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Editorial

Special Issue: Environmental Flows, Ecological Quality, and Ecosystem Services

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Global environmental change is greatly disturbing rivers and estuaries by a number of stressors, among which water withdrawal, damming, pollution, invasive species, and climate change are the most worrying. All of them have a direct connection to river hydrology and preserving flow regimes has become one of the key issues for protecting our future water resources and river ecosystems. Thus, the science and methods to establish adequate environmental flows (e-flows) is a keystone to implement an integrated management of water resources. This is even more critical in water scarce river basins, where the preservations of ecological functions and values of aquatic ecosystems (i.e., water quality, sediment dynamics, productivity, biodiversity, carbon cycling, etc.) critically depend on river flow regime. However, scientists and managers often find it very difficult to quantitatively link the ecological status and biodiversity of aquatic ecosystems and their services to specific e-flow regimes. This Special Issue includes papers investigating the links between river flow regime, the status of aquatic ecosystems, and the benefits they provide to our society either from the science or management perspective.

The main group of papers focuses on the conceptual, quantitative, and qualitative links of flow regime and e-flows with river ecosystem functions and values, such as the preservation and ecological status of inland wetlands [1], the functions and values of temporarily closed estuaries [2], the preservation of fish species richness [3], the impact on fish spawning period [4], the ecological quality, bird diversity and shellfish fisheries in a lowland river and its coastal area [5], and the ecosystem productivity of coastal areas [6]. Moreover, one of the papers [7] performs an in-depth review of ecohydrological links in the lower Ebro River and its Delta, which is one of the most studied cases regarding the impacts of flow regime alteration on socioecological functions and values. Finally, a couple of papers deal with management and policy issues, such as Chinese policies of hydropower projects to avoid negative environmental impacts [8] and the proposal of a new framework for managing ecological quality and ecosystem services in coastal waters [9].

Most of the papers highlight the idea that, besides promising progress in establishing and implementing e-flows in rivers and coastal areas, efforts are not sufficient to preserve the ecological integrity and health of river ecosystems. On the other hand, the multidimensional character of e-flow research and management suggests that a holistic socio-ecological approach is needed to successfully establish, test, and implement sound-flow regimes under an adaptative framework.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Conflicts of Interest: The author declares no conflict of interest.

Citation: Ibáñez, C. Special Issue: Environmental Flows, Ecological Quality, and Ecosystem Services. *Water* **2021**, *13*, 2760. https://doi.org/10.3390/w13192760

Received: 24 September 2021
Accepted: 26 September 2021
Published: 6 October 2021

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