



Climate change impacts on water management in mountain regions: a complex system framework

Stefano Terzi (1,2), Silvia Torresan (1,3), Stefan Schneiderbauer (2), Andrea Critto (1,3), Marc Zebisch (2), Antonio Marcomini (1,3)

(1) University Cà Foscari Venice, Venice, Italy (stefano.terzi@unive.it), (2) Institute for Earth Observation, Eurac Research, Bolzano, Italy, (3) Centro-Euro Mediterraneo sui Cambiamenti Climatici (CMCC), Lecce, Italy (silvia.torresan@cmcc.it)

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Mountain environments are facing important impacts due to climate change and human activities. Shifts of temperature and precipitation are affecting the amount of available water in mountain environments, especially in terms of snow cover and glaciers extension. Moreover, hydropower production, agriculture and tourism activities make use of large quantities of water for economic purposes. In a long-term perspective, environmental and human pressures on water can have important consequences, leading to conflictual situations among strategic sectors that rely on unsustainable use of water resource.

The presence of a high number of actors involved and changing environmental conditions call for the application of methodologies capable of representing complex biophysical and socio-economic interrelationships that lead to potential impacts.

For these reasons, new methodologies need to be explored to allow for a better comprehension of complex risk processes and their future dynamics in order to support policy-makers in adaptation strategies implementation.

Complex system methods, such as system dynamics and Bayesian networks, are increasingly applied in representing risk processes, as they combine socio-environmental information through explicit representation of variables interactions. A conceptual framework using one methodology was developed, encompassing changes in the water quality and quantity as well as socio-economic impacts on strategic sectors of mountain regions (e.g. discharge reduction due to long-term glaciers melting affecting hydropower production).

By incorporating future scenarios of climate change, an application of the framework will be tested in the case study of the Province of Trento (Italy). Finally, it will be possible to provide information to improve the management of water resources and prioritize potential alternative water strategies for climate change adaptation (e.g. regulation, pricing, drip irrigation, wastewater reuse, water harvesting).