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A multi-disciplinary approach for the integrated assessment of water alterations under climate change

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Understanding the co-evolution and interrelations between natural and human pressures on water systems is required to ensure a sustainable management of resources under uncertain climate change conditions. To pursue multi-disciplinary research is therefore necessary to consider the multiplicity of stressors affecting water resources, take into account alternative perspectives (i.e. social, economic and environmental objective and priorities) and deal with uncertainty which characterize climate change scenarios.
However, approaches commonly adopted in water quality assessment are predominantly mono-disciplinary, single-stressors oriented and apply concepts and models specific of different academic disciplines (e.g. physics, hydrology, ecology, sociology, economy) which, in fact, seldom shed their conceptual blinders failing to provide truly integrated results.
In this context, the paper discusses the benefits and limits of adopting a multi-disciplinary approach where different knowledge domains collaborate and quantitative and qualitative information, coming from multiple conceptual and model-based research, are integrated in a harmonic manner.
Specifically, Bayesian Networks are used as meta-modelling tool for structuring and combining the probabilistic information available in existing hydrological models, climate change and land use projections, historical observations and expert opinion. The developed network allows to perform a stochastic multi-risk assessment considering the interlacing between climate (i.e. irregularities in water regime) and land use changes (i.e. agriculture, urbanization) and their cascading impacts on water quality parameters (i.e. nutrients loadings).
Main objective of the model is the development of multi-risk scenarios to assess and communicate the probability of not meeting a "Good chemical water status" over future timeframe taking into account projected climatic and not climatic conditions.
The outcomes are finally used to identify tradeoffs between different water uses and perspectives, thus promoting the implementation of best practices for adaptation and management with ancillary co-benefits and cross-sectoral implications (i.e. tourism, fishing, biodiversity).
Some preliminary results, describing the application of the model in the Dese-Zero river estuary, one of the main tributaries of the Venice Lagoon in Italy, will be here presented and discussed.