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Åsne Lund Godbolt, Cecilie Flyen, Åshild Lappegard Hauge, Anne-Cathrine Flyen, Louise Leren Moen,

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Future resilience of cultural heritage buildings – how do residents make sense of public authorities' sustainability measures?

Åsne Lund Godbolt

Department of Building and Infrastructure, SINTEF Byggforsk, Oslo, Norway

Cecilie Flyen

Department of Architectural Management, SINTEF Building and Infrastructure, Oslo, Norway and Faculty of Architecture and Design, Norwegian University of Science and Technology, Trondheim, Norway

Åshild Lappegard Hauge

Department of Building and Infrastructure, SINTEF Byggforsk, Oslo, Norway

Anne-Cathrine Flyen

Department of Building, Norwegian Institute for Cultural Heritage Research, Oslo, Norway, and

Louise Leren Moen

Department of Building and Infrastructure, SINTEF Byggforsk, Oslo, Norway

Abstract

Purpose – This paper aims to analyze climate resilience and adaptation of cultural heritage buildings from the perspectives of both public authorities and residents. From a user-oriented domestication perspective, it investigates what barriers the residents meet when trying to make their homes more sustainable and resilient to climate impacts.

Design/methodology/approach – The analysis is based on a qualitative case study: an apartment building from 1890 in an area with protected heritage buildings in Oslo, Norway. The building is in need of renovation to withstand the impacts of climate strain. Expert interviews with public authorities, and interviews/focus groups with residents in the case study, form the empirical basis of the results.

Findings – The findings reveal that the residents find the public authorities' sustainability measures confusing and lack information on what to do. The residents have domesticated an environmentally friendly lifestyle, but they are not very concerned about the cultural heritage status of their building. On the contrary, the protection clause is experienced as a barrier against renovation, and the windows are a special concern.



Practical implications – Better cooperation between actors representing public authorities could result in easier access to information and less confusing advices for sustainability in cultural heritage buildings.

Originality/value – This paper gives new insights on how information from public authorities is perceived by residents, and thus indicates how policy measures for cultural heritage and sustainability should be communicated to achieve public understanding.

Keywords Sustainability, Communication, Resilience, User perspective, Cultural heritage buildings, Public authorities

Paper type Research paper

1. Introduction

1.1 Background

Culturally valuable buildings are significant for historical continuity and life quality among residents in a city. A high number of people live in culturally valuable building environments that are important to them, and cultural heritage environments represent environmental, social, and economic values (Mid. St.35, 2012/2013). They affect individuals' identity, well-being and self-understanding and provide uniqueness and individuality. In Norway, up to 80 per cent of the current building stock will remain beyond 2050 (Almås *et al.*, 2011). Of these, roughly 10 per cent of the buildings are built before 1900 and are of great historical interest and with completely different construction techniques compared to modern buildings (Flyen *et al.*, 2015). Some cultural heritage buildings are listed according to the Cultural Heritage Act, governed for conservation according to the Planning and Building Act or defined as valuable without formal/legal protection. Still, cultural heritage buildings are threatened by regulations and energy demands aiming at new buildings without any references to culturally valuable buildings (Enova, 2013). Vulnerable to current climate stresses, and in light of climate change, a need for development of mitigation and adaptation strategies for cultural heritage buildings has emerged. Such strategies can also be transferred to existing buildings in general. In the ongoing discourse on climate adaptation and energy efficiency in Norway, the topic cultural heritage has, so far, been rather absent.

1.2 Objectives and scope

In the research project CulClim[1], we analyze the challenges of making cultural heritage buildings resilient to future climate from the perspectives of both residents and public authorities. The research questions in this paper are: how do public authorities communicate energy efficiency measures and climate adaptation in relation to cultural heritage buildings? How are these measures appropriated by the residents, and how do they experience living in a cultural heritage building in need of renovation and climate adaptation? What barriers do they meet when trying to make their homes more sustainable and resilient to climate impacts? These different approaches involve an analysis of the public authorities' shaping of sustainability and cultural heritage buildings and an investigation of how households think and act in respect to climate adaptation and energy efficiency in their cultural heritage setting.

1.3 Relevant research

In many countries, policymakers have struggled to find instruments that effectively make households engage with energy efficiency and climate adaptation (Geller *et al.*, 2006). Biggart and Lutzenhiser (Biggart and Lutzenhiser, 2007) suggest that policymakers rely too much on economics in their design of policy instruments; thus, researchers must investigate actual behavior with respect to energy consumption and climate adaptation. In studies of

energy culture, household energy behavior has been understood as a result of a combination of activities, preferences, values, technologies and material structures (Aune, 1998, Stephenson *et al.*, 2010). Energy behavior and attitudes are influenced in complex ways by factors such as price, awareness, commitment and trust, as well as a sense of moral obligation (Godbolt, 2014). In many ways, household energy practices are framed by dominant conceptions of comfort, cleanliness and convenience, which become embedded in the built environment (Shove, 2003a).

According to Owens and Drifill (2008), it is important to study the social, cultural and institutional contexts in which energy attitudes and behaviors are formed. They believe that there is a need for a rich understanding of opposition to energy facility siting. Furthermore, they call for more deliberation and better communication between decision-makers, technical experts, other stakeholders and the public. Consequently, Owens and Drifill (2008) argue that the social sciences can help us understand issues related to attitudes and behavior in the context of energy and climate adaptation in a better way than can traditional, economic and rationalist information deficit models. For instance, the fact that individuals' pro-environmental attitudes are often not reflected in significant shifts in behavior, or that these attitudes are apparently inconsistent, should not come as a surprise (although it is often offered as a paradox). Insights from social psychology demonstrate the complexity of attitudes and behaviors and the relationship between the two. Also, recent work from the social sciences has drawn attention to the important influence of routine habits, cultural norms, practices, social networks, fashion and the dynamic interplay of human agents and technologies in socio-technical systems that structure patterns of energy consumption in everyday life.

Individuals may perceive that they have "neither the prime responsibility to take action, nor the agency to have much effect" (Godbolt, 2014; Owens, 2000). In this way, user behavior may be restricted by a sense of futility of individual action. However, even small changes in user behavior and building structures may have large and positive impact within energy saving (Grytli, 2004; Svensson *et al.*, 2012), and even small deviations might have large negative impact. At this, it may be possible to intervene with minor structural changes in cultural heritage buildings and still obtain positive mitigating effects. At the same time, these buildings should be treated with respect in terms of preserving the value, which implies implementing as little as possible on building structures and environments. This is, however, not synonymous with not implementing measures.

1.4 Domestication theory: from a user perspective

The theoretical framework of this paper is based on a multidisciplinary social science approach emphasizing the importance of interaction between society (policy, tools and contracts), technology and material conditions and user needs, motivation and daily life (Shove, 2003a; Shove, 2003b). To establish a user-centered focus on sustainability and cultural heritage buildings, we lean on domestication theory. This perspective helps us understand how knowledge and information is selected, transformed and, eventually, put to use in people's everyday lives. To domesticate issues of sustainability and cultural heritage, people need to negotiate the meanings and practices of these matters in a dynamic, interactive manner that makes sense within their own cultural framework (Sørensen *et al.*, 2000). As Martin (1994) shows, most people do not appropriate scientific concepts to emulate experts but rather to make sense of their own lives and find solutions to relevant challenges in their own cultural framework. Instead of seeing the public as passive recipients who have been excluded from the production and validation of knowledge, we should understand and include the public as participating societal actors who consider, validate, adapt and

supplement the knowledge that is communicated to them (Martin, 1994; Ryghaug, *et al.*, 2010).

The domestication concept conveys the public's need to "tame" facts and artifacts that are taken from a "wild" outside world and to put them into a domestic setting (Sørensen *et al.*, 2000). However, the taming of technologies or knowledge is not one-sided. As Lie and Sørensen (1996, p. 8) put it: "This process of taming is characterized by reciprocal change"; in other words, both technology/knowledge/artifacts and users may change. "Domestication therefore has wider implication than a socialization of technology: it is a co-production of the social and the technical" (Sørensen, 2006, p. 46). Moreover, this approach allows for clarification of the involved beliefs and values in this process. To analyze domestication of the hybrid of technologies and knowledge that constitutes cultural heritage buildings and sustainability issues means to study the development of practices, the construction of meaning and the processes of learning with respect to the area or object of concern (Sørensen *et al.*, 2000; Sørensen, 2006).

Strategies of domestication – or, in this case, sense-making and appropriation of sustainability and cultural heritage – take place in three main dimensions: the practical, the symbolic and the cognitive. First, people develop energy practices that they deem appropriate. How can they act upon the challenges they perceive? Second, regarding the symbolic dimension, they interpret sustainability and cultural heritage in ways that allow them to make sense of these issues, to uphold their identity and to be helpful to the public self-presentation they wish for. Third, and finally, these issues need to be cognitively appropriated to allow people to make use of available technologies and behavioral options (Godbolt, 2014; Sørensen, 2006).

2. Methodological approach

2.1 Qualitative case study methodology: focus groups and interviews

This paper is based on qualitative case study methodology. To study the residents' perspectives, we have conducted three focus group interviews with residents and board members of the housing cooperative. A total of 16 people were interviewed, three women and 13 men, and the interviews lasted for approximately an hour. The focus group method is well-suited for exploring attitudes and arguments (Morgan, 1997; Godbolt, 2014). We used a semi-structured interview guide that accommodated participants' own inputs (Morgan, 1997). The interview guide focused on the residents' everyday lives, their efforts (or lack of such) to improve energy efficiency and their perceptions of climate adaptation and cultural heritage. Further, the paper is based on findings from individual interviews with five residents of the building. These interviews focused more on the residents' experiences with their own apartments; what challenges do they meet when it comes to comfort, energy consumption and maintenance of the apartments?

To investigate the public authorities' perspectives, we have conducted three expert interviews with key representatives for the National Directorate for Cultural Heritage, the Cultural Heritage Management Office of Oslo (county and local levels) and Enova (publicly owned establishment for more environmentally friendly consumption and generation of energy in Norway). The interviews lasted for about an hour and were taped and transcribed. We used a semi-structured interview guide with the following main topics: policy instruments concerning cultural heritage buildings, collaboration and allocation of responsibilities between the different levels of public authorities, collaboration and communication with building owners, energy efficiency and upgrading of protected and/or listed buildings and sustainability strategies for cultural heritage.

2.2 Case study: cultural heritage residential building in Oslo

The CulClim project provides an in-depth study of a selected building case; a privately owned domestic block of apartments in an urban setting in Oslo. The case study encompasses two buildings in a courtyard, situated within a listed and protected cultural heritage environment. All the facades of the buildings are protected; thus, all alterations of the exterior are prohibited. Mapped necessary features that need upgrading are air leakages because of old and/or maladapted and damaged windows of different vintages; moisture defects and damages in basement, roof and in connection with windows; mold growth; clogged or lacking ventilation shafts and aeration valves; condensation problems during the cold season; etc. Much of the mapped damages and defects are linked not only to lacking maintenance over time but also to poor or maladapted craftsmanship, where modern detail solutions have been used.

A board, appointed by and among the apartment owners, conducts the management of the jointly owned parts of the property. The joint property is, presented by the board, in close cooperation with the local and regional cultural heritage authorities, currently working with a window project. The aim is to repair original windows that are able to be salvaged, to make copies of the originals and replace the rest of malfunctioning, vintage-varying windows. This will ensure better technical, building physical and comfort levels; extend the lifetime of the building; and, at the same time, restore the cultural heritage expression of the facades. In addition, the board is closely cooperating with the research project CulClim to obtain knowledge of the building stock and map necessary and possible measures within maintenance, upgrading-, mitigation- and climate adaptation (Plate 1, Figure 1 and Plate 2).

3. Results and discussion

3.1 Public authorities' approach: energy efficiency vs cultural heritage

At a national level, the Directorate for Cultural Heritage is responsible for the management of all protected archeological and architectural buildings, monuments, sites and cultural environments in accordance with relevant legislation. Each county employs officers



Plate 1.
Facade of the case study building block

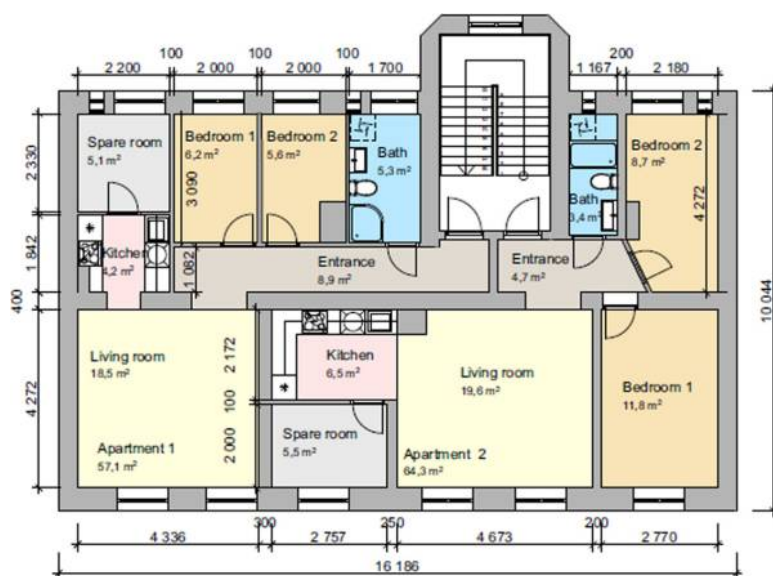


Figure 1.
Plan layout of
apartments in the
front building



Plate 2.
Residents use fabrics
to avoid drafts from
the old windows

responsible for cultural heritage conservation in connection with the administration of cultural affairs in general, to advise the county administration in cultural conservation questions and to ensure that protected monuments and sites and cultural environments are taken into account in the planning processes. Enova, a public enterprise owned by the Ministry of Petroleum and Energy, aims to drive forward the changeover to more environmentally friendly consumption and generation of energy in Norway. How do

these public actors communicate sustainability measures to residents living in cultural heritage buildings?

The Directorate for Cultural Heritage, the Cultural Heritage Management Office and Enova have very different approaches to their marketing activities. Enova is by far the most noticeable or visual in the home upgrading market, disseminating different types of information leaflets, internet information and industry- and user-directed marketing, mostly concerning possible energy efficiency measures, available support schemes and grants, etc. The cultural heritage authorities give invaluable advice and are also financing (the CH Management Office) and knowledge-supporting (both levels). However, none of the heritage authorities are outgoing or outward-oriented in their approach to the public. This implies that in the case of cultural heritage building upgrading and climate adaptation projects, the owners have to:

- know that they live in a listed and/or protected building;
- know that they have to consult the cultural heritage authorities when they want to intervene or upgrade their building; and/or
- explore relevant authorities, public requirements/limitations and solutions/measures on their own.

A high degree of private ownership, limitations linked to cultural heritage conservation considerations and high implementation costs of energy efficient and/or climate adaptive measures represent barriers to obtain a sustainable environment of cultural heritage domestic buildings. In addition, older buildings are often considered inconvenient, and many owners and developers would prefer to replace them with modern buildings. Nevertheless, there is also a growing interest in restoring and repairing old, valuable buildings. When asked about requests from the public, the representative of the Cultural Heritage Management Office replied that:

Yes, we get quite a few inquiries; about advice, everything procedural, and if measures or actions must be checked or approved by public authorities. Some want help finding well skilled craftsmen and architects, but we cannot give recommendations. There are different buildings and different structures, different limits of tolerance, and of course, there are no easy answers.

In practice, the building codes do not apply for cultural heritage buildings, making it difficult for owners to know current limitations (or possibilities). Measures have to be comprehensive, costly and extensive before the building codes come into use. If they do apply, conservation considerations will be overarching, and cultural heritage aspects are to be emphasized. Furthermore, cultural heritage buildings worthy of preservation can be listed, and have a high value, but still not be protected legally. These buildings are the most difficult to designate. Even if the owners literary do “nothing wrong” in terms of the legal position, such buildings can be damaged because of technical measures, structures and the use of modern, unsuitable materials. Building features that are desirable to preserve may at this be destroyed.

The cooperation between local planning and building, local/regional and national cultural heritage authorities seems to be well functioning, at least for those represented in our case study. The role of Enova is, however, more indistinct, outside of this area of responsibilities, and does not take into consideration the responsibilities following their building technical advice and funding. The representative for the Cultural Heritage Management office acknowledged that the cooperation between his office and Enova is lacking; they were somewhat surprised by some of the campaigns Enova runs, “which recommends changing or removing the things that we want to preserve”. Similarly, the

interviewee from the Directorate for Cultural Heritage emphasized that even if Enova has joined them in some projects where information leaflets and reports have been an outcome, “it seems like Enova doesn’t pursue or implement the developed material into their advice or funding assessment of projects”.

It is beyond doubt necessary to invest in upgrading measures of the cultural heritage built environment to meet the increasing demand for sustainability and future resilience. To achieve this, Enova has an important influential impact through funding and advice services. Yet, it is a cause for concern if the advice given is not necessarily adapted to cultural heritage buildings, materials and detail solutions, and thus may have an adverse effect. Recent studies have demonstrated that pollution, waste generation and energy use can be reduced massively by maintaining old buildings instead of demolishing and rebuilding. At this, protection and preservation of existing buildings make a direct and important contribution to a more sustainable development of the built environment (Boro, 2013; Butters and Leland, 2012). How did the residents make sense of these issues within their cultural framework?

3.2 Practical domestication: how do the residents cope with their buildings?

Our case study demonstrates that the residents were confronted with several challenges when trying to cope with their cultural heritage buildings: the connection between an ageing building stock, inherent and increasing vulnerability toward current and changing climate stresses and lacking maintenance was becoming more evident. As already pointed out, from a user-oriented domestication perspective, we see that people develop practices that they deem appropriate in their everyday lives. Thus, the residents need to find practical solutions to challenges they perceive as relevant in their cultural framework – which in this case is a cultural heritage building in Oslo. How can we describe the residents’ practices concerning climate adaptation and mitigation in this cultural heritage building?

The residents appreciated many aspects of living close to the city center in Oslo, in a popular part of the city called Grünerløkka. The area is green and the apartments are less expensive than apartments in other parts of the city. The sizes of the living room and the largest bedroom are generous. However, the second bedroom, the hallway and the kitchen were experienced as too small. Our user interviews show that the residents found ways to adapt to these limitations by using their apartments economically, with less technological appliances and gadgets and by decorating with simple furniture. However, the shortcomings of the old buildings made constraints on the residents’ everyday lives: The apartments are cold in the winter and perceived as too hot in the summer. The residents tried to cope with the heat in the summer through opening windows on both the sides of the apartment and shutting off the coldest rooms during winter, using fewer square meters for a period: “I have an oil heater that I carry around in my apartment. I have a kind of sphere with warmth around me.”

There were serious moisture problems in the building, not only in the basement (used for storage) but also in some of the rooms in the apartments. Some of the residents said that they have to get rid of things to be able to live there, as they cannot place valuable equipment in the basement. There was moisture on the walls below the windows in the bedrooms and in the bathrooms. Especially, the windows were a concern; they were difficult to close and this led to cold drafts. Some residents believed that this draft could be positive for the air circulation flow and the moisture problems. However, in the winter, many of them tried to fix the cracks with tape. One of the residents explained how they had to put a blanket in the windowsill to be able to sit at the dinner table in the winter period: “As

always, there is a little, open gap that I always put a rug in front of". Another resident had the same problem:

Since we have windows that will not close properly, one of our rooms cannot be used in the winter because it is too cold. Of course, it adds a lot to how much electricity you use in the winter.

These findings are examples of practical domestication or user behavior when it comes to coping with an old building. Obviously, it is not easy to domesticate issues such as sustainability and cultural heritage in a coherent, practical way. As we have seen, the residents adjusted their everyday lives and practices to this setting, but still experienced challenges with the buildings when it came to comfort and convenience; draft from the windows was a special concern. How did the residents construct meaning to this living environment?

3.3 Symbolic domestication: user identities of cultural heritage and sustainability

The research started out with a presumption that the heritage status of the buildings mattered to the residents and had importance to them when buying their apartment. In contrast, the residents claimed that they lived in the area because of the central localization and that they had not chosen their apartment because of the cultural heritage status. When we asked about the symbolic meaning of living in a cultural heritage building and the importance of the protection clause, one of the residents answered: "As for me, it was a thing that just suddenly meant; you cannot change windows because they are listed". None of the participants in the focus groups knew about the heritage value at the time of acquisition except from one resident: "Yes, I knew about it, but it didn't matter for the purchase".

The residents were young and used collective transport. Many of them were students, living alone or sharing an apartment with friends. A few of them had small children. The residents seemed to have domesticated an environmentally friendly lifestyle, especially at a symbolic level. Some of them were very conscious on how their energy actions affected the environment and claimed that they adjusted their everyday energy practices according to this engagement:

I do not feel I can do much more (to the environment) than I already do, because then it will go at the expense of something else. I feel like I consume the energy I have to consume. I have to cook and shower and stuff like that.

Still, investment in energy-efficient appliances seemed to be a relevant energy saving effort for many of the residents.

The residents' perceptions on cultural heritage and sustainability may serve as examples of symbolic domestication or lack of such. As we can see, the heritage aspect of living in a cultural heritage building was not symbolically domesticated as part of the residents' identities or self-presentations. Although the board put a lot of effort into making the window renovation in line with the guidelines for cultural heritage buildings, the residents did not have a special interest in these aspects. On the other hand, when it came to sustainability and energy efficiency, these issues were symbolically domesticated into "green" meanings and values of the residents. At a practical level, however, the cultural heritage buildings constrained their domestication of sustainability. How did the residents describe the processes of learning concerning energy efficiency and climate adaptation in connection to their historical living environment?

3.4 Cognitive domestication: what to do?

The focus groups demonstrate that the residents were familiar with energy efficiency and upgrading measures in general (the type of information that Enova communicates), but they

did not know what to do with cultural heritage buildings in particular. The residents experienced the protection clause as a barrier towards renovation, and this resulted in less climate adaptation and energy efficiency efforts than potentially possible:

That is the problem; applying for permission to change the existing windows, costs that I had not invested in. Then there is everything else around. I don't bother because it's too much. I rather live with wearing wool socks than taking the entire process with the Cultural Heritage Management Office.

As we can see, there was a lack of cognitive domestication of information on how to renovate cultural heritage buildings. An example is the limited knowledge that the residents had about what to do with the moisture problems that continued to degrade the building. Furthermore, they found the available information confusing and lacked cognitive insights on how to act. Clearly, the cognitive domestication process of these issues was hampered by the feeling of powerlessness among the residents, who felt frustrated when dealing with the public authorities. Although the chairperson in the board of the buildings actually represented special competence on housing and the real estate market, they had trouble domesticating these issues cognitively. The process of dealing with different public authorities and navigating through their jungle of advices was perceived as difficult. Do these perspectives talk together at all?

3.5 Communication challenges and mixed messages between the perspectives

Through media, Norwegians get the impression that energy efficiency is important regardless of cultural heritage status or building age. Our case study shows that this leads to confusion and insecurity among residents, when they are made aware of the meaning of the heritage status. The residents are to try to find information themselves on how to renovate and make their building sustainable and establish contact with the city cultural heritage authorities. There is a risk that the mixed messages concerning sustainability (that do not consider heritage status) leave the residents incapable of action, which again leads to building degradation. In our case study, the residents experienced the process as difficult to handle, although the chairperson of their board happened to be a legal practitioner, specialized in property rights. Despite this relevant background, the chairperson found it challenging to reveal the opportunities and regulations of the building. Without this competence in the board, the apartment building would probably continue the degradation process, as is the case for many of the neighboring blocks with similar heritage status. Accordingly, this study reveals severe communication challenges between the public authorities' and the residents' perspectives, creating risks for degradation of historical buildings instead of sustainability.

4. Conclusions

This paper gives insights into domestication processes of sustainability and cultural heritage from a user perspective. As we have seen, the residents developed specific practices or behavior to cope with the moisture problems and the cold drafts from the windows in their cultural heritage building. Further, there was a lack of symbolic domestication of cultural heritage. The residents lived in the area because of the central localization, and they had not chosen their apartment because of the cultural heritage status. However, issues concerning sustainability were symbolically domesticated by the residents to a higher degree; an environmentally friendly lifestyle seemed to be important to their self-presentation. On a cognitive (and practical) level, the residents experienced the protection clause as a barrier against renovation, making everyday life less comfortable and

convenient for the residents. There was a lack of knowledge, and therefore a lack of cognitive domestication on how to renovate a future-resilient building.

As we have seen, the public authorities represented different perspectives on sustainability and cultural heritage. These perspectives were communicated separately based on the involved actors' specific agenda and communication strategies, and they were not co-produced to reach out to the public as an effort to give them guidance according to their domestic setting and cultural context. As a result, the residents' domestication or sense-making processes concerning sustainability and cultural heritage were experienced as more complicated and confusing for the users than necessary. The residents found it difficult to navigate in this area of concern: how could they make sense of these issues within their own cultural framework? Obviously, making cultural heritage buildings resilient for climate change should not be left alone as a responsibility for residents. How can public authorities help residents in a better way to make their cultural heritage buildings sustainable for the future?

Our case study analysis demonstrates the need for more outreaching communication between the actors involved. The mixed messages from public authorities and the complexity of different actors representing different interests (energy efficiency and cultural heritage) create barriers for sustainability measures in cultural heritage buildings. Apparently, better cooperation between the energy efficiency authorities and the cultural heritage authorities could result in easier access to information and less confusing advices for the residents. We suggest that the energy efficiency authorities should be more dedicated to advising applicants if discovering a cultural heritage protection clause on a building. Their counseling service could also include advices for cultural heritage buildings, and they should especially not under communicate these matters. An alternative is to clearly direct these queries to the cultural heritage authorities. Either way, information strategies from the energy efficiency authorities to the public should point to the fact that cultural heritage buildings are to be treated in different ways than buildings from 1950 and up. Many of these renovation measures are relevant not only for heritage buildings but also for old buildings that easily get moisture problems with extra insulation.

The findings indicate that the resilience of cultural heritage buildings is too dependent on the owners, and that there is no systematics in providing information to owners about their buildings' heritage status. Such providing of information is random and devolves only on the owners who themselves are interested in seeking such information. To improve the resilience and sustainability of the buildings, the information on heritage status and the barriers and opportunities that come with it must be provided systematically. Examples of simple measures to secure the information dissemination on heritage status are physical labeling of the buildings (plaque) to indicate status of protection and information from the real estate agents to inform buyers and heritage authorities about transfer of property. When supplying free counseling services, Enova's representatives should request information on a buildings' heritage status and forward the questions to the heritage authorities. The information given from the heritage authorities must be more tangible to help residents struggling with old windows, cold drafts, moisture and other technical challenges.

One of the desired outputs of the CulClim research project is to form a set of guidelines that the energy efficiency authorities can use when giving advice to upgrading projects of cultural heritage buildings in a Scandinavian climate, both listed and formally protected. This user guide will answer questions concerning both processes and technical measures. Even if residents or owners of historical buildings do not reach the energy efficiency goals of the energy authorities, it will ensure the

adaptability and make the building stock more sustainable in both increasing the energy efficiency and prolonging the lifetime. This will:

- safeguard that measures are performed in line with the necessary conservation considerations;
- increase the building quality and comfort; and
- encompass the cultural heritage valuable buildings in the grantees.

Further research should include testing different information strategies on renovation and climate adaptation for residents in heritage buildings. This type of information on technical measures will also be relevant for residents living in older blocks of flats in general.

Note

1. CulClim: a research project on climate mitigation and adaptation of heritage buildings from a user perspective. It was financed by the Norwegian research council, conducted by SINTEF Building and Infrastructure and Norwegian institute for cultural heritage research 2014-2017.

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Corresponding author

Åsne Lund Godbolt can be contacted at: asne.godbolt@cappelendamm.no