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Significance of hydrological model choice and land use changes when doing climate change impact assessment

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Uncertainty in impact studies arises both from Global Climate Models (GCM), emission projections, statistical downscaling, Regional Climate Models (RCM), hydrological models and calibration techniques (Refsgaard et al. 2013). Some of these uncertainties have been evaluated several times in the literature; however few studies have investigated the effect of hydrological model choice on the assessment results (Boorman & Sefton 1997; Jiang et al. 2007; Bastola et al. 2011). These studies have found that model choice results in large differences, up to 70%, in the predicted discharge changes depending on the climate input.

The objective of the study is to investigate the impact of climate change on hydrology of the Odense catchment, Denmark both in response to (a) different climate projections (GCM-RCM combinations); (b) different hydrological models and (c) different land use scenarios. This includes:

1. Separation of the climate model signal; the hydrological model signal and the land use signal
2. How do the different hydrological components react under different climate and land use conditions for the different models
3. What land use scenario seems to provide the best adaptation for the challenges of the different future climate change scenarios from a hydrological perspective?

Four climate models from the ENSEMBLES project (Hewitt & Griggs 2004): ECHAM5 – HIRHAM5, ECHAM5 – RCA3, ARPEGE – RM5.1 and HadCM3 – HadRM3 are used, assessing the climate change impact in three periods: 1991-2010 (present), 2041-2060 (near future) and 2081-2100 (far future). The four climate models are used in combination with three hydrological models with different conceptual layout: NAM, SWAT and MIKE SHE.

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