

BioSpace25 - Biodiversity insight from Space
10 - 14 February 2025 | ESA-ESRIN | Frascati - Italy

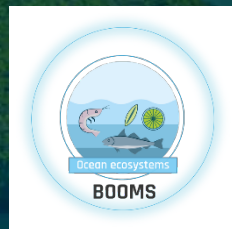
BIOMONDO - Towards Earth Observation supported monitoring of freshwater biodiversity

Petra Philipson¹, Carsten Brockmann², Miguel Dionisio Pires³, Marieke Eleveld³, Niklas Hahn¹, Tamara Keijzer⁴, Jelle Lever⁵, Daniel Odermatt⁵, Aafke Schipper⁴, Jorrit Scholze², Kerstin Stelzer², Susanne Thulin¹, Tineke Troost³



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The ESA Biodiversity+ Precursor for freshwaters



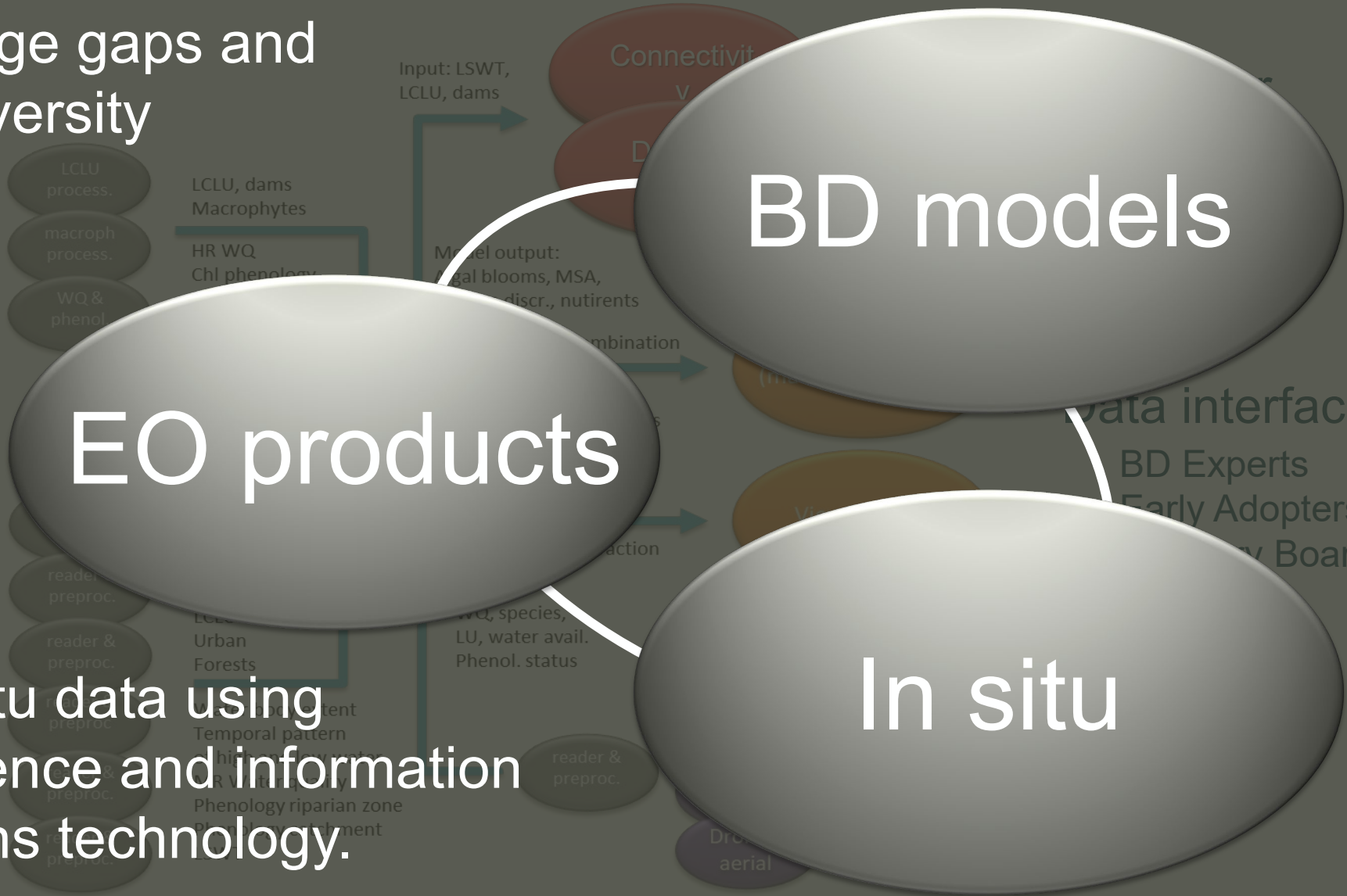
freshwater ecosystems

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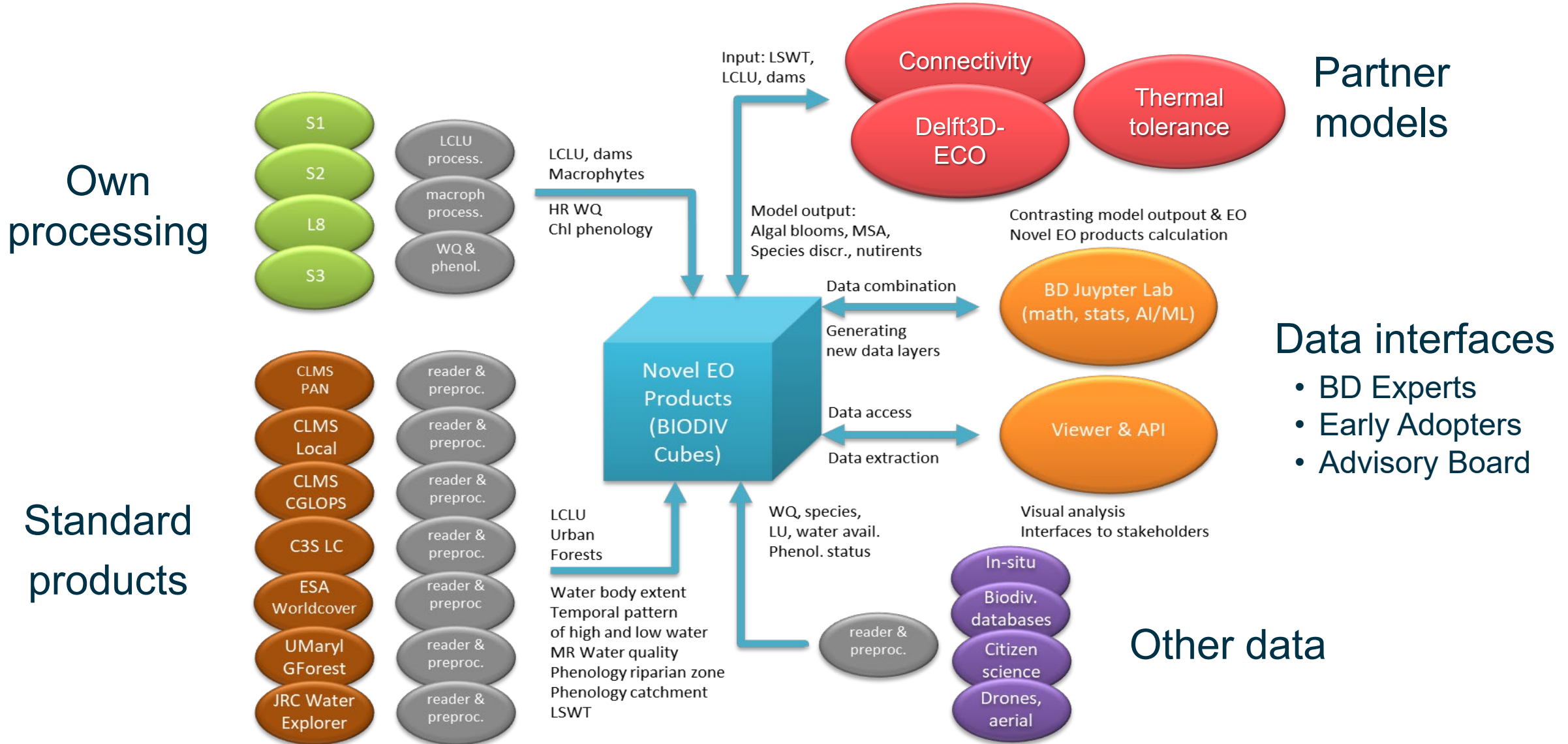
The scope of the Precursors



To identify knowledge gaps and challenges in biodiversity monitoring...
...and develop solutions that integrate EO based products, biodiversity modelling and in situ data using advanced data science and information and communications technology.



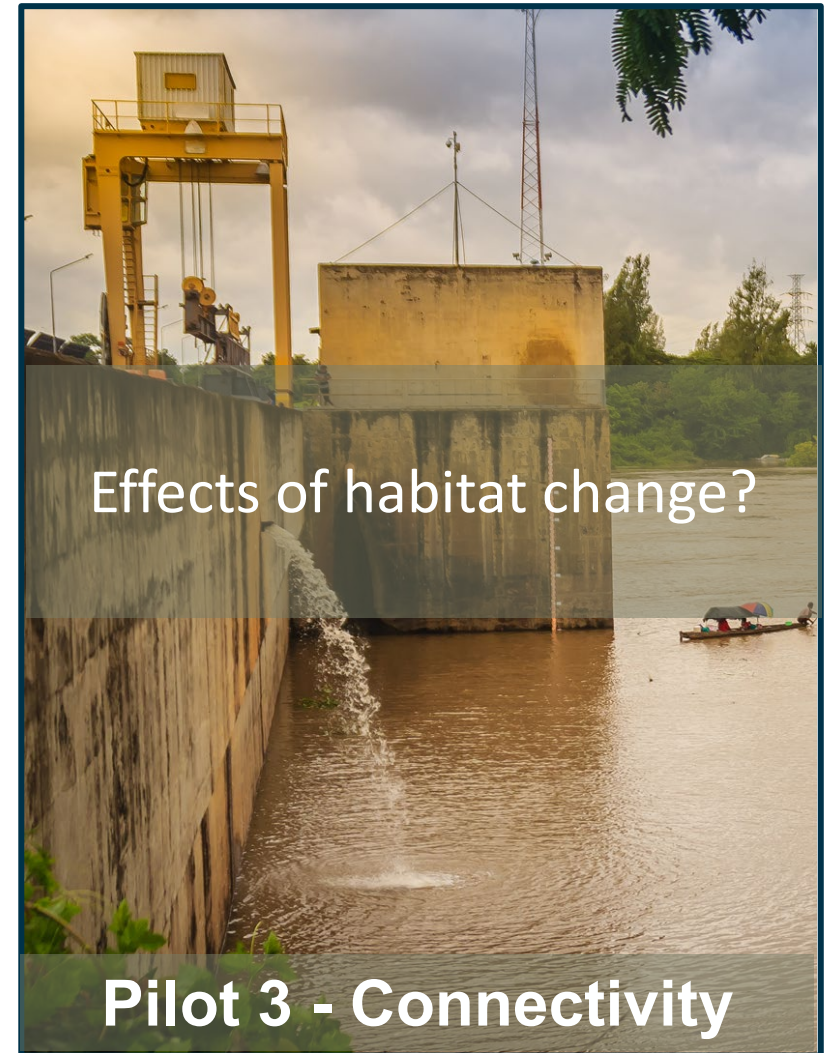
The BIOMONDO Freshwater Laboratory



BIOMONDO Pilots

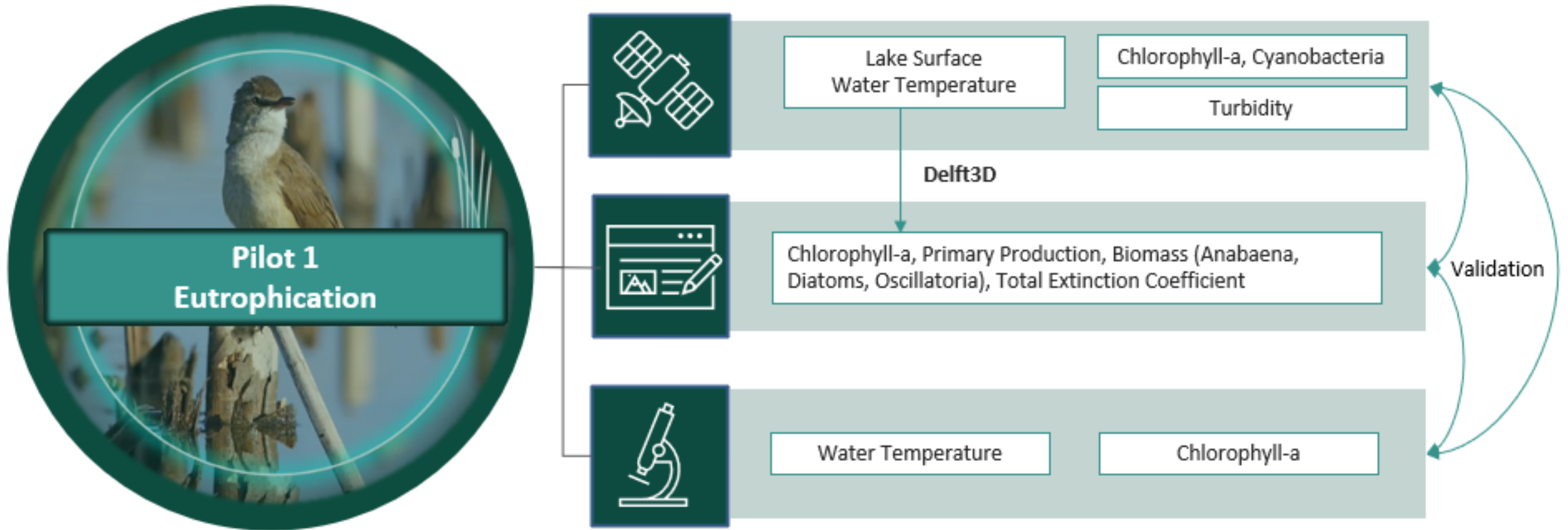


How will the diversity of life and ecosystem services in freshwater ecosystems change with...



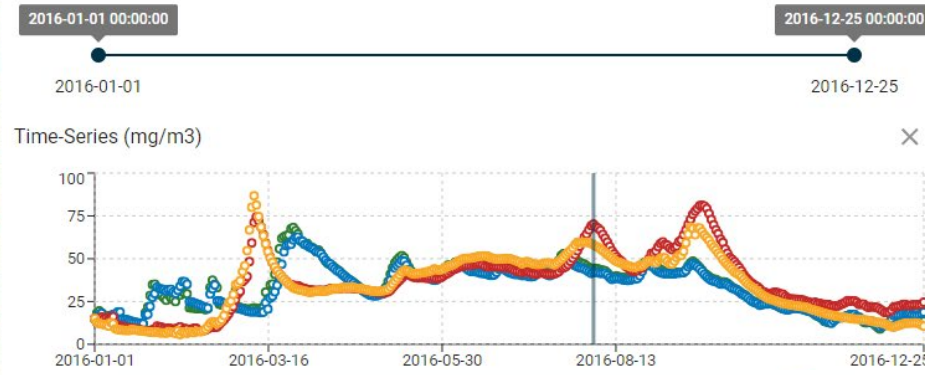
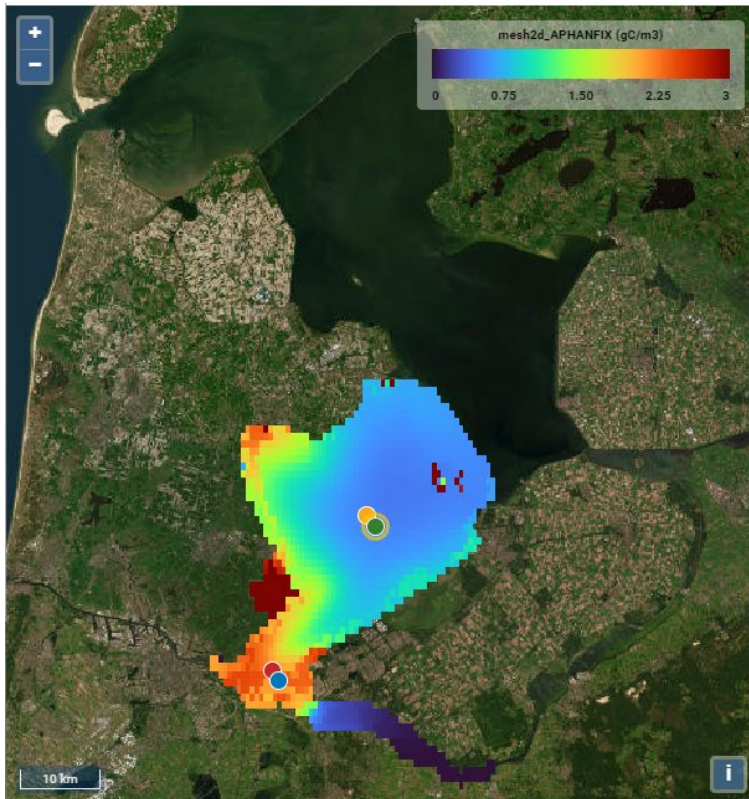
Pollution – Eutrophication

Exploring EO data forced hydrodynamic water quality modelling to assess the impact of eutrophication and other habitat changes on water quality

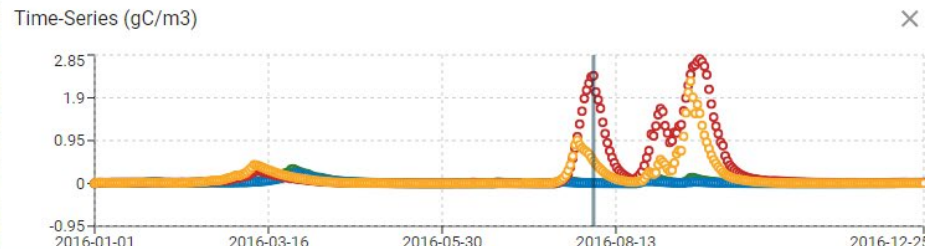


Lake Marken (NL) – Chl a & cyanobacteria

Replacing in situ measure air temperature with EO based Lake Surface Water Temperature (LSWT) to force the Deltares Delft3D model for estimation of algal composition 2016.



- EO forced Chlorophyll a ($\mu\text{g/l}$) time series
- In situ forced Chlorophyll a ($\mu\text{g/l}$) time series

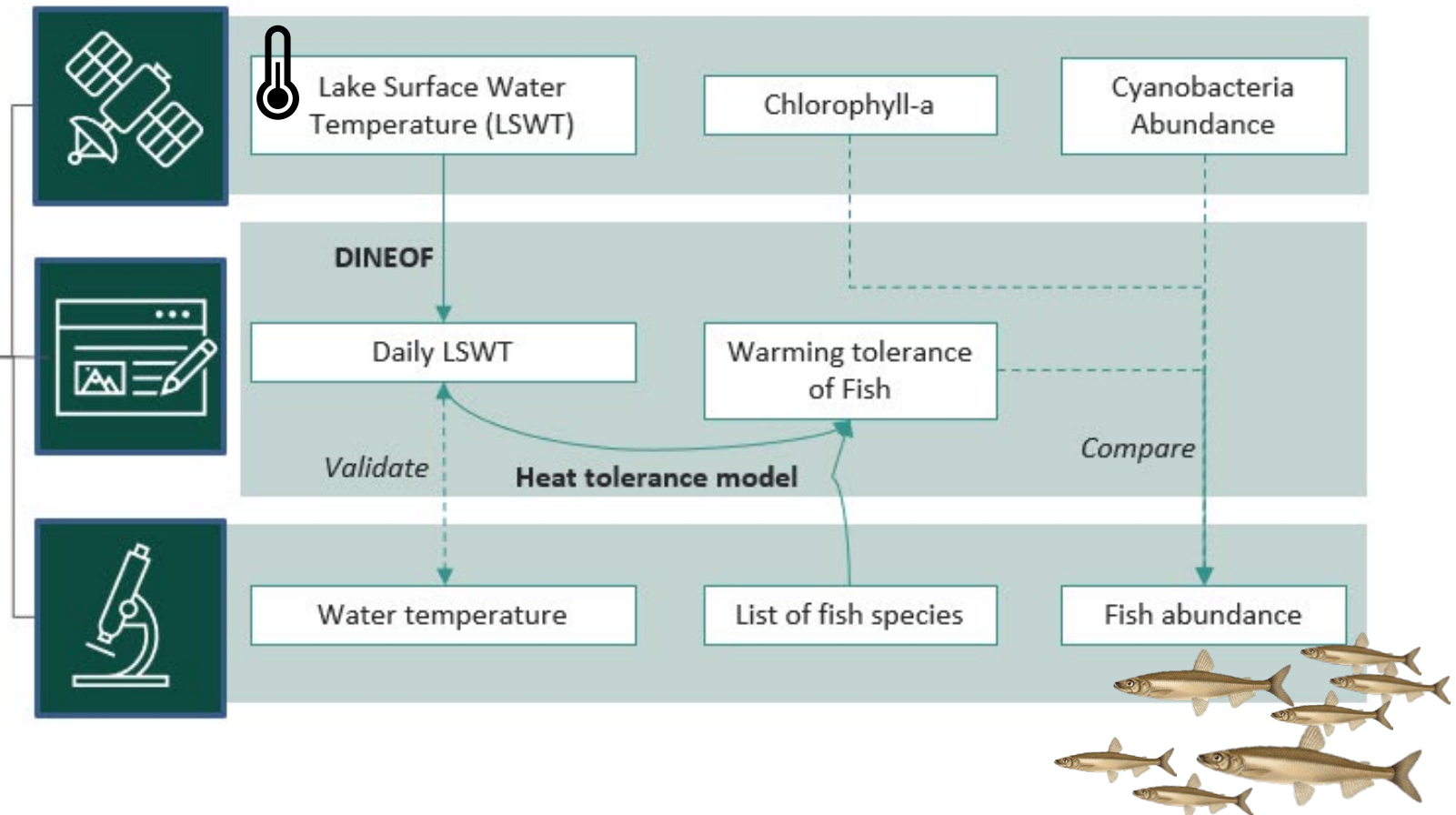


- EO forced Aphanizomenon (gC/m^3) time series
- In situ forced Aphanizomenon (gC/m^3) time series

Resulting in different levels, spatial patterns and temporal trends.

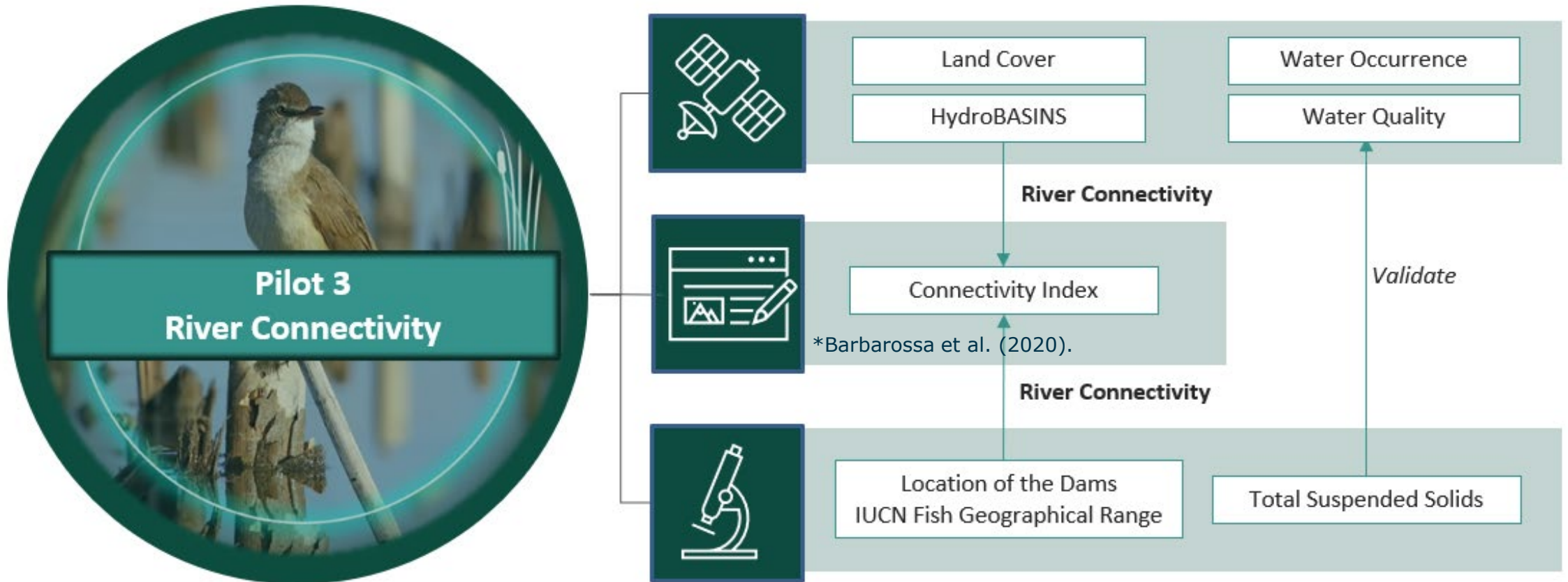
Climate change – Heat waves

Exploring the impact of changes in water temperature and heat waves on freshwater fish diversity



Land use change – Connectivity

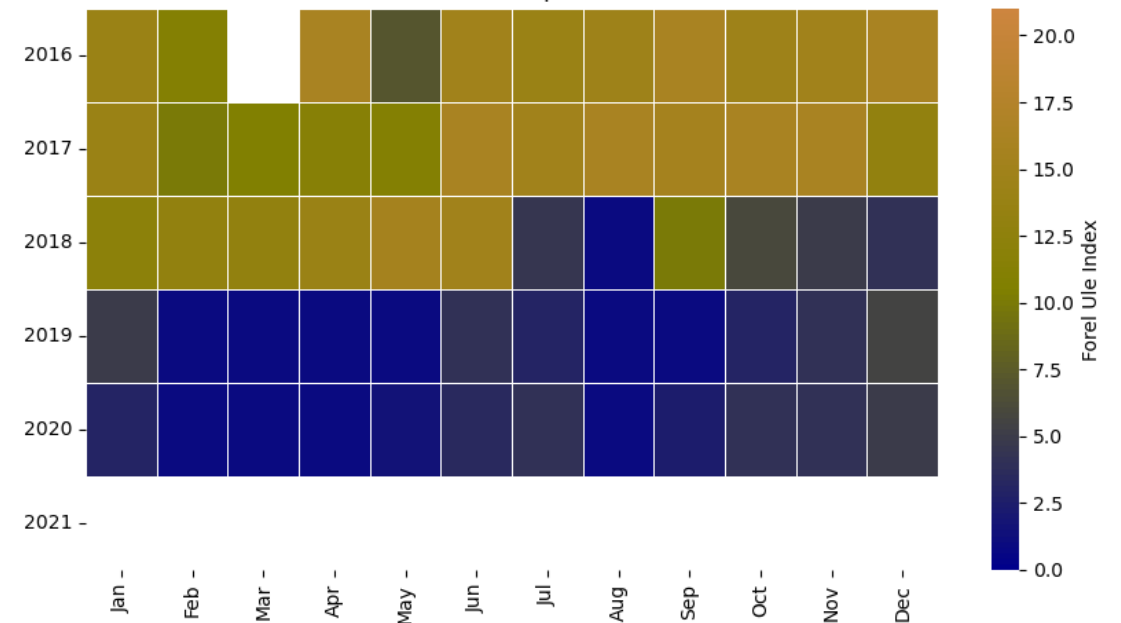
Exploring the impact of dams on river fragmentation and water quality and its effect on biodiversity



Mekong basin – Water quality



Colour index for Nam Giep sub-basin before and after dam construction



The surrounding habitats are significantly changed and the reduced sediment transport affects the downstream delta.

Future work & Key recommendations



BIOMONDO tasks included the development of a **5-year R&D roadmap**

1. **Monitoring and modelling biodiversity variables**

- Direct monitoring, extraction of relevant metrics, or modelling of the biotic part of the ecosystems

2. **Monitoring and modelling of environmental variables**

- Direct monitoring and modelling of drivers of environmental change and/or abiotic properties that define a system's habitat type

3. **Classification of habitat types and ecosystem condition/state**

- Classification of freshwater ecosystems according to their habitat type and state

4. **Impact assessments, attribution, and forecasting**

- Brings information from 1-3 together -> Impacts of drivers of change on biodiversity variables, studied for a particular habitat type and ecosystem state.