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Increasing house owners adaptive capacity: Compliance between climate change risks and adaptation guidelines in Scandinavia

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ABSTRACT

Climate change is expected to intensify weather related risks affecting the existing building stock. To increase the understanding of how the capacity among individual house owners to mitigate such risks can be improved, this study analyses the compliance between anticipated climate risks and existing adaptation guidelines to house owners in Denmark, Norway and Sweden. The assessment of climate risks is based on a review of climate change and building research literature. The compilation of available guidelines is based on an assessment of information from government authorities, municipalities as well as insurance companies and organizations. Results reveal a high compliance between available guidelines and risks for already experienced weather risks, while somewhat new risks from anticipated climate change impacts are less covered. To better facilitate adaptive responses, further adaptation guidelines would earn from explicitly targeting house owners, as well as highlighting relationships between anticipated climate impacts, existing weather risks and individual management practices. Public–private cooperation is identified as an important means for making information more accessible and easily available.

1. Introduction

The Scandinavian countries (Denmark, Norway and Sweden) are often considered having a relatively low vulnerability to climate change effects (Juhola et al., 2012, 2014). However, a trend toward increased cost for claims payments to individual house owners from weather related damage has been observed during the last years (Forsikring and Pension, 2013), and these costs are expected to increase further in the future due to anticipated climate change impacts (IPCC, 2012). Within the region climate change is expected to intensify experienced impacts leading to higher likelihood of; (1) drastic and devastating events such as floods, landslides, heat waves and storms, and (2) more gradual changes such as increased risks for water leakage and mold. To a varying degree these changes are expected to generate negative outcomes for residential buildings and public health (Stocker et al., 2013). The severity of current and anticipated impacts depend on both recent severe

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weather events and on societal changes such as urbanization, and are therefore most pressing in urban areas due to dense settlements and economic activity, as well as high pressure on existing infrastructure (Glaas and Jonsson, 2014).

To support individual house owners in mitigating such climate change impacts, information on how to incorporate climate change consideration in individual decision-making processes is a decisive aspect (Lisø et al., 2003). Such information has been presented as one among several determinants of society's adaptive capacity, often conceptualized under the heading of "information and skills" (Engle and Lemos, 2010:7). Here adaptation guidelines represent one important means for building adaptive capacity among house owners, provided they are targeting relevant risks and are available for this specific group of actors (Glaas, 2013; Eriksen et al., 2011; Adger et al., 2007). So far, assessments of adaptive capacity have often focused on the public sector, highlighting the capacity of institutions to manage challenges posed by climate change (e.g. Storbjörk and Hedrén, 2011; Glaas et al., 2010; Urwin and Jordan, 2008), while the preconditions for building private and individual capacity to adapt remains poorly understood (Tompkins and Eakin, 2012; Agrawala et al., 2011).

In all of the Scandinavian countries, various types of adaptation guidelines have been developed for managing weather impacts when maintaining, renovating and (re)building houses, which potentially could facilitate such decisions. However, currently this information is widely dispersed and it is thereby not clear what impacts are most and least covered by existing guidelines, how current guidelines need to be improved, for what risks new guidelines need to be developed and what type of information should be included.

To contribute to the understanding of how climate change adaptation can be facilitated among individual house owners, this study analyzes the compliance between anticipated climate change risks and available adaptation guidelines to this target group in Denmark, Norway and Sweden. Individual house owners refer, in this context, to non-professionals maintaining a residential building such as a private house, cottage or condominium. The overview of anticipated climate change trends and impacts on residential buildings is based on a review of climate change and building research literature, while the compilation of available guidelines to house owners is based on an assessment of information from government authorities, municipalities as well as insurance companies and organizations on their official webpages. The study was guided by the following research questions:

1. Which climate change related risks to residential buildings are anticipated for the Scandinavian region during this century?
2. To what extent do exiting adaptation guidelines to house owners cover the anticipated risks in the region?
3. What actors and countries are most active in developing such guidelines?
4. How should further adaptation guidelines be developed to better facilitate adaptation among individual house owners?

2. Climate impacts in Scandinavia

Societies have always been effected by, and have had to adapt to, varying weather conditions. Due to the location of the Scandinavian countries, cold winters and relatively large amounts of rain and snow have been considered important aspects when houses and infrastructure have been built and maintained. However, climate change is expected to have impacts on these weather conditions by influencing central climate parameters and by generating long term effects such as sea-level rise. Such changes combined with an existing and increased sensitivity of the building stock (due to e.g. densely built urban areas, a high proportion of paved areas, residential areas built closer to watercourses and high pressure on municipal sewage systems) are expected to increase the risks for weather related damage on buildings (IPCC, 2012). Here, the condition of the existing building stock is an important contributory factor to the severity of the anticipated climate impacts presented below.

2.1. Anticipated climate change trends

Recent climate change scenarios show increasing trends for some climate features in Scandinavia during the course of this century, while the development of other features is still more uncertain. In the latest assessment report by the Intergovernmental Panel on Climate Change, distinct increases for e.g. mean summer and winter temperatures, for mean precipitation during winter and for sea level rise are presented, while the trends for changes in wind patterns (including storms) are argued less certain (IPCC, 2013).

The IPCC uses four main climate scenarios, called RCP[1] 2.6, 4.5, 6.0 and 8.5 (Stocker et al., 2013). In this paper, results from a scenario describing a rather low degree of future change (RCP 4.5) were used. Similar trends as presented below are visible also in the other scenarios, but mostly with higher increases. We discuss results for Scandinavia based on a large ensemble of global climate model (GCM) projections from CMIP5 (Climate Model Intercomparison Project Phase 5) put forward in the IPCC assessment (e.g. Christensen et al., 2013). These projections give a broad picture of climate change for the Scandinavian region under RCP 4.5. However, as land-sea contrasts and altitude of the mountains are not well-resolved in the relatively coarse-scale GCMs, some features of the climate are not well captured. Furthermore, some processes are not represented in a good way at the coarse resolution. A particular problem with this is that some extreme events, like heavy precipitation, have small-scale features that

[1] Representative Concentration Pathways.