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## Submarine Groundwater Discharge: The invisible mechanism that degrades the quality of crystalline bathing water in the Balearic Islands

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Coastal environments have experienced a rapid transformation due to the expansion of tourism. This growth may enhance problems as over-saturation of spaces or environmental pollution. One of the main problems is associated with the collapse of environmental infrastructures, which may become saturated during high seasons. Indeed, wastewater treatment plants (WWTP) can be located in coastal areas delivering high concentrations of nutrient effluents into the marine environment. Alternatively, WWTP effluents are introduced into coastal aquifers via injection wells, given that the geological matrix is used to filter naturally the transported effluent solutes. However, the injection of significant amounts of WWTP effluents can modify the hydrogeological dynamics and enrich substantially the solute concentrations in groundwaters. Zones with a hydraulic connection between the coastal aquifer and the sea, these contaminated groundwaters may be transferred to coastal environments via Submarine Groundwater Discharge (SGD). Thus, SGD may act as a pathway delivering part of the WWTP-derived nutrients and pollutants into the marine environment, which may lead to eutrophication or harmful algal blooms. More importantly, such process may become threatening for society when the discharge occurs into bathing waters, affecting the ecosystem and perception of stakeholders.

In this study, we evaluate the role of SGD as a conveyor of nutrients from a karstic coastal aquifer affected by the injection of WWTP effluents to the Deià cove in Mallorca (Balearic Islands). Results show that the tourism seasonality changes the coastal aquifer natural dynamics during the dry season, delivering via SGD, nutrients concentrations above the maximum limits established by the Spanish and European water framework directives. Due to those enriched nutrient fluxes, the coastal water ecosystem has registered the highest values of  $\delta^{15}\text{N}$  in *Posidonia oceanica* in the Balearic Islands and suffers periodic algal blooms, creating a conflict among stakeholders.