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Making a home out of a temporary dwelling: a literature review and building transformation case studies

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ABSTRACT

Temporary transformations of vacant buildings could alleviate the shortage of housing for urgent home seekers. However, not much is known about the transformation of buildings into temporary, adequate, and affordable housing. A multidisciplinary literature review covering design, indoor environmental quality, housing, and environmental psychology, was performed to determine if such an integrative approach could shed light on a new perspective to provide housing for 'urgent home seekers'. Subsequently, building transformation case studies were compared with the literature review findings. It is concluded that there is a gap in knowledge on how the concept of 'home' can be added to existing regulations in order to design and realise temporary housing that fits the needs of urgent home seekers.

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KEYWORDS
Indoor environmental quality; occupant comfort; environment and behaviour; adaptability

Introduction

In the last decade, on the one hand the need for affordable housing for urgent home seekers is increasing increasingly problematic, while on the other hand the number of vacant office, industrial, other public buildings, like schools and churches is increasing. These vacant buildings could serve as a short-term housing solution before transformations for the long-term are realised, which could reduce the pressure on the market in the near future for the ones most in need.

Currently in the Netherlands, the group of 'urgent seekers' consists mostly of refugees, students, starter-home seekers, and people leaving care institutions. Policymakers more and more consider temporary housing in transformed buildings as a solution for this urgent needs. The knowledge about the needs of the different groups of urgent seekers is limited. Students probably have other needs than refugees and people leaving care institutions.

Living in their dwelling is for people not only a purely functional thing that is being optimised, but is also something meaningful (Ellsworth-Krebs, Reid, and Hunter 2015). The fact that the notion of 'home' involves emotions and hence meaning to the occupant, makes the difference between the word 'home' and 'house'. Temporary homes are often unsuitable to be personalised because their temporary nature (Brun and Fábos 2015).

It is necessary to better understand if and how those temporarily transformed buildings can function as a home. Therefore, the aim of this paper is to answer the following two questions:

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(1) What can be learned from the literature that can benefit the design temporary housing: housing policies, indoor environment, and environmental psychology.
(2) How does the transformation of vacant buildings work in practice in the Netherlands: an preliminary exploration of some case?

Methods

Literature review

A literature review of studies performed in four disciplines (housing, architecture, indoor environmental quality, and environmental psychology) was performed. Governmental and non-profit strategic policy documents were considered reviewed for policies, demographic projections, and statistics about the housing market. Books were also included, when found relevant for peer-reviewed journal articles, Google scholar, Web of science, and Scopus were used. Keywords applied for the different disciplines are presented in Figure 1.

Case studies

In addition to the literature review, case studies were conducted for better understanding today's building transformation practice in the Netherlands of vacant buildings into temporary dwellings. A total of eight buildings were selected from a governmental website on transformation projects as well as an Internet search. The buildings varied in type user, in length of stay, in original function of the building, and in location. All visits were guided by an expert in transformation or the visited building's daily manager.

Before each visit, information about the building was gathered (floorplans, design intention, financing, etc.) and three topics from the building transformation literature were further investigated during the tour:

1. Bringing together the stakeholders before the start of the project.
2. Determining the function of the building and the direct environment in relation to the intended users.
3. Situation-specific factors and design requirements.

After each visit, the main points from the tour were written down and documented with pictures of the building.

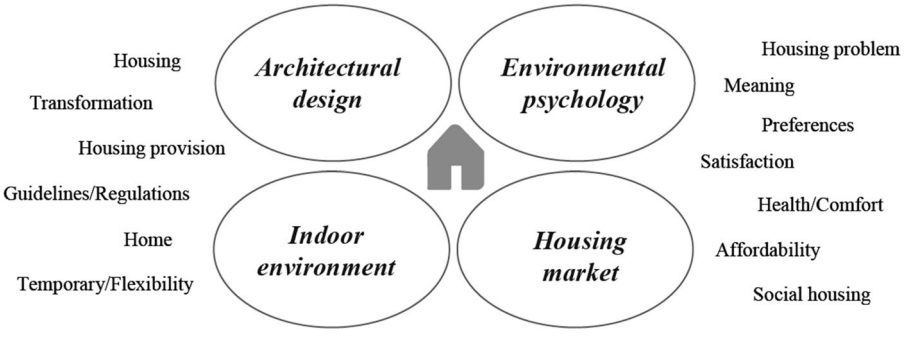

Figure 1. Keywords for the different disciplines.

Literature review

Policy and population for affordable housing

Brief history of affordable housing

A common theme in the literature since 1893 is that housing for disadvantaged groups tends to be below standards or unavailable, and tends to be in need of improvements (Marshall 1893; Aronovici 1914; Wood 1934; Cooper Marcus, Sarkissian et al. 1986; Jacobs, Kemeny, and Manzi 2003; Ball 2016). Due to a low quality living environment, health effects have changed for residents in the last century from tuberculosis, diphtheria, typhoid, and scarlet fever in the early twentieth century (Gould 1900) to respiratory infections, cardiovascular diseases, and mental health problems in the early twenty-first. (Bluyssen 2009).

Before governments became responsible for providing affordable housing, it was done by non-profit organisations with charity-raised funds, as well as by employers who were concerned about the living conditions of their employees (Gould 1900; Wood 1934). Aronovici (1914) proposed that the affordable housing problem lied in economic aspects and that limiting the rent leads to less investment and thus to lower quality of dwellings. The reason why governments got involved in housing provision was because of health concerns of the population: improved housing conditions improved the health of its residents and hence created more productive employees (Beekers 2012).

In the United States and Europe, to provide better quality housing, the slums were demolished and housing units were built in areas away from the demolition site elsewhere, so as to comply with the regulations of that time (Reynolds 1893). The effectiveness of such slum removal was calculated in profit from selling land and the replacement of housing, and in decreasing numbers of death and people with diseases (Reynolds 1893).

After World War II, social housing played a key role in solving housing shortages in many European countries. Gradually social housing developed into part of welfare states and social housing provides played a key role in the provision of affordable housing for vulnerable groups. Since the nineteen nineties, social housing became more marketised and privatised (Scanlon, Fernandez Arrigoitia et al. 2015).

Current policies in the Netherlands

The housing market in the Netherlands can be divided into an owner-occupied and rental market. The rental market can be divided into social and private renting. The Netherlands stands out with a large social rental sector available for lower, middle, and even higher income groups. The Housing Act 2015 was created to have stricter rules of housing allocation, investment, and supervision for housing associations (Rijksoverheid 2015).With the Housing Act, housing associations are obliged to allocate at least 90% of their total stock to people with an income of below € 40,349; as of 2017 (Haffner, van der Veen, and Bounjouh 2014; Rijksoverheid 2017). Similarly, there exists a tax to be paid by housing associations owning more than ten housing units. To stimulate the housing provision, the tax is reduced when associations invest in building transformations or demolition of poor quality housing in areas with a declining population (Rijksoverheid 2016).

In 2008 after successful lobbying, an addition to the law was accepted: which specifies that students can be offered a temporary rental contract, and vacant buildings can be rented out for a maximum of 10 years (this was originally 5 years) (Andrews, Caldera Sanchez, and Johansson 2011; Haffner, van der Veen, and Bounjouh 2014). The recently approved form of temporary rental contracts is expected to open up a flexible rental market and to decrease the pressure on the housing market.

Nevertheless, for owners, possibilities of changing the function of the building are limited and often considered financially unattractive, discouraging them from making the building temporarily available (Harmsen 2008; van der Velden, Tiggeloven, and Wassenberg 2016).

Need for new solutions

For people who are starting on the housing market (students, graduates, settled asylum seekers, young single people, couples, divorcees, and people who lived previously in assisted living or institutions, or who experienced a change in household composition) the need for housing is usually more urgent. This group, called the 'urgent home seekers' (spoedzoekers), has the most difficulty finding an adequate place to live because of the highly demanded Dutch housing market.

Several factors have been identified that hinder the access of vulnerable and immigrant groups to adequate housing: a lack of temporary and permanent housing in appealing areas, empty unprosperous areas, difficulties to maintain and improve building standards, vulnerable people on waiting lists, discrimination and anti-immigrant sentiment, an information gap, and a lack of administrative capacity to allocate housing, budgetary issues, and political issues (Europe 2015).

Types of temporary housing solutions for the influx of refugees in 2014–2015 were tent camps, occupy empty churches, schools, prisons, hotels, vacation homes, or transformed containers, and other prefab structures. However, this was intended to be short-term: for a maximum of a few months, until better and permanent housing could be found (IFHP 2015). The temporary transformation of buildings in the Netherlands for a maximum of ten years was originally meant to solve the shortage of housing exclusively for legal refugees, however, other types of urgent house seekers were allowed to be housed (Ministry 2016).

In the previous paragraphs, it has been presented how the housing market evolved to a market with less governmental intervention and more free market policies. However, currently, the market and social housing providers do not provide enough adequate housing for all seekers. Transforming vacant buildings into temporary housing is presented as a type of solution for the current housing problem.

Building transformation and indoor environmental regulations

Housing regulations in practice

Standards and regulations have been updated regularly, specifying characteristics such as the minimum amount of surface area, to ventilation rates, or daylight access percentages (Reynolds 1893; Coad 2006; Neufert, Neufert et al. 2012; Ton et al. 2014).

An example of social housing meeting the new quality standards is Pruitt-Igoe in St. Louis, Missouri, U.S.A. This project representing 'modernism' in housing consisted of 33 buildings of single loaded corridor apartments. The construction ended in 1955 to replace the inner city slums of St. Louis. Since the buildings were in a bad state and criminality rised, demolition of the entire project started only 18 years after construction. Because of its size, the project received a lot of attention as to why it failed, and it was named the 'Death of Modernism' (Jencks 1977). Examples similar to Pruitt-Igoe are common: single load corridor apartments were demolished prematurely for similar reasons, for example, 'De Bijlmer' in the Netherlands (Bijlmermuseum 2016). On of the reasons for the failure of such buildings is assumed to be the displacement of families breaking the existing social cohesion and the lack of maintenance of the new building (Newman 1973; Sommer 1974). Therefore, the social and psychological effects of housing and neighbourhood lay-out seem to be more easily overlooked when affordable housing is urgently needed.

Housing quality and knowledge on indoor environmental quality

From a design point of view, several guidelines are available for adequate quality housing, such as minimum sizes for spaces (Neufert, Neufert et al. 2012), the 'Pattern Language' (Alexander, Ishikawa et al. 1977), and site design guidelines for medium density housing (Cooper Marcus, Sarkissian et al. 1986). These guidelines generally do not take into account indoor environmental quality aspects.

Over the years, building regulations have been created in response to low-quality housing, and along with such regulations, research has been carried out of the effects of indoor environment

quality on health and wellbeing, frequently in combination with the type of housing (Appold and Yuen 2007; Lee, Cho et al. 2012). In the research, usually four iEQ factors are investigated to have an effect on health: air, lighting, acoustical, and thermal quality (Bluyssen 2009). Besides the iEQ factors, other factors that have an effect on health and wellbeing are (Bluyssen 2014): personal factors (family status, education, habits, etc.), physical factors of the environment (lay-out), physiological and psychological factors (mood, crowding) (Evans, Schroeder, and Lepore 1996), and privacy (Altman 1976)). Such a variety of factors makes the development of guidelines for the indoor environmental quality complex.

Additionally, occupants generally do not realise that certain health symptoms have a relation to exposure to certain conditions (Bluyssen 2009). Poor indoor air quality can have an effect on health: depending on sources of air pollution (e.g. people and activities, materials, appliances, and outdoor sources), exposure can result in respiratory problems, dizziness, headaches, tiredness, or an increased risk of cancer (Vardoulakis et al. 2015; Bluyssen, Ortiz, and Roda 2016). Appropriate lighting is said to reduce stress, to improve mood and quality of sleep, and to increase productivity and alertness at work when there is enough light at the right moment (van Bommel 2006). A constant exposure to 'unwanted' sounds has proven to increase stress levels and thus the risk of cardiovascular diseases, obesity, and depression (Evans, Hygge, and Bullinger 1995). Finally, thermal comfort is influenced by the design of a building, the use of construction materials, heating, ventilation, and cooling possibilities, the people and the activities they perform (Nicol and Humphreys 2002).

Considerations for building transformations

Transforming existing vacant buildings into housing can be faster than building new dwellings – without considering factors such as permits that need be requested – and more sustainable because the materials are used for a longer time. Transformation can be temporary, where the 'old' function is changed into housing for a maximum of 10 years (Haffner, van der Veen, and Bounjouh 2014)). Regulations and safety standards are not as the same for buildings transformed for temporary housing as they are for newly built buildings or for buildings that are permanently transformed (Ton et al. 2014). Buildings meant for temporary housing require a different business model than other types of transformations because profits are calculated based on transformation costs, future occupancy, and type of dwelling (Geraedts and Van der Voort 2003; Harmsen 2008; van Dijk, Gelinck, and van Zeeland 2010). With changing occupancy levels and demands for types of dwellings, it is more difficult to predict profits; thus it represents a high risk investment.

Most of the knowledge available on building transformation comes from the transformation of vacant offices, representing the majority of the transformed buildings into housing. For a successful conversion of office buildings, the most important building characteristics that have been put forward are: depth and height; size; structure; envelope and cladding; internal space; lay-out and access; services; acoustical separation; and fire safety and means of escape.

Depth and height determine the total surface of the building but also the amount of daylight that penetrates the building and options for natural ventilation. Total size is important because buildings that are larger than 10,000 m^2 usually create density problems in the neighbourhood, for parking but also other amenities. The amount of floors attracts different users where higher buildings often do not have appropriate internal access routes for the elderly or families with young children.

Other important features are location site, character (city, safety, and greenery), the distance to and quality of services in the area (such as shops, supermarkets, and leisure), and accessibility to public transport and cars and parking seem important (Gann and Barlow 1996; Geraedts and Van der Voort 2003; Remøy and van der Voordt 2014). Such considerations are technology oriented; however, it seems, unclear from the literature how existing buildings can be transformed while taking into account both the technology and the subjective perspective of the resident.

Meaning and effect of the home environment on the users

Meanings of home

Qualitative research on the meaning of home has resulted in a list of meanings that are attributed to the dwelling, beyond the idea that the purpose of the house lies in providing its residents shelter and access to resources (Rapoport 1969; Bachelard 1994). These meanings are among others: Attachment and identity, social rules, affordances, happiness, belonging, responsibility, self-expression, critical experiences, permanence, privacy, time, meaningful places, knowledge, the desire to return, quality of relationships, friends and entertainment, emotional environment, development of self-identity, security, continuity, ownership, personal space, aspirations and goals, personal values, domestic spaces and objects, personal preferences, appropriation, affluence, secrecy, control, centre of activities, and an indicator of personal status (Korosec-Serfaty 1984; Smith 1984; Altman, Werner, and Oxley 1985; Sixsmith 1986; Lawrence 1987; Despres 1991).

Dovey has suggested that in order to improve housing quality and the feeling of home, temporal processes should be included in the design guidelines. It has been suggested by Dovey (1985) to better include the meanings of home in housing design.

Effects of the home environment on the users

Poor building quality, caused by deteriorated materials and construction, could lead to a poor indoor environmental quality and contribute to ill-health, social stigma, and difficulties in social mobility (Evans, Wells, and Moch 2003; Jackson 2003; Cattaneo et al. 2009).

It has been found that the quality of the living environment is correlated to happiness, and happiness in its turn strengthens the immune system (Veenhoven 2008). Another study found that in a deprived neighbourhood, people experience poorer health, which could not be fully explained by socio-economic status or housing quality (Poortinga, Dunstan, and Fone 2008). This shows that there is more to the house than the quality of the building alone.

As far as location is concerned, greenery with walking and cycling paths is appreciated by the residents. This allows more physical activity among people in the neighbourhood, which in it turns improves health (Jackson 2003). Another effect of visible green areas sis that is its stress-reducing properties (Kaplan 1995). The presence of favourite places in the vicinity has a similar stress-reducing effect (Korpela and Hartig 1996). Being further away from playing areas for households with children and the presence of more noise in dense areas is considered to be less satisfactory (Evans, Wells, and Moch 2003).

Smaller house encourages the feeling of security. Regulating privacy is easier in a house with more rooms, and social interaction is more likely to happen in spaces with curved walls (Keeley and Edney 1983). For earthquake evacuees, houses that looked like a 'house' reduced levels of stress and depression more than houses that looked like containers (Caia, Ventimiglia, and Maass 2010). In a study among first-year students, their decorating behaviours were related to their commitment to stay (Hansen and Altman 1976).

Having control over one's environment contributes to a sense of home (Sixsmith 1986) but also to wellbeing (Evans, Wells, and Moch 2003), and a lack of control has been found to be one of the causes of the Sick Building Syndrome (Burge 2004). Owning a dwelling instead of renting one also makes residents more satisfied with their housing situation, regardless of housing quality, costs, or household type (Elsinga and Hoekstra 2005); thus, home ownership is generally the ideal situation for health and wellbeing (Michelson 1977; Elsinga and Hoekstra 2005; Hegedus, Horvath et al. 2015).

Assessing the housing needs of occupants

Currently, there are two ways of figuring out housing needs: housing needs research, where respondents are usually asked in a survey to indicate preferences for various options (known in the Netherlands as 'woonwensen onderzoek') and inspection of the databases of real estate agents and social

housing providers. Depending on the research focus, research into housing needs can shed light on people's choices or preferences.

In housing needs research, combinations of data from values, behaviour, socio-economics, and socio-demographics are used because they have been found to be effective in predicting preferred housing type. Demographics is necessary because the type of household generally requires different spaces and locations, while income determines the available options (Jansen 2011). However, the available options that are based on the household type and income do not predict what the preferences of end-users are. Choices depend not only on what is possible, but also on what is preferred by end-users (Jansen, Coolen, and Goetgeluk 2011). Preferences relate to trade-offs and features of the house, like size, price, location, and style. Housing preferences are usually measured with a survey or by looking at patterns of people moving house (Michelson 1977; Williamson 1981; Jansen 2011; Ouwehand and Doff 2011).

Current research on housing needs focuses on physical features of the dwelling and household characteristics. The two types of existing research, the research into meanings attributed to the home and the research into effects of the home environment on the occupants' health are available but not always used to support each other. Combining the two types of knowledge could simplify the process of matching housing user groups.

Case studies of transformed buildings

To create a better understanding of the transformation of vacant buildings into temporary housing, a variety of cases was explored. Figure 2 demonstrates the variation in the type of users and type of building.

Description of the case studies

In total eight case studies were visited:

1. Strijp S: The process was initiated by the owner of the area, who made the final plan in cooperation with the municipality of Eindhoven. Because the municipality was involved, the transformation of the area was part of a larger urban plan for the city, which was very flexible in nature, which made it possible to adjust the plan to the current market situation (smaller dwellings, slower development).
2. ACTA – Go West: The former dental science building from Amsterdam University was bought by an association that wanted to demolish the building as part of a larger redevelopment project. Because the demolition was postponed, the building was partly transformed into workplaces

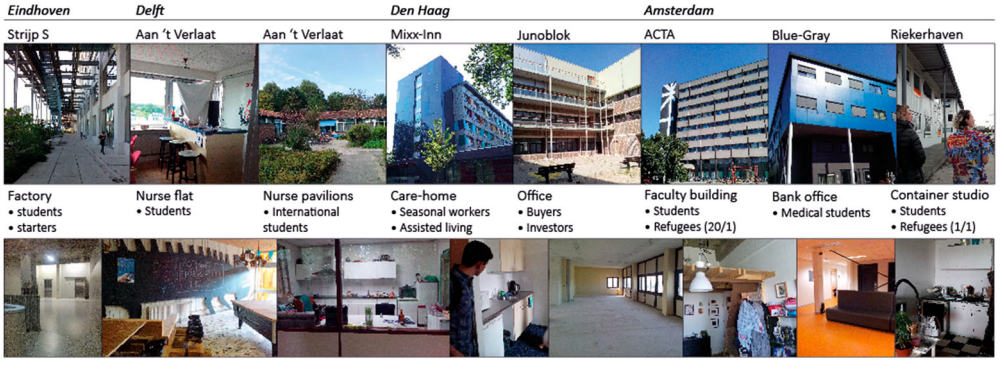

Figure 2. Summary of case studies.

(ground and first floor) and affordable housing units for students. The creative use of the two lowest floors is supposed to integrate the building into the existing social context, creating a more livelier atmosphere in the neighbourhood and providing an affordable platform for artists.

3. BLUE-Gray: This building was used as a temporary office building for a bank. Its proximity to the medical centres of two educational institutions, while being situated in a zone planned for redevelopment, combined with high demand for medical student housing, made it relatively simple to acquire the building from the bank and to acquire the necessary permit needed by the owner.
4. SHS aan 't Verlaat: Students from Delft University of Technology, Netherlands started the initiative after experiencing the urgent need for student housing in Delft and the high vacancy rates of mostly office buildings. The students were searching for a vacant property and contacted the owner of the building that used to function as housing for nurses. The owner was open to the idea of temporary transformation for a maximum of 10 years. Before the transformation, the building had been empty for 10 years.
5. Aan 't Verlaat pav: Another building right next to the previous one, 'the pavilions' were also transformed shortly after the first transformation of the first building was finished, because it proved to be successful.
6. Mixx-Inn: The owner and housing association decided to transform the building because it did not function adequately as an elderly people's home. After changing the user group to young adults and starters, it took some time to find stakeholders. After transformation, the housing market had collapsed. The user group today is different from the intended one, but the building was transformed in such a way that the apartments can be combined with each other and are suitable for different user groups.
7. Junoblok: This office building was owned by the municipality. Because of the low demand for office spaces, a plan was made to redevelop it. The building would only be transformed into apartments intended for ownership. Transformation and sell occurred faster than planned. The business model was intended for tenants to buy units and combine them according to their needs by finishing the interior, which would save time and costs to the project developer.
8. Riekerhaven: This residential complex consists of containers that were first used elsewhere in Amsterdam, but had to be relocated because the original area would be permanently redeveloped. With the municipality, the complex's current location was decided to be around sports fields, while it was also decided that 50% of its future residents would have to be students, and the other 50% had to be male settled asylum seekers aged 18–27 years old. The tenants are residing alternately between students and asylum seekers. The rental contracts all have a maximum of five years.

More information on the case studies is presented in Appendix.

Some findings of the eight cases

The eight cases demonstrate similarities. Firstly, the decision to transform the building: all eight transformations took place in buildings that had been empty for more than two years. Moreover, the decision-makers had to be in influential positions in the organisation to overcome the obstacles.

Secondly, there are similarities in the technical requirements for the transformations: all eight buildings needed replacement of piping and installations to achieve the required quality level, and to make the spaces appropriate for living instead of working; every living space needed its own heat and ventilation controls, which previously only existed per floor.

There were also differences: the quality level of the transformation appeared to depend on the amount of time the building was planned to function as housing: the longer, the higher the quality. Moreover, the location was a key factor: the more attractive the location, the higher the expectations for return on investment were, and the higher the ambitions.

The perceived risks where seen not only in the magnitude of the transformation but also in the prospective user groups. Students tend to be seen as unconcerned about their dwelling. This view was an argument used by decision-makers to use cheap and low quality furniture and materials, and to prohibit users from making certain changes in the rooms. Factors that were taken into account for the decision about the degree to which the future tenants could make changes were the quality of the building after the transformation and the period of use.

Conclusions and future directions

Since the crisis in 2008, transformation projects started to appear more regularly because of the large number of vacant buildings. As of 2018, the real estate market is recovering, however, it is not known if the previously seen increase in vacant buildings will continue. The demand for housing for starters, students, and settled refugees is not likely to decline, while the Housing Act reduces the supply of affordable social rental dwellings. To summarise, the transformation of vacant buildings into temporary housing for urgent home seekers is proposed as a solution by policy makers; however, this solution is outside the scope of classic regulation of adequate housing in the Netherlands.

Historically, indoor environmental quality has been based on measurable parameters, but it is that a healthy and comfortable indoor environment is more than such parameters. Including the concept of 'home' into regulations or guidelines for building quality and services is necessary. 'Home' guidelines for temporary housing in transformed buildings could provide similar quality levels as for 'standard' housing. In psychological research, general meanings of home have been tried to be identified without concrete results. Objective connections between specific dwelling elements that contribute to the attribution of the meaning of 'home', and whether such 'meanings of home' are related to the indoor environment has not been found.

There are examples of housing designs of people living in poverty and refugees having been offer a supported self-built house instead of a prefabricated one. The problem in such cases is that the residents had no influence on the design of these houses. The home-making process tends to be overlooked and designers usually do not base their design solution on the users' needs.

There are differences between people and in what they hope to benefit by their home. However, even though meanings are attributed to the home, there has not been a research on the relative importance of these meanings for different people. Guidelines or regulations as to how to design 'good' homes do not address this issue beyond differences related to household composition. The need to continually interact with, engage with, and adjust the home while living in it, is not taken into account by the regulations nor by the design of the transformed buildings. It is essential to know what type of design is most suitable for whom and how to realise this in transformed buildings, to fulfil the needs of the urgent home seekers.

This review focused on the possibility of transforming vacant buildings into housing, and what regulations and information exist to provide affordable and adequate temporary housing. To transform vacant buildings into housing, one of the main factors is the location, where a better location means a better chance for return on investment. Consequently, this has an effect on the affordability of housing in central locations. Guidelines for transformation are based mostly on physical factors and assume that the transformation is permanent. Projects that are transformed for longer periods have a different quality level, and buildings that are in better locations and in a better state are more suitable to be sold. The type of transformation sets limits about the type of user and whether it is advisable for the building owner and future user to invest in the building, whether it be financially, socially, or psychologically.

Having control and being able to adjust one's home environment is import for the wellbeing of urgent home seekers. Control not only affects the psychological attachment of a resident to the place, but also his or her health, his or her appreciation to the dwelling, and the possibility to invest and move forward in society.

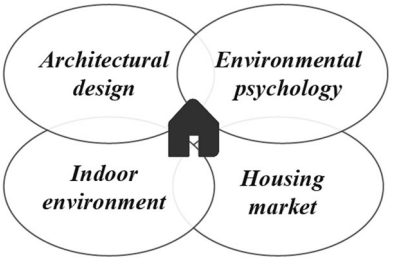

Figure 3. Combining the four disciplines to improve 'home' for urgent home seekers in (temporary) housing in transformed buildings. Housing: how is adequate housing embedded in policies? Indoor environment: what is healthy housing? Environmental psychology: what makes housing home? Architectural design: how can design support these requirements?

To transform buildings from a user perspective, combining the disciplines of environmental psychology, indoor environment, housing and architectural design can be helpful. Looking at the interactions between user and building instead of cost efficiency could result in new perspectives on what would function for the user. What designers and building owners think is necessary for the future resident, may not be. This synchronising the different expectations and needed from owners, designers, and users could result in other options that are not only ideal for all parties but also cost efficient.

One way to include the meanings of home in building guidelines, and specify them for different users, is with the use of a questionnaire on the relative importance of the meanings of home. The outcome can be compared with demographic variables and preferences for the indoor environment, which could make it possible to categorise the dwellers based on which meanings of home are important for them. This information can be used to identify which physical and non-physical elements contribute to those meanings, and how they could be included to design guidelines in addition to the current regulations. Homes that are designed from a user perspective have the potential of improving the residents' psychological and physical wellbeing, which can allow them to have an improved quality of life in other aspects of their lives (Figure 3).

Combining the disciplines of architectural design, indoor environment, environmental psychology, and housing enables identifying the housing needs of urgent home seekers. The next step is then to translate this knowledge into new design perspectives to solve housing shortages for urgent home seekers without the loss of quality or affordability for the users.

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Marja G. Elsinga holds the Chair Housing Institutions & Governance in Delft University of Technology since 2010. She is leading the research program Housing in a Changing Society in the Faculty of Architecture and the Built Environment and is visiting professor in the College of Architecture and Urban Planning in Tongji University in

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Mieke Oostra is a Professor Spatial Transformations at Hanze University of Applied Sciences in Groningen in 2012. Her research group is focusing on the transformations of the built environment and the construction industry necessary to materialise the ambitions towards energy neutrality and circular construction, with a special focus on the interests of end-users and clients. Mieke Oostra holds a master degree in Architecture and a doctorate both from the Delft University of Technology. In the past she consecutively worked for Slavenburg Construction, where she was responsible for embedding customer-centred innovations in the business processes, TNO (the Dutch equivalent of the German Frauenhofer Institute) were she worked as a building process innovation expert in the Energy and Comfort Systems department, and as a professor Innovative Technology in Construction at Saxion University.

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Appendix. Visits of the eight buildings

Design

The eight case studies showed a number of interesting design elements in relation to the lay-out, fit of floorplans, end-users wishes, and space (Figures A1–A8).

The lay-out of the rooms and hallways seems to be optimised economically, by maximising the amount of studios/rooms within the building regulations (which are often lower for transformed and temporary buildings (Ton et al. 2014)), for as little costs as possible (based on information from documents on the projects and talks with people involved).

Except for Mixx-Inn, the floorplans are all rectangles that fit within the original structure of offices or previous rooms and have no direct access to shared or private outside space (Figure A9). Most hallways and sometimes shared spaces like living rooms and kitchens are without daylight or windows. The hallways with front doors provide access to often around 18 or more studios or rooms, although it is known that less units are better for creating a sense of community, with the accompanying benefits of feeling secure and attached (Newman 1973).

When the residents would like to make any changes to the unit which is more than paint the walls in a neutral colour, they need to get permission from the housing association first, or it needs to be unmade when they move out (as is the case with most rental contracts). Sometimes the walls in the shared areas and rooms could be painted as desired, though usually only in the more temporary projects (ACTA, SHS).

Figure A10 shows the space syntax diagrams of three of the buildings. ACTA is low-cost student housing, Strijp S is for starters and is owned by a housing association, Blue-Gray is student housing planned for a longer period than ACTA (design made by the same architect as ACTA).

The transformed buildings do not, or barely, have private or shared outside spaces to use that are within easy reach of their room or studio, excluding some areas that are outside of the building and accessible for all residents.

The experience of the residents

During the visits, the experience of the occupants was not investigated. Sometimes the person giving the tour gave some (personal) information about experiences. In research on user experiences in other transformation projects in the Netherlands, three points were identified (Scholtens et al. 2015): (a) Residents of transformed buildings who bought their dwelling were more satisfied than renters, (b) costs, location, and waiting time were more important reasons to move to a transformed building than the fact that it was a transformed building, and (c) most complaints were about issues that cannot be controlled by the residents (noise from surroundings, thermal insulation, daylight access, and ease of opening windows/ventilation). A similar experience can be expected for the eight case studies visited for this paper.

The building transformations fit with the current trend of reuse and showing construction materials in buildings. It can also be said that it is sustainable because the materials used for the building will be used for longer, compared to demolition (Remøy, Haugen, and van der Voordt 2007). The service installations are updated to more energy efficient versions, and the building skin is sometimes insulated, reducing energy use compared to similar pre-transformation use.

Figure A1. Strijp S.

Figure A2. ACTA.

Figure A3. Blue-Gray.

Figure A4. Aan't Verlaat flat.

Figure A5. Aan't Verlaat paviljons.

Figure A6. Mixx-inn.

Figure A7. Junoblok.

Figure A8. Riekerhaven.

Figure A9. Floor plans Acta, Strijp S and Blue-Gray.

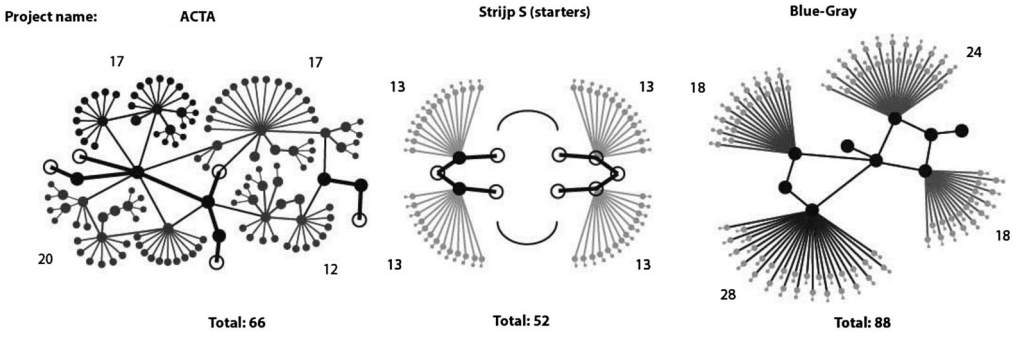

Figure A10. Space Syntax diagrams (number indicates total rooms/studio's).