



Global human and economic losses from river floods at global warming of 1.5°C, 2°C and 3°C

Francesco Dottori (1), Wojciech Szewczyk (2), Juan Carlos Ciscar (2), Fang Zhao (3), Lorenzo Alfieri (1), Yukiko Hirabayashi (4), Alessandra Bianchi (5), Ignazio Mongelli (2), Katja Frieler (3), Richard Betts (6,7), and Luc Feyen (1)

(1) European Commission, Joint Research Centre, Directorate Space, Security and Migration, Ispra, Italy (francesco.dottori@ec.europa.eu), (2) European Commission, Joint Research Centre, Directorate Energy, Transport and Climate, Sevilla, Spain, (3) Potsdam Institute for Climate Impact Research, Potsdam, Germany, (4) Institute of Industrial Science, The University of Tokyo, Japan, (5) Arcadia SIT, Vigevano, Italy, (6) College of Life and Environmental Sciences, University of Exeter, UK, (7) Met Office Hadley Centre, Exeter, UK

Assessing climate change risks and the benefits of curbing global warming is essential to support ambitious climate mitigation and design climate adaptation policy. River floods are among the costliest disasters worldwide and are sensitive to warming, yet few studies investigated their socioeconomic implications for different levels of global warming. Here we present estimations of global human and economic losses from river floods under Specific Warming Levels (SWLs), from the Paris Agreement targets (1.5°C and 2°C) to a 3°C warmer world. We combine in a multi-model framework estimates of changes in flood hazard with global vulnerability and exposure datasets to simulate inundation processes, human losses, direct damages, and their economic implications under future socio-economic scenarios. Ensemble mean results show that at 1.5°C warming, depending on the socio-economic scenario, human losses from flooding could rise by 70 to 83%, direct flood damage by 160 to 240%, with a relative welfare reduction between 0.23 to 0.29%. At 2°C, the rise in death toll is 50% higher, that in direct losses double, and welfare losses grow to 0.4%. In a 3°C warmer world, direct flood damages could rise to ten times present values, human losses triple and welfare losses amount to 0.65%. Moreover, higher warming implies a larger spread in results between climate ensemble members, leading to larger uncertainty in potential impacts. Flood impacts show an uneven regional distribution. The Asian continent is most affected by river floods now and shows rising shares of the global impacts under all SWLs. In a 3°C warmer world, China's mean welfare loss increases to nearly 1.5% with a maximum loss of 3%, whereas in South Asia relative welfare losses are twice the global average.