

What is the quality of our river ecosystems? The new emerging stressors

An ecosystem is a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (e.g. coral reefs, wetlands, rainforests, boreal forests, cultivated farmlands).

The Ecosystem services are the benefits that people obtain from ecosystems (food, freshwater, timber). The emergence of the concept of natural capital in recent decades reflects the recognition that environmental systems play a fundamental role in determining economic output and human well-being.

Rivers are ecosystems that provide services as water for consumers, aquatic organisms for food and medicines, recreation and sport activities, etc.

Rivers receive chemical stressors from anthropogenic origin, including organic matter and inorganic nutrients (phosphorus, nitrogen), and many organic contaminants such as pesticides, pharmaceuticals, perfluorinated compounds surfactants or metals as well as newly discovered emerging risks like metal and carbon-based nanomaterials and microplastics.



Fig 1. Examples of good and bad quality river ecosystems

In impaired rivers other stressors also come to play and co-occur with these chemicals, with specific effects and different manifestation in time and space. Amongst these stressors, new “emerging stressors” that include climate change, emerging substances, habitat deterioration, direct hydrological alteration, and invasive species have to be considered when we evaluate the quality of the ecosystem. It is the cumulative impact of the multiple stressors which together affect

structure (biodiversity), functioning, and health of ecosystems and species. The combination of stressors can have deleterious effects on freshwater ecosystems although most current knowledge is limited to the effects of single stressors on the chemical and ecological status of water bodies and on ecosystem functioning.

One of the key stressors in the Mediterranean rivers is water scarcity that can limit biodiversity and economic activities in entire regions. Climate change impacts on water availability, water quality and ecosystem services in river basins, as well as their impacts on the human society and economy.

The current and future necessity to face water availability while making possible the conservation of ecosystems was the departure point of the Spanish SCARCE project (Assessing and predicting effects on water quantity and quality in Iberian rivers caused by global change). This project was carried out in Mediterranean river basins of the Iberian Peninsula. The studies were carried out considering different spatial scales, as well as including a set of different socio-ecological scenarios. To deal with the assessment of risk for the ecosystem services provided by rivers, SCARCE project deal with sediment transport and river channel morphology, chemical quality, ecosystem processes, modelling, socioeconomic scenarios, ecosystem services and river management.

The project was carried out in a multidisciplinary manner being possible to contribute to increase the current knowledge, and transversely helping on developing key aspects in the management and sustainable use of resources. We gain sound scientific information on the ways water scarcity interacts with other stressors in freshwater ecosystems, to understand its environmental and socio-economical consequences, and to convey this information to managers, stakeholders and policy makers in order to minimise impacts, to adapt to oncoming changes, and to improve our management and policies.

Publication

[River conservation under multiple stressors: Integration of ecological status, pollution and hydrological variability.](#)

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