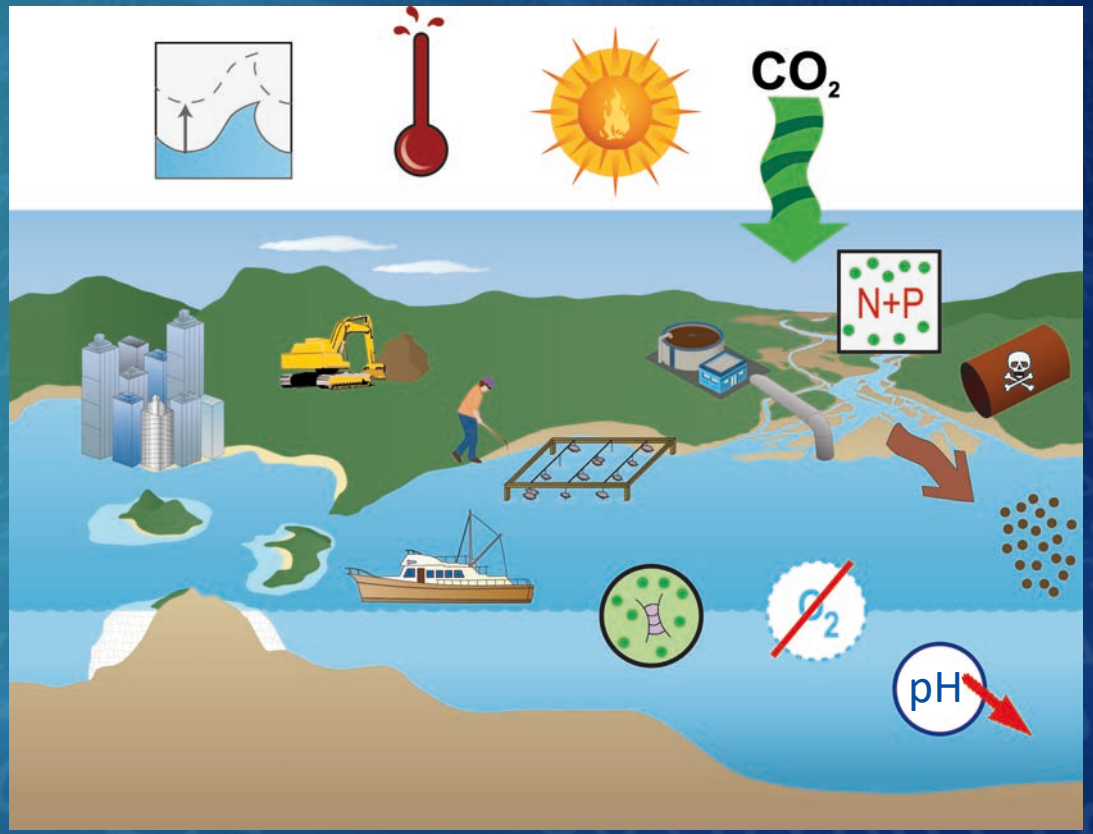
RiOMar: Observing and anticipating the evolution of River-dominated ocean margins in the 21st century

- Coastal ecosystems are **crucial for humanity** (especially in river-dominated ocean margins-RiOMar) for ressources, energy, services, …
- These systems are particularly vulnerable to **combined human and climatic stressors**
- Eutrophication, hypoxia, acidification, warming, contamination, extreme events characterize the **exposome of coastal ecosystems**
- Their **evolution in the future** in this combined **human and climatic stressor** is particularly uncertain



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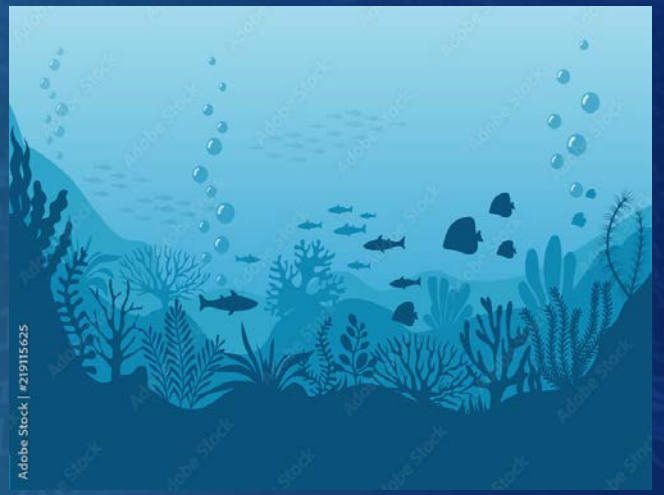
Research questions

- What is the fate of RiOMar's **ecosystems in the 21st century**?
- Can we provide **scientifically-grounded solutions**?

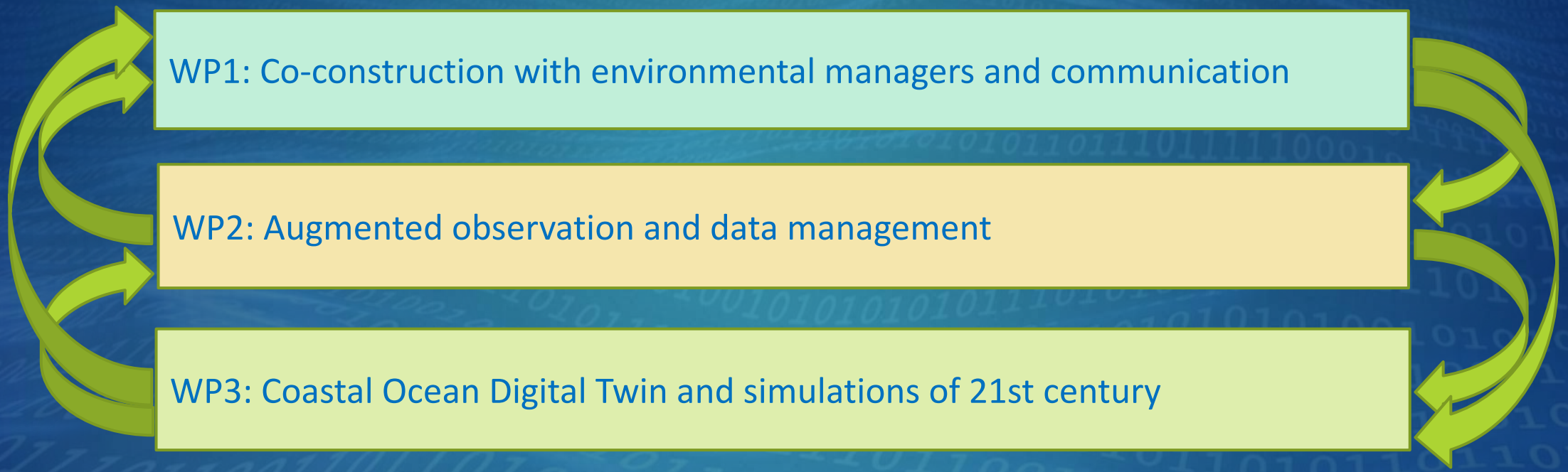


Objectives

- **Simulate coastal ocean ecosystems** under the combined influence of anthropogenic pressure and climate change **during the 21st century**
- Define and design a **future integrated observation network** dedicated to provide **constraints for modelling** and monitor pluri-decadal changes of RiOMar areas
- **Co-construct evolution scenarios** and indicators for **environmental managers** in order to propose **relevant and sustainable solutions** for public policies

Research organisation

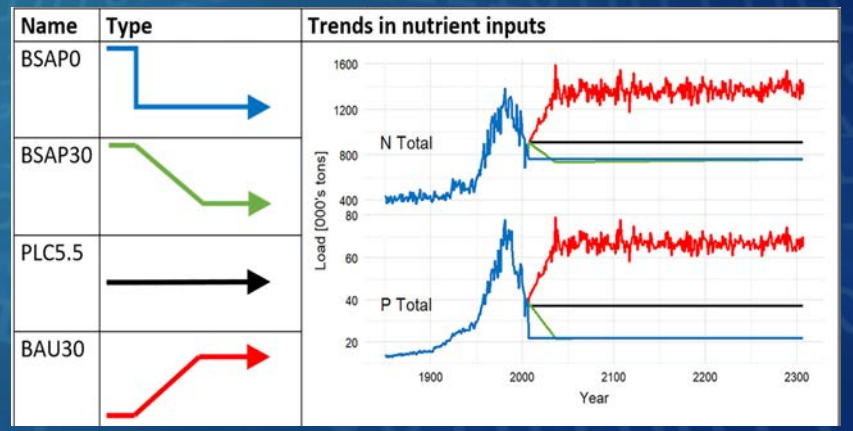
- **3 main actions**



- Developped on **5 types of RiOMars**

WP1: Co-construction with environmental managers

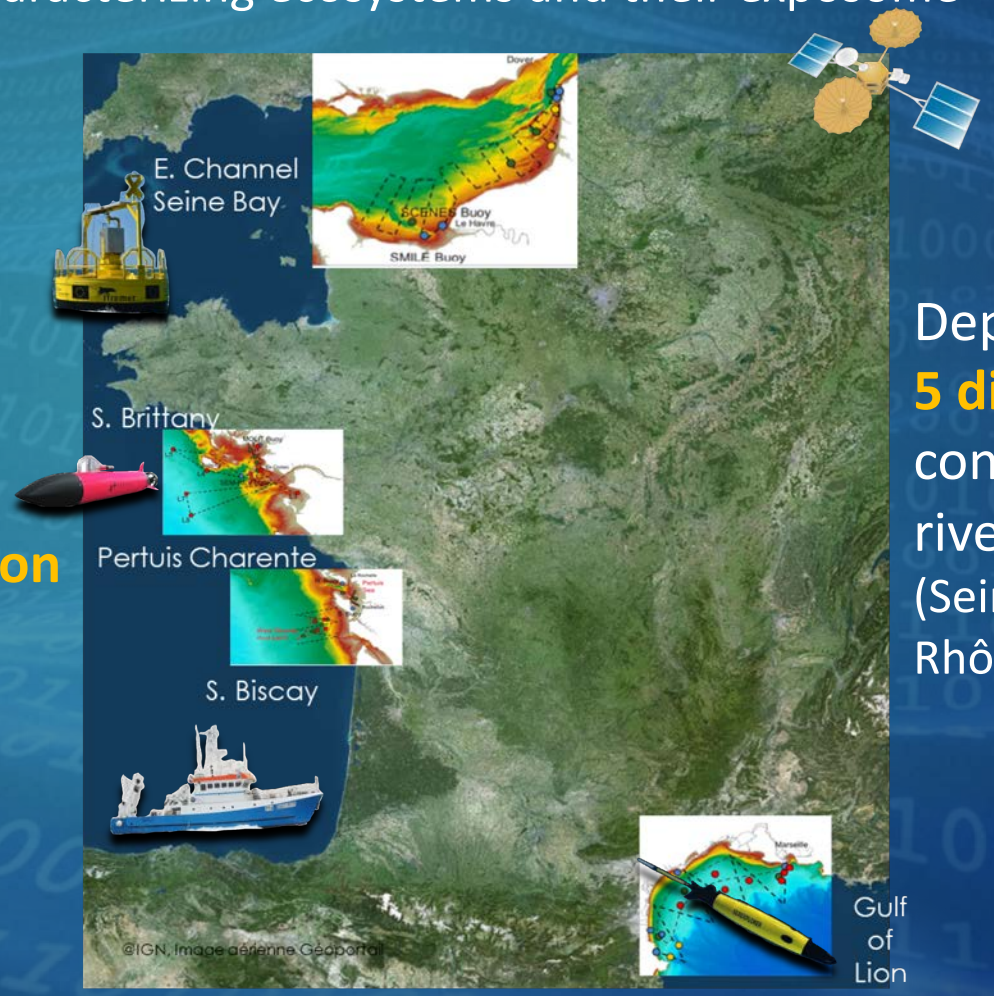
- Create a novel **relationship between environmental managers and researchers** in order to prioritize research actions useful for public policies
- Define **co-constructed scenarios** for the evolution of RIOMars that are useful for **management**
- Develop tools to share **research products** with managers and train them to their use



WP2: Augmented observations

Multidisciplinary observing systems
(physics/ biogeochemistry/ biology)
characterizing ecosystems and their exposome

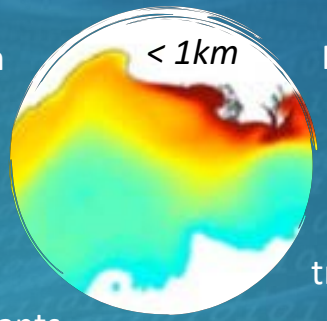
- **Extending spatial observation scale**
  - low cost mooring, gliders and drones, satellite imagery, participative observation
- A step forward to interconnected observing systems and **smart observation**
- FAIR databases for **enhanced integration with modelling**



Deployed regionally in **5 different RiOMars** connected to major rivers in mainland France (Seine, Loire, Gironde, Rhône and Charente)

WP3: Digital twin of the Coastal Ocean

Coastal Ocean coupled Model



Augmented observations

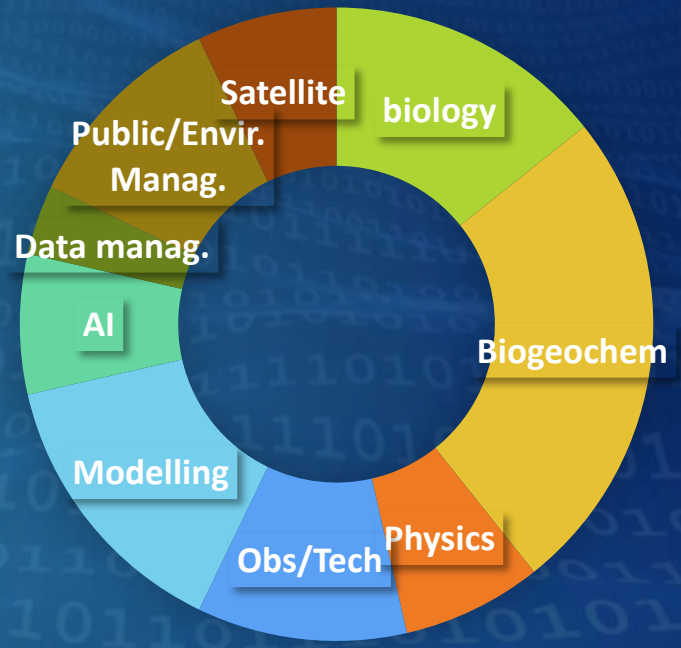
- **Simulations for the 21st century** (2000-2025; 2030-2050 and 2080-2100) including **climate change** (RCP 8.5) and **anthropogenic input scenarios** co-designed with the environmental managers
- To propose **science-based solutions** for vulnerable coastal regions influenced by rivers (AI-based products and merged key indicators)

Integration

Digital twin of the Coastal Ocean

A unique and diverse consortium

- **Multidisciplinary skills** from circulation to biogeochemistry, biology, observation, modelling, AI, data management spread in **20 French research laboratories**
- New effort coordinated with the entire **French coastal research network**
  - **4 National Observation Services** coordinators (ILICO-RI: SOMLIT, COAST-HF, MOOSE, PHYTOBS)
  - **1 National Modelling Service** coordinator (SiROCCO)
  - **1 Ocean Data Center** coordinator (ODATIS/Data-Terra RI)
- **OFB partner:** National institution leading the environmental management for the coastal ocean
- **1 non profit company (Mercator) and 2 citizen NGOs** (Astrolabe Expédition-citizen observation and Climates-youth for climate and oceans) – link with society and outreach



somlit Service d'Observation en Milieu Littoral
COAST-HF
MOOSE Mediterranean Ocean Observing System for the Environment
phytobs
sirocco
ODATIS

Calendar of operations

	Y1	Y2	Y3	Y4	Y5	Y6
Coordination						
WP1: Co-construction with envir managers and communication	Co-contruction phase		Defining solutions and communication			
WP2: Augmented observations	Building augmented observation systems		Data banking and utilization by models			
WP3: Coastal Ocean Digital Twin	Building the Digital Twin	Using data for the present		Projections for the future		
WP4: Eastern Channel-Bay of Seine	Regional investigations of ecosystems					
WP5: Mor Braz – Loire	Regional investigations of ecosystems					
WP6: South Biscay-Gironde	Regional investigations of ecosystems					
WP7: Pertuis Sea – Charente	Regional investigations of ecosystems					
WP8: Gulf of Lion - Rhône	Regional investigations of ecosystems					

Towards solutions for a sustainable ocean

- RiOMar's ecosystems are **under pressure (climatic and anthropogenic)** in a complex exposome
- Urgent need of **co-construction** with environmental managers to initiate **science-based solutions** for the 21st century
- We propose a new generation of **integrated *in situ* observations, modelling and AI** approaches to define these solutions
- Strong **link with international efforts**
  - UN Ocean Decade: CoastPredict and GOOD
  - JERICO effort at the European level

Réflexions sur le lien avec ILICO et les autres PPRs

- ILICO
  - S'appuyer largement sur les efforts déjà entrepris dans ILICO (4 (co)resp de SNO dans le projet)
  - Etendre les observations: type de mesure (e.g. benthique), spatialisation (glider, micro-AUV, drones, sat., Mastodon)
  - Coupler observation et modélisation
  - Réfléchir sur les observatoires de demain

- Autres PPR
- FUTURE-OBS
  - projet très différent de RiOMar, basé sur l'étude de la biodiversité à l'actuel
  - Points communs: zones d'étude (Med et Manche), lien avec gestionnaire envir. (OFB partenaire)
- FUTURE-RISK
  - Plutôt orienté Outre-Mer
- MEDIATIONS
  - Modélisation des systèmes côtiers métropolitains
  - Très limité sur l'observation
  - Centré sur l'actuel (??)