# Ecological modeling of restoring Mediterranean lagoon: global sensitivity analysis and model behavior

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**Abstract**

Since the 1960s, Mediterranean lagoons have experienced nutrient over-enrichment due to nitrogen and phosphorus loadings from watersheds resulting in eutrophication of these semi-enclosed ecosystems. Since the 2000s, public policies have been pursued aiming to reduce these external nutrient loadings. This policy has already initiated restoration processes in some of the lagoons. However key questions remain on the time required for restoring all the biological compartments of the ecosystem the identification of maximal allowable N and P loadings to lagoons that are compatible with the maintenance of good ecological state as requested by the EU water frame directive. A numerical tool, based on the LOICZ methodology, is developed as an attempt to bring quantitative responses to these questions. GAMELAG is a simple physical box-model simulating water and nutrients fluxes at the interface of the lagoon coupled to key biogeochemical processes to evaluate matter fluxes between relevant biological compartments. If mathematical models have been largely used to understand ecosystems and to identify relevant management measures to achieve biodiversity objectives, the sensitivity of spatial and temporal scales used to model the system remains poorly studied. We hereby present a model exploration study using global sensitivity analysis to assess model behavior regarding to temporal scales of driving forces.

**Keywords:** eutrophicated lagoon ecosystems, box, models, global sensitivity analysis, uncertainties

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