

Effect of climate change on water quality of rivers

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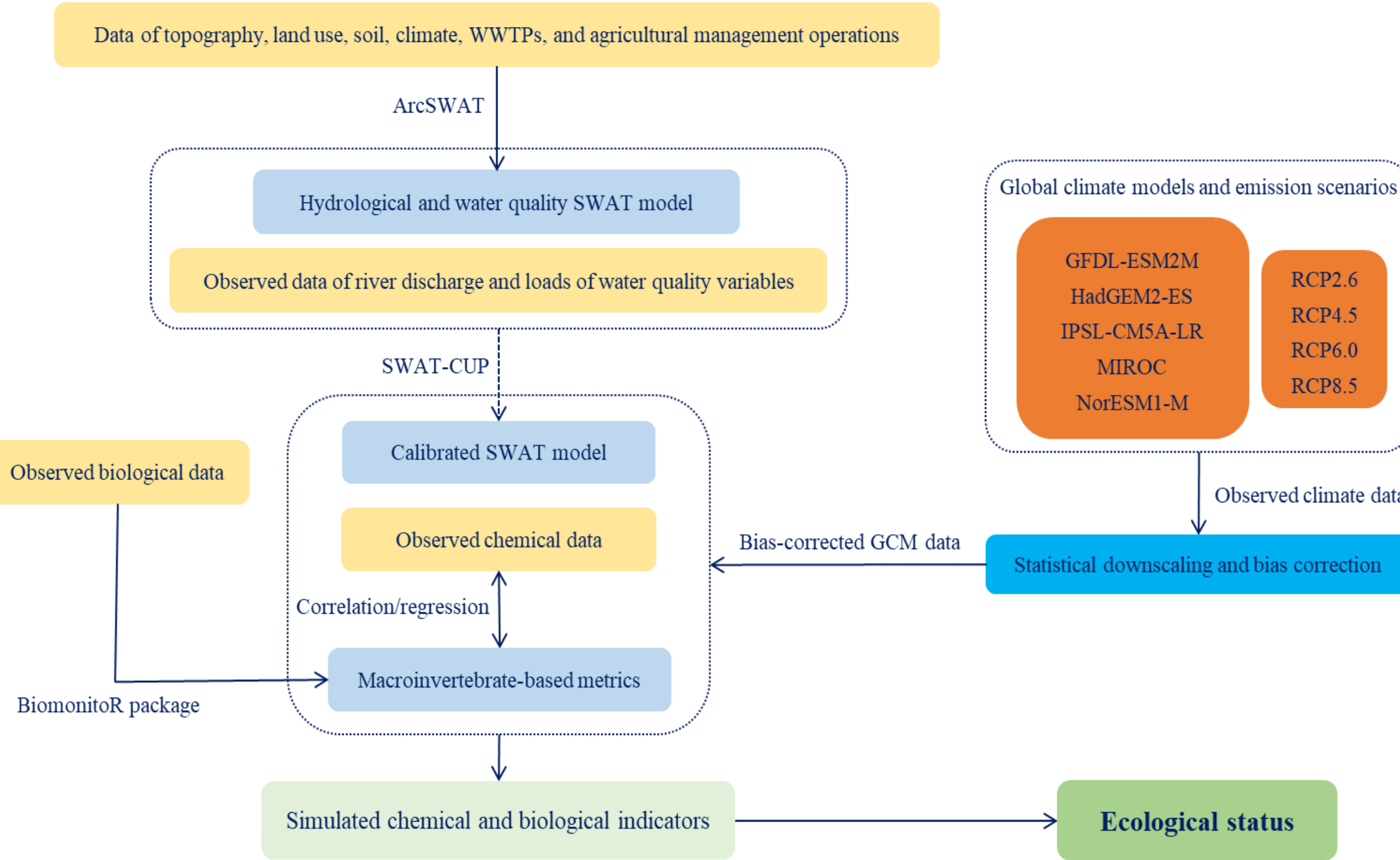
Department of Environment, Land and Infrastructure Engineering

World Water Day 2024

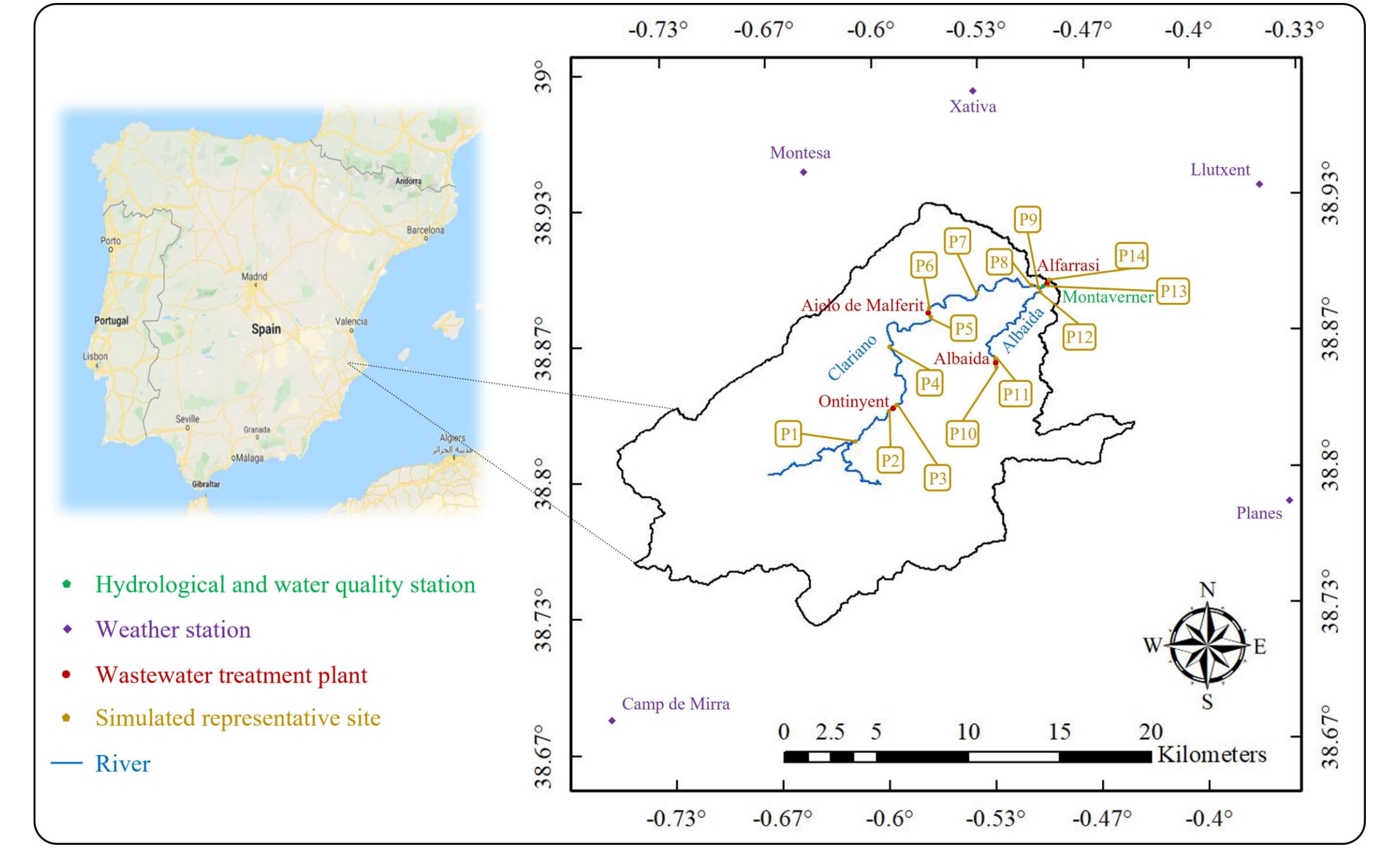
Introduction

- Climate change constitutes a menace to global freshwater sources.
- Addressing and managing the effects and challenges posed by climate change on freshwater environments, requires a holistic and fundamental understanding of linkages between climate, hydrology, water quality, and biodiversity.
- These connections can be studied by integrating water quality monitoring and modeling.
- The aim of the present work is to understand how the processes induced by climate change can impact river water quality.

Methodology



Study area and data

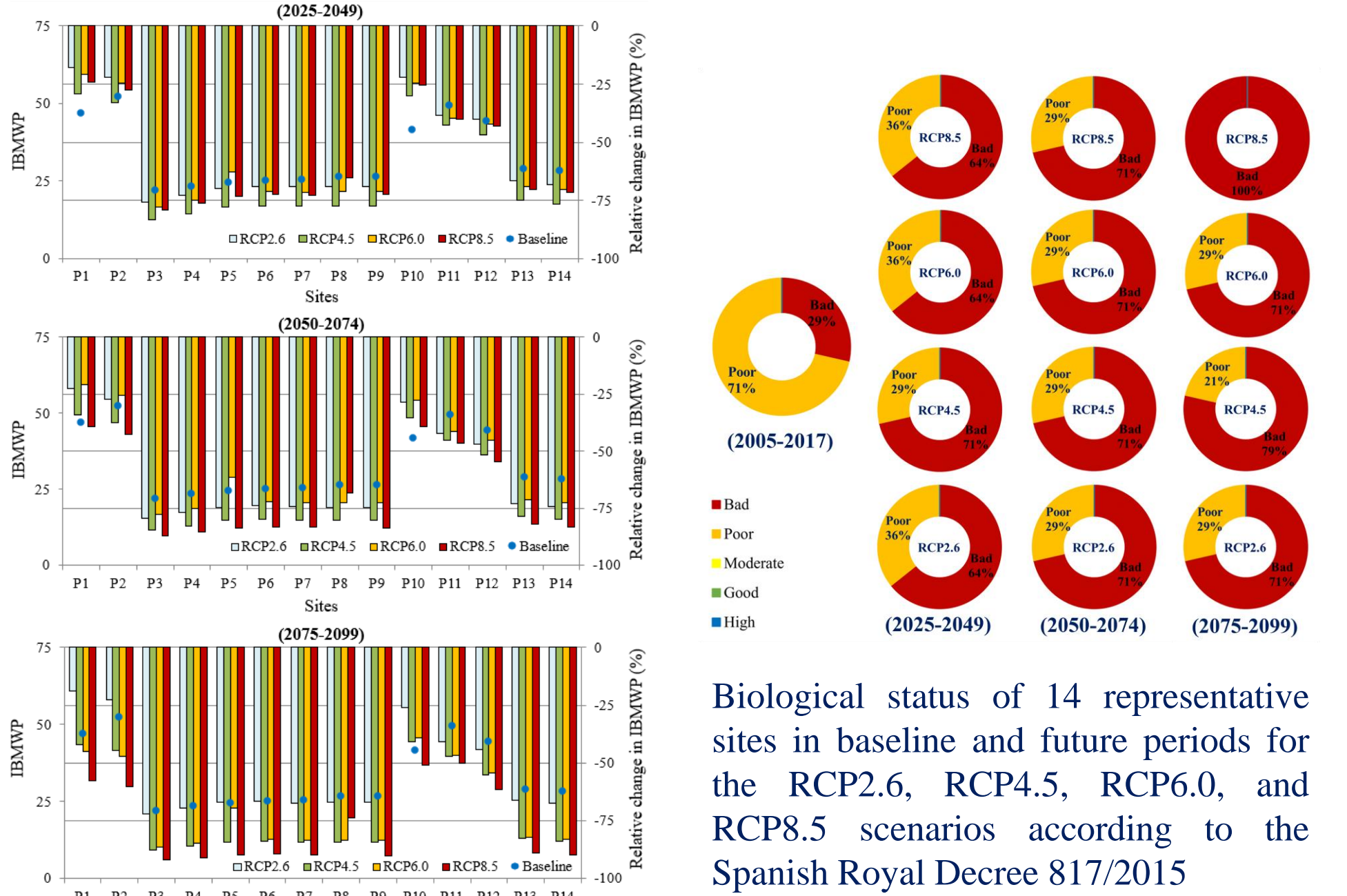


Data	Description	source
Topography	DTM25: Digital Terrain Model with 25 m grid spacing	Spanish National Geographic Institute
Land use	MCA 2000-2010: the land use and crop map of Spain with a scale of 1:50,000	Ministry of Agriculture, Fisheries and Food of Spain
Soil	HWSD v1.21: Harmonized World Soil Database version 1.21 with a resolution of about 1 km (a 30 arc-second raster database)	(FAO/IIASA/ISRIC/ISSCAS/JRC)
Climate	Precipitation/Minimum temperature/Maximum temperature/Solar radiation/Relative humidity/Wind speed	Valencian Institute for Agricultural Research, GCMs, the Spanish National Meteorological Service (AEMET)
WWTP	Data include: the effluent flow rate, suspended solid, CBOD, mineral phosphorus, nitrate, ammonia, organic phosphorus. Monthly data Period: 2002-2017 Four WWTPs: Aielo de Malferit, Albaida, Alfarrasi, and Ontinyent	The Public Entity for Sanitation of Wastewater, Valencia
Agricultural management operations	Planting, harvesting, fertilization and irrigation	Literature
River discharge	Daily data Period: 2005-2017 Montaverner Station	Júcar Hydrographic Confederation
River suspended solids/nitrate/phosphorus loads	Monthly to trimonthly data Period: 2005-2017 Montaverner Station	Júcar Hydrographic Confederation
Chemical/biological data (Albaida Valley)	Chemical data include: the concentrations of nitrate, nitrite, ammonium, phosphate, and total phosphorus Biological data include: the abundance of macroinvertebrates at family level Six sampling sites Sampling period: 2010-2012 Chemical data include: the concentrations of nitrate, nitrite, ammonium, and phosphate	Polytechnic University of Valencia
Chemical/biological data, Catalonia Region	Biological data include: the abundance of macroinvertebrates at family level 117 sampling sites Sampling period: 2015-2020	The Catalan Water Agency

Chemical water quality



Biological water quality



Ecological status

- Climate change influences water quality and ecological status.
- Based on predicted chemical and biological status, the ecological status of certain representative sites is expected to downgrade in the future compared to the baseline
- Scientifically informed decisions are essential to manage and protect freshwaters.

References

- Vagheei et al. (2023). Climate change impact on the ecological status of rivers: The case of Albaida Valley (SE Spain). Science of the Total Environment 893, 164645.
- Vagheei et al. (2022). Ecohydrologic modeling using nitrate, ammonium, phosphorus, and macroinvertebrates as aquatic ecosystem health indicators of Albaida Valley. Journal of Hydrology: Regional Studies 42, 101155.