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Changes in floods in Finland due to climate change: General assessment on national scale

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Even within a relatively small area like Finland the effects of climate change on floods can be non-uniform due to differences in climate and watershed characteristics. The overall picture of the changes in flood hazard in Finland with consistent methods and scenarios has been missing since the European scale assessments have been contradictory and not reliable on small scale (Lehner et al. 2006; Dankers and Feyen 2008). There is also a lack of comprehensive analysis on how the changing flood discharges may affect the extents of flood inundation areas, and therefore possible flood risk. According to EU directives and national guidelines, climate change should be taken into account in all future flood assessments and projects.

This study aims at providing this overall picture of the changes in floods and flood inundation areas by 2010-39 and 2070-99 and of some of the most important uncertainties involved. All together 20 climate scenarios from different global and regional climate models and emission scenarios (A2, B1 and A1B) were used. The hydrological simulations were done with the Watershed Simulation and Forecasting System (WSFS), which is largely based on a semi-distributed HBV-type conceptual hydrological model. The changes in inundation areas were modelled with TUFLOW 2D hydraulic model.

Preliminary results indicate that the greatest decreases in flood discharges will occur in small snowmelt flood dominated watersheds due to decreases in snowpack magnitudes. Instead, increased precipitation will cause floods to increase in large central lakes and rivers where floods are volume floods. There will also be a significant shift in runoff and flood seasonality. Autumn and winter floods will increase everywhere in Finland and spring floods will decrease especially in southern and central parts of the country. These changes will also be reflected in the flood inundation area extents.