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# A regional level multi-hazard impact assessment based on indicators of climatic and non-climatic change

T. Lung (1), C. Lavalle (1), R. Hiederer (1), and L.M. Bouwer (2)

(1) Institute for Environment & Sustainability (IES), European Commission - Joint Research Centre, Ispra, Italy (tobias.lung@jrc.ec.europa.eu), (2) Institute for Environmental Studies (IVM), Vrije Universiteit Amsterdam, Amsterdam, The Netherlands (laurens.bouwer@ivm.vu.nl)

Over the coming decades, Europe is expected to be confronted with major impacts due to anthropogenic climate change, with an increase in the frequency of some extreme weather events. Across the different European regions, impacts and vulnerability will vary in intensity and effect, according to changes in exposure to specific climatic stimuli and changes in non-climatic factors (sensitivity and vulnerability). To better prioritise adaptation strategies, there is a need for quantitative pan-European regional level assessments that are systematic and comparable across multiple hydro-meteorological hazards. This study presents an indicator-based impact assessment framework at NUTS-2 level that quantifies potential regional changes related to four weather-driven hazards: heat stress, river flood risk, drought proneness, and forest fire danger. This is done by comparing the current (baseline) situation with two scenarios, for the periods 2011-2040 and 2041-2070. For each hazard individually, the method integrates outcomes of a set of coherent high-resolution regional climate models from the ENSEMBLES project, based on the SRES A1B emission scenario, with current and projected non-climatic parameters such as land use and socio-economic factors, in order to quantify shifts in potential regional climate change impacts. In addition, an index of regional adaptive capacity is developed and compared with the impact indicators to identify regions of potentially high vulnerability. The results project strongest increases for heat stress, in particular in central Europe, and for forest fire danger, which not only rises considerably in the southern European regions but also shows a northwards shift. For drought proneness and flood risk the sign and magnitude of change vary across regions. An overall assessment combining all four hazards shows a clear trend towards increasing impact from climate-related natural hazards for most parts of Europe in the coming decades. The most vulnerable regions are projected to be found in eastern and southern Europe, which currently have the lowest adaptive capacities. This spatially explicit portfolio of comparable hazard assessments provides a valuable basis for discussions in the context of climate adaptation mainstreaming at EU and regional level. In the future, the assessment framework can be extended with data on other extreme weather events.