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Assessment of climate change impacts on groundwater resources: the case study of Veneto and Friuli plain in Italy

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Climate change will have different impacts on water resources and water-dependent services worldwide. In particular, climate-related risks for groundwater and related ecosystems pose great concern to scientists and water authorities involved in the protection of these valuable resources. Research is needed to better understand how climate change will impact groundwater resources in specific regions and places and to develop predictive tools for their sustainable management, copying with the envisaged effects of global climate change and the key principles of EU water policy. Within the European project Life+ TRUST (Tool for Regional-scale assessment of groundwater Storage improvement in adaptation to climaTe change), a Regional Risk Assessment (RRA) methodology was developed in order to identify impacts from climate change on groundwater and associated ecosystems (e.g. surface waters, agricultural areas, natural environments) and to rank areas and receptors at risk in the high and middle Veneto and Friuli Plain (Italy). Based on an integrated analysis of impacts, vulnerability and risks linked to climate change at the regional scale, a RRA framework complying with the Sources-Pathway-Receptor-Consequence (SPRC) approach was defined. Relevant impacts on groundwater and surface waters (i.e. groundwater level variations, changes in nitrate infiltration processes, changes in water availability for irrigation) were selected and analyzed through hazard scenario, exposure, susceptibility and risk assessment. The RRA methodology used hazard scenarios constructed through global and high resolution models simulations for the 2071-2100 period, according with IPCC A1B emission scenario in order to produce useful indications for future risk prioritization and to support the addressing of adaptation measures, primarily Managed Artificial Recharge (MAR) techniques.

Relevant outcomes from the described RRA application highlighted that potential climate change impacts will occur with different extension and magnitude in the case study area. Particularly, qualitative and quantitative impacts on groundwater will occur with more severe consequences in the wettest and in the driest scenario (respectively) and on natural and anthropic systems through the reduction in quality and quantity of water availability for agricultural and other uses (about 80% of agricultural areas and 27% of groundwater bodies at risk). While, such impacts will likely have little direct effects on related ecosystems – croplands, forests and natural environments – lying along the spring area (about 12% of croplands and 2% of natural environments at risk).

The major outcomes of the described RRA application are here presented and discussed.