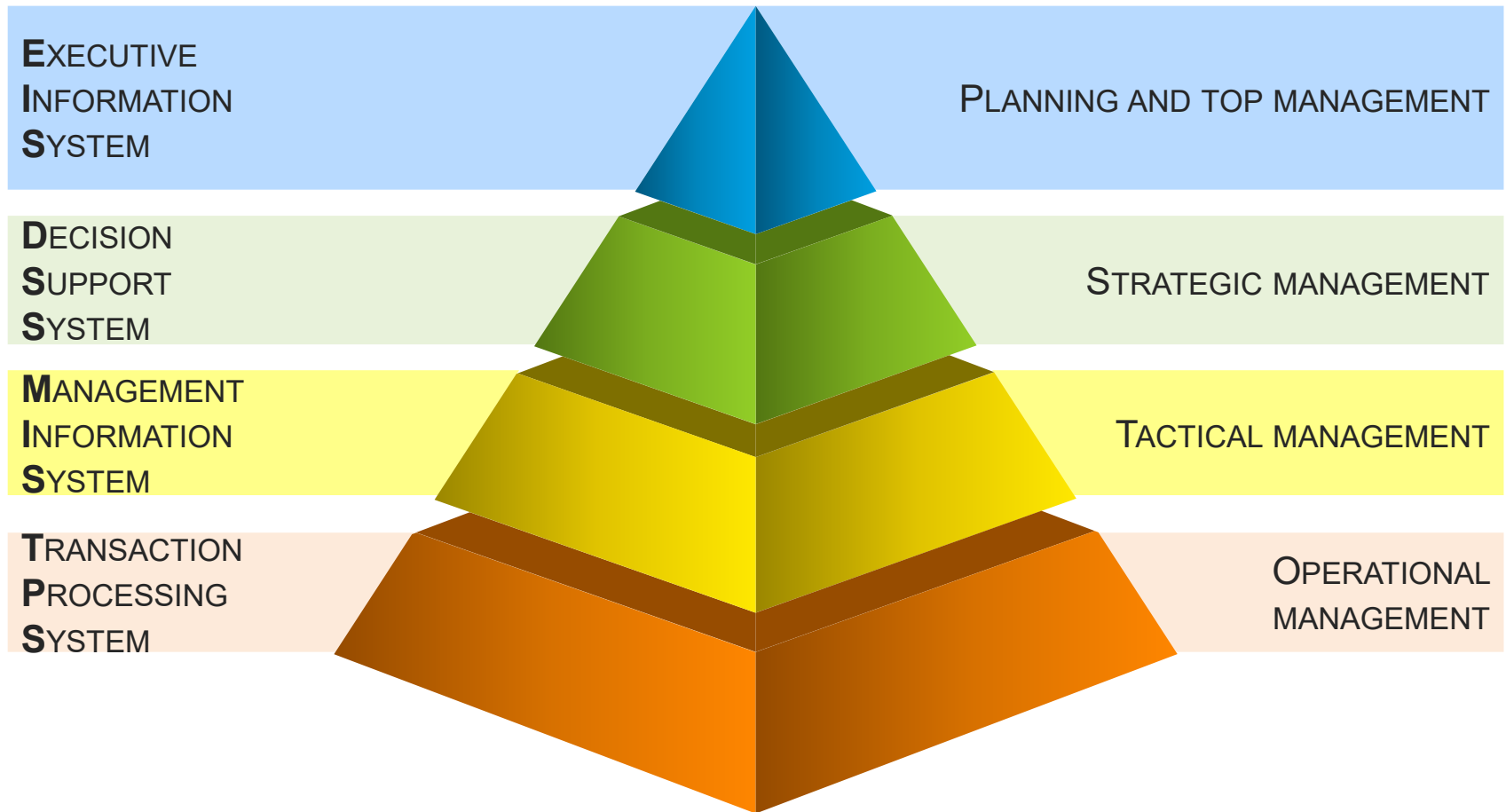
A question of time and scale for water management





# ICT for MAR/SAT optimization & water reuse

Global approach

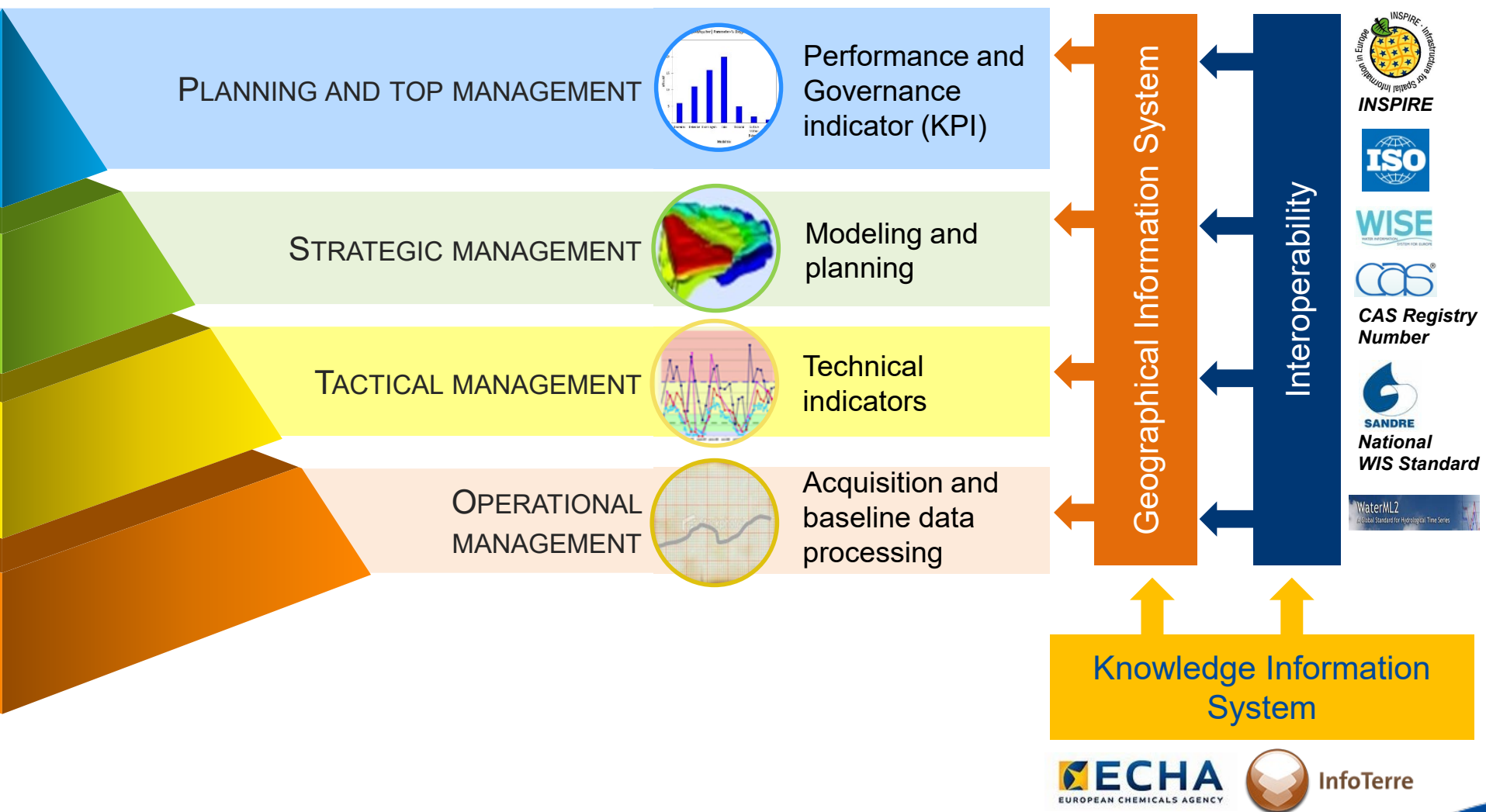


Conceptual Pyramid of Information System



# ICT for MAR/SAT optimization & water reuse

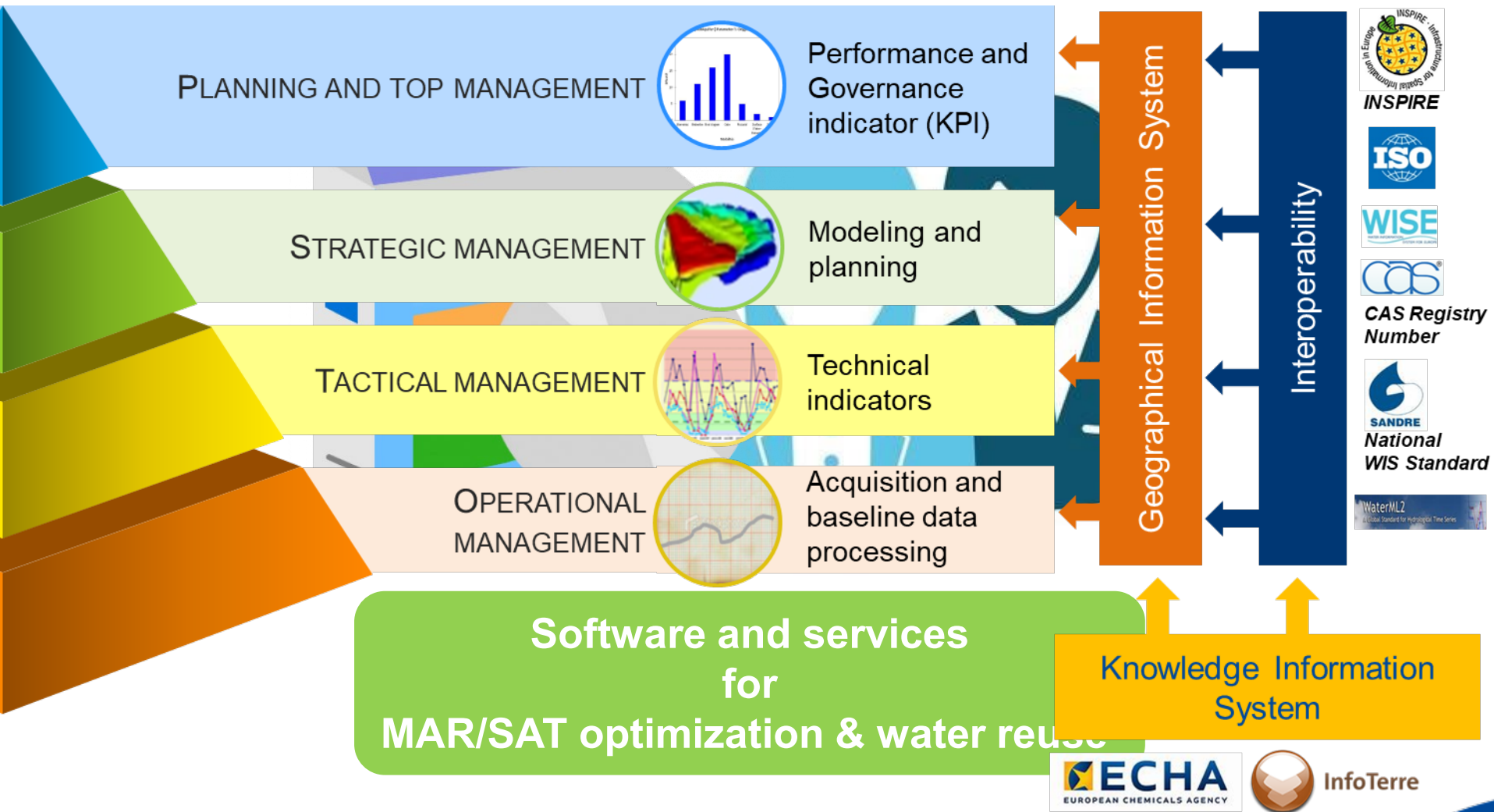
Global approach





# ICT for MAR/SAT optimization & water reuse

Global approach





# ICT for MAR/SAT optimization & water reuse

Demonstration site for AquaNES project

Demonstration site : Agon-Coutainville (FR)



The study site is located  
on the shoreline in  
Normandy (FR) at Agon-  
Coutainville





# ICT for MAR/SAT optimization & water reuse

Demonstration site for AquaNES project

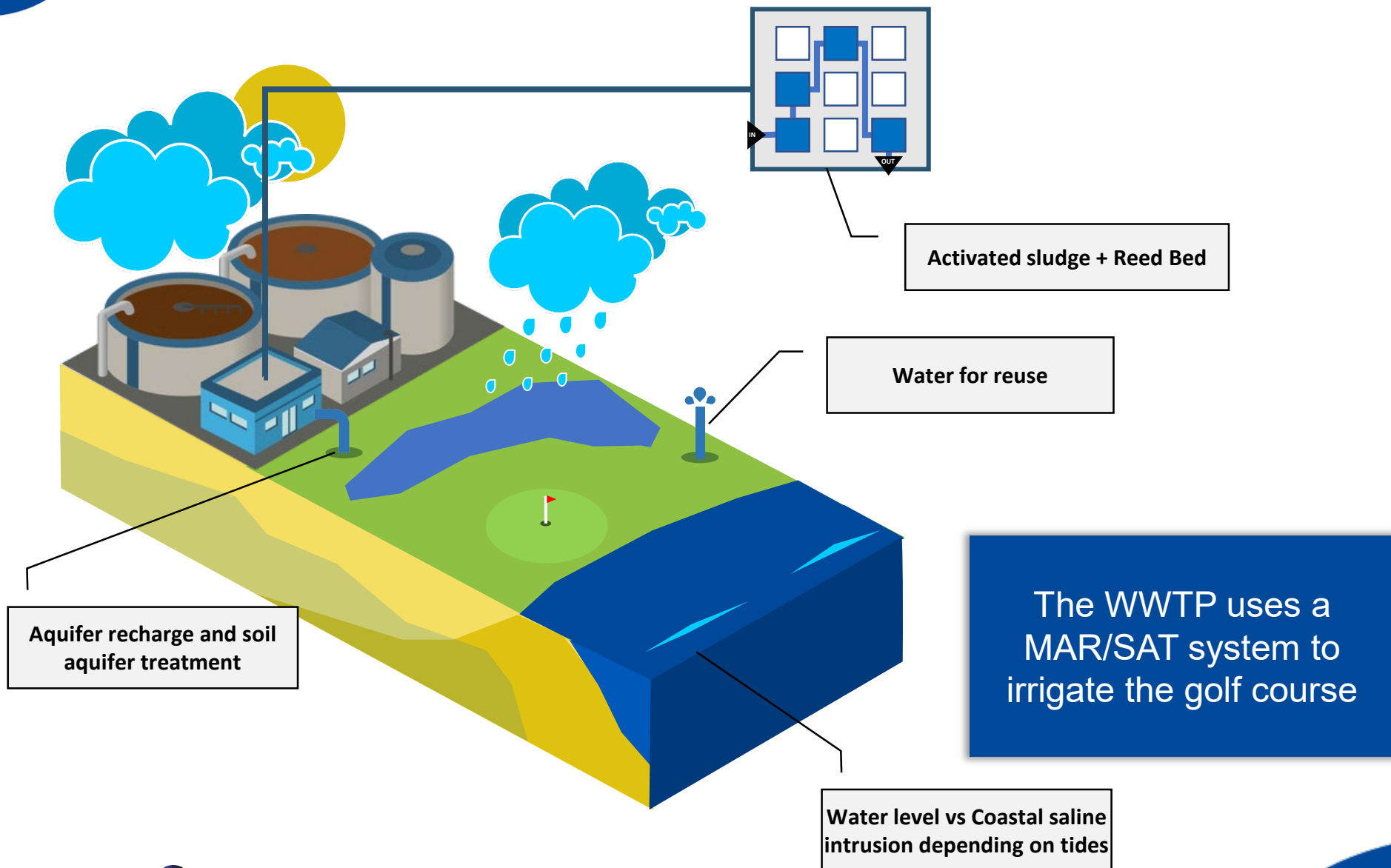
Demonstration site : Agon-Coutainville (FR)



The study site is located on the shoreline in Normandy (FR) at Agon-Coutainville

# ICT for MAR/SAT optimization & water reuse

## Combined Natural Engineered Systems dedicated to golf course irrigation

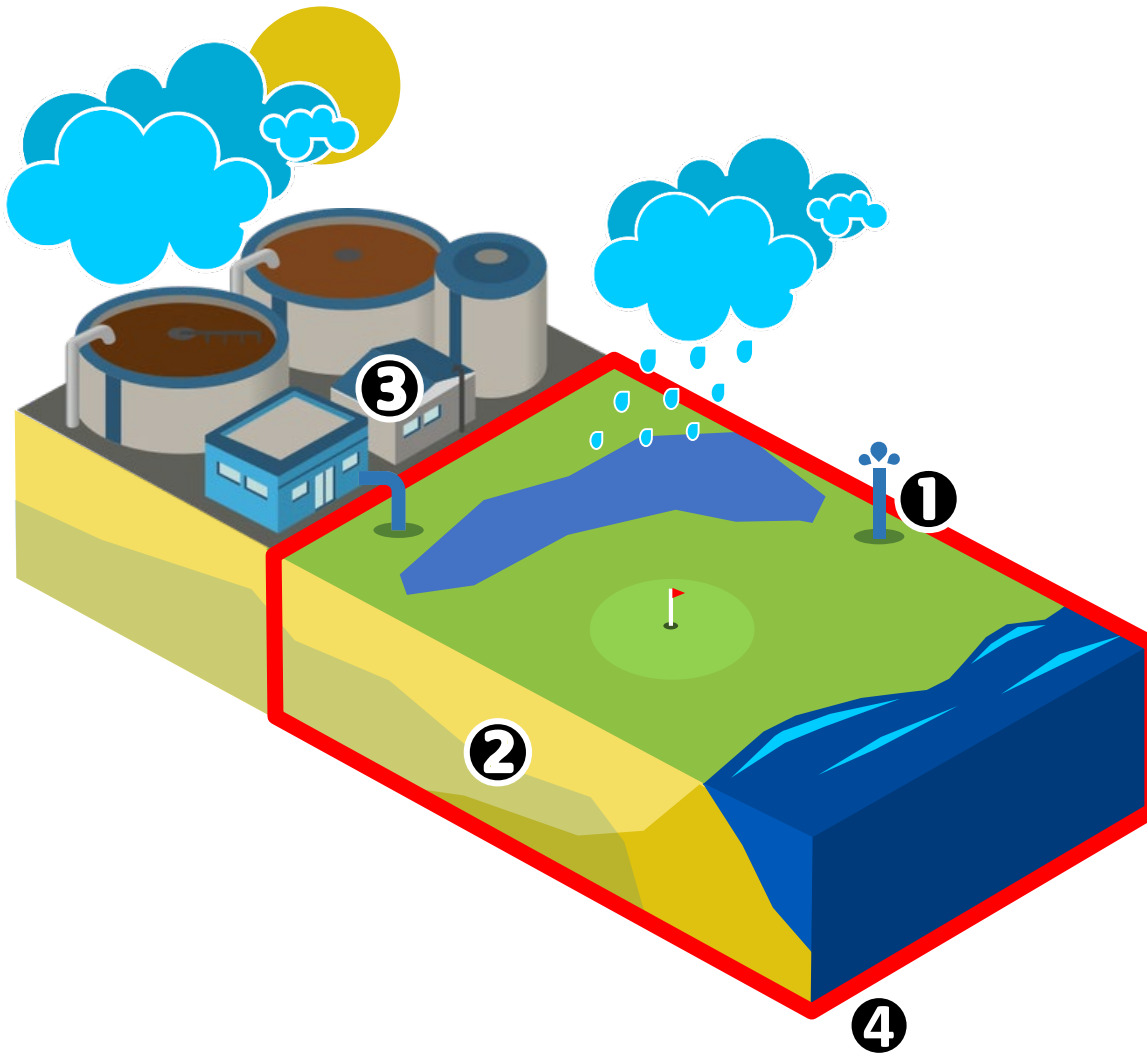






# ICT for MAR/SAT optimization & water reuse

Combined Natural Engineered Systems dedicated to golf irrigation



Can we use the water for the golf course ?



What happens in the soil aquifer system ?



How to manage the recharge ?

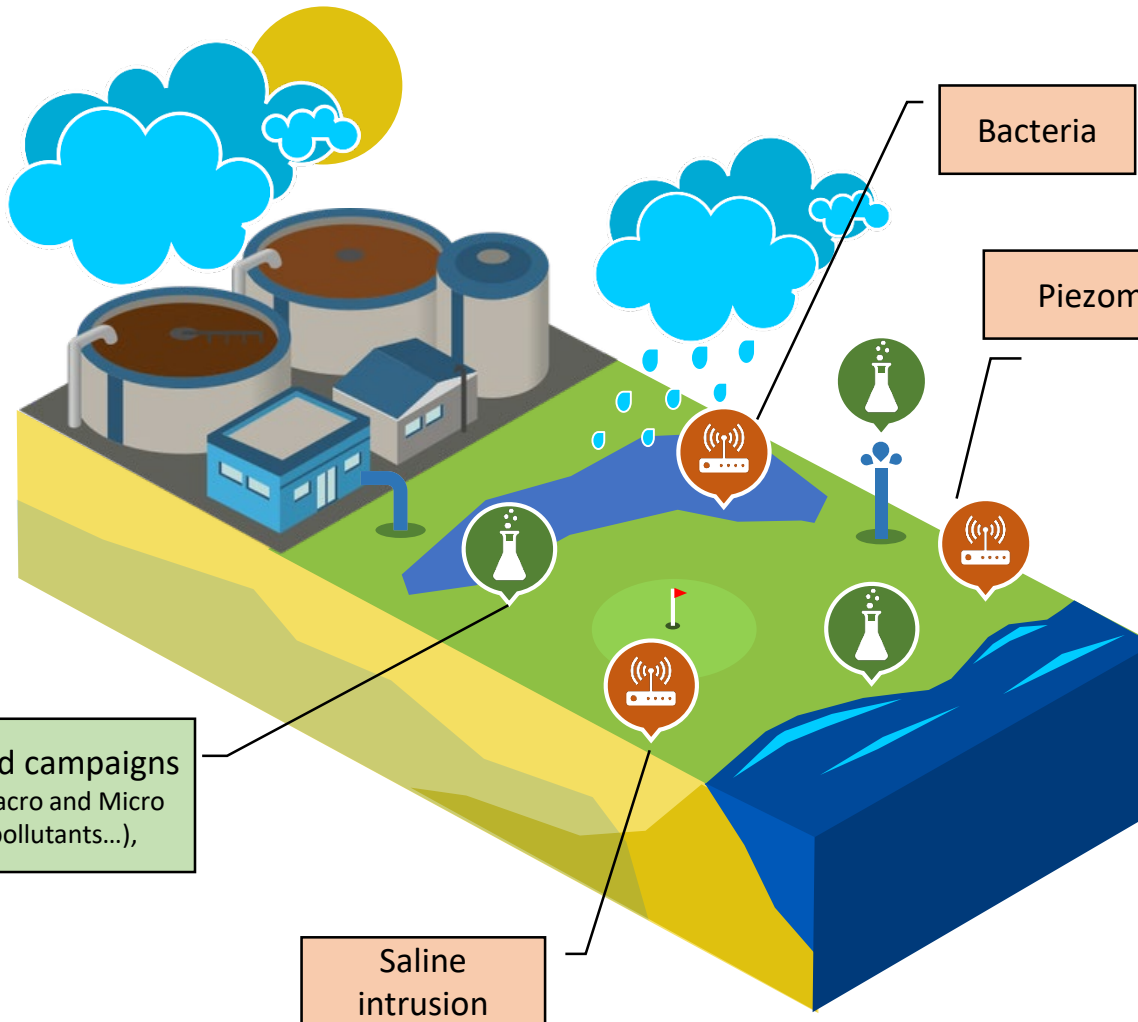


Is it feasible on the long term ?



# ICT for MAR/SAT optimization & water reuse

Combined Natural Engineered Systems dedicated to golf irrigation



Offline data acquisition  
*Sampling campaigns*



Bacteria

Piezometry

Many parameters need to be measured to track their evolution across the site and the behavior of the hydrosystem



Online data acquisition  
*Sensors*

Field campaigns  
(Macro and Micro  
pollutants...),

Saline  
intrusion



Subsurface  
Monitoring  
Device





# ICT for MAR/SAT optimization & water reuse

Combined Natural Engineered Systems dedicated to golf irrigation



Database

Knowledge Repository (KR)

LYXEA

géo-hyd  
membre d'Antea Group



All these collected data are processed for compliance and interoperability and centralized in a database in order to facilitate their exploitation



# ICT for MAR/SAT optimization & water reuse

Combined Natural Engineered Systems dedicated to golf irrigation



Database

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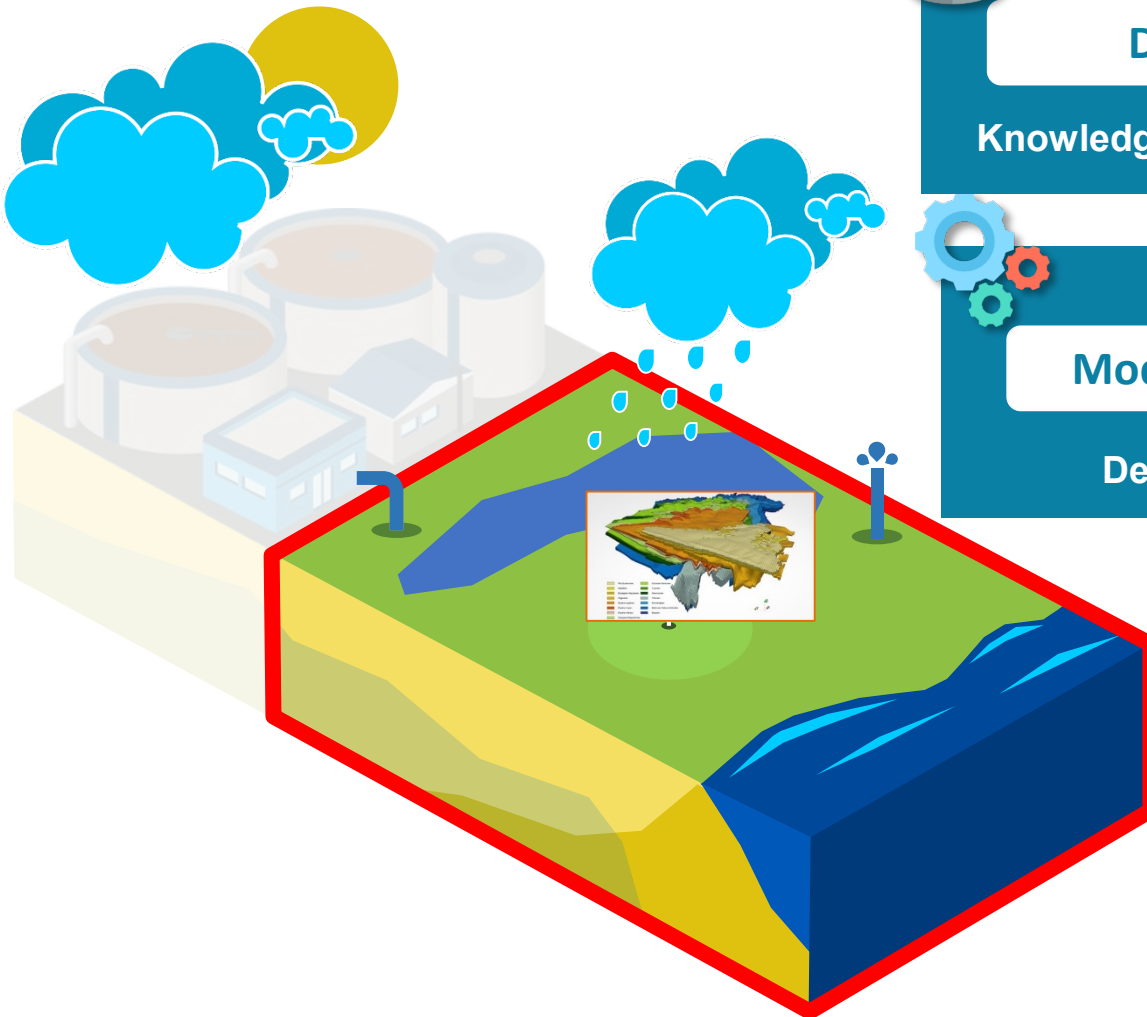


Modelling Engine

Decisional Data

MARTHE

Associations pour une terre durable  
brgm

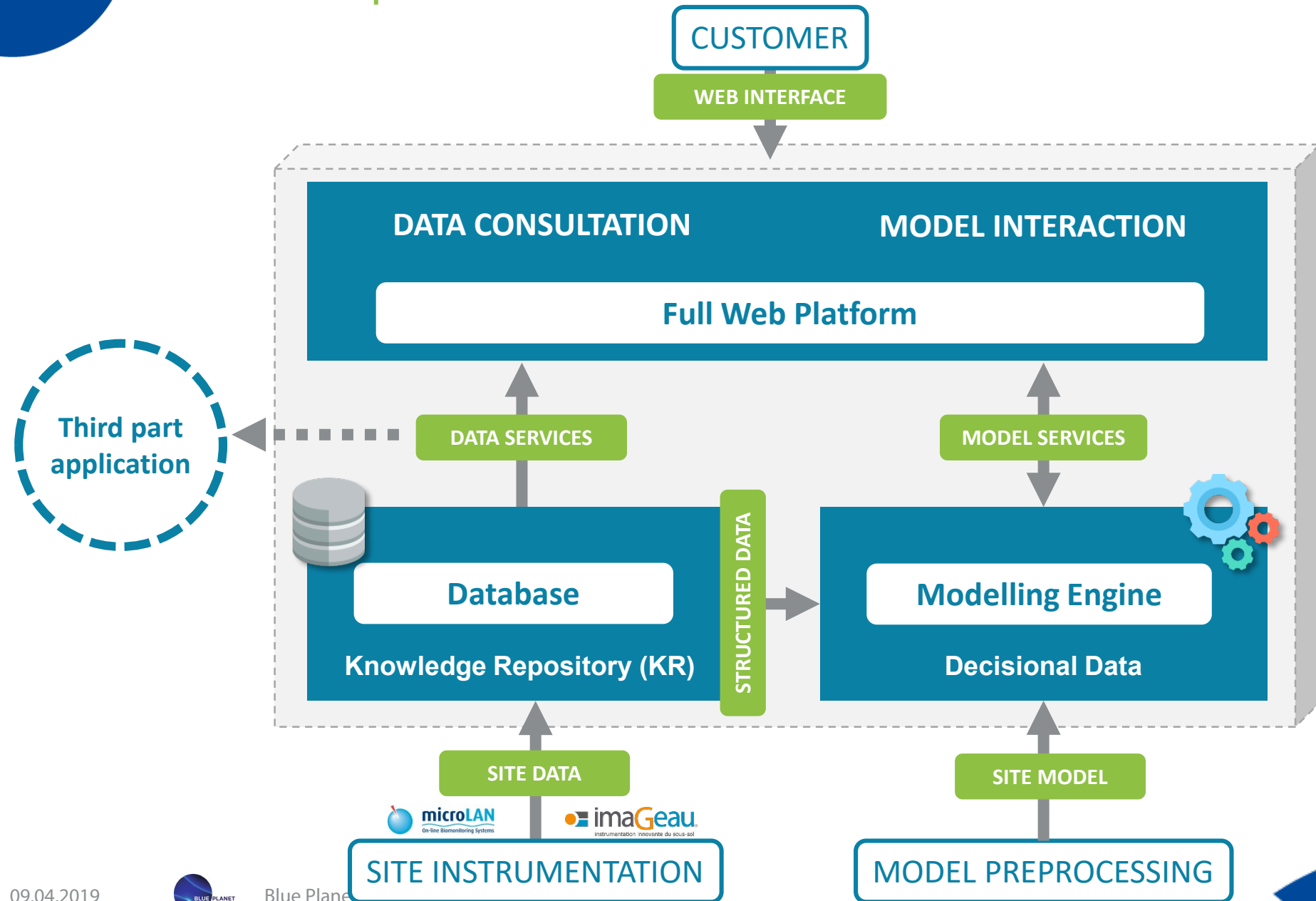


The hydrogeological functioning of the subsoil is modeled to have a 3D digital view of the site and be able to predict future situations



# ICT for MAR/SAT optimization & water reuse

## Software - Components architecture



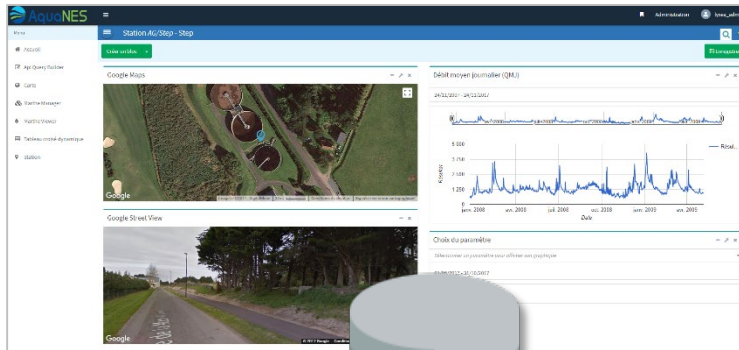




# ICT for MAR/SAT optimization & water reuse

Final product : Combined ICT solution & Engineering services

## Dashboards

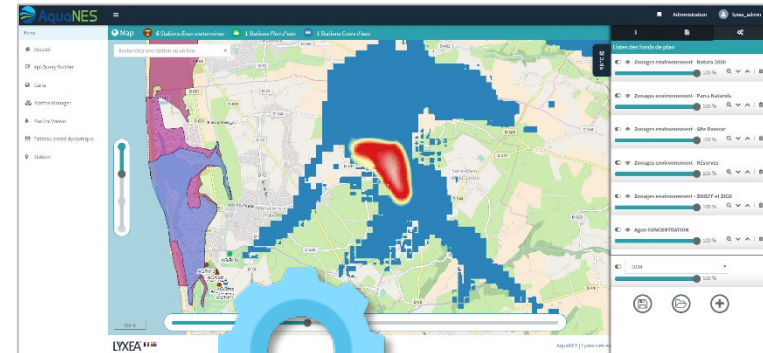


Database  
(Lyxea)



Data update

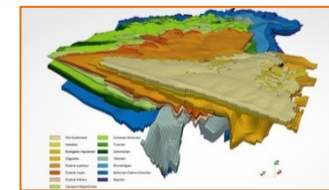
## Modelling execution & visualisation



Modelling Engine  
(Marthe)



Data Acquisition



3D Model

Monitoring platform

Site settings



# ICT for MAR/SAT optimization & water reuse

Final product : Combined ICT solution & Engineering services

Service delivery

2

## Web Solution

SaaS or On-Premise

Monitoring platform

1

## Engineering Services

Data acquisition + Site modelling

Site settings



# ICT for MAR/SAT optimization & water reuse





# AquaNES

Demonstrating Synergies in Combined Natural and Engineered Processes for Water Treatment Systems



The AquaNES project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 689450



# ICT for MAR/SAT optimization & water reuse

## Screens

Site Management System

<https://aquanes.lyxea.fr>



The screenshot shows the AquaNES website interface. On the left, a navigation menu is visible with the following items: Home, Decision support : Irrigation, Water quality monitoring, Data Viz, Map, and Station. The main content area features a large aerial photograph of a water treatment facility with a long concrete wall and surrounding greenery. The website header includes the AquaNES logo and the text "Site Management System".



**LYXEA**  
DEMONSTRATING SYNERGIES IN COMBINED NATURAL AND ENGINEERED PROCESSES FOR WATER TREATMENT SYSTEMS



The diagram illustrates the "TREATMENT PROCESS COMBINATION". It shows a flow from a "WWTP" (Wastewater Treatment Plant) to "Activated sludge", which then feeds into "Sand Dune Filtration". From there, the water is used for "Reed Bed", "Golf irrigation", and "SMD" (Surface Micro-Drip). The "SMD" is also connected to "SMD Data Autonomous & Teletransmitted". The diagram also shows "Groundwater" and "Saline Intrusion" in the "Sea". The AquaNES logo and the text "brgm" and "géo-hyd" are visible in the top left corner of the diagram.

**TREATMENT PROCESS COMBINATION**  
The demonstration sites consist of a full-scale operational WWTP and MAR/SAT systems. The secondary treated wastewater is discharged into a natural reed bed from which it infiltrates into the





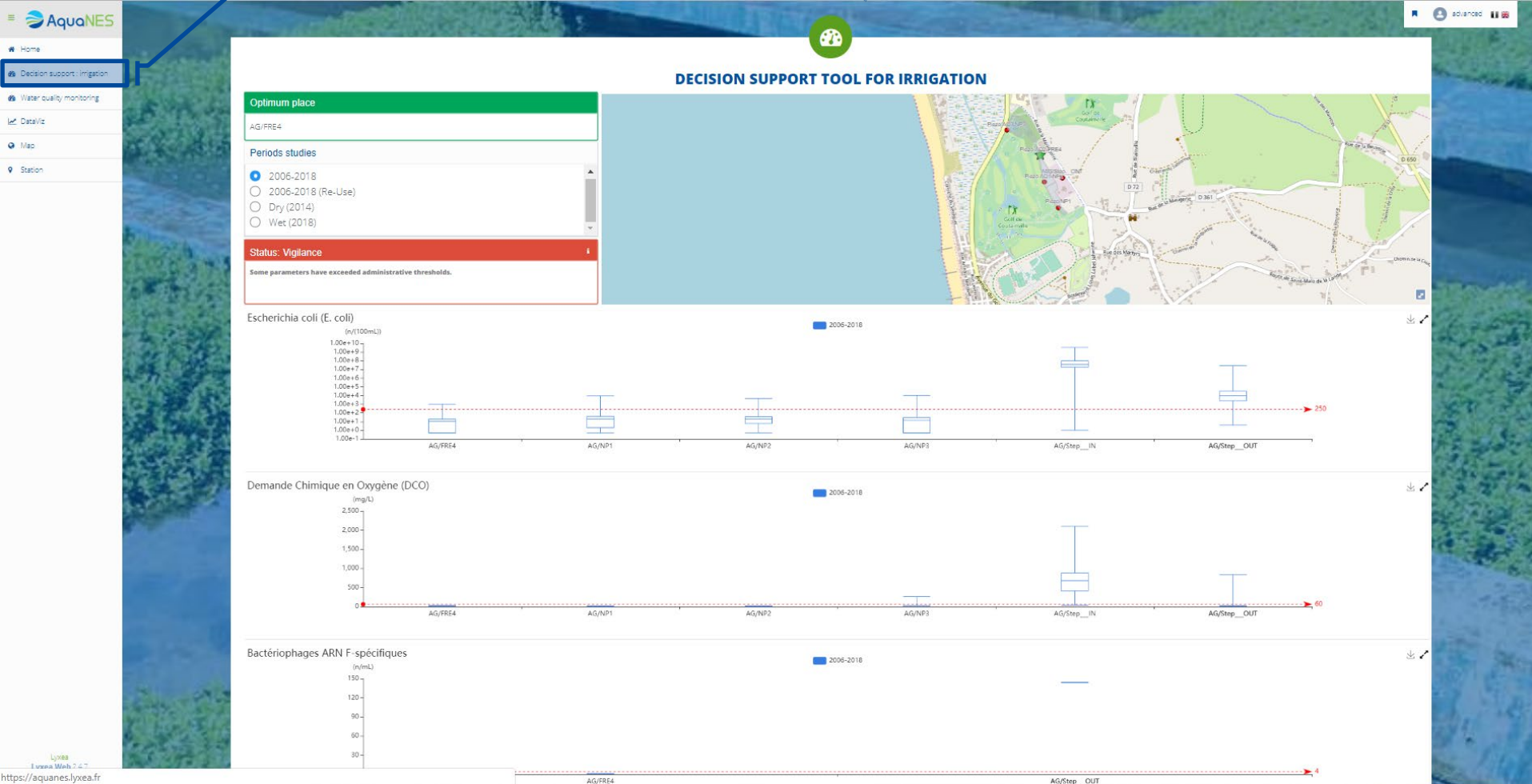
# ICT for MAR/SAT optimization & water reuse

## Screens

Operational Management



<https://aquanes.lyxea.fr>



Lyxea  
Lyxea Web 2.0  
<https://aquanes.lyxea.fr>



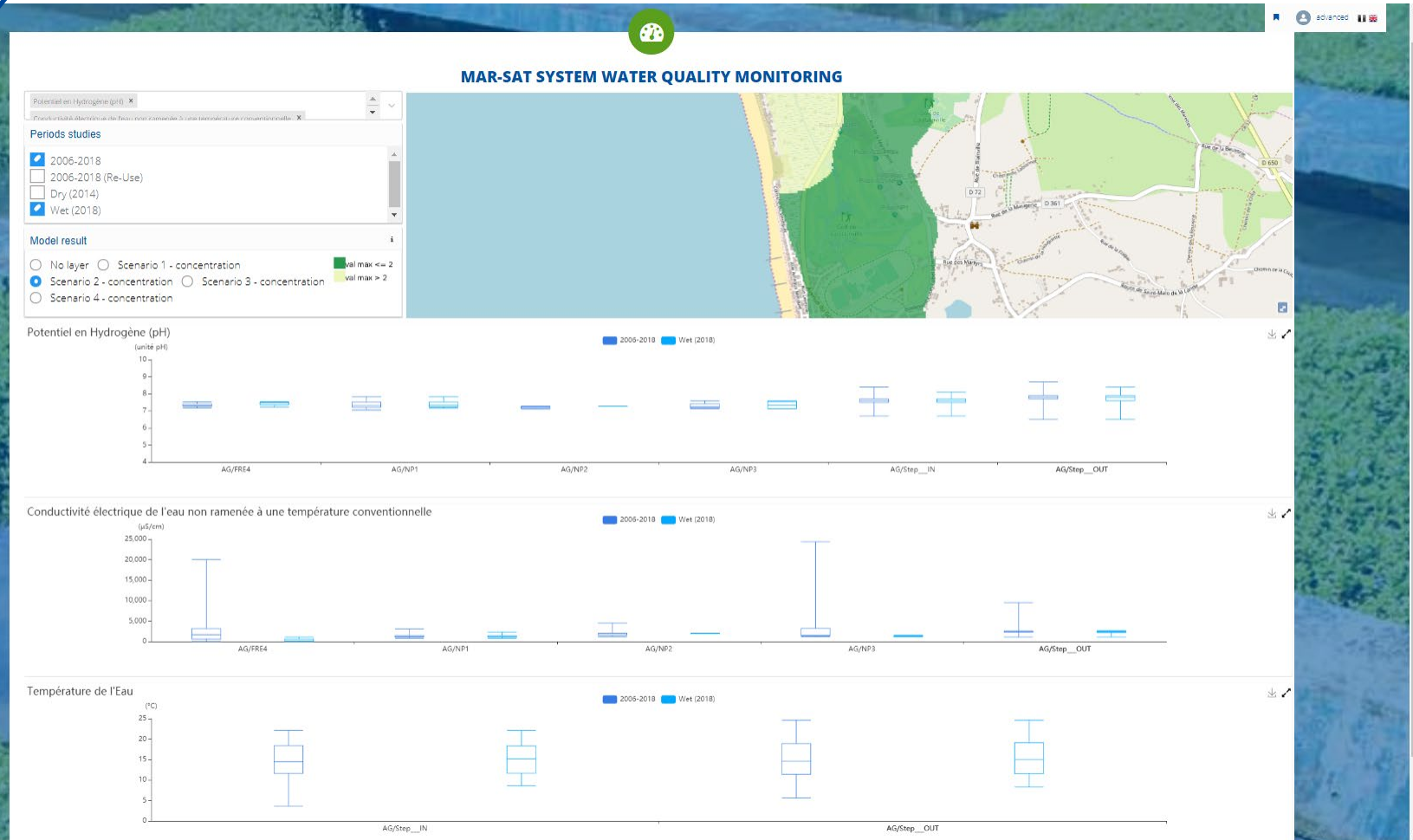
# ICT for MAR/SAT optimization & water reuse

## Screens



<https://aquanes.lyxea.fr>

Tactical Management

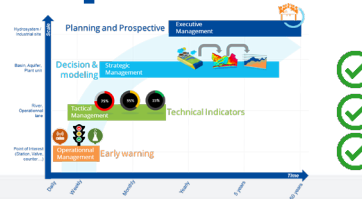




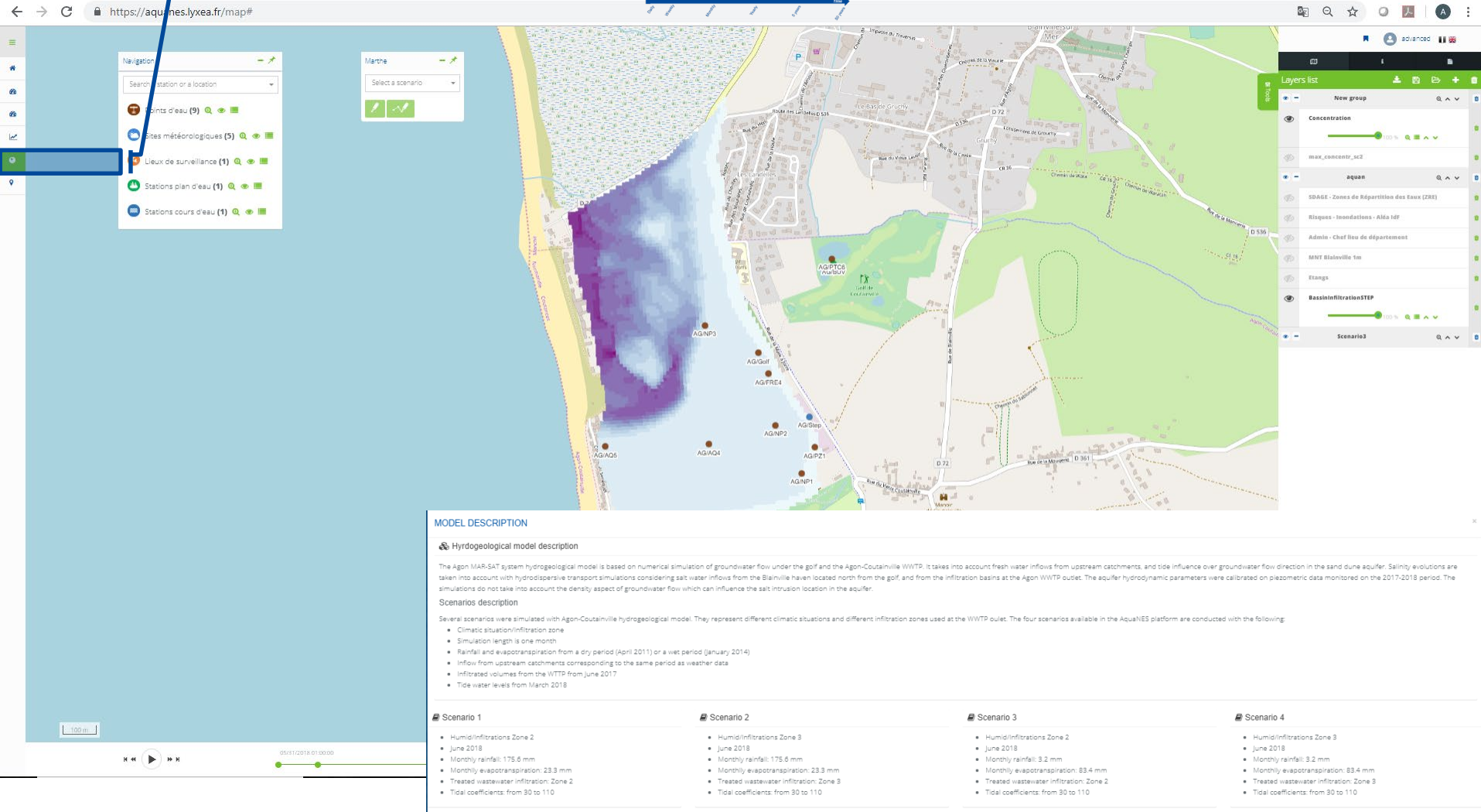
# ICT for MAR/SAT optimization & water reuse

## Screens

### Decision Support Management



<https://aquanes.lyxea.fr>



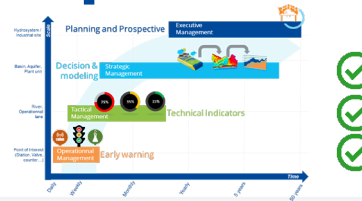




# ICT for MAR/SAT optimization & water reuse

## Screens

Data Management



<https://aquanes.lyxea.fr>



# ICT for MAR/SAT optimization & water reuse

## Thank you for your attention

Integrated  
Recharge  
Management

 AquaNES

 Géosciences pour une Terre durable  
brgm

 géo-hyd  
membre d'Antea Group

