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## Facilitating climate change adaptation through communication: Insights from the development of a visualization tool

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### Abstract

Climate change communication on anticipated impacts and adaptive responses is frequently presented as an effective means to facilitate implementation of adaptation to mitigate risks to residential buildings. However, it requires that communication is developed in a way that resonates with the context of the target audience, provides intelligible information and addresses perceived barriers to adaptation. In this paper we reflect upon criteria for useful climate change communication gained over a three year development process of a web-based tool - VisAdapt™ – aimed at increasing the adaptive capacity among Nordic homeowners. Based on the results from continuous user-testing and focus group interviews we outline lessons learned and key aspects to consider in the design of tools for communicating complex issues such as climate change effects and adaptive response measures.

### 1. Introduction

Communication is presented as key in facilitating implementation of adaptation measures by enhancing the understanding of anticipated risks from climate change, as well as the available options for adaptive responses among specific target groups (Wibeck 2014; Cone et al. 2013). In such efforts, taking people's sense of belonging as the entry point is important to be able to contextualize potential effects and response measures in a way that makes sense to the user (Scanell and Gifford 2009). Homeowners are presented as an important target group for adaptation communication since many adaptive responses need to be implemented at a household level to avoid climate related impacts – such as flooding and water leakage, rot and mold, and storm damage – which risk affecting residential buildings and human health (Glaas et al. forthcoming; Wamsler and Brink 2015; Bichard and Kazmierczak 2012).

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However, to develop useful communication, it is also important to consider and address deeply embedded socio-cognitive barriers to adaptation (Adger et al. 2013; Adger et al. 2009). These barriers – such as perceived exposure to climate related risks as well as perceived ability and responsibility to act – may hamper individual responses if not thoroughly addressed (Kettle and Dow 2014; Otto-Banaszak et al. 2011; Grothmann and Patt 2005). Developing communication for adaptation, thus, demands an understanding of the underpinning norms, values and local context which influence these barriers among targeted actors to facilitate adaptation (Moser 2014; Moser and Ekstrom 2010). To be able to answer these demands, there is a need to shift focus in climate change communication from information deficits to addressing barriers and driving forces for public engagement and reflection (Wibeck et al. 2013).

In this short communication we reflect upon criteria for useful climate change communication to overcome individual barriers to adaptation. We draw on experiences gained over a three year design and development process of a web-based tool - VisAdapt™ – aimed at increasing the adaptive capacity among Nordic homeowners. Based on our conclusions from continuous user-testing and focus group interviews in the Nordic region, we discuss requirements for developing meaningful communication for climate adaptation towards this specific target group.

## 2. Identified socio-cognitive barriers to adaptation

During the development of the VisAdapt™ tool, single-person user testing as well as focus group interviews were conducted with stakeholders in Denmark, Norway and Sweden to build an understanding of homeowners' perceived barriers to implement adaptive responses on their property. Such barriers relate to the perceived severity and likelihood of local impacts (perceptions on risks) as well as on the perceived own ability and role to manage these (perceptions on responses) (Lieske et al. 2014; Blennow and Persson 2009; Wolf and Moser 2011; Grothmann and Patt 2005). The below themes were identified in the transcribed empirical material, i.e. recordings from the focus groups interviews and observations from user testing.

### 2.1. Low risk perception

A first type of individual barrier to adaptation relates to a relatively low estimation of risk in relation to the stakeholders' local areas. One example of this was presented by a respondent in one of the focus group interviews:

“If a storm comes once every 10 years, a Gudrun [a Nordic-wide storm in 2005], no one was injured, it just damaged a lot of forest, it's not so bad compared to the effects in other parts of the world” (Focus group 3, authors translation).

This quote is illustrative for most of the discussions held with Nordic stakeholders during the project, who generally devalued local impacts. Though not catastrophic in a global perspective, the storm Gudrun, for example, did lead to deaths, injuries and damages for billions of Euros in the Nordic region. Interestingly, even when weather related impacts had been experienced by stakeholders themselves, the same pattern appeared to be consistent. Similar observations have also been made in previous studies. Whitmarsh et al. (2013), for example, point to the fact that climate change risk is often underestimated, which in turn will affect people's willingness to implement adaptive measures to climate change. Our findings suggest that even though most stakeholders have good

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understandings of climate change impacts in general; they hold perceptions of low climate risks in relation to their local areas. This in turn could influence their sense of relevance for adaptation and, thus, function as a barrier to implementing adaptive measures in relation to their own properties.

## 2.2. Spatial and temporal distance

A second type of barrier relates to spatial or temporal distance to climate change impacts. Some stakeholders emphasized the time factor by pointing out that there is still time to get used to the changes or that the impacts of climate change will affect the next generation, while others discussed climate change impacts on e.g. the North Pole or the Arctic.

Several studies in the climate change communication literature point towards such distance in time and space as a key communication barrier (e.g. Stokes 2014; Pidgeon and Fischhoff 2011; Spence and Pidgeon 2010). When people perceive climate change impacts as something that happens in the future or on a faraway continent, it reduces their sense of agency since other concerns seem more immediate and relevant (c.f. Raymond and Brown 2011). Interestingly, the “distance” perspectives did not dominate the discussions, but were raised in relation to the implementation of adaptive measures, and may therefore still act as an important barrier to adaptation.

## 2.3. Responsibility assigned to other actors

A third type of barrier relates to responsibilities. Stakeholders often discussed the balance between individuals', governments' and insurance companies' responsibilities for implementing adaptive action. Though homeowners showed some tendency to assign responsibility to themselves – especially in relation to the management of specific weather related events such as heavy rainfall or storms – such measures were seldom related to climate change. Rather, they framed these as practical problems or obstacles that homeowners naturally should take care of. Thus, although acknowledging homeowners' responsibilities in the day-to-day maintenance of their private properties, the discussions on responsibility for adaptation to climate change primarily revolved around other actors, such as national government and municipalities in particular. A third highlighted actor group was insurance companies. However, here the discussions related more to covering the costs of weather related damages than the insurance sector's responsibility for promoting and implementing adaptive measures.

The main responsibility for managing long term climate change impacts was assigned to other actors in the discussions. This might be interpreted as a barrier to adaptation on the individual level, which also has been identified in previous studies (c.f. Adger et al. 2013, Lieske et al. 2014). However, the perceived low personal responsibility of managing long term climate change effects seemed blurred by a generally low knowledge of what such management actually might imply in terms of adaptation.

## 2.4. Lack of clarity on appropriate adaptive actions

A fourth type of barrier relates to adaptive responses. Generally, homeowners seemed confused about what adaptive action is appropriate to take and when. This further seems to stem from two unclear relationships; the first between measures for managing climate versus weather related impacts, and the second between measures for adaptation versus measures for mitigation.

First, participants seemed to separate measures that homeowners implement regularly to manage weather related impacts from measures that would secure against climate change impacts. While

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measures for managing weather impacts were seen as self-evident and something that all house owners naturally do – for example painting the facade or cleaning gutters and pipes – measures for managing climate change impacts were seen as uncommon, under-communicated and abstract. This separation, which most often is highly artificial, can act as an individual barrier to adaptation as homeowners downplay the importance of traditional management practices for weather impacts, and because management of climate change impacts appears too challenging.

Second, stakeholders generally had a hard time separating measures for adaptation from measures for mitigation. For example, energy reduction was often argued an important adaptation measure. The focus on climate change mitigation could be seen as yet another barrier to adaptation, since adaptation becomes a less salient, and abstract topic in the minds of homeowners. Though homeowners might consider it as a personal responsibility to prepare their houses for weather related risks, they do not seem to link these actions to climate change, as, in their minds, climate change measures primarily relate to energy reductions.

## 2.5. Financial costs

A last identified type of barrier to adaptation relates to costs. In all focus groups and user testing, financial costs were brought up as an important aspect of climate change adaptation since climate change impacts and measures were argued as generally very costly. However, our results suggest that costs can act both as a limiting and as a motivational factor to take action. As previously emphasized by Bichard and Kazmierczak (2012), financial costs have acted as a significant perceived barrier to adaptation in a UK context, and the same tendency is evident also in this study. Nevertheless, reduction of costs or financial reward systems – such as lowered insurance premiums – seems to also be one of the main motivational factors for stakeholders to take action.

## 3. Criteria for useful communication

Based on the above identified barriers to adaptation, and previous findings within the climate change communication literature, we propose four broad but interrelated criteria for useful adaptation communication directed towards homeowners:

### 1) **Highlight anticipated impacts of climate change on a local level and in a relatively near future.**

This is important for creating a sense of relevance among individual homeowners and to avoid the perceived spatial and temporal distance. This aspect has previously been raised in a more general sense in the literature (e.g. Lujala et al. 2015; Shaw et al. 2009), but seems of particular importance for developing communication towards homeowners as a target group.

2) **Relate anticipated climate change impacts to experienced weather related risks** (c.f. O'Neill and Nicholson-Cole 2009). By making this connection explicit, anticipated climate change impacts would likely appear as less abstract among the target group. To avoid assigning the responsibility to other actors, a further important aspect would be to specify which of these impacts are within the realm of individual homeowners to manage, and what impacts should rather be handled by society – e.g. municipalities – as joint problems.

3) **Make individual adaptive choices explicit to homeowners.** This could be achieved by presenting easy-to-use guidelines that relate to the locally anticipated impacts (c.f. Sheppard et al. 2011; Scanell

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and Gifford 2009). By highlighting alternative ways forward, and by demonstrating the sole purpose of these measures, appropriate adaptive actions for managing specific risks are likely to be clearer to the target audience.

**4) Illustrate how individual action can make a difference for mitigating anticipated impacts** (c.f. Niepold et al. 2008; Nicholson-Cole 2005). In a focus group study on perceptions of uncertainty in climate change communication, Wibeck and Linnér (2012) found that ambiguity about the effects of action alternatives was an important concern to the participants, in particular alternatives related to individual actions, such as lifestyle changes. By explicitly highlighting the purpose and outcomes of specific measures for homeowners in such a way, communication could have the potential to enhance engagement and create a sense of ownership for management which has been found important for spurring action on adaptation in previous studies (e.g. Bohman et al. 2014). Judging from the adaptation barriers that were identified in this, useful communication would further need to include information on likely costs and future cost reductions.

#### **4. Ways forward in communicating adaptation – introducing VisAdapt™**

The identified barriers and proposed criteria for effective communication on adaptation have been used as guidelines in the development of the web-based communication tool VisAdapt™ (visadapt.info). The tool, which was publically launched in November 2014, aims at increasing the adaptive capacity among Nordic homeowners by presenting anticipated climate change impacts for the region over the coming 40-60 years, and by compiling existing adaptation guidelines to homeowners for managing weather related risks.

VisAdapt™ differs from other climate change visualization tools in that it contains interactive information on both anticipated impacts and possible adaptive responses in relation to a selected location and house features (Neset et al. forthcoming). The tool is built around a visual interface comprising three sections (windows). In the leftmost section, based on a search on the home address and through selecting key house materials, users are provided with a map position including a Google Street View picture of their house, as well as locally relevant information on possible adaptation measures. The stepwise approach in the tool, going from left to right (figure 1), answers the communication demands proposed above by visualizing anticipated changes and risk maps for the specifically searched local area (the middle section), and by presenting adaptation measures for the users' own house features (the rightmost section).

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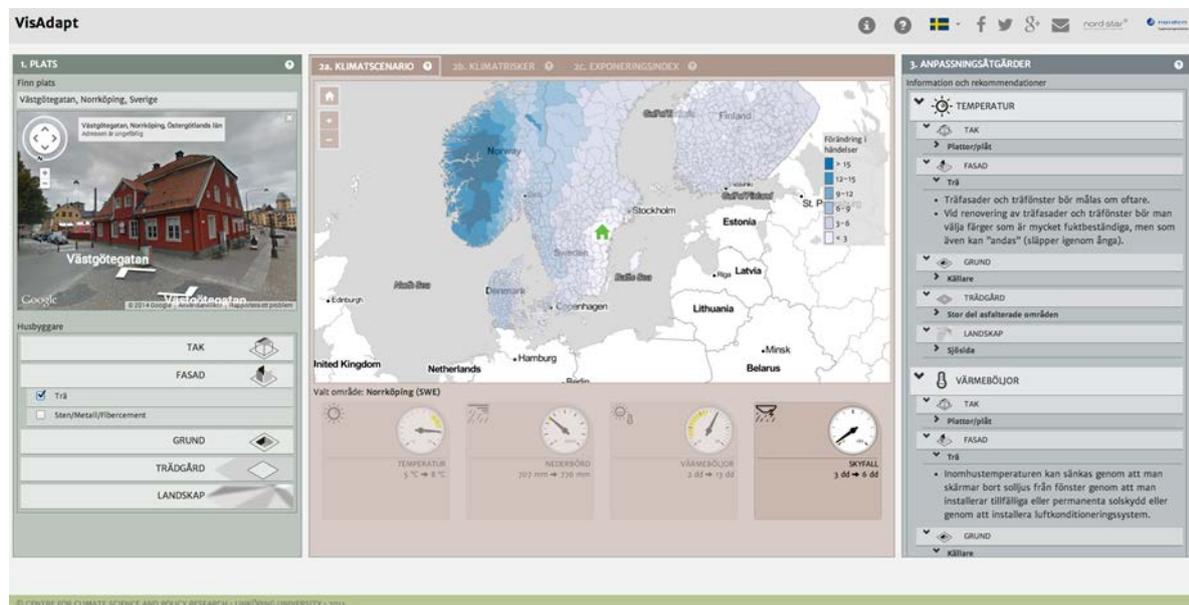


Figure 1. Overview of the interface of the web-tool Visadapt™.

The adaptation measures listed in the rightmost section of the tool have been collected from insurance companies and organizations, municipalities, government authorities and research institutes in the Nordic region (c.f. Glaas et al. forthcoming), and are ranked according to what climate change effects that are expected to be the biggest in the selected area. They also highlight what risks that homeowners should manage themselves. The included risk maps (predominantly related to flooding) have been collected from government authorities in the Nordic countries.

VisAdapt™ has so far been accessed by approximately 16 000 users in all five Nordic countries (June 2015, 8 months after the release) and is currently under thorough evaluation. Future results will thus reveal to what extent the tool can be an effective means for facilitating adaptation by supporting individual decision-making processes. So far, research analyzing how specific target groups perceive and incorporate such adaptation communication into their individual decisions is generally lacking, but could add important puzzle pieces for the understanding of how climate change adaptation can be facilitated (Evans et al. 2014; Wibeck 2014, Whitmarsh et al. 2013; Pettit et al. 2012).

Preliminary results from our user testing indicate that VisAdapt™ is a useful tool for spurring engagement on adaptation as an issue, and demonstrate that the connection between experienced weather related risks and climate change impacts appears more distinct to the users after testing the tool. Nevertheless, homeowners generally argue that more specific information on costs, systems for part-financing implementation (e.g. through lower insurance premiums) and stepwise guidance for implementation are additional aspects which would need to be made more explicit in future efforts to better facilitate implementation.

## 5. Conclusions

Based on the outcomes from continuous user testing and focus group interviews with homeowners in the Nordic region, we have assessed perceived barriers to adaptation, which are important to

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address in any communicative effort. Results reveal individual barriers to adaptation comprising a generally low risk perception, perceived spatial and temporal distance to impacts, responsibility assigned to other actors, a lack of clarity on appropriate adaptive action, and perceived high costs of implementation of adaptation. For instance, the data revealed that most people in our study remained confused about what climate change impacts and adaptation actually would imply. They lack familiarity with the term adaptation in relation climate change or confuse it with mitigation, thinking that they can “adapt” to climate change through mitigative actions such as installing solar panels. Also, participants tend not to attribute the responsibility or blame for climate change to themselves or individual actors. Individual action is further considered as ineffective for managing risks. Responsibility for action is thereby transferred to other actors, such as local governments.

Targeting these barriers is of vital importance for climate change communication in general, and for designing effective communication on adaptation options in particular. In order to spur engagement and understanding on adaptation, input on the tested tool suggests that it is important to explicitly highlight locally anticipated climate change impacts in a relatively near future, relate impacts to experienced weather risks, make individual adaptive choices explicit and clearly illustrate how individual action can make a difference. Developing a direct relation to a well-known reference point can be an important aspect in such efforts. For example, as found in this study, equipping a visualization tool with a component showing the close neighborhood can be an effective way to overcome the ‘not here, not now, not me’ issue (Wolf et al. 2009).

Public perception of risk has been found to be significantly influenced by affective imagery (Leiserowitz 2006). As further supported by results in this study, visualization tools can act as an effective means to raise people’s awareness of potential impacts of climate change and to overcome perceptions of climate change as vague, abstract and hidden (Lujala et al. 2015). To avoid reproducing a ‘not here – not me’ perception, a central feature of the VisAdapt™ tool is that it brings the possible impacts of climate change to a user’s doorstep and provides adaptation guidelines relevant for his/her own home based on physical building- and landscape features.

Through further evaluation of the tool we will be able to also address questions related to how targeted communication on adaptation can influence individual decision-making processes among specific target groups such as homeowners. Such aspects are rarely studied and more research is required to support the understanding of how implementation of adaptation can be supported on the ground. As our preliminary results indicate, however, being more explicit about practical ways to implement adaptive measures is key in such approaches.

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