Nutrient mitigation pathways for sustainable lake ecosystems in Europe

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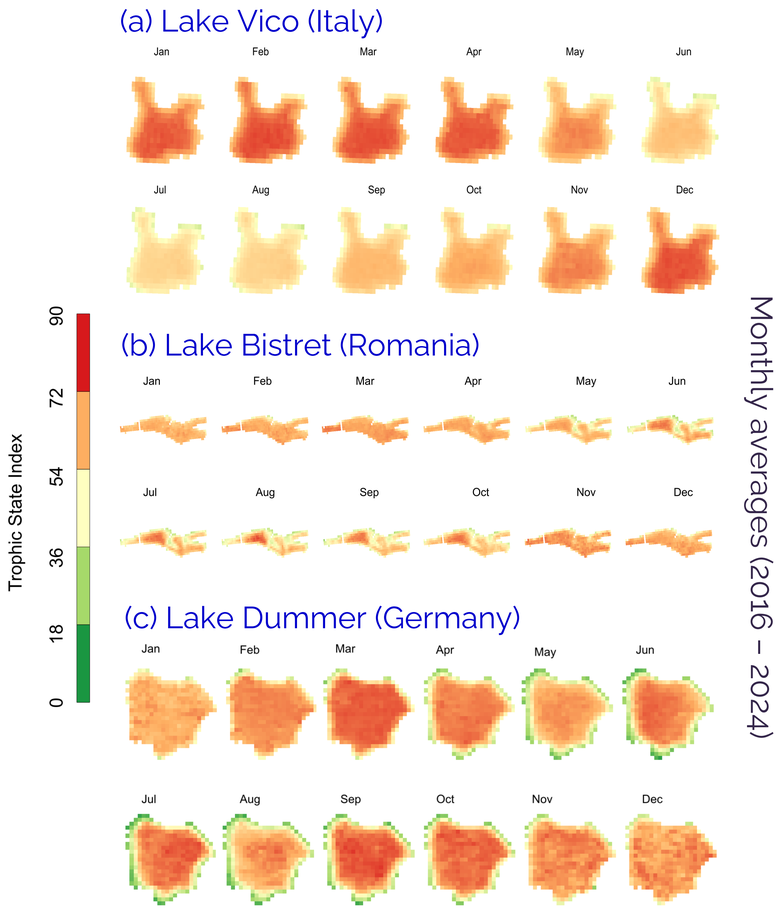
1. Context and status

- Excessive nutrient loading into rivers, lakes, and estuaries has been a primary driver of aquatic ecosystem degradation worldwide, and European lakes are no exception. E.g.

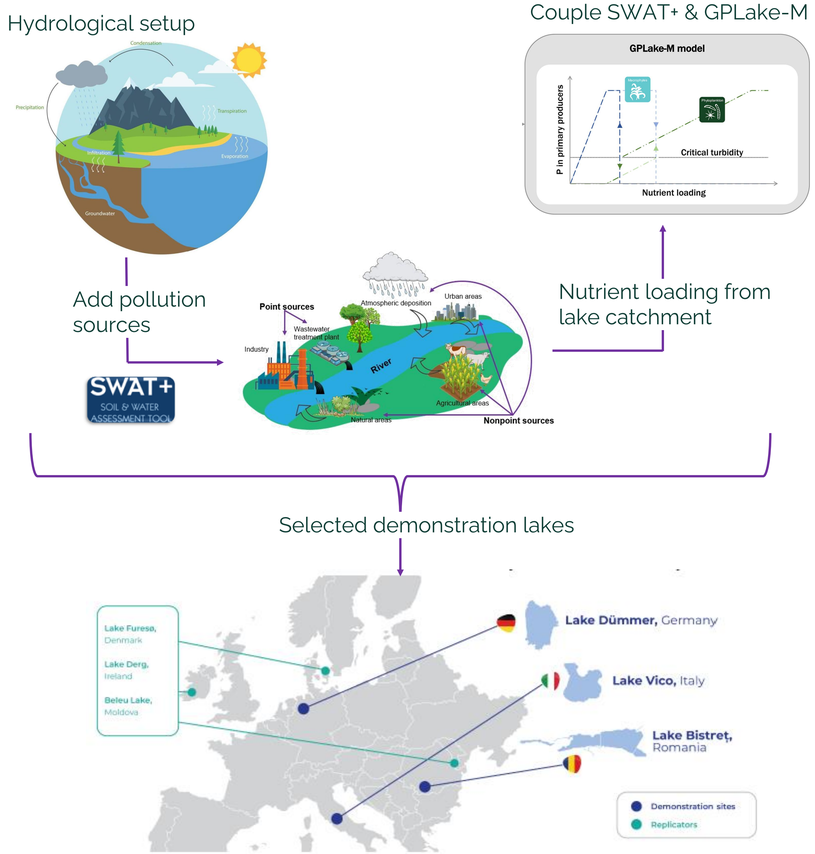


- Using Trophic state index (TSI) as a representative indicator of eutrophication, all these lakes are mostly **eutrophic (TSI>50)** throughout the year.

- Urgent need to control/mitigate lake eutrophication

2. Proposed Approach

- Test multiple sustainable management strategies to reduce external nutrient inputs from catchments to lakes by coupling a catchment and a lake model.



2.1 Selected sustainable management practices (BMPs)

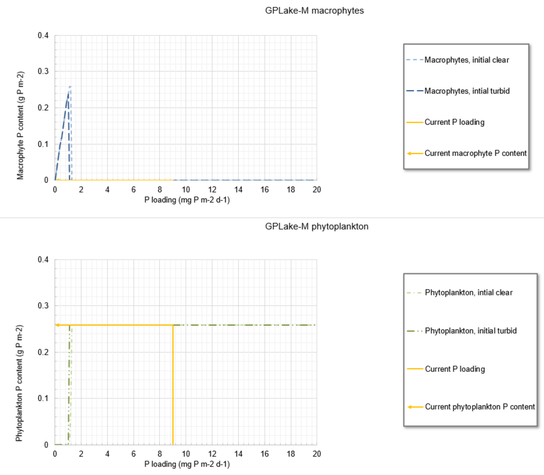
(a) Contour farming

(b) Filter strips

(c) Fertilizer reduction

3. Learnings (Lake Vico)

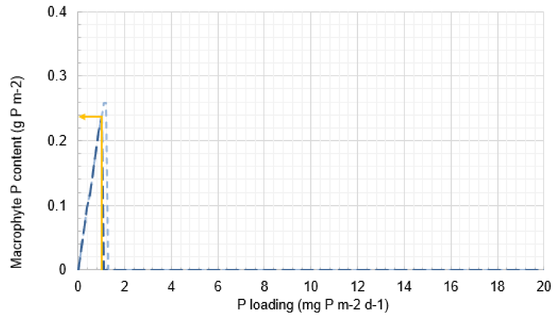
- With the current Phosphorus loading (41 ton/yr), the lake is phytoplankton dominant with zero macrophytes.



By back-casting. a larger reduction **(89 %)** in nutrient loading is required to reverse a shift from dominance of phytoplankton to macrophyte dominance.

Pathway	TP (Kg/yr)	Reduction(%)
Baseline (180kg/ha -N and 150Kg -P)	41125	
Fertilizer reduction (-40%)	28697	30.22
Fertilizer reduction (-80%)	13434	67.33
Filter strip	17008	58.64
Contour	23180	43.64
Filter strip + Contour	6565	84.04
Filter strip + Contour + 50% reduction	4026	90.21

- A pathway of **combining all BMPs** is the most effective.



References

Copernicus Global Land Service (CGLS, https://land.copernicus.eu/global/); van Wijk, D., Chang, M., Janssen, A.B.G., Teurlincx, S., Mooij, W.M., 2023. Regime shifts in shallow lakes explained by critical turbidity. Water Res. 242, 119950. https://doi.org/10.1016/j.watres.2023.119950

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