Large-scale economic modelling of flood impacts on regional and national economies

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The economic damage due to natural hazard risks in the EU over 1980-2016 amounted to 500 billion Euro (EEA, 2018), mostly triggered by extreme weather and climate-related events whose frequencies and/or intensities are expected to increase as a result of climate change in many regions across Europe. Floods are responsible for 40% of the recorded damage. The above estimates account only for capital lost, recovery and opportunity costs. Significant indirect economic losses generated by spill-over effects and disruption of production webs are omitted. Effective climate change adaptation and disaster risk reduction require an economic assessment of both direct- and indirect economic damages. A better understanding of natural hazard risk and ensuing economic losses is important for coordinating responses to shocks and crises within the European Economic and Monetary Union. In the absence of financial protection, the incidence of major disasters in several EU member states may exacerbate economic imbalances and deteriorate credit ratings (S&P, 2015).

We estimate the direct and indirect economic losses of floods across Europe using a combination of contemporary stage-damage (Amadio et al., 2018; Huizinga et al., 2017) and computable general equilibrium (CGE) models (Carrera et al., 2015; Koks et al., 2016). CGE models are nonlinear models of circular flows of goods and services between agents, where representative households and firms choose their demand and supply following constrained optimization problems. For hazard characterisation we employ DEM-retrieved Geomorphic Flood Index (GFI, Samela et al., 2017) that has been proven useful for riverine flood-hazard mapping over large geographical regions in which information on flooding potential is limited or patchy. GFI is trained by model-based simulations (Alfieri et al., 2015; Dottori et al., 2016) to characterise the flood hazard distribution across the EU.

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