Protection of natural environment

QUALECOS : Quality of Coastal Water and Health Risks)

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Pôle d'analyses et de recherche de Normandie
PROLOG INGENIERIE

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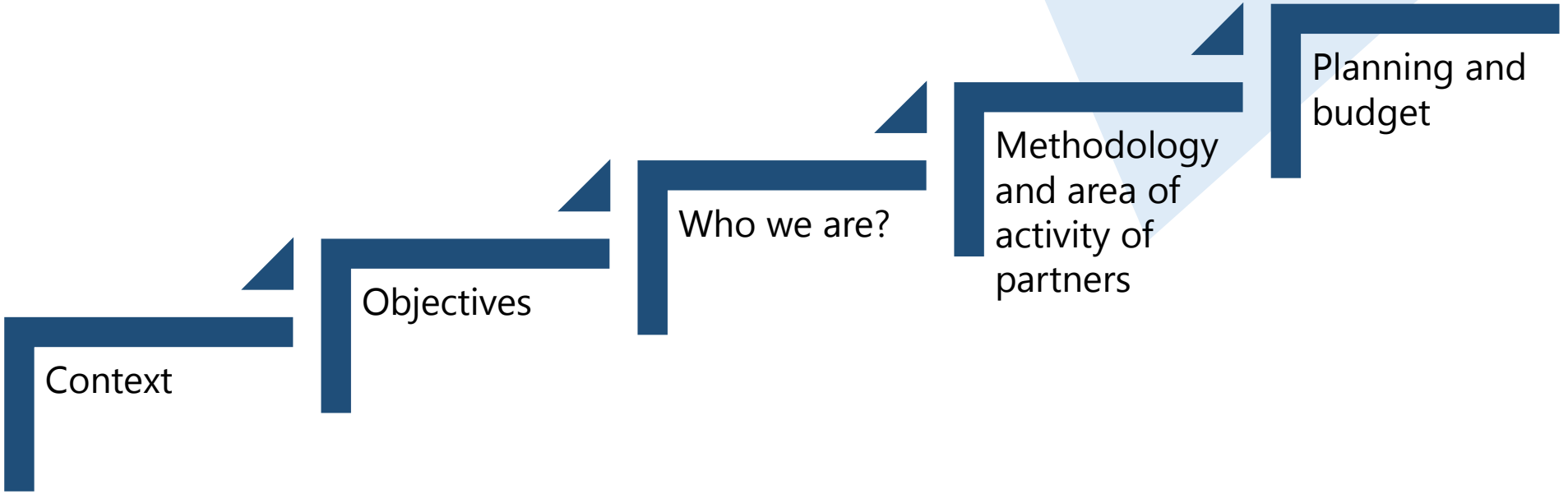
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Context

The stakeholders of maritime sector are faced, for increasingly frequent and longer periods, with swimming bans and bans of consumption of products from shellfish farming and aquaculture due to various pollutions.

Huîtres contaminées : vent de panique chez les ostréiculteurs à l'approche de Noël

Par **Simon Cherner**
Publié le 19/12/2023 à 19:17, mis à jour le 19/12/2023 à 20:45

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Selon l'Agence régionale de santé des Pays de la Loire, 47 personnes auraient été intoxiquées depuis début décembre à la suite de la consommation d'huîtres contaminées. *Blondet Eliot / Blondet Eliot/ABACA*

(Article from le Figaro on 19/12/2023)

Huîtres d'Arcachon interdites à la vente : « Dès qu'il pleut, tout dégueule dans le Bassin »

Lecture 3 min

Accueil • Sud Ouest Éco • Ostréiculture

Au port de la Barbotière, à Gujan-Mestras, ce 28 décembre, Jimmy Poiraud et Rudy Roselle récupèrent les mollusques qui devaient être vendus pour la Saint-Sylvestre afin de les rapporter vers les parcs à huîtres. © Crédit photo : Claude Petit/ « SUD OUEST »

(Article from Journal Sud-Ouest on 28/12/2023)

→ This leads to high financial and environmental costs

QUALECOS : QUALité des Eaux Cotières et risques Sanitaires

The objectives of this presentation are:

- ✓ **To present our project of conceiving and developing a decision support numerical tool for a predictive and proactive management of inland and maritime sanitary risks of the exposed geographical sector in order to answer the following questions:**
  - ❑ How quickly does pollution occur and for how long?
  - ❑ When to pick up the sea products?

- ✓ **Looking for fundings and European partners**

At least, the system must model the following critical parameters:

- **Faecal indicators** (E. coli, intestinal Enterococci): indicators commonly used to measure health risks in bathing water and in consuming seafood (standardised indicators).
- **Microbial tracers** including bacteroids: indicators to better identify the origin of pollution (animal or human).
- **Enteric viruses** (enteroviruses as a model of noroviruses): enteric viruses often present in the environment.
- **Phytoplankton** that are pathogenic for wildlife and/or human such as the pseudo-nitzschia: this phytoplankton is often present in the Normandy coast and can cause problems for the production of scallops.

Who we are? Partners of the research program

Consultancy company independant of any financial and industrial group. **We are engineers, computer specialists and geomaticians specialising in the field of water.** PROLOG INGENIERIE is the main partner who initiated this research project. We will be the Leader of the Group and will ensure the general development of the forecasting system that will be implemented.

The leading French public laboratory for the analysis of shellfish products for human consumption. They will work on the measurement campaigns and the analysis of biological and physico-chemical parameters in the marine environment in order to monitor the evolution of different sources of pollution in water, sediments and shellfish.

Lboratory of the university of Caen. They have been recognised expertise in numerical modelling of the coastal and estuarine hydrodynamics, particularly in the English Channel. Many of their works have focused on the transport of suspended sediments and turbulence.

Laboratory of the university of Rouen. They are experts in algorithms and machine learning. They will work on the the predictive management and the implementation of meta-models based on the available measurements and the results of numerical models of coastal and estuarine environments.

By constituiting this Group, **PROLOG INGENIERIE**, who is the **Pilot of this Program**, have made a choice focused on the feasibility and the pragmatism of the project by inviting different partners specialised in different fields which are necessary for this project.

Indeed, it is fundamental for us to look beyond the research program and **ensure** that the **methodologies developed within the framework of this program on a Pilot site can subsequently be applied on other sites in France and abroad.**

This research program will thus serve as a **methodological basis for other projects in different territories at the service of residents, tourist activities and aquaculture stakeholders.**

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Proposed method

1st phase : Bibliography, design of modelling tool

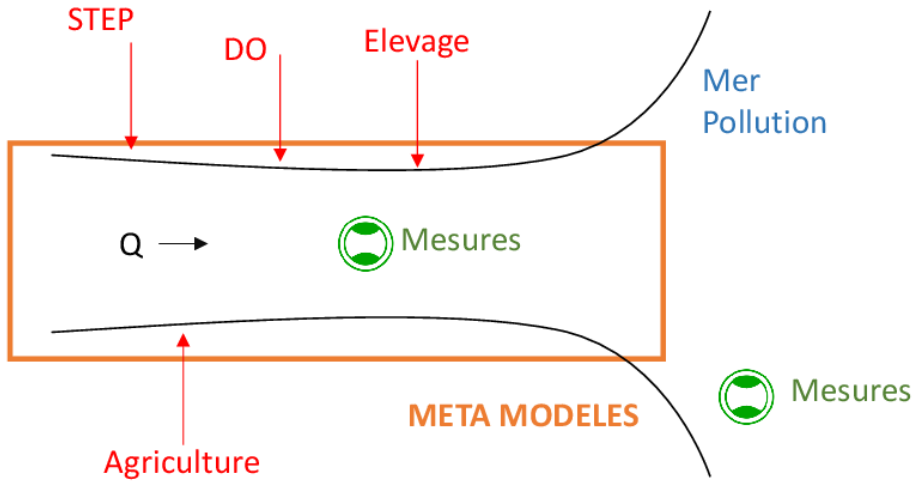
2nd phase : Development of the 3D modelling tool for water quality indicators

Use of measurements and deterministic models:

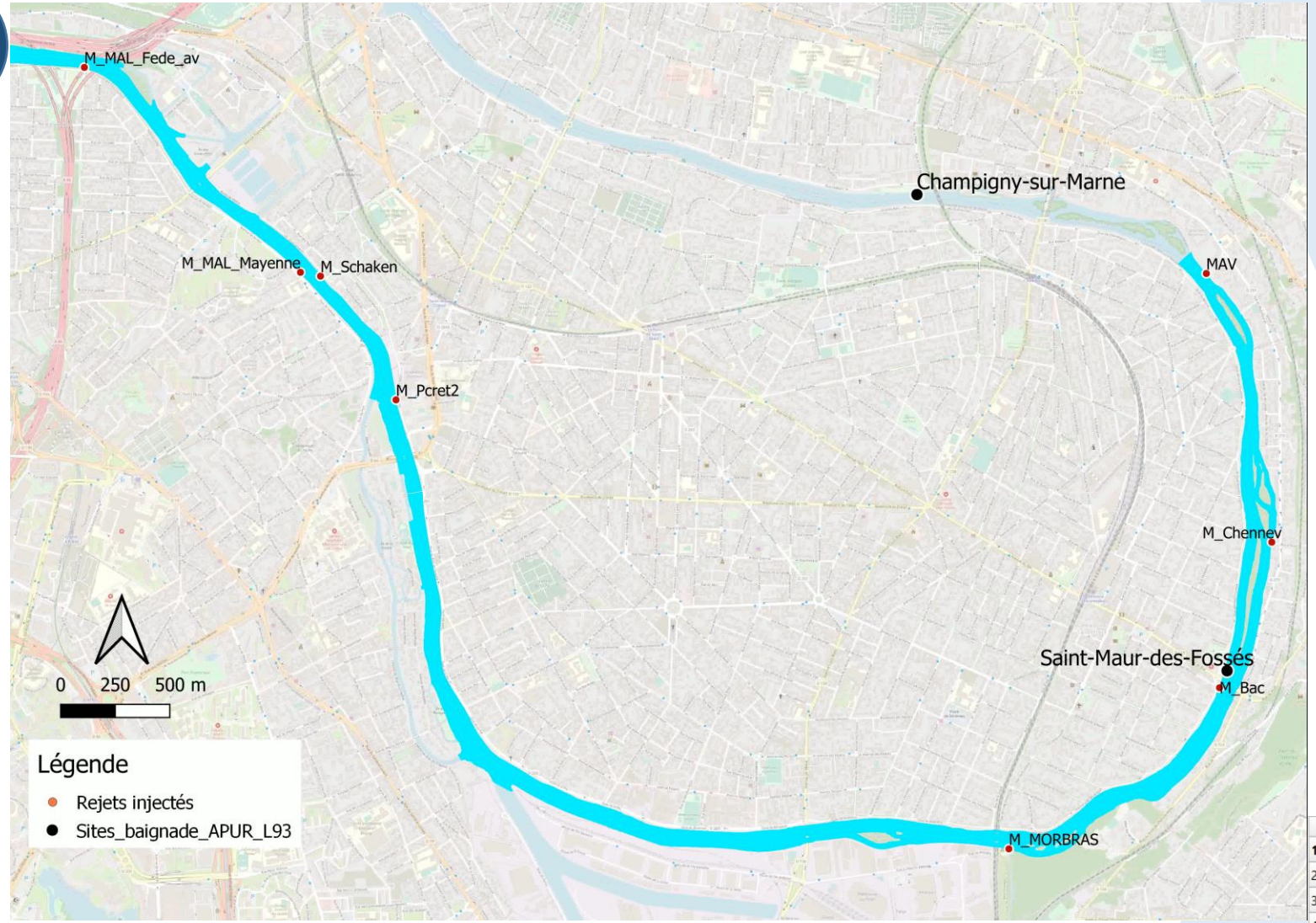
- Calibration of the prediction system and
- Generation of different events to expand the prediction scale of the given coastal sites

3rd phase : Implementation of a support system for the predictive and proactive management of inland and maritime sanitary risks

Construction of a meta model for each site using a stock of simulations realised under different conditions by the Machine Learning technique powered by a permanent measurement network.



Method for modelling the dispersion of pollutants by Telemac-2D/3D



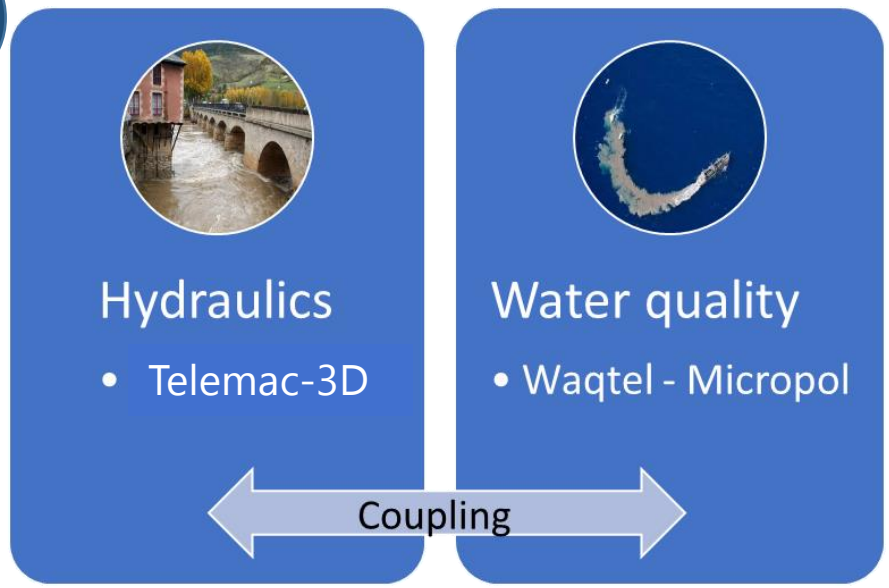
Done :

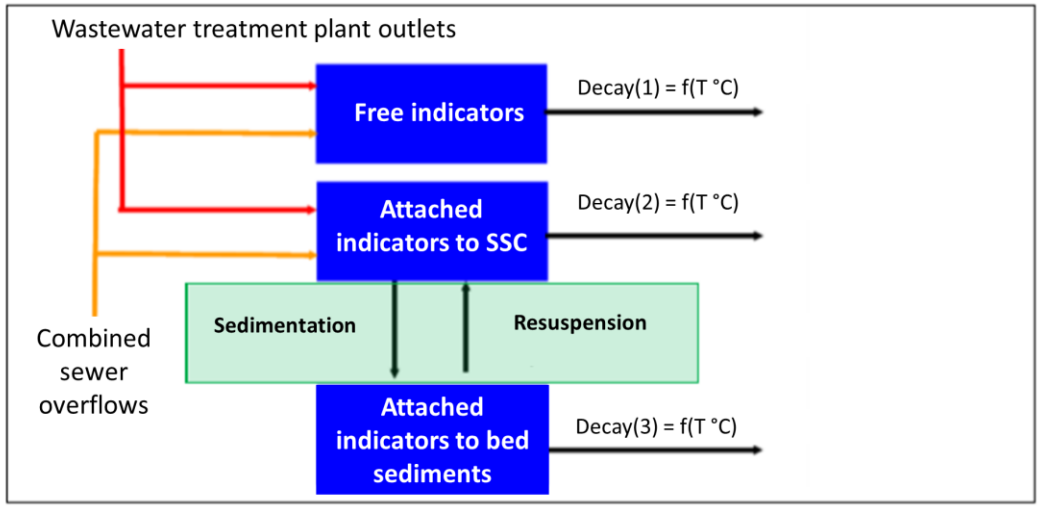
« 2D deterministic model» constructed and used for modelling the faecal indicators in rivers.

To be done :

- **Improve the BIF mortality laws in the marine environment;**
- **Impact of turbulence**
- **Other indicators (tracers of microbial sources, norovirus, pathogenic phytoplankton**)

	Couleur	Valeur inférieure	Valeur supérieure
1		0.0	900.0
2		900.0	2000.0
3		2000.0	5000.0
4		5000.0	10000.0
5		10000.0	20000.0
6		20000.0	30000.0
7		30000.0	40000.0
8		40000.0	50000.0
9		50000.0	60000.0
10		60000.0	1000000.0





Done :

«3D deterministic model » constructed and used to model the faecal indicators in rivers.

To be done :

- **Modelling the three forms of indicators (free, attached to suspended matters and atttached to bed sediments) is an innovation subject which is not currently implemented in models, except in the laboratory**

→ **Improve the re-suspension of pollutants in bed sediments.**

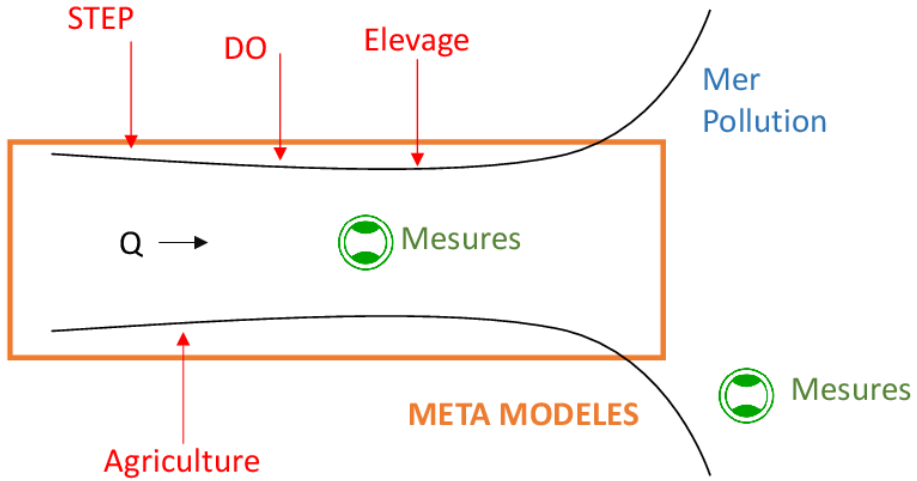
- **The interactions of different forms of indicators in a natural context (effect of turbidity, radiation, etc.) are also not correctly represented in existing models.**

Creating a database and a meta model

To be done :

- **Creation of meta-models.**
- **Determination of the most relevant Machine Learning techniques based on the available input data.**
- **Statistical learning makes it possible to detect the relationship between variables within a set of data, in order to predict the values of output variables based on the values of input variables.**

(Source : https://www.alvantia.com/en/meta-algorithms-and-base-models-in-machine-learning/)



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Planning and budget

		Cost (excl. tax)	**Duration**
Phase 1	**Biobliography and design of modelling tool**	195 620.00 €	6 months
Phase 2	**Development of 3D modelling tool**	1 937 669.00 €	24 months
Phase 3	**Implementation of a support system for the predictive and proactive management of inland and maritime sanitary risks**	1 222 960.00 €	24 months
	Total	3 356 249.00 €	48 months (overlapping)

Contact us …

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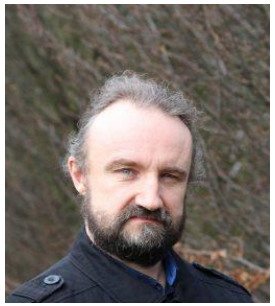

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