

BIOMONDO



Towards Earth Observation supported monitoring of freshwater biodiversity

The European Space Agency (ESA) activity called Biodiversity+ Precursors is a contribution to the joint EC-ESA Earth System Science Initiative launched in February 2020 to jointly advance Earth System Science and its response to the global challenges that society is facing at the onset of this century. BIOMONDO is the ESA Biodiversity+ Precursor project focused on freshwaters and biodiversity in lakes and rivers.



Project partners



ESA Biodiversity+ Precursors



BIOMONDO Pilots

The purpose of the biodiversity pilot studies is to explore if Earth Observation products in combination with models and in situ data can support freshwater biodiversity monitoring and management.

- ▶ **Pilot 1 – Eutrophication** Exploring the impact of eutrophication and other habitat changes on the water quality.
- ▶ **Pilot 2 – Heat tolerance** Exploring the impact of changes in water temperature and heat waves on freshwater fish diversity.
- ▼ **Pilot 3 – Connectivity** Monitoring river connectivity effect by dams, and their changes and impact on biodiversity.



Lower Se San 2 hydropower station, Cambodia

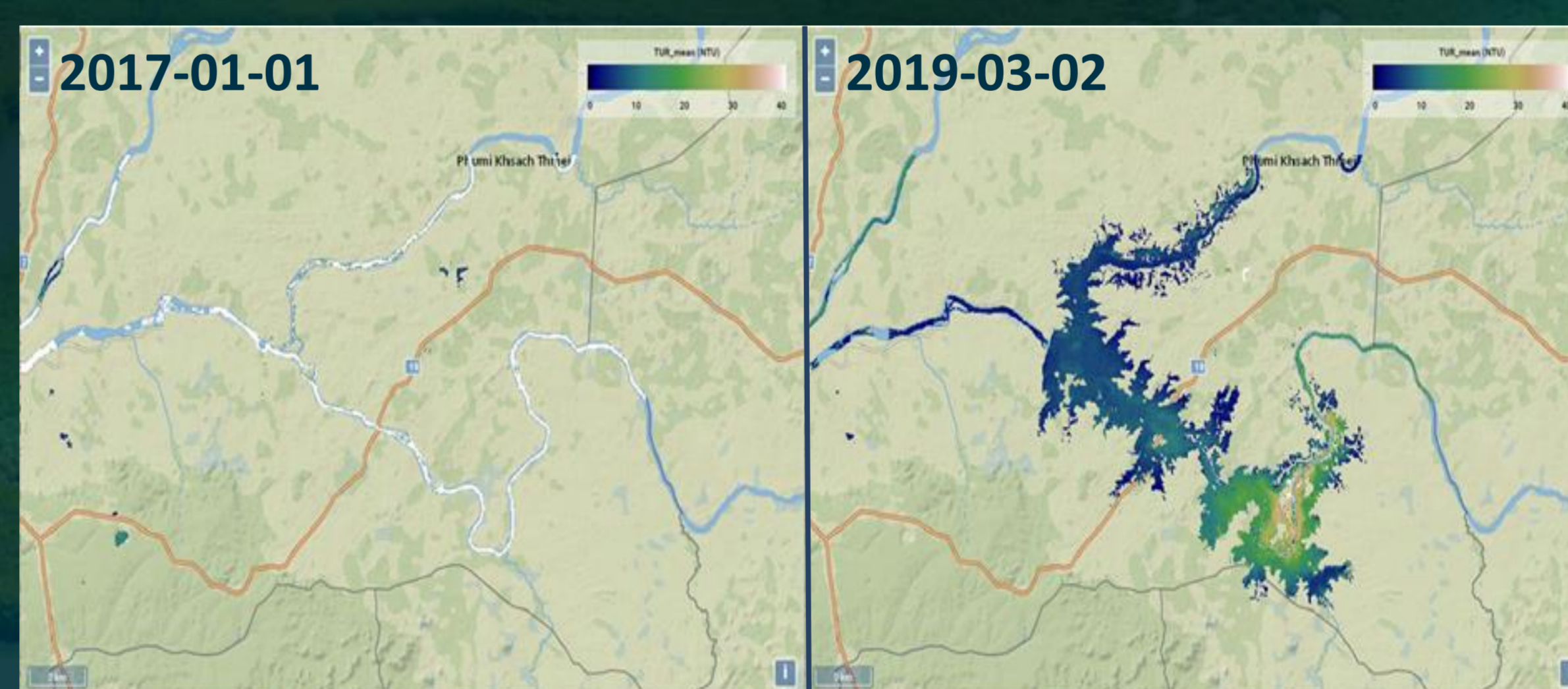
Credit: Chen Gang, Imago / Alamy Stock Photo

The EO based water quality products and connectivity model outputs generated in BIOMONDO, were assessed with respect to their usefulness for management and decision support in relation to:

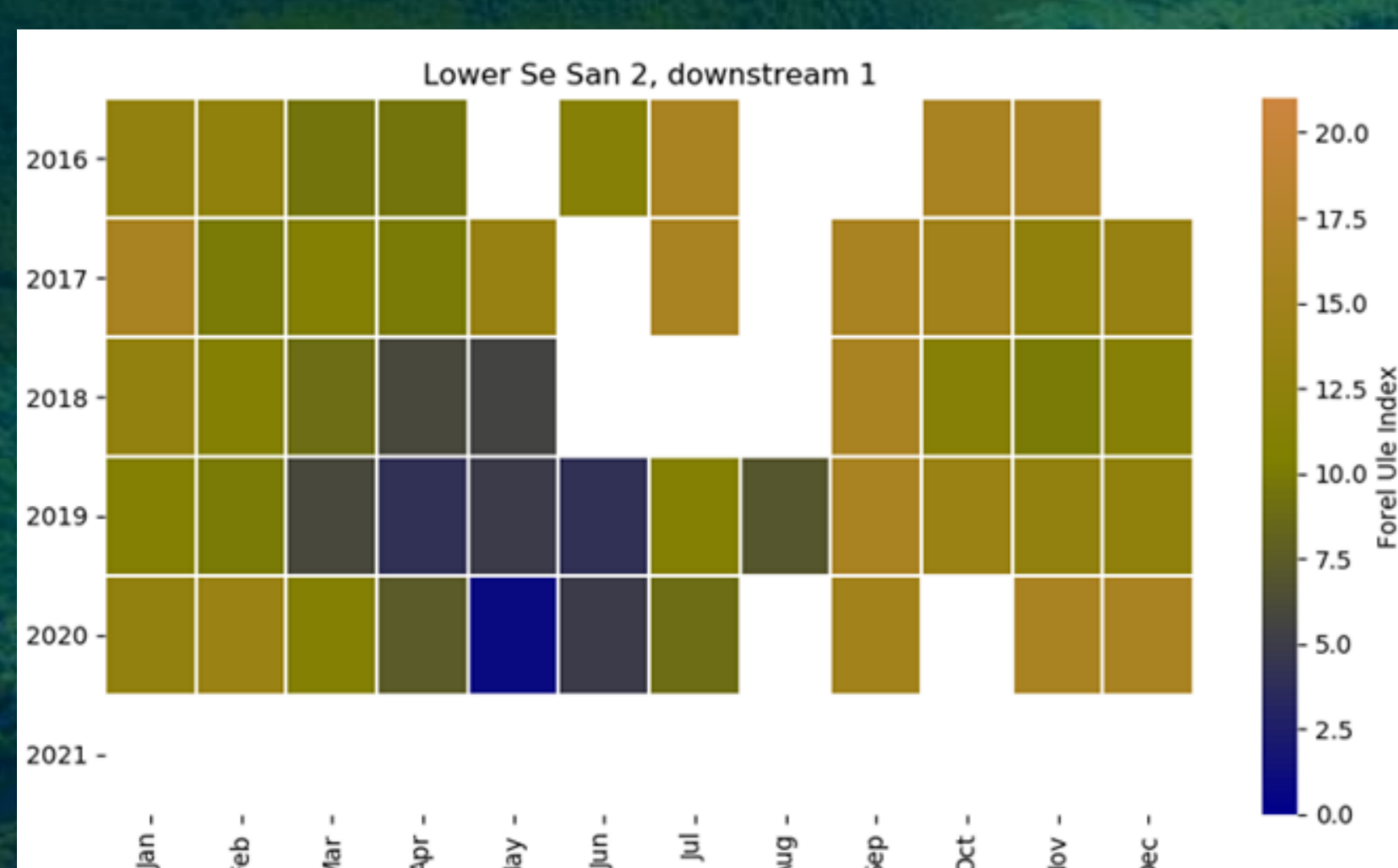
- Creation of indicators for targets of the **EU 2030 Biodiversity Strategy** such as restoration of 25,000 km of rivers to free-flowing and efforts to restore natural sedimentation processes as required by the **EU Nature Restoration Law**.
- Updates to guidelines of the **WFD** with inputs both to **River Basin Management Plans** and assessments of status and changes to water quality to achieve good status of all European surface waters.
- Improved inputs to goals and targets of global frameworks (**SDG's and KM-GBF**) connected to clean energy, climate, clean water and biodiversity of freshwater and terrestrial ecosystems.

EO products to support EU 2030 Biodiversity Strategy & EU Nature Restoration Law

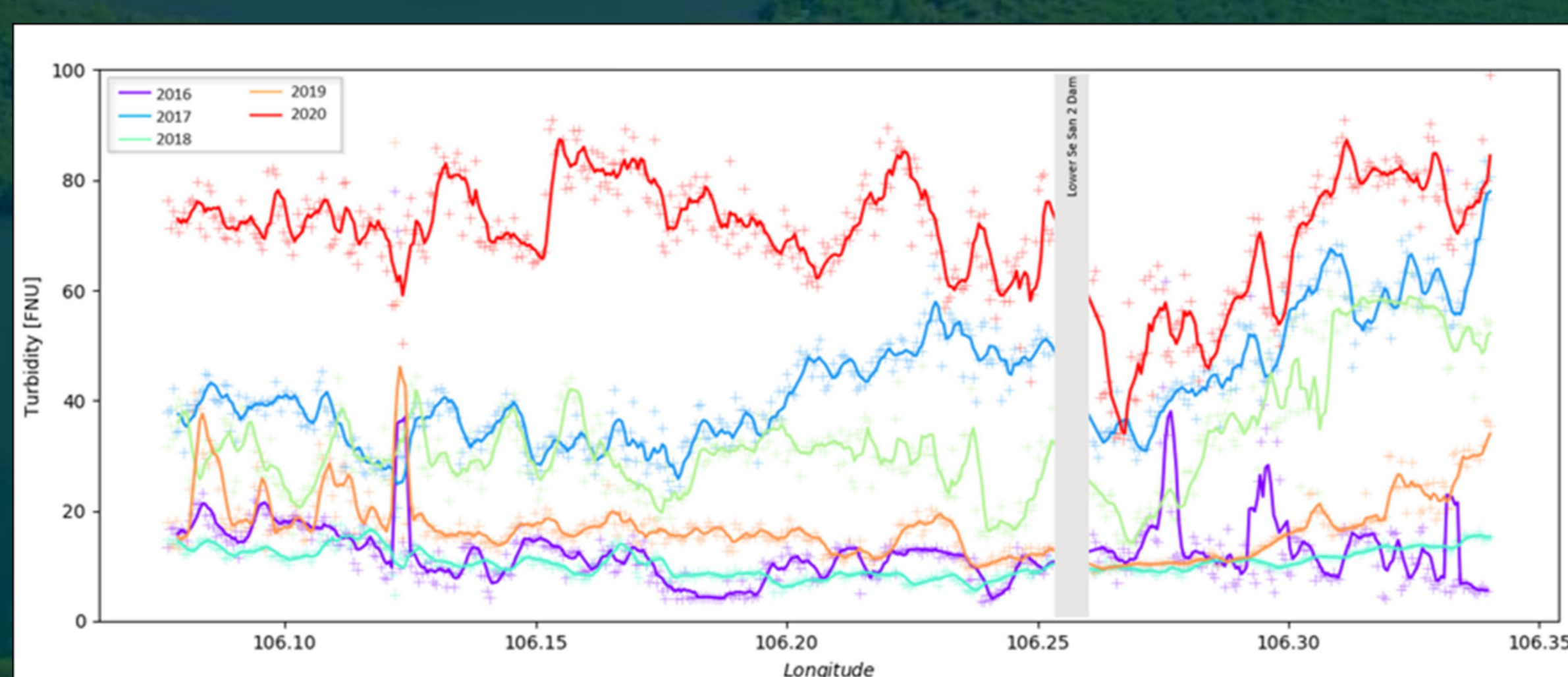
In the Mekong basin, hydropower dams hinder fish migration and alter the natural sediment transportation. This threatens many fish species and puts inland fishery at risk. Dams compromise nutrition security of downstream communities and has a negative impact on ecosystems of floodplains and deltas. But river dams can also contribute to water security, flood protection and renewable energy supply, thereby playing a role in sustainable water resource management and for achieving climate targets of emission reduction.



EO based turbidity maps over the Lower Se San 2 dam basin area before and after the dam construction in 2018, resulting in a reservoir with varying water quality and clearer water downstream.



Monthly EO based estimates of water colour between 2016-2020 for the Mekong River water, downstream of Lower Se San 2. The water is clearer post dam construction in 2017.



Annual median turbidity transects at Lower Se San 2 between 2016-2020. The grey box shows the area of the dam, and upstream is to the right and downstream is to the left in the figure.

Time series of EO derived water quality parameters such as water colour and turbidity can help track effects of dam constructions or removal. This has utility for policy makers to track progress against biodiversity targets and for managers to improve decision-making processes for planning optimization and on-ground mitigation actions as well as inform trade-off discussions related to the Water-Energy-Food-Ecosystems (WEFE) Nexus.