

Technical University of Denmark



Influence of urban land cover changes for the exposure of European cities to flooding during high-intensity rainfall events

Kaspersen, Per Skougaard; Høegh Ravn, N. ; Arnbjerg-Nielsen, Karsten; Madsen, H.; Drews, Martin

Publication date:
2015

Document Version
Peer reviewed version

[Link back to DTU Orbit](#)

Citation (APA):

Kaspersen, P. S., Høegh Ravn, N., Arnbjerg-Nielsen, K., Madsen, H., & Drews, M. (2015). Influence of urban land cover changes for the exposure of European cities to flooding during high-intensity rainfall events. Abstract from 26th International Union of Geodesy and Geophysics (IUGG) General Assembly 2015, Prague, Czech Republic.

DTU Library
Technical Information Center of Denmark

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Influence of urban land cover changes for the exposure of European cities to flooding during high-intensity rainfall events.

Per Skougaard Kaspersen ^{a*}, Nanna Høegh Ravn ^b, Karsten Arnbjerg-Nielsen ^c, Henrik Madsen ^d, Martin Drews ^a

^a Climate Change and Sustainable Development group, Department of Management Engineering, Technical University of Denmark, Frederiksborgvej 399, building 110, DK - 4000 Roskilde, Denmark

^b LNH Water, Skelbækgade 30 3th, 1717 Copenhagen V, Denmark

^c Department of Environmental Engineering, Technical University of Denmark, Miljovej, Building 114, 2800 Kgs. Lyngby, Denmark

^d DHI, Agern Allé 5, 2970 Hoersholm, Denmark

* Corresponding author. Tel.: +45 2012 5884; E-mail address: pskk@dtu.dk

Keywords: *Urban flooding, extreme rainfall, land cover change, climate change, remote sensing, Landsat, hydrological modelling, risk assessment*

Abstract

The extent and location of impervious surfaces within urban areas due to past and present city development strongly affects the amount and velocity of run-off during high-intensity rainfall and consequently influences the exposure of cities towards flooding. The frequency and intensity of extreme rainfall are expected to increase in many places due to climate change and thus further exacerbate the risk of pluvial flooding. Improved knowledge of the impacts of both urban land cover changes and climate change towards the risk of flooding in urban areas is needed when planning for climate proof cities. This paper examines the influence of recent changes in urban land cover, under present and future climatic conditions, on the exposure of cities to pluvial flooding. Eight European cities are included in the analyses, representing different climatic conditions and historical urbanisation trends within Europe. A combined hydrological-hydrodynamic modelling and remote sensing approach is used to simulate the occurrence of a range of extreme rainfall events under current and expected future climatic conditions, and for different levels of urbanisation, which corresponds to historical (1984) and current (2014) urban land cover. Landsat satellite imagery are analysed to quantify historical changes in impervious surfaces. The outputs of the remote sensing analyses are combined with regionally downscaled estimates of current and expected future rainfall extremes to enable 2D overland flow simulations and flood hazard assessments, and to compare the relative influence of land cover changes with that of expected climate change. Preliminary results confirm that recent land cover changes within major European cities can play a central role for the cities' exposure to flooding.