

The Urban Book Series

Eugenio Arbizzani · Eliana Cangelli ·
Carola Clemente · Fabrizio Cumo ·
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Technological Imagination in the Green and Digital Transition

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Chapter 81

Design for Emergency: Inclusive Housing Solution



Francesca Giglio and Sara Sansotta

Abstract The paper describes a study on the growing emergency of homelessness, of which alarming data are estimated at national and European levels and which the Cohesion policies of the European Community are addressing. Thanks to the recent launch of the Collaboration Platform on Homelessness to stimulate dialog, improve data collection and monitoring and strengthen cooperation between all actors involved in the fight against the phenomenon. The emerging concept of ‘Design for Emergency’ highlights the historical link between temporary and emergency living regarding the welfare and health implications of the weak. The aim is twofold: to define a theoretical and design model that can be repeated, contributing on the one hand to a process of social reintegration for fragile realities and on the other to the circularity of construction processes and the recovery of resources and components, through innovative housing solutions, with characteristics of modularity, disassembly and dry connections. The results, deriving from a deductive scalar methodological approach, concern: (i) data collection is inherent to the issues addressed, the emergency conditions; (ii) a critical analysis of the data acquired and systematized; (iii) methodological and design experimentation. The research hopes for repeatable results in diverse marginal contexts, respecting the disparate needs not only of the users but of the place where the temporary installation will be needed. This is an aspect in which the intervention of the municipal administrations and all possible stakeholders involved is fundamental and which at the moment may represent a limitation, albeit a surmountable one of the research.

Keywords Cohesion policies · Design for emergency · Homelessness · Quality of life

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81.1 Introduction

Meeting human needs at sustainable levels of energy use is critical to avoiding catastrophic climate change and ensuring the well-being of all people (Vogel et al. 2021). While global trajectories are focused on responding to the environmental emergency through *decarbonization of global energy systems and reducing global energy use* (Grubler et al. 2018; IPCC 2018), social emergency strategies aim to ensure *the well-being and decrease inequalities among various population groups* (Ranmal et al. 2021), whose needs relate primarily to the issue of housing. Indeed, the relationship between health and housing is complex and influenced by many interrelated factors. The relationship between emergency conditions and housing responses is becoming more complex over the years due to the increase in the types of vulnerable groups that no longer only affect developing countries but constantly belong to the everyday emergency life of our urban centers (Kidd et al. 2021).

The social goals of the European Community, as set out in the challenges of the Green Deal, can also be interpreted through a new role for design as an opportunity to propose emerging innovations, even on a small scale, helpful in improving the quality of life and providing answers to the most disadvantaged. Therefore, the consequences of environmental and social emergencies regarding people's health are the background for extensive debates by the European community. The 20 principles of the European pillar on social rights aim at strategies whose goals are inclusiveness and well-being, especially toward population groups with fragility (Cantillon 2019). Responding to these needs through temporary housing models that contribute to giving new dignity to fragile segments of society is a debate that has been ongoing for many years and has led to many experiments.

As a backdrop to this scenario, the emerging concept of 'Design for Emergency' highlights and reinforces the historical link between temporary and emergency housing, in favor of quality of life. The paper proposes an intervention model aimed at the homeless through innovative housing solutions. It is intended to activate social and environmental processes, outlining a social reintegration activity and strategies contributing to the circularity of construction processes and the recovery of resources and components.

From the results of the systemic work of retrieval, classification and interpretation of the themes and case studies, the experimentation of a multifunctional urban micro-architecture was carried out in response to the housing demand of the same. The study also hopes for repeatable results in diverse marginal contexts, respecting the disparate needs of users and places and contributing to the integrated programs of municipal administrations through the involvement of all possible stakeholders.

81.2 The Homeless Condition Between Design for Emergency and Unpleasant Design

Billions of people worldwide are still deprived of basic needs, and current pathways to sufficient needs satisfaction seem to involve highly unsustainable levels of resource use (O'Neill et al. 2018). Carbon or environmental intensities, understood as measures of unsustainability, increase inequalities as an outcome of urbanization processes, showing asymmetrical relationships between 'developed' and 'less developed' countries (Greiner and McGee 2020).

For almost a decade, the 'European Observatory on Homelessness' has promoted the production of an increasing number of policy analyses on existing homelessness strategies in member states (Benjaminsen and Dyb 2008; Baptista 2009; Wygnańska 2009; Hansen 2010; Houard 2011; Hermans 2012; Sahlin 2015). The focus of the European Pillar on Social Rights is on the principles '16—Health care' and '19—Housing and assistance for the homeless' (Commission 2019). Regarding the latter, the European Commission and the European Federation of National Organizations (FEANTSA) signed and launched the *European Platform on Homelessness*. The Platform's launch is the beginning of a process to establish common understanding and commitment and ensure concrete progress in Member States' social cohesion policies in the fight against homelessness.

For the commitment to respond concretely to this emergency, the report 'Technological innovation for humanitarian aid and assistance' (EPRS 2019) highlights how technological innovations are recognized as being capable of playing a crucial role in addressing humanitarian challenges. Through human-centered solutions, shaped to provide users with shelter-related solutions and aimed at a broader social inclusion strategy, the ultimate goal is to improve the health of the most vulnerable. This contribution is part of this challenge that looks at an increasingly extended, varied, and hybrid emergency condition.

The focus on health and well-being for the weakest groups has been accentuated in some ways in the fight against the COVID-19 emergency, through the development of 'Design for Emergency', an initiative of the Centre for Design (CAMD) at Northeastern University (Boston, USA) as an open platform, created to gather the needs of different social groups and to respond through innovative solutions that connect, inform and support communities.

While, on the one hand, the community is engaged in designing projects and strategies that aim at the concepts of equity, inclusiveness, and welfare of the weak, on the other hand, urban planning seems to increase social stratification. This concept reinforces hierarchies and transforms the landscape into a battleground, blaming the disenfranchised, masquerading as design. In fact, for some years now, the trend of so-called *Hostile Architecture* or *Unpleasant Design* has been emerging, i.e., a particular urban design that, behind the apparent functionality or aesthetics, has an exact goal, namely to exercise a kind of social control over public space and discourage particular behavior considered 'anti-social' (Savičić and Savić 2013).

Hostile Architecture reveals itself on several levels, spreading compulsively in several ‘developed’ countries such as the United States, Europe and Italy included, identifying itself not as a product of accident or carelessness but as a thought process.

Savić and Savicic (2013) extensively discuss the reasons for these interventions, pointing out that the administrations most inclined to use this type of design are those of the richest and largest cities, which have to deal with a high number of people. Defensive urban interventions have the advantage of eliminating the need for surveillance and human intervention. Still, they actually solve some social problems by simply moving them elsewhere and trying to hide them, to make them invisible.

Finally, in addition to the political and social issues, one of the main problems with these interventions is that they are definitive: they do not allow for negotiation, limit activities and deny interactions.

81.3 Inclusive Housing Solution: A Research Path

The reflection, and thus the study, is translated as a (counter) proposal to the model of Hostile Architecture and in line with ‘Design for Emergency’, with a long-term research goal as that of resolving the distance between a state of affairs and a series of contemporary pressures of use that tend to define public spaces in cities in an impulsive manner. This strategy aims to connect shelter environments and common areas without feeling the need to classify spaces but to define them by collective social use. The experimental project (Fig. 81.1), Structured on a theoretical intervention model, was based on research conducted by the authors at the Department Architecture and Territory, Mediterranean University of Reggio Calabria. In its twofold morphological configuration, the experimentation is intended to represent a strategy, through human-centered processes, oriented at developing intervention models that can fit harmoniously into the social inclusion projects of public administrations. This, through a structured planning process, so that the location of the shelters is strategic for social re-inclusion aimed at improving the quality of life of the homeless through a technological system that combines dual functions.

The innovative aspect of the proposal does not lie in the use of ‘new’ materials and technologies but in the promotion of a more feasible social inclusion between homeless municipalities and citizens by identifying useful solutions to address health inequalities related to housing. The research path was articulated following a deductive, systematic and scalar methodological process, structuring a thematic frame of reference, moving from the definition of the macro-theme of ‘Design for Emergency’ to the construction of the variables that define an emergency condition through which to respond effectively and rapidly to it. For this phase, a theoretical reference model was developed for the social inclusion and innovation of vulnerable groups, the homeless. Specifically, the research is structured in three phases:

- preparation of data on the issues addressed and emergency conditions, with case studies and types of intervention plans. European strategic approaches to social



Fig. 81.1 Experimental Project: Home or Shelter? A filter between man and word

inclusion of homeless people show an increasing tendency among member states, *‘to move toward the development of more comprehensive and integrated strategies or at least approaches’* and their monitoring;

- critical analysis of acquired and systematized data. The analysis of the case studies on the most common homeless shelters, together with the statistics (Figs. 81.2 and 81.3), led to a design reflection on the space and configuration of possible shelters, closely linked to the urban design of cities, as a theoretical assumption of reference for the research;
- methodological and design experimentation. The experimentation is presented as an opportunity for research activity, still in progress, whose first results have concerned the development of an urban micro-system, a micro-architecture developed as a transitional, multifunctional housing system, which in the nighttime

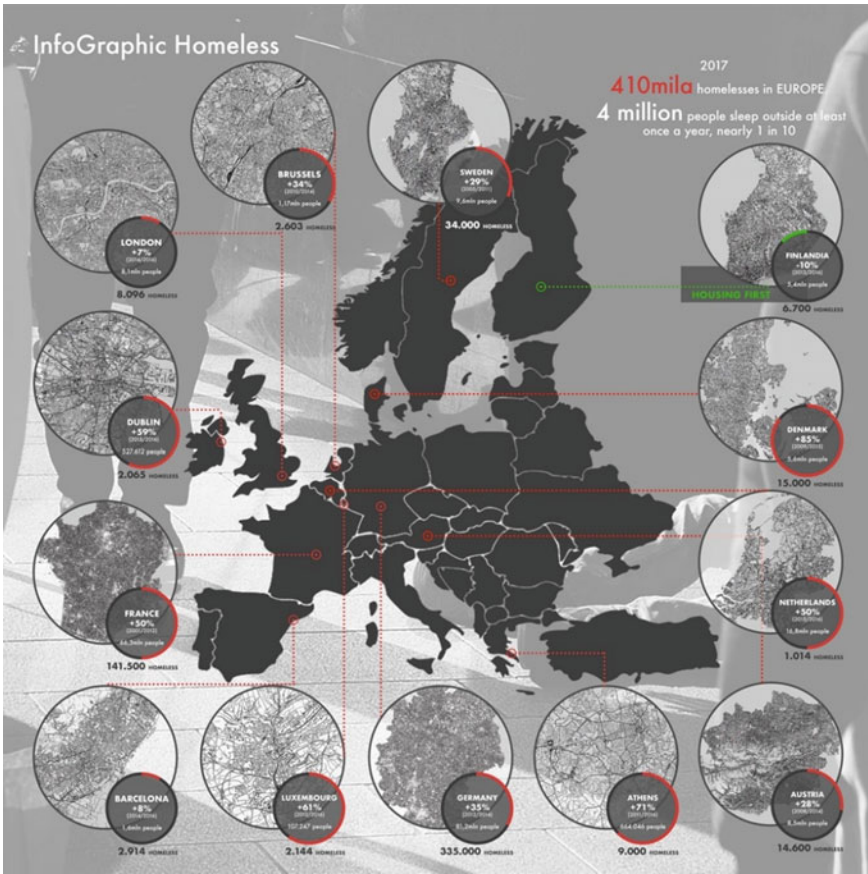


Fig. 81.2 InfoGraphic Statistics Homeless in Europe

configuration, the most critical, is configured as a shelter (specifically for homeless people) and in the daytime configuration, is configured as a system of shaded urban seating, supplemented by small micro-activities such as book sharing.

In this sense, the research aims to outline the close relationship between well-being and housing by setting up a technological system that can meet the basic needs of vulnerable groups and by being part of a real social inclusion plan. This is done through what is called *Housing Led*, i.e., those strategies that promote forms of residency combined with assistance and support services. The project has thus been translated as a theoretical foundation, proposing a way out of the superficiality with which forms and images without substance are habitually elaborated, with outcomes unrelated to the real issues of the housing emergency (Agnoletto 2008).

InfoGraphic Homeless

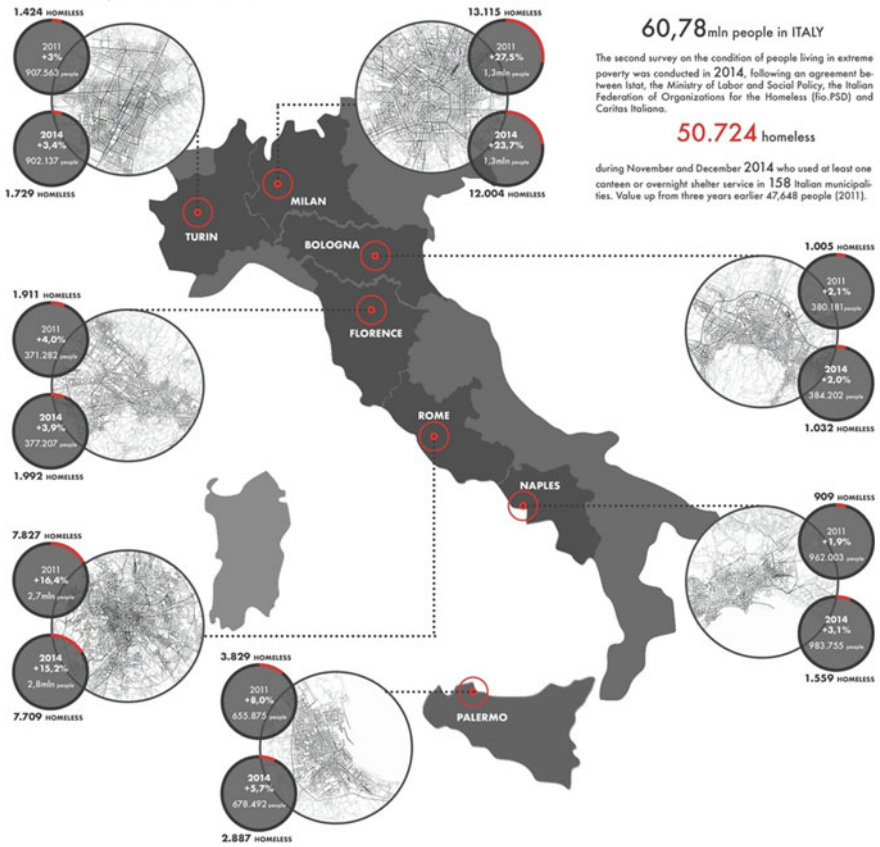


Fig. 81.3 InfoGraphic Statistics Homeless in Italy

81.4 The Design Experimentation

The composition of the shelter is based on a modular grid applied to the architectural and compositional concept of Japanese vernacular architecture, the tatami, and in particular to the tearoom (minimal living space), resulting in the ‘Tatami Shelter’.

The ‘Tatami Shelter’ shares Perriand’s (1949) observation that the constructive and compositional value of the Tatami lies in its ease of assembly and disassembly, and according to De Lucchi (2017), Japanese architecture refers to the micro dimension. He explains that it is an intrinsic characteristic of the Japanese; thanks to the Tatami, they can sleep on the table on which they eat and eat on the bed on which they sleep; it is natural to think that space is as compressed as possible.

The shelter consists of four and a half tatami mats (four equal modules and one half-module), each measuring 180×90 cm with an overall height of approximately 2.6 m, as in traditional Japanese culture, with a 45 cm cantilever (Antonini et al. 2020). In the daytime phase (Fig. 81.4), the cantilever serves as a seat for the users of public spaces. In the nighttime phase (Fig. 81.5), it serves as a container for the activities carried out by the homeless; finally, it is a technological solution as it prevents the rising humidity. By installing a track system that allows the movement of three components, the seats change their configuration to become a comfortable shelter.

The micro-architecture is designed through a glulam frame with a curtain of wood panels and compact polycarbonate to protect it from the weather. The roof is not reminiscent of the archetypal house but follows the principle of vertical closures, a glulam frame with a slatted plywood panel for shading, and compact polycarbonate.

The infill frames also act as sliding frames (Fig. 81.6). They are equipped with handles that facilitate the closing of the shelter and lock the modules themselves when they reach the preset configuration.

There are four main activities that a homeless person can carry out within its 7sqm space: *Access*, *Rest*, *Refreshment* and *Storage* (Fig. 81.7). Two steps, stored inside a module, can be dragged via a rail system to allow the homeless person to access

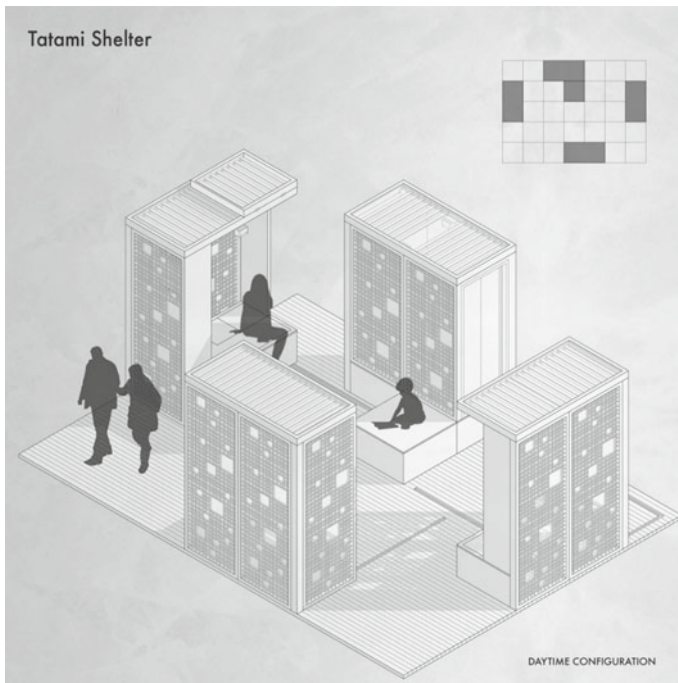


Fig. 81.4 Tatami Shelter—day time configuration

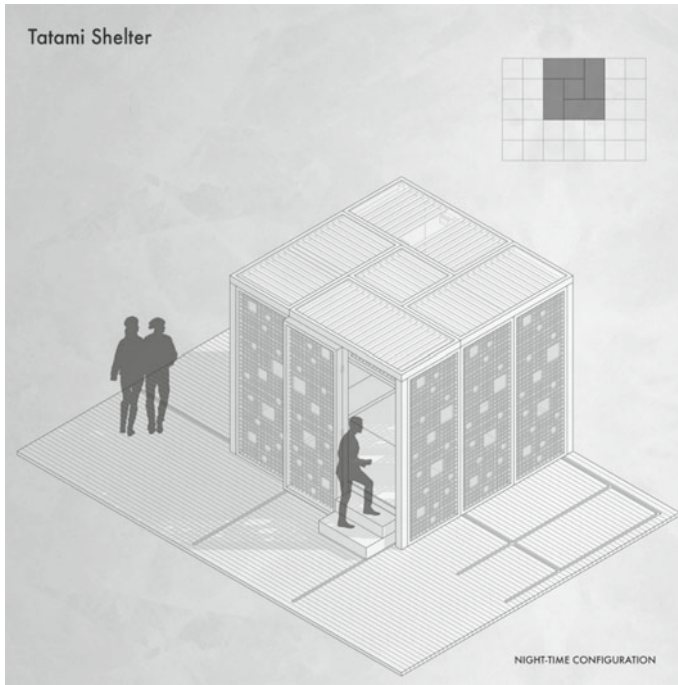


Fig. 81.5 Tatami Shelter—night time configuration

it. Refreshment is provided by a hydraulic piston underneath the 90×90 cm half-module, which can be raised to become a table; the chairs are obtained by tilting part of the tatami, reclining at 90° . Among the modules designed, the homeless person can store his personal belongings, thanks to the possibility of lifting them with a hinge system.

Finally, ‘Tatami Shelter’ is equipped with a special toilet module intended for the exclusive use of the homeless and equipped wall including a washbasin under which is a rotating toilet. The plant engineering part is off grid: water is collected from the roofs of the modules and stored on-site to reuse for the toilet.

In its double configuration, the urban micro-architecture assumes the location in public spaces equipped with drinking water useful for integrating the supply of the same, inserting itself within the renewable energy systems to which the urban areas in which it will be installed are predisposed, guaranteeing adequate standards of use.

Although to be considered a future development, the maintenance aspect is considered for the location of the project proposal of the integrated social cohesion plans. The use of the shelter finds the solution of cleaning and maintenance by the users, not only for the micro-architecture but also for the park where the shelter will be installed.

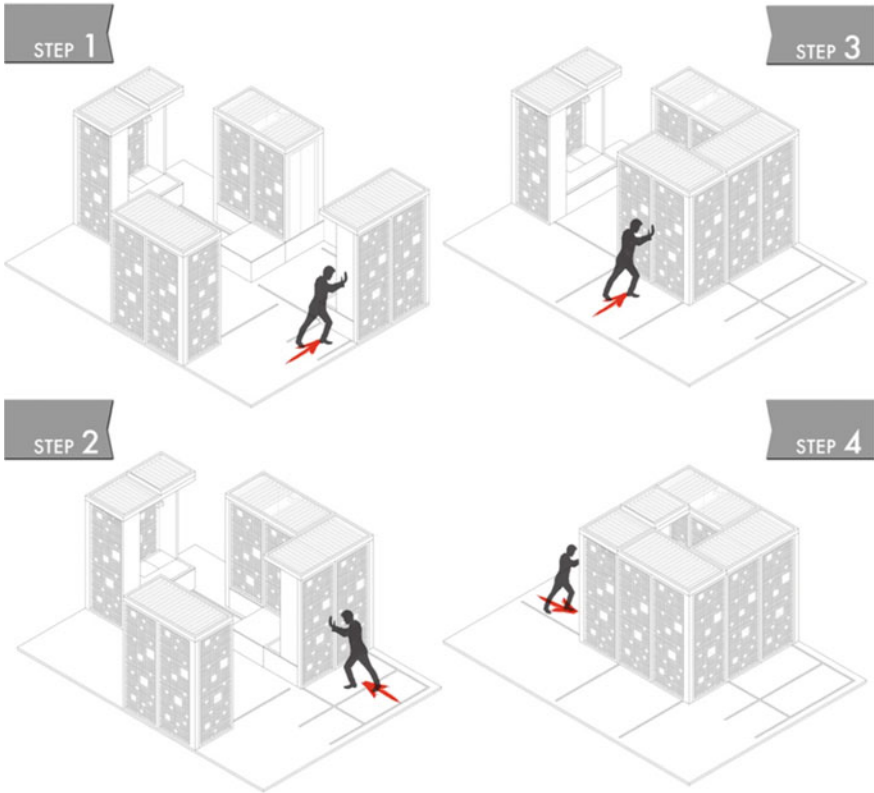


Fig. 81.6 From Bench to Shelter, sliding frames

81.5 Conclusions and Future Developments

The twofold challenge to emergency conditions, both environmental and social, has as a common goal the rethinking of housing models that, regarding temporariness, can become an opportunity for new projects, useful to improve the quality of life and provide answers to the most disadvantaged groups. The need to intervene in and for emergency conditions is a driving principle behind the goals of constructive and productive innovation, intending to use material and immaterial resources through socially and materially sustainable models for the contexts of intervention. This scenario aims to identify the relationships between health and housing for the main mechanisms of housing accessibility and housing conditions.

On a theoretical level and an applicative one, the contribution provides ideas to feed the debate on the emerging condition of ‘Design for Emergency’ and the social cohesion policies in place in this particular historical moment. An aspect that must



Fig. 81.7 Main activities: access, rest, refreshment and storage

be read about the need/opportunity to propose new temporary housing models of an emergency nature that can guarantee the dignity and well-being of those who use them and at the same time represent new design, construction and realization parameters.

A small model of intervention, therefore, that combines cultural identities and housing models to improve the quality of life of specific vulnerable groups, interpreting reversibility as a paradigm in the relationship with the context, in urban connections, and in the revitalization of brownfields.

The replicable theoretical model of the research allows for possible future developments in other contexts where similar problems need immediate and operational responses on the territory. The desire to involve public administrations and stakeholders is connected to this perspective, with a view to the participation and involvement of all the actors belonging to the chain, which guarantees, through a bottom-up approach, in the most complete and broadest sense of the term, an opportunity to improve the quality of life, respecting people and places.

References

- Agnoletto M (2008) Smallness. Area n. 98
- Antonini E, Boeri A, Giglio F (2020) Emergency driven innovation. Low tech buildings and circular design. Springer
- Baptista I (2009) The drafting of the Portuguese homeless strategy: an insight into the process from a governance-oriented perspective. *Eur J Homelessness*
- Benjaminson L, Dyb E (2008) The effectiveness of homeless policies—variations among the Scandinavian countries. *Eur J Homelessness* 2(1):45–67
- Cantillon B (2019) The European pillar of social rights. Towards a European Social Union, p 54
- De Lucchi M (2017) Microarchitecture and minimal habitat. *Area* 151:4–11
- EPRS (European Parliament Research Service) (2019) Technological innovation for humanitarian aid and assistance. [https://www.europarl.europa.eu/RegData/etudes/STUD/2019/634411/EPRS_STU\(2019\)634411_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2019/634411/EPRS_STU(2019)634411_EN.pdf). Accessed 1 Mar 2021
- European Commission (2019) The European pillar of social rights in 20 principles
- Greiner PT, McGee JA (2020) The asymmetry of economic growth and the carbon intensity of well-being. *Environ Sociol* 6(1):95–106
- Grubler A, Wilson C, Bento N, Boza-Kiss B, Krey V, McCollum, DL, Rao ND, Riahi K, Rogelj J, De Stercke S, Cullen J, Frank S, Fricko O, Guo F, Gidden M, Havlík P, Huppmann D, Kiesewetter G, Rafaj P, Schoepp W, Valin H (2018) A low energy demand scenario for meeting the 1.5 C target and sustainable development goals without negative emission technologies. *Nat Energy* 3(6):515–527
- Hansen FK (2010) The homelessness strategy in Denmark. *Eur J Homelessness* 4:113–125
- Hermans K (2012) The Dutch strategy to combat homelessness: from ambition to window dressing? *Eur J Homelessness* 6(2):101–118
- Houard N (2011) The French homelessness strategy: reforming temporary accommodation, and access to housing to deliver ‘Housing First’: continuum or clean break. *Eur J Homelessness* 5(2)
- IPCC (2018) Global warming of 1.5 °C: an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. Intergovernmental Panel on Climate Change
- Kidd SA, Greco S, McKenzie K (2021) Global climate implications for homelessness: a scoping review. *J Urban Health* 98(3):385–393
- O’Neill DW, Fanning AL, Lamb WF, Steinberger JK (2018) A good life for all within planetary boundaries. *Nat Sustain* 1(2):88–95
- Perriand C (1949) Au Japon. *L’Architecture d’Aujourd’hui*
- Ranmal R, Tinson A, Marshall L (2021) How do health inequalities intersect with housing and homelessness. *Eur J Homelessness* 15(3)
- Sahlin I (2015) Searching for a homeless strategy in Sweden. *Eur J Homelessness* 9(2)
- Savičić G, Savić S (eds) (2013) Unpleasant design. GLORIA
- Vogel J, Steinberger JK, O’Neill DW, Lamb WF, Krishnakumar J (2021) Socio-economic conditions for satisfying human needs at low energy use: an international analysis of social provisioning. *Glob Environ Change* 69:102287
- Wygnańska J (2009) The development of a national homeless strategy in Poland: achievements and challenges. *Eur J Homelessness* 3:201–214

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