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How do changes along the risk chain affect flood risk?

Ayse Duha Metin et al.

Correspondence to: Ayse Duha Metin (admetin@gfz-potsdam.com)

Table S1: Simulation-based studies on the causes of flood risk changes and their relative contributions. H, E indicate whether changes in hazard or exposure are investigated. (EAD: Expected Annual Damage; EAP: Expected Annual Population exposed).

		Drivers considered								
Study	**Time frame, region**	**Climate change (H)**	**Land subsidence (H)**	**Change in GDP (E)**	**Change in population (E)**	**Change in asset values (E)**	**Change in land use (E)**	**Change in cropland area (E)**	**Risk indicators**	**Results**
Alfieri et al. (2015)	1990-2080, Europe (28 countries)	✓		✓	✓				EAD, EAP	▪ Risk increases by an average of 220%, due to climate change only. ▪ When socio-economic development pathways are included, current mean estimates of € 5.3 B of EAD increase to 20-40 B€ in 2050, 30-100 B€ in 2080 and current mean value of 216,000 EAP range between 500,000-640,000 in 2050, 540,000-950,000 in 2080.
Arnell and Gosling (2016)	2050, global (20 regions)	✓		✓	✓	✓		✓	EAD, EAP	▪ Climate change has the potential to considerably change human exposure to flood, but for different climate scenarios this impact is highly uncertain. ▪ The ranges of risk indicators for different climate models are substantially higher than the ranges for emission and socio-economic scenarios under a given climate model.

Bouwer et al. (2010)	2040, south Netherlands	✓				✓	✓		EAD, Loss probability curves	▪ Increase in expected damage due to change in asset values and land use is between 35-172 % while climate change causes 46-201 % increase in damage by 2040. ▪ For different land use categories, losses remain largely unchanged. ▪ Impact of change in assets are quite significant, they may double damage values.
Budiyono et al. (2016)	2030, Jakarta	✓	✓				✓		EAD	▪ As a result of combinations of all future scenarios, median increase of 180 % by 2030. ▪ Land subsidence as a single driver has the largest contribution which increases risk by 126%. ▪ No clear signal is found on the effect of climate change on the flood risk. Climate change results found highly uncertain. ▪ If land use changes with a same rate as the last 30 years, change in land use leads to large increase in the flood risk.
Elmer et al. (2012)	1990-2020, Mulde River, Germany	✓				✓	✓		EAD	▪ Climate change impact is important but not dominant. ▪ The expansion of residential areas (land use change) is the main driver of flood risk.
Feyen et al. (2009)	2071-2100, Europe	✓					✓		EAD	▪ Both climate change and land use change have significant effects on future flood risk increase. ▪ Increase in exposure due to urbanization outweighs effects of climate change.
Feyen et al. (2012)	2071-2100, Europe	✓							EAD, EAP	▪ Flood damages are anticipated to rise across Western Europe and to decrease across north-eastern parts of Europe.

										▪ Current annual damage of € 6.4 billion and 250,000 people exposed are projected to € 14-21.5 billion annual damage and 400,000 people exposed by the end of the century due to climate change.
Hall et al. (2003)	2030-2100, England and Wales	✓		✓	✓	✓	✓		EAD, EAP	▪ Socio-economic drivers have more influence on increasing flood risk than by climate change. ▪ Scenario with combination of highest economic growth and increasing flood frequency can cause up to 20 fold increase in risk. ▪ Change in asset values has higher impact on flood risk. ▪ Scenario with great change in climate can double number of people at risk.
Hattermann et al. (2014)	2011-2100, Germany	✓							EAD	▪ Due to climate change, flood losses considerably increase. ▪ On average, total annual damage increases from €465 million to €993 million by the end of century.
Lung et al. (2013)	2011-2040 and 2041-2070, Europe	✓				✓	✓		3 impact indicators related to 100-year flood: percentage of flooded area; mean water depth of flooded area; percentage of commercial & industrial areas within flooded area (only for 2011-2040)	▪ To identify potential impacts of flood, combination scenarios of climatic and non-climatic drivers found to be crucial. ▪ Throughout Europe, there are slight increase in flood risk due to climate change mainly. ▪ The interactions between human settlements and hydro-geographical settings of the regions may increase flood risk. For example catchments with major river systems have higher flood risk.

Muis et al. (2015)	2000-2030, Indonesia	✓					✓		EAD	▪ Climate change was found as highly uncertain on flood risk. ▪ Land use change (urban expansion) is the main driver of flood risk. ▪ This has been emphasized that increase in exposure will result in 76 % increase in flood risk, on average.
Rojas et al. (2013)	2000-2080, European Union	✓		✓	✓	✓			EAD, EAP	▪ Depending on the combined effect of climate change and socio-economic changes, there are significant increase in future damages and number of people affected by floods. ▪ By the combination of all drivers, number of people affected increases from 200,000 up to 360,000. ▪ The largest share of damages are due to change in asset values, GDP and population projections (socio-economic changes).
Te Linde et al. (2011)	2030, Rhine catchment	✓					✓		EAD	▪ Increase in EAD ranging from 54% to 230% in 2030 compared to 2000, depending on climate change and land-use scenarios. ▪ Approx. 75 % of increase attributed to climate change.