Delft University of Technology

Document Version
Final published version

Licence
CC BY

Citation (APA)
Dos Santos Vieira Brysch, S. L. (2023). *Towards a new Existenzminimum: defining principles for the co-design of affordable collaborative housing.* [Dissertation (TU Delft), Delft University of Technology]. A+BE | Architecture and the Built Environment. https://doi.org/10.7480/abe.2023.23

Important note
To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Copyright
In case the licence states "Dutch Copyright Act (Article 25fa)", this publication was made available Green Open Access via the TU Delft Institutional Repository pursuant to Dutch Copyright Act (Article 25fa, the Taverne amendment). This provision does not affect copyright ownership.
Unless copyright is transferred by contract or statute, it remains with the copyright holder.

Sharing and reuse
Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy
Please contact us and provide details if you believe this document breaches copyrights.
We will remove access to the work immediately and investigate your claim.

This work is downloaded from Delft University of Technology.

Towards a new Existenzminimum

Defining principles for the co-design of affordable collaborative housing

Sara Brysch

Towards a new Existenzminimum

Defining principles for the co-design of affordable collaborative housing

Sara Brysch

TOC

A+BE | Architecture and the Built Environment | TU Delft BK

23#23

Design | Sirene Ontwerpers, Véro Crickx

Cover photo | Sara Brysch

ISBN 978-94-6366-788-3
ISSN 2212-3202

© 2023 Sara Brysch

This dissertation is open access at https://doi.org/10.7480/abe.2023.23

Attribution 4.0 International (CC BY 4.0)

This is a human-readable summary of (and not a substitute for) the license that you'll find at:
https://creativecommons.org/licenses/by/4.0/

You are free to:
Share — copy and redistribute the material in any medium or format
Adapt — remix, transform, and build upon the material
for any purpose, even commercially.
This license is acceptable for Free Cultural Works.
The licensor cannot revoke these freedoms as long as you follow the license terms.

Under the following terms:
Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

Unless otherwise specified, all the photographs in this thesis were taken by the author. For the use of illustrations effort has been made to ask permission for the legal owners as far as possible. We apologize for those cases in which we did not succeed. These legal owners are kindly requested to contact the author.

Towards a new Existenzminimum

Defining principles for the co-design of affordable collaborative housing

Dissertation

for the purpose of obtaining the degree of doctor
at Delft University of Technology
by the authority of the Rector Magnificus, prof.dr.ir. T.H.J.J. van der Hagen
chair of the Board for Doctorates
to be defended publicly on
Wednesday 20 December 2023 at 15:00 o'clock

by

Sara Lia BRYSCH
Master of Architecture, University of Porto, Portugal
born in Porto, Portugal

This dissertation has been approved by the promotors.

Composition of the doctoral committee:

Rector Magnificus,	chairperson
Prof.dr.ir. V.H. Gruis	Delft University of Technology, promotor
Dr. D.K. Czischke	Delft University of Technology, copromotor

Independent members:

Prof. dr. E.M. van Bueren	Delft University of Technology
Dr. N. J.A. Mota	Delft University of Technology
Dr. H. G. Larson	Lund University, Sweden
Dr. G. Ledent	University of Louvain, Belgium
Dr. A. Kockelkorn	Ghent University, Belgium

This PhD research has been financially supported by the Portuguese foundation 'Fundação para a Ciência e Tecnologia' (FCT), grant number SFRH/BD/136257/2018.

To my daughter Camila

Preface

Between minimum and collaborative housing: the journey that led me to this PhD*

*Text adapted from the original published in May 2018 in co-lab-research.net

As a three-year-old girl, I would sit in the improvised swing that my dad set up for me in the living-room-to-be, and I would witness the fascinating process of transforming piles of bricks into thick walls and long glass slabs into windows. A part of the house was growing up at the same time that I was growing up. Ever since, I have always considered the built environment as a permanent process; a living organism, constantly adapting to new needs and demands.

Many years later, finally as an Architecture student at the Faculty of Architecture in Porto, Portugal (not surprisingly, after this bucolic and heart-warming introduction) I developed a particular interest in the origins of some collective housing models, more specifically on Existenzminimum, and decided to work on that topic in my Master Dissertation. When specifically used in the housing domain, Existenzminimum can be translated as minimum dwelling. However, Existenzminimum is one of those (German) concepts that cannot be accurately translated into other languages. This approach mainly aimed at creating a new way of living at affordable levels, more suitable to the new post-war societal needs, through a 'mini-max dwelling concept', where the minimum amount of space could accommodate the maximum of life.

After my Master Defence, on the 9th of December 2011 (symbolically enough, on the exact same day that an international symposium was being held in Berlin on the redefinition of Existenzminimum), my supervisor Dr. Nuno Grande said to me: "Ok, now you have the basis to start a PhD." Although his suggestion inspired me, after spending six sleepless years designing and making models, at that point I was itching to start working as an architect, to finally put into practice everything I had learned.

So, there I was, freshly graduated, full of energy and ready to fly… little did I know that I was about to land in the middle of the economic crisis, which hit Portugal very harshly. No construction = no architecture design. And I had no uncles or cousins in need of a house or a refurbishment in that moment. So, I decided to fly somewhere else.

I flew to Berlin, to work at Heim Balp Architekten; and then, two years and a half later, to Mexico City, where I worked at Tatiana Bilbao Estudio. In both places, I was able to expand my knowledge on how different cultures explore the general approaches of housing in the contemporary context. In Berlin, I had the opportunity to develop a specific minimum housing model, which we called Bento Box, following the same principle of 'minimum of space for maximum of life'. In Mexico – a completely different context – I learned about the practical qualities of incremental housing models, with Tatiana Bilbao's Vivienda Popular, where a temporary minimum unit is set up (equipped with the basic services) with the possibility to grow over time, depending on the needs and financial possibilities of the household.

Professional practices aside, I also learned a lot about minimum and collective living arrangements through my personal daily life experience. During the first part of my stay in Berlin and then my whole stay in Mexico City, I had to share the space with other – often messy – flatmates. In total, five different apartments, five different layouts, five different social dynamics. In Berlin, the undersized and overstuffed kitchen didn't contribute to a healthy social environment, and the shared bathroom was worth a 'not recommended for sensitive people' sign. In one of the places in Mexico, our room was directly connected to the shared living room, so every time someone was throwing a party and I just wanted to sleep after an intense working week, I had to discreetly roll into the common bathroom (next to the room, also facing the living room) with my pyjamas and a toothbrush in my hand, hoping that nobody would see my outfit, and then almost suffocate myself with pillows against my head to sound-proof my sleep.

These experiences taught me a great lesson: this kind of collective or shared living arrangements requires a conscious design to guarantee the quality of spaces and to promote more natural social relationships. The 'typical' and conventional layouts, tailored for nuclear-family structures, are no longer suitable for the contemporary citizen, who has now different needs and demands. 'The times they are a changin'! The way people live, work, consume, commute is taking new shapes… but how are people reacting to all this? How is design responding to these changes? What new approaches in housing are being developed to give answers to the societal and economic shifts that are becoming so obvious?

I raised these questions in a presentation I gave in November 2016 at the ENHR seminar Comparative Housing Policy: New approaches to affordable housing hosted by the TU Delft, Faculty of Architecture and the Built Environment. One of the participants was Dr Darinka Czischke, who approached me to say that her research on Collaborative Housing touched exactly on the same issues. We immediately saw the potential to work together on this. A year and a half later, I was working with

Darinka as research assistant at Co-Lab Research. At the same time, I started my PhD at the Management in the Built Environment (MBE) Department, TU Delft, and here we see the result.

Now this specific journey has ended. I enjoyed every minute of it. And I have a lot of special thanks to say. I start by thanking the best supervisors I could wish for. Thank you Vincent, always there, always assertive. With you, I learned to focus on what matters, to find practical solutions, to keep confident and enjoy the ride. I feel so honoured to be one of your PhDs. Thank you Darinka, for being so much more than a co-promotor and daily supervisor. For trusting in my potential since the beginning and for taking risks for me. Thank you for all the opportunities you kept providing me along the way, and for sharing your knowledge and network with me. You are and will always be an inspiration for me.

I am very grateful for all the participants who may this research possible. Special thanks go to Cristina Gamboa: thank you for always making yourself available to talk to me, to send me useful material, you were essential to this research. Thank you, Adrià Garcia, for our discussions and reflections that culminated in one of the papers that shape this thesis.

To my PhD fellows and colleagues, a big thank you. Vale and Anne, thank you for sharing the Shire with me! Thank you Maca, for partnering up to create our "co-design reading groups". Thank you, Bart, Bas, Biyue, Astrid, Lizet, Luz Maria, Alejandro, for all the support and time we spent together. Carla, my spiritual guide, I will miss our conversations and gluten-free cakes. Marije, I am so glad we met each other, it was a pleasure to collaborate and celebrate the book launch with you! Thank you Flip, for sharing with me your valuable knowledge and experience, and for making possible to share the same roof at Centraal Wonen for three months.

Thank you Mom and Dad, for being the best parents ever. Mom, my eternal cheerleader, thank you for your unconditional love and support. Dad, my favourite peer reviewer, thank you for always being there when I needed a critical eye and insightful revisions. Zé, my love, my best friend, my partner, thank you for being part of my life. You have always encouraged me to follow my dreams, even when it meant to put yours on hold, and you always kept me motivated and confident to go on. Together, we have created the most perfect project of all: our daughter. Camila, thank you for making this journey even more meaningful. Keep that smile and contagious laughter, and the whole world will smile with you.

Contents

List of Tables 15
List of Figures 16
Summary 19
Samenvatting 25

1 **Introduction** 31

1.1 **The challenge of linking housing, affordability, design and collaboration** 32
1.1.1 Affordable housing 33
1.1.2 ***Existenzminimum*** 35
1.1.3 Collaborative housing 35
1.1.4 Co-design 37

1.2 **Problem formulation** 39
1.2.1 Research gap and assumption 39
1.2.2 Research aim and objectives 41
1.2.3 Research questions 43

1.3 **Research approach** 44
1.3.1 Research paradigm 44
1.3.2 Scope and case study selection 46
1.3.3 Research design and methods 49

1.4 **Research impact** 55
1.4.1 Scientific relevance 55
1.4.2 Practice and societal relevance 55

1.5 **Thesis structure** 56

2 **Reinterpreting Existenzminimum in Contemporary Affordable Housing Solutions** 69

2.1 **Introduction** 70
2.2 **Methodology** 72

2.3 **The Original Principles of Existenzminumum** 75
2.3.1 Innovation and Cost-Effectiveness in Construction 77
2.3.2 Minimum Quality Standards 77
2.3.3 Redesign of Domestic Layout 78
2.3.4 Relationship between Architecture and the City 81
2.3.5 Community Building and Social Concern 81

2.4 **The Current Application of Existenzminimum Principles: A Critical Analysis** 83
2.4.1 Innovation and Cost-Effectiveness in Construction 84
2.4.2 Minimum Quality Standards 86
2.4.3 Redesign of Domestic Layout 90
2.4.4 Relationship between Architecture and the City 92
2.4.5 Community Building and Social Concern 94

2.5 **Conclusion: Towards a New Definition of Existenzminimum** 98

3 **Affordability through design** 113

The role of building costs in collaborative housing

3.1 **Introduction** 114
3.2 **Methodological approach** 117

3.3 **Analytical framework: identifying the design criteria influencing building costs in collaborative housing** 119
3.3.1 Minimum standards 121
3.3.2 Housing typology 122
3.3.3 Construction approach 122
3.3.4 Organisational structure 123
3.3.5 Participation and decision-making 123
3.3.6 Time 125

3.4 **Identifying the design criteria influencing building costs in collaborative housing: findings** 125
3.4.1 Minimum standards 128
3.4.2 Housing typology 130
3.4.3 Construction approach 131
3.4.4 Organisational structure 132
3.4.5 Participation and decision-making 132
3.4.6 Time 133

3.5 **Discussion** 134
3.5.1 The building as a 'product' of a collective 'process' 134
3.5.2 Trade-offs between costs and other values 135

3.6 **Conclusions** 136

4 **Sharing is saving?** 145

Building costs simulation of collaborative and mainstream housing designs

4.1 **Introduction** 146
4.2 **Distinguishing the Design Criteria behind Affordable- Mainstream Housing (MH) and Collaborative Housing (CH)** 148
4.3 **Building costs simulation model** 153
4.4 **Results: comparing mainstream housing (MH) and collaborative housing (CH) building costs from a design perspective** 159
4.5 **Discussion** 162
4.6 **Conclusions** 164

5 **The process of value setting through co-design** 175

The case of La Borda, Barcelona

5.1 **Introduction** 176
5.2 **A value-hierarchy analytical framework to assess co-design in collaborative housing (CH)** 177

5.3 **Case and methods** 180
5.3.1 Data analysis 184

5.4 **Findings** 187
5.4.1 Value footprints 187
5.4.2 Values and trade-offs in co-design decisions 187

5.5 **Discussion: value setting in a co-design process** 191
5.5.1 Co-adaptation between values and co-design decisions 191
5.5.2 The role of conflict in value setting 192
5.5.3 The role of co-design in value setting 193

5.6 **Conclusions** 194

6 **Conclusion** 213

6.1 **Summary of key findings** 214
6.1.1 What design criteria are used in current housing to increase affordability? [Chapter 2] 214
6.1.2 What design criteria are used in collaborative housing to increase affordability? [Chapter 3] 215
6.1.3 To what extent and how do co-design decisions influence building costs in housing when compared to mainstream affordable housing design? [Chapter 4] 215
6.1.4 How does the co-design process unfold in the face of diverse values amongst (future) residents? [Chapter 5] 216

6.2 **Defining principles for the co-design of affordable collaborative housing** 217
6.2.1 Adjust your “self” 219
6.2.2 Set your minimum threshold 219
6.2.3 Apply a need-based design 220
6.2.4 Follow an efficient design 220
6.2.5 Invest now to save later 221
6.2.6 Go the extra mile 221
6.2.7 Do-it-Together 222
6.2.8 (Un)involve professionals strategically 222

6.3 **Research contribution** 223
6.3.1 Implications for policy: Towards a new Existenzminimum 223
6.3.2 Scientific contribution 224
6.3.3 Practice and societal contribution 225

Curriculum Vitae 227
List of publications 233

List of Tables

1.1 Overview of selected case studies (Source: Author) 48

1.2 Overview of studies linked to the sub-questions (Source: Author) 53

2.1 Features and concepts related to current 'affordable' and 'low-cost' housing, scanned from the systematic literature review (Source: Author) 74

3.1 Different levels of citizen/end-user participation (Source: Authors) 124

3.2 Summary of the findings applying the analytical framework, related to the 16 selected cases. 126

4.1 Distinguishing design criteria of affordable MH and CH (Source: Authors) 153

4.2 Summary of the building costs simulation results. 160

5.1 Snapshot of the first analytical step: coding (Source: Authors) 185

5.2 Values, tensions and trade-offs detected in co-design decisions (Source: Authors) 190

List of Figures

1.1 Core concepts and sub-concepts underlying the research (Source: Author) 33

1.2 The socio-economic and project-level dimensions of affordable housing (Source: Author) 34

1.3 Dimensions of collaborative housing (Source: Author) 36

1.4 Different design approaches depending on the participation level of the end-users (Source: Author) 38

1.5 Scheme displaying the research assumption (Source: Author) 41

1.6 Scope of the research (Source: Author) 42

1.7 Sequential exploratory design of the research (adapted from original source: https://www.nottingham.ac.uk/) 45

1.8 Criteria for the selection of the case studies (Source: Author) 47

1.9 Map of the selected case studies (Source: Author) 48

1.10 Scheme of data collection and analysis (Source: Author) 49

1.11 Flashcards used in the interviews (front side) (Source: Author) 51

1.12 Flashcards used in the interviews (back side) (Source: Author) 51

1.13 Input for simulation using the BudsyS software (Source: Image courtesy of Casper Mouissie) 52

2.1 Framework used to identify the design principles of Existenzminimum (Source: Author) 72

2.2 Existenzminimum design principles (Source: Author) 76

2.3 Comparative spatial studies, by Alexander Klein (Source: Klein, 1927) 79

2.4 Frankfurt Kitchen, by Schütte-Lihotzky (Source: May, 1926) 80

2.5 Praunheim (left) and Römerstadt (right), Frankfurt, by Ernst May (Source: Author) 82

2.6 Existenzminimum principles, from a contemporary perspective (Source: Author) 83

2.7 The Urban Rigger, Copenhagen, 2016, by BIG (Source: Author) 85

2.8 La Borda, Barcelona, 2018, by LaCol Architectura Cooperativa. Note: the image was taken two months after the residents moved into the building and shows the unfinished state of the building, understood as a constant process. (Source: Author) 85

2.9 Examples of Tiny Houses. (Sources: Stott, 2015 and Block, 2018). 87

2.10 Tulou Collective Housing, Guangdong, 2008, by Urbanus. (Source: Urbanus, n.d.). 88

2.11 Roam Co-living, Bali, 2015, by Alexis Dornier. Source: Archdaily (2016). 88

2.12 La Borda (Ground- and first floor), Barcelona, 2018, by LaCol Architectura Cooperativa. Note: the highlighted areas were added by the Author and correspond to the common spaces. (Source: image courtesy of LaCol Architectura Cooperativa) 89

2.13 Spreefeld Genossenschaft (shared kitchen and dining room), Berlin, 2014, by Carpaneto Architekten, Fatkoehl Architekten and BARarchitekten. (Image courtesy of Fatkoehl Architekten) 89

2.14 Mehr als Wohnen (plan of cluster apartment), Zurich, 2015, by Duplex Architekten. Note: the highlighted areas were added and correspond to the shared spaces. (Source: McMaster, 2016) 91

2.15 Spreefeld (axonometry of cluster apartment), Berlin, 2014, by Carpaneto Architekten, Fatkoehl Architekten and BARarchitekten. Note: the highlighted areas correspond to the shared spaces. (Source: image courtesy of Fatkoehl Architekten) 91

2.16 Wohnprojekt Wien (plans of ground and underground floors), Vienna, 2013, by Einszueins Architekten. Note: The communal kitchen and the multi-purpose rooms can be used or rented by external groups. (Source: image courtesy of Einszueins Architekten) 93

2.17 Usual services included in co-living contracts, Berlin. (Source: Happy-Pigeons, n.d.). 94

2.18 The Collective Co-living, London/New York. Note: this promotional image highlights the community-oriented approach of co-living models. (Source: The Collective, n.d.) 96

2.19 La Borda general assembly, Barcelona. Note: all decisions - from the design to the management of the building - are collectively taken in general assemblies. (Source: image courtesy of La Borda) 96

2.20 Examples of housing projects based on co-design processes: (a) Wohnprojekt Wien, Vienna (Source: Author); (b) R50, Berlin (Sources: exterior image by the Author; image courtesy of ifau); (c) La Borda, Barcelona (Sources: image courtesy of La Borda; exterior image by the Author); (d) Village Vertical, Lyon (Source: Author) 97

3.1 Analytical framework (Source: Authors) 120

3.2 Residents perceptions on what should be considered a minimum standard (Source: Authors) 129

3.3 Right: floor plans of Sofielunds, Malmö (Source: image courtesy of Kanozi Architects). Left: La Borda, Barcelona (Source: image courtesy of Lacol Arquitectura Cooperativa). Note: In Sofielunds, units range from 35,6m2 (1-bedroom apartments) to 75,8m2 (3-bedroom apartments); in La Borda, units range from 40m2 ('S') to 76m2 ('L'). 130

4.1 Diagram illustrating the chosen typologies and dwelling types used in the simulation (Source: Authors). 155

4.2 Snapshot of the design specifications and resulting building costs for AT-MH (Source: Image courtesy of Casper Mouissie) 158

4.3 Snapshot of the design specifications and resulting building costs for AT-CH (Source: Image courtesy of Casper Mouissie) 158

5.1 Value Hierarchy Model adapted from Van de Poel, 2013 and Elsinga et al., 2020 (Source: Authors) 179

5.2 La Borda's general assembly during the design phase (Source: image courtesy of La Borda) 181

5.3 Ground floor and first floor plans of La Borda (Source: image courtesy of Lacol) 181

5.4 La Borda during the living phase (Source: Authors) 182

5.5 La Borda during the living phase (Source: Authors) 182

5.6 La Borda during the living phase (Source: image courtesy of La Borda) 182

5.7 La Borda during the living phase (Source: image courtesy of La Borda) 183

5.8 Timeline with data sources for 'value-setting events' and 'co-design decisions' (Source: Authors) 184

5.9 Value footprints of 'value-setting events' 1, 2 and 3 (Source: Authors) 189

6.1 The proposed design principles and synergies between them (Source: Author) 218

Summary

‘Towards a new *Existenzminimum*: defining principles for the co-design of affordable collaborative housing’ is about bringing forward the *design* dimension – and more specifically *collaborative design*, or *co-design* – to the study of housing affordability. It does so by assessing if and how co-design processes used in collaborative housing help to reduce building costs and, consequently, increase the overall affordability of a housing project. Collaborative housing is an umbrella term that encompasses a variety of housing forms based on collective self-organisation and collaboration, where future residents participate actively in the design and development process and aim to live together by sharing spaces.

By looking at affordability from a design perspective, this thesis builds on *Existenzminimum*, a design concept developed in the interwar period in Europe. The aim was to provide affordable housing suitable to the *modern* family through space and construction optimisation and minimum quality standards, . Currently, the majority of (public, social or affordable) ‘mainstream’ housing disregard the design dimension, resulting in conventional layouts. Yet, original *Existenzminimum* values, such as social focus, architectural design experimentation, and quality standards, are rediscovered in the design of innovative affordable housing solutions. Many collaborative housing projects, resulting from co-design processes, incorporate these values. These housing projects, commonly defined by smaller private units and shared rooms, are the result of the specific needs of the residents’ group, who is often the developer of its own housing and who define their minimum thresholds.

Building costs play a significant role in determining the affordability of a housing project. These mainly depend on design decisions. If the original *Existenzminimum* proved its potential towards affordable housing provision through design, in our days sharing living arrangements and co-design processes indicate that they also contribute to achieve even more affordable levels in housing and to create more suitable solutions. Collaborative housing design solutions, resulting from co-design processes, may have an extra impact in reducing building costs and increasing affordability, when combined with more conventional design solutions.

However, no research has been yet conducted specifically focused on how the design of collaborative housing influences affordability, notably due to its potential to reduce building costs. Therefore, the aim of this research is to assess the extent to which and how collaborative housing, as a result of (co-)design processes, represents an affordable housing solution. The main deliverable of this thesis is a set of general principles for the design of affordable collaborative housing, to be applicable to similar contexts. This leads to the main research question:

To what extent and how do the design criteria in European collaborative housing contribute to affordability?

Conceptually, this research question connects four key notions: *housing*, *affordability*, *design*, and *collaboration*. It also entails a quantitative ("to what extent") and a qualitative dimension ("how"). The research design is therefore structured to provide possible answers to these two dimensions. In line with this, we operationalise the research by conducting four studies, materialised in four academic peer-reviewed papers (see Figure Sum.1). Considering 'affordable housing design solutions' as the general scope of this research, Study 1 provides an overview of current innovative design solutions of multi-family housing, including collaborative housing projects, Study 2 and 4 exclusively focus on the collaborative housing (light case studies and single case study, respectively), whereas Study 3 compares collaborative with mainstream housing (simulation).

More specifically, the first one, entitled 'Reinterpreting *Existenzminimum* in Contemporary Affordable Housing Solutions', sets the scene, i.e., it conceptually frames the whole research by underscoring the role of design in the study of housing affordability. Mainly based on literature review, it revisits the original principles of *Existenzminimum* and investigates if and how this concept is currently applied by assessing contemporary housing projects considered affordable.

The second study is linked to the previous one and identifies the design criteria used in collaborative housing to reduce building costs, increasing this way its affordability. Applying a multiple case study approach, we propose an analytical framework to assess the design phase of 16 collaborative housing projects in different European cities through the lenses of affordable building costs. The paper 'Affordability through design: the role of building costs in collaborative housing' concludes that co-design processes increase the chances of improving housing affordability, mainly due to the often-applied needs-based approach and the redefinition of minimum housing standards, which help to reduce the building costs.

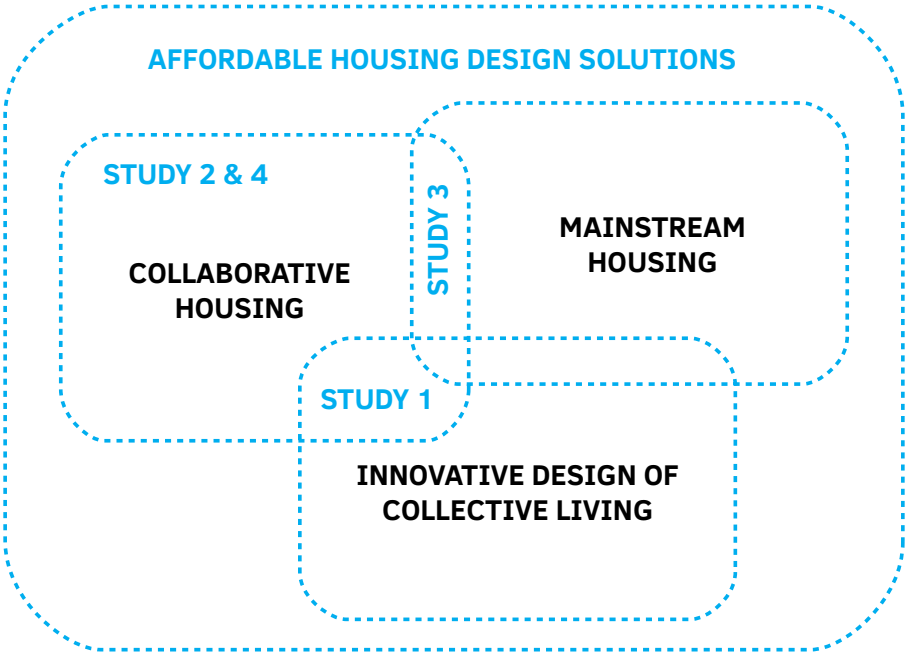


FIG. SUM.1 Research scope and related studies (Source: Author)

The following study departs from the hypothesis that collaborative housing, due to its co-design process, may be more affordable than mainstream housing from a building costs perspective. The study "Sharing is saving? Building costs simulation of collaborative and mainstream housing designs" assesses the extent to which the design criteria used in collaborative housing actually contribute to reduce building costs, when compared to affordable mainstream housing with the same construction and finishing standards. By applying a basic simulation model based on design choices, findings indicate that collaborative housing represents a more affordable and space-efficient solution when compared to mainstream housing, if we look at the building costs per unit. This is because collaborative housing provides units that cost less while it includes larger common spaces and extra quality. Ultimately, it calls for the need to reformulate current space and quality standards applied to contemporary housing in general, and to collaborative housing in particular.

Affordability is never the only driver for any housing project, and less so in collaborative housing, where community building and sustainability are (also) often key values of the projects. This motivates the fourth and final study, a longitudinal single case-study, a recently built collaborative housing project in Barcelona, *La Borda*. The aim is to unfold how values are collectively set in a co-design process and translated into a housing project. "The process of value setting through co-design: the case of *La Borda*, Barcelona" shows how affordability is articulated with other (sometimes conflicting) values while making co-design decisions, and what kind of design trade-offs are necessary to give shape to a collaborative housing project.

Conclusions and implications

This PhD research deals with the current problem of lack of affordable housing and focuses on how design affects housing affordability. Rather than formulating or proposing possible solutions, it seeks to evaluate the potential of existing practices, by uncovering the design criteria of affordable collaborative housing. This is done through a systematic analysis involving theory (literature review), reality (analysis of real cases) and 'representations' of reality (simulation).

Findings refute existing claims about the unaffordability of the collaborative housing design solutions, and show that collaborative housing, through (co-)design, is a valid affordable housing design solution, and even more affordable than affordable mainstream housing. This happens when co-design choices and trade-offs are made to reduce building costs and, at the same time, invest in affordability in the long term. According to this research, these decisions are based on a collective self-redefinition of Existenzminimum, affecting the housing layout and the building process. From a theoretical perspective, the research contributes to filling the knowledge gaps regarding the relationship between *housing*, *affordability*, *design*, and *collaboration*. It densifies the existing literature on collaborative housing in general and counteracts the conventional 'condescending' and top-down approach towards architecture and planning. From a methodological perspective, the proposed analytical frameworks can assist qualitative and quantitative studies, both in academia and professional setups, linking building costs with collaborative housing.

This thesis delivers a set of design principles for future co-designers who aim to realise an affordable collaborative housing project. These principles result from the combination of the generally applicable principles to reduce building costs in collective mainstream housing with co-design specific ones that can add to this effort, through the involvement of the residents in the process. They may help to increase the possibilities of streamlining and optimising the co-design

process of affordable collaborative housing, contributing this way to make co-design approachable to larger segments of the population. By shedding light on how design matters for affordability in (collaborative) housing, the reflections and outputs of this research can inform and benefit residents' groups, architects working in collaborative housing projects, and other relevant stakeholders. This research complements existing studies on more general factors impacting housing affordability, such as tenure models, land acquisition, and funding mechanisms. It ultimately questions how do people collectively (re)define their own minimum quality standards and how this can lead to the formulation of new design standards or parameters for collaborative housing.

Towards a new *Existenzminimum*.

TOC

Samenvatting

‘Op weg naar een nieuw Existenzminimum: het definiëren van principes voor het co-ontwerp van betaalbare collectieve woningen’ brengt de ontwerpdimensie - en specifiek collectieve vormgeving, ofwel co-ontwerp – naar onderzoek over de betaalbaarheid van woningen. Dit wordt gedaan door te beoordelen of, én hoe co-ontwerpprocessen die worden gebruikt in collectief wonen helpen om bouwkosten te verlagen en daardoor de betaalbaarheid van woningbouwprojecten te vergroten. Collectief wonen is een overkoepelende term die een verscheidenheid aan woonvormen omvat. Het gaat hierbij om collectieve zelforganisatie en samenwerking waarin de toekomstige bewoners actief deelnemen aan het ontwerp- en ontwikkelingsproces en gezamenlijk wonen door leefruimtes te delen.

Het Existenzminimum is een ontwerpbegrip dat ontwikkeld is in Europa tijdens het interbellum. Het doel van het Existenzminimun was om betaalbare woningen te bieden die geschikt zijn voor het moderne gezin door middel van ruimte-, en bouwoptimalisatie en minimale kwaliteitsnormen. Deze dissertatie bouwt voort op dit ontwerpbegrip door betaalbaarheid vanuit het ontwerpperspectief te bekijken. Hedentendage ontbreekt in het merendeel van de (publieke, sociale of betaalbare) ‘mainstream’ woningen de ontwerpdimensie, wat resulteert in conventionele woningplattegronden. Toch worden de oorspronkelijke Existenzminimum-waarden herontdekt in het ontwerp van innovatieve betaalbare woningen, zoals de focus op sociale aspecten, het architectonische ontwerpexperiment en kwaliteitsnormen. Veel collectieve woningbouwprojecten die ontwikkeld zijn met co-ontwerpprocessen, bevatten deze waarden. Deze woningen worden meestal gekarakteriseerd door kleinere privé-eenheden en gedeelde leefruimtes. Deze zijn afgestemd op de specifieke behoeften van de bewonersgroep, die tegelijk vaak de ontwikkelaar is van haar eigen woningen en zelf de minimumeisen bepaalt.

Bouwkosten spelen een belangrijke rol bij het bepalen van de betaalbaarheid van een woningbouwproject. Deze zijn voornamelijk afhankelijk van ontwerpbeslissingen. Het oorspronkelijke Existenzminimum heeft zijn nut bewezen om huisvesting betaalbaarder te maken middels het ontwerp. Vandaag de dag bieden het delen van leefruimtes en het toepassen van co-ontwerpprocessen extra mogelijkheden om woningen nog betaalbaarder én passender te maken. Ontwerp oplossingen voor collectief wonen, die ontwikkeld zijn met co-ontwerpprocessen, kunnen een extra invloed hebben op het verlagen van de bouwkosten en het vergroten van de betaalbaarheid wanneer ze worden gecombineerd met meer conventionele ontwerpoplossingen.

Er is echter nog geen onderzoek gedaan dat zich specifiek richt op hoe het ontwerp van collectieve woningen de betaalbaarheid beïnvloedt. Dit is opmerkelijk gezien het potentieel om de bouwkosten te verlagen. Het doel van dit onderzoek is daarom om te beoordelen in welke mate en hoe collectieve woningen, die ontwikkeld zijn met (co-)ontwerpprocessen, een betaalbare huisvestingsoplossing bieden. Het belangrijkste resultaat van dit proefschrift is een reeks algemene ontwerpprincipes voor betaalbare collectieve woningen, die in een vergelijkbare context kunnen worden toegepast. Dit leidt tot de hoofdonderzoeksvraag:

In welke mate en hoe dragen de ontwerpcriteria gebruikt in Europese collectieve woningen bij aan de betaalbaarheid?

Conceptueel verbindt deze onderzoeksvraag vier sleutelbegrippen: huisvesting, betaalbaarheid, ontwerp en samenwerking. Het omvat ook een kwantitatieve ('in welke mate') en een kwalitatieve dimensie ('hoe'). De onderzoeksaanpak is zo gekozen dat het onderzoek mogelijke antwoorden op deze twee dimensies kan opleveren. Het onderzoek wordt uitgevoerd in vier deelstudies, die uitgewerkt zijn in vier academische peer-reviewed artikelen (zie figuur Sam.1). 'Betaalbare ontwerpoplossingen voor woningen' wordt beschouwd als het gedeelde onderwerp van het onderzoek. Studie 1 biedt een overzicht van huidige innovatieve ontwerpoplossingen voor meergezinswoningen inclusief collectieve woningbouwprojecten. Studie 2 en 4 richten zich uitsluitend op collectief wonen (respectievelijk meerdere 'light' casestudies en één diepe case study). In studie 3 wordt collectief wonen vergeleken met reguliere huisvesting (door middel van simulatie).

De eerste deelstudie, getiteld 'Herinterpretatie van het Existenzminimum in hedendaagse betaalbare woonvormen', zet de toon. Deze studie biedt het conceptuele kader voor het gehele onderzoek door de rol van ontwerpen te benadrukken binnen onderzoek naar de betaalbaarheid van woningen. Deze studie is voornamelijk gebaseerd op literatuuronderzoek. Het houdt de oorspronkelijke principes van Existenzminimum opnieuw tegen het licht en onder zoekt of en hoe dit concept momenteel wordt toegepast bij het beoordelen van hedendaagse woningbouwprojecten, die als betaalbaar worden beschouwd.

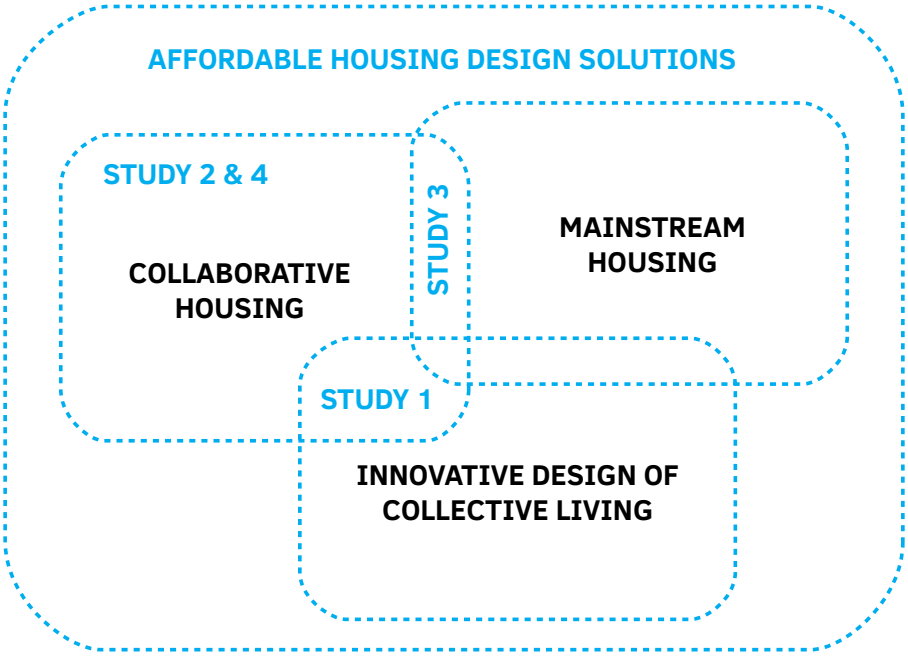


FIG. SUM.1 Gedeelde onderwerp onderzoek en onderwerp deelstudies (Bron: de auteur)

De tweede studie sluit aan bij de vorige en identificeert de ontwerpcriteria die worden gebruikt bij collectieve woningbouwprojecten om de bouwkosten te verlagen en zo de betaalbaarheid ervan te vergroten. Door middel van meerdere casestudies stellen we een analytisch raamwerk voor om de ontwerpfase van 16 collectieve woningbouwprojecten in verschillende Europese steden te beoordelen op de betaalbaarheid van de bouwkosten. Het artikel 'Betaalbaarheid door ontwerp: de rol van bouwkosten in collectief woningbouw concludeert dat co-ontwerpprocessen de kansen vergroten om de betaalbaarheid van woningen te verbeteren. Dit komt vooral doordat er vaak kritisch wordt gekeken naar behoeftes van het collectief en de minimale woningeisen, wat helpt om de bouwkosten te verlagen.

De volgende deelstudie gaat uit van de hypothese dat collectief wonen betaalbaardere bouwkosten heeft dan reguliere woningen door het co-ontwerpproces. Het onderzoek ‘Delen is sparen? Bouwkostensimulatie van collectieve en reguliere woningbouwontwerpen’ beoordeelt de mate waarin de ontwerpcriteria die worden gebruikt bij collectieve woningbouwprojecten daadwerkelijk bijdragen aan het verlagen van de bouwkosten, vergeleken met betaalbare reguliere woningen met eenzelfde hoofddraagconstructie en afwerkingsniveau. Door een eenvoudig simulatiemodel toe te passen op basis van ontwerpkeuzes vinden we dat collectief

wonen een meer betaalbare en ruimte-efficiënte oplossing is in vergelijking met reguliere woningen – als we kijken naar de bouwkosten per eenheid. Dit komt omdat collectief wonen eenheden biedt die minder kosten, terwijl er grotere gemeenschappelijke ruimtes zijn en extra kwaliteit. Ten slotte, roept de studie op om de huidige ruimte- en kwaliteitsnormen her te formuleren die worden geeist bij hedendaagse woningen in het algemeen, en in het bijzonder bij collectieve woningen.

Betaalbaarheid is nooit de enige drijfveer voor enig woningbouwproject, en zelfs nog minder voor collectieve woningen, waar de opbouw van een gemeenschap en duurzaamheid (ook) vaak sleutelwaarden zijn. Dit vormde de aanleiding voor het vierde en laatste deelonderzoek. Dit is een longitudinale studie van één casus: een recent gebouwd collectief woningbouwproject in Barcelona, La Borda. Het doel is om te achterhalen hoe waarden collectief worden bepaald in een co-ontwerpproces en worden vertaald naar een woningbouwproject. “Het proces van waardebepaling door middel van co-ontwerp: de casus van La Borda, Barcelona” laat zien hoe betaalbaarheid wordt gebalanceerd met andere (soms tegenstrijdige) waarden bij het nemen van co-ontwerpbeslissingen. Én, welke trade-offs nodig zijn bij het ontwerpen om vorm te kunnen geven aan een collectief woningbouwproject.

Conclusie en implicaties

Dit promotieonderzoek behandelt het huidige probleem van het gebrek aan betaalbare woningen en richt zich op de manier waarop ontwerp de betaalbaarheid van woningen beïnvloedt. In plaats van zelf mogelijke oplossingen voor te stellen, probeert dit onderzoek het potentieel van de bestaande praktijk te evalueren, door de ontwerpcriteria van betaalbare collectieve woningen te onderzoeken. Dit gebeurt door middel van een systematische analyse van de theorie (literatuuronderzoek), de realiteit (analyse van echte cases) en ‘representaties’ van de werkelijkheid (simulatie).

De bevindingen van dit onderzoek weerleggen bestaande beweringen over de onbetaalbaarheid van collectieve woningontwerpen. Ze laten zien dat collectief wonen, door middel van (co-)ontwerp, een valide betaalbare oplossing is voor het ontwerpen van woningen, en zelfs betaalbaarder dan reguliere betaalbare woningen. Dit komt doordat er co-ontwerpkeuzes en afwegingen worden gemaakt om de bouwkosten te verlagen en tegelijkertijd te investeren in de betaalbaarheid op de lange termijn. Volgens dit onderzoek zijn deze beslissingen gebaseerd op een collectieve zelfherdefinitie van het Existenzminimum, die van invloed zijn op de woningplattegrond en het bouwproces. Vanuit theoretisch perspectief draagt het onderzoek bij aan het vullen van de kennishiaten in de relatie tussen huisvesting,

betaalbaarheid, ontwerp en samenwerking. Het vult de bestaande literatuur over collectief wonen aan en gaat in tegen conventionele top-down en paternalistische benaderingen van architectuur en planning. Vanuit methodologisch perspectief kunnen de voorgestelde analytische kaders worden toegepast in kwalitatieve en kwantitatieve studies naar bouwkosten en collectief wonen, zowel in academisch onderzoek als in de praktijk.

Dit proefschrift levert een reeks ontwerpprincipes op voor toekomstige co-ontwerpers die een betaalbaar collectief woningbouwproject willen realiseren. Deze principes komen voort uit de combinatie van de algemeen geldende principes om de bouwkosten van meergezinswoningen te verlagen met specifieke co-ontwerpprincipes die aan de betaalbaarheid kunnen bijdragen door de betrokkenheid van de bewoners bij het ontwerpproces. Deze principes kunnen helpen om het co-ontwerpproces van betaalbare collectieve woningen te stroomlijnen en te optimaliseren, en op deze manier bij te dragen aan het toegankelijk maken van co-ontwerp voor meer mensen. Door licht te werpen op de manier waarop ontwerp van belang is voor de betaalbaarheid van (collectieve) woningen, kunnen de reflecties en resultaten van dit onderzoek een waardevolle bijdrage zijn voor bewonersgroepen, architecten die werken in collectieve woningbouwprojecten en andere belanghebbenden. Dit onderzoek vormt een aanvulling op bestaande onderzoeken naar meer algemene factoren die van invloed zijn op de betaalbaarheid van woningen, zoals eigendomsmodellen, grondverwerving en financieringsmechanismen. Het stelt de vraag hoe mensen collectief hun eigen minimale kwaliteitsnormen kunnen (her)definiëren en hoe dit kan leiden tot het formuleren van nieuwe ontwerpnormen of parameters voor collectief wonen.

Op naar een nieuw *Existenzminimum*.

1 Introduction

Europe is currently facing significant challenges in the field of affordable housing provision. This long-standing trend has been compounded by the effects of the 2008 global financial and economic crisis. There is a systemic failure by established (private and public) housing providers to deliver housing that meets the needs of the population. Moreover, given the increasing trend towards urbanisation and densification, the available space in cities is becoming increasingly scarce. Furthermore, high construction costs pose a 'severe challenge for the provision of affordable housing' (Pittini, Koessl, Dijol, Lakatos, & Ghekiere, 2017, p. 14).

The above highlights some of the contributing factors behind the re-emergence of interest in collaborative housing over the last couple of decades. Collaborative housing is a concept that includes a wide variety of collectively self-organised housing forms (Fromm, 1991; Lang, Carriou, & Czischke, 2020; Vestbro, 2010a) where 'individuals co-produce their own housing in full or part in collaboration with established providers.' (Czischke, 2018, p. 7). The renewed popularity of collaborative housing connects to the recent reinterpretation of modernist concepts, such as *Existenzminimum* (Brysch, 2011; Ruby & Ruby, 2011). *Existenzminimum* (minimum dwelling) was, from a design perspective, a concept applied in Europe in the 1920s to determine the criteria for good quality (public) housing at reduced prices. In this concept, design was used to create affordable housing solutions. Collaborative housing usually follows a collaborative design process - or co-design - and involves high levels of user participation, from the conception to the management of the building. This emphasises a more process-oriented dimension that is often disregarded in design studies. In this thesis, the concept of (housing) design considers both the final 'produt' and the 'process' in its definition (see Figure 1.6)

Although 'minimum dwelling' and 'collaborative design' are not new, the combination of these concepts may help to achieve alternative affordable housing solutions today. Therefore, this research investigates the design principles to be used in collaborative housing to increase affordability, and the extent to which they actually contribute to affordability when compared to conventional, or mainstream, affordable housing.

The following section (1.1) introduces the conceptual framework that structures this thesis. Then, section 1.2 identifies the research gap and presents the aim, objectives and the guiding research questions. The research approach is described in section 1.3. The chapter ends by highlighting the expected impact of the research from a societal and academic perspective (section 1.4) and by providing the outline of the thesis (section 1.5).

1.1 The challenge of linking housing, affordability, design and collaboration

Although often disregarded in the study of housing affordability, design plays a significant role in influencing the affordability of a housing project, due to its impact on building costs. This resonates with *Existenzminimum* and with alternative approaches involving collaboration in housing provision (Lang et al., 2020) and in design (co-design). Some scholars consider collaborative housing as a possible solution to help provide more affordable housing, mainly thanks to its non-speculative and self-organised nature (Aernouts & Ryckewaert, 2017; Cabré & Andrés, 2018; Czischke, 2018; Harris, 1999; Tummers, 2016). Is there a role for *design* is this? More specifically, how can design, as a collaboration between end-users (residents) and professionals, contribute to reaching more affordable design solutions in housing? The challenge of this thesis lies in the combination of four concepts, namely *housing*, *affordability*, *design* and *collaboration* (Figure 1.1). The following sections describe the sub-concepts that emerge from this combination: affordable housing, *Existenzmininum*, collaborative housing, and co-design.

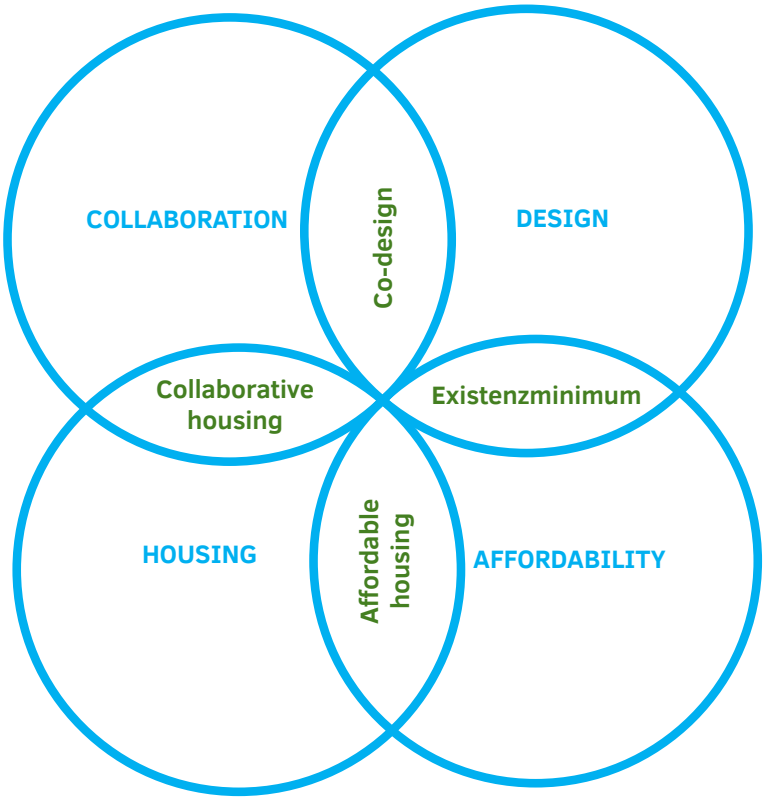


FIG. 1.1 Core concepts and sub-concepts underlying the research (Source: Author)

1.1.1 Affordable housing

Despite its extensive use, the concept of affordable housing is subject to a variety of definitions (Haffner & Heylen, 2011) and refers to different target groups (Czischke & van Bortel, 2018). Most authors focus on the macro level, i.e., on the contextual factors affecting the rise or fall of housing prices. Also, they explore the different tools for measuring affordability, considering the financial situation of a household and the respective housing costs (Haffner & Heylen, 2011; Hulchanski, 1995). Other scholars transcend the economic focus and include project-level factors that also influence affordability. This broadens the concept by including in its definition other values such as sustainability (Czischke & Brysch, 2017; Mulliner, Smallbone, & Maliene, 2013) and standards linked to adequate space and quality (Haffner & Heylen, 2011; Lerman & Reeder, 1987; Maclennan & Williams, 1990; Stone, 1993).

Considering the above, affordable housing relates to the ability of the household to pay for a dwelling that complies with specific standards. Thus, the concept of affordable housing encompasses two core dimensions (see Figure 1.2): (1) a contextual, socio-economic dimension (linked to the relationship between a household's financial means and the price of their housing at a given point in time), and (2) a project-level dimension, linked to the physical or spatial aspect of housing.

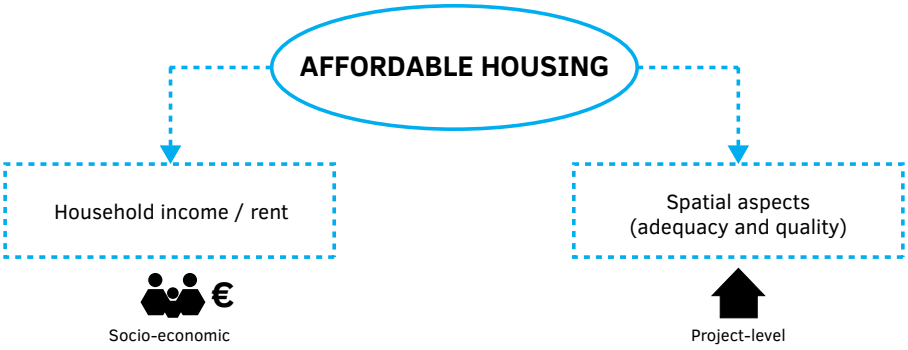


FIG. 1.2 The socio-economic and project-level dimensions of affordable housing (Source: Author)

This thesis focuses on the project-level and spatial dimension of housing affordability. This allows the concept not to be restricted to a specific target group. This way, affordable housing design solutions may range from social and public housing to non-profit companies or organisations. Affordable housing is understood here as housing designed to reduce building and subsequent use costs and to comply with at least the minimum standards for adequate housing. Building costs are considered the expenditures incurred during the design and construction of a housing project. They also entail the process-related ones, namely the developer's fees. Use costs refer to those incurred during the living period, related to space optimisation, energy consumption, and required maintenance.

This is where a distinction should be made between low-cost and affordable housing. The latter is associated with cheap building solutions, often low quality, whereas the former takes into consideration concepts such as quality, sustainability and life-cycle consequences. For instance, affordable design solutions may consider higher initial building costs, if these will be compensated in the long run, by savings on low-maintenance or energy costs.

1.1.2 *Existenzminimum*

The above understanding of the concept of affordable housing directly connects to *Existenzminimum* (the complete term is *Die Wohnung für das Existenzminimum*), or minimum dwelling (May, 1930; Mumford, 2002; Teige, 1932/2002), which embodied both the determination of (quality) standards for adequate housing, and the ability of (minimum-wage) families to pay for the housing. Although the term generally refers to a set of minimum conditions for dignified living, in this thesis *Existenzminimum* is assessed from a design perspective. *Existenzminimum* was the result of many scientific studies, exercises of spatial optimisation, and definition of minimum standards. Following a normative and technocratic approach, the aim was to develop a minimum and affordable dwelling, suitable for the circumstances of that time (need to rebuild entire cities, new technological advancements), considering the new household structures and lifestyles, such as women emancipation, smaller households, etc. (Gropius, 1930). Architectural design was here considered essential for the development of this new affordable housing solution.

Existenzminimum was conceived to produce a standard solution, or *the* standard, as it became the basis for the development of mainstream housing in the following decades. In the period between 1945 and 1975 most of the housing complexes were built in Europe (Mosayebi & Kraus, 2023). Often, however, this concept was misinterpreted leading mainstream (affordable) housing to acquire a bad reputation, stuck in outdated design formulas and obsolete layout configurations (Burkhalter & Castells, 2009; Mosayebi & Kraus, 2023).

In contrast, recent examples of innovative affordable housing solutions, based on experimentation and on a renewed social awareness by the architects, may represent a revival of the original *Existenzminimum* and a reinterpretation of its principles (Brysch, 2011; Montaner & Muxí, 2014; Ruby & Ruby, 2011). This indicates the potential of the concept to provide affordable housing solutions today and calls for a re-conceptualisation of the current meaning of *Existenzminimum*.

1.1.3 Collaborative housing

Similar to affordable housing, collaborative housing is also subject to different interpretations and definitions. As an umbrella term, it encompasses collective self-organised housing forms such as cohousing, ecovillages, self-building initiatives, resident-led housing cooperatives, among others (Fromm, 1991; Lang et al., 2020; Vestbro, 2010a).

In this research, collaborative housing is related to both *developing together* and *living together* (see Figure 1.3). These two defining dimensions are linked to the 'driving forces' behind the development of the housing project. Developing together is mainly driven by residents who are motivated to collaboratively self-provide and self-manage their own housing (Czischke, 2018; Landenberger & Gütschow, 2019; Ruiu, 2016). Here, living together may not be part of the goal. Living together, on the contrary, is mainly related to the shared intention (Vestbro, 2010a) of the users to live as a community, which is often materialised in the physical layouts of the housing, e.g., private units complemented with shared spaces (Beck, 2020; Fromm, 2012) or in efforts to increase social interaction among residents (Jarvis, 2011; Williams, 2005). Distinguishing *developing-* from *living together* helps to define and systematise the different collaborative housing forms across Europe (Cziscke, Huisman, Brysch, Vergara d'Alençon, & Cortés-Urra, 2021). On the one hand, many resident-led cooperative housing projects and collective self-building are often based on collective self-provision and self-management; on the other hand, many cohousing initiatives and ecovillages emerge to promote community living. Nevertheless, these two dimensions do not exclude one another (Cziscke et al., 2021): cohousing often combines co-design processes with collective living arrangements. Furthermore, the degree of user participation in each of these forms can change, as well as the intensity of community life.

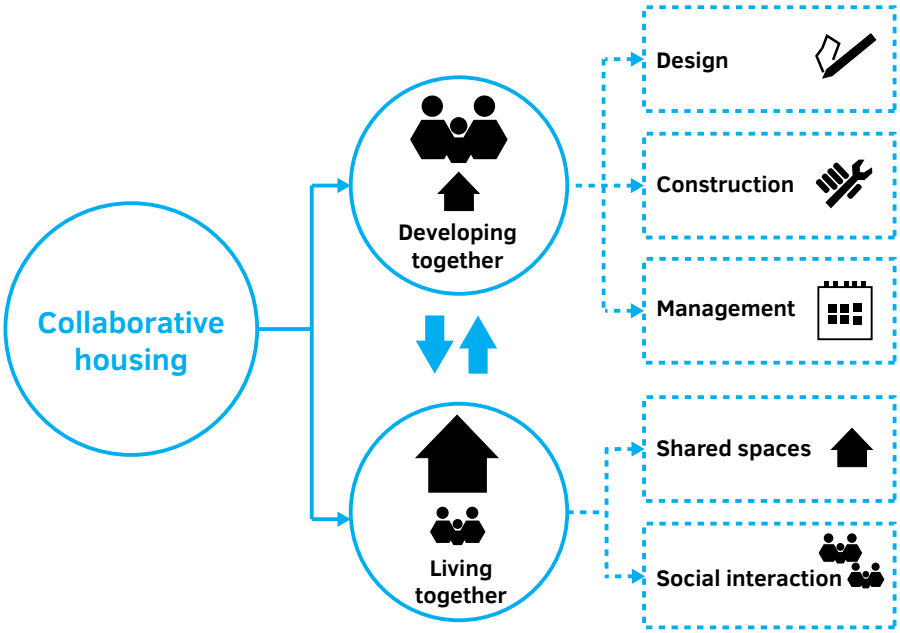


FIG. 1.3 Dimensions of collaborative housing (Source: Author)

What are the main reasons behind efforts to collectively self-organise, to initiate or to join collaborative housing projects? Historically, they were mainly *ideological*, to create a stronger sense of community, to follow more sustainable lifestyles, or to allow a proactive ageing (Czischke, Peute, & Brysch, 2023; Fromm, 2012; Vestbro, 2010b), and *practical*, to reduce the burden of (female) housework, such as cooking and cleaning (Tummers, 2015; Vestbro, 2000). The first wave of collaborative housing in northern Europe, namely the cohousing settlements in Denmark, Sweden and The Netherlands was based on communitarian and feminist utopian values (Meltzer, 2001 *apud* Williams, 2005). These projects were only available to a few families, who owned enough financial, social and cultural capital to lead such alternative projects and lifestyles. This supports the generalised prejudice that collaborative housing mainly targets white well-educated elites (Arbell, 2022; Tummers, 2015). More recently, however, people are paying attention to the potential *economic* and *social* benefits of collaborative housing, as a solution to find affordable ways of living in the city (Aernouts & Ryckewaert, 2017; Cabré & Andrés, 2018; Czischke, 2018; Harris, 1999; Lang et al., 2020; Tummers, 2016), and to enhance social inclusion, such as the integration of refugees and ethnic minorities (Carriou, 2014; Czischke & Huisman, 2018; Jarvis, 2015; Jarvis & Bonnett, 2013).

1.1.4 Co-design

Co-design as a collaborative process occurs when people 'work together towards a common interest or project.' (Zamenopoulos & Alexiou, 2018, p. 12). Understood as a 'specific instance of co-creation' (Sanders & Stappers, 2008, p. 6) co-design is 'a design methodology in which the future users of a design participate as co-designers in the design process' (Van der Velden & Mörtberg, 2015, p. 41) with an emphasis on the collaboration between multiple actors or stakeholders (Mattelmäki & Visser, 2011; Sanders & Stappers, 2008). In the context of collaborative housing, where future residents collaborate among them and with professionals to realise their housing project (Czischke, 2018), co-design is often applied to guarantee that future residents are active participants in the design process.

Co-design follows the tradition of *participatory design* (Mattelmäki & Visser, 2011; Sanders & Stappers, 2008), and goes beyond the *user-centred* approach (Sanders & Stappers, 2008) where designers consider the needs of end-users. Manzini (2016) distinguishes *expert design,* which involves the professionals from *diffuse design*, which involves the end-users; *co-design* is the interaction between both. Some theories and methods linked to participation and self-management processes applied in the context of developing countries (Alexander, 1977; Montaner, 2001;

Turner, 1988) are relevant to frame co-design practices. For example, 'pattern language' is a comprehensive design methodology based on participation and community living 'patterns' that enable non-professionals to shape their own environment (Alexander, 1977). Stenberg, Harling, & Berglund (2022) refer to this method as the precursor of co-design in the architecture field.

Co-design therefore entails *collaboration* between professionals and end-users and implies the *participation* of end-users in the process. Czischke (2018, p. 8) defines a framework for a 'continuum of user involvement' in the context of co-production and established collaborations in collaborative housing provision. This continuum ranges from residents' consultation (lowest level of user involvement) to the 'entrepreneurial exit' level (Gofen, 2012), where end-users take full initiative and responsibility in providing housing. Combining these notions with the seminal work on citizen participation developed by (Arnstein, 1969) a parallel may be drawn to assess the different levels of participation and collaboration in the design phase (Gaete Cruz, Ersoy, Czischke, & Van Bueren, 2022). 'Expert' design is led by professionals and does not consider any participation or input from the end-users; in 'diffuse' design, end-users not trained as designers take the lead in the process. While the former has no participation of the end-users, the latter it is based on full participation of end-users; in both cases, there is no collaboration. Within the notion of 'participatory design', different levels of participation and collaboration may be applied: 'user-centred design' while still led by professionals, considers insights of end-users in the process, whereas 'co-design' involves higher participation levels across the process as end-users are considered 'co-designers' (see Figure 1.4).

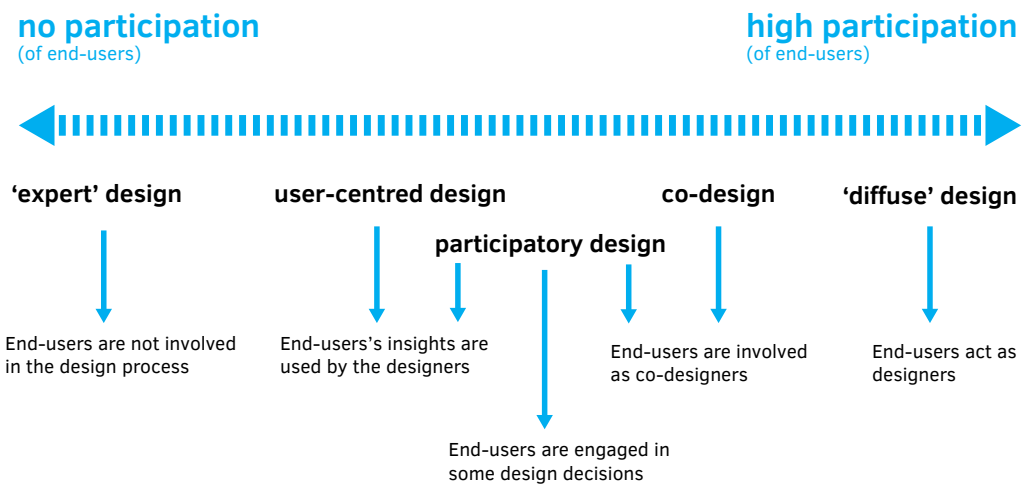


FIG. 1.4 Different design approaches depending on the participation level of the end-users (Source: Author)

TOC

These approaches involving future residents in the design process of a housing project require a change of roles (Lee, 2008; Sanders & Stappers, 2008, 2012) of the conventional figure of the architect and the (future) residents. On the one hand, in a co-design process architects must refrain from their top-down approach and acquire skills of a moderator or facilitator to properly deal with the group of residents (Czischke et al., 2023; Fiehn, Buchanan, & Haward, 2023). They also must re-position themselves between mere technical assistants who draw what the others say and the *star-architects* who have the power to set all the design rules. Residents, on the other hand, used to step in a house without providing any (design) input, have a voice and 'interfere' in the design process. As co-designers, residents are required to think and make decisions in a collaborative manner, usually through different non-hierarchical decision-making techniques, such as dynamic governance or sociocracy (Fiehn et al., 2023; Jarvis, 2015), consensus and voting (Jarvis, 2011; Ruiu, 2016; Williams, 2005). Co-design is said to foster design innovation (Trischler, Pervan, Kelly, & Scott, 2018), in contrast to conventional design processes. This may represent an added value in the housing field, as many current housing solutions are based on outdated layouts (Burkhalter & Castells, 2009).

1.2 Problem formulation

1.2.1 Research gap and assumption

In the past years, a specific research strand has developed linking collaborative housing and affordability, 'focused on emerging [collaborative housing] models and their innovative and radical potential to address the lack of affordable housing options.' (Lang et al., 2020, p. 22). Collaborative housing initiatives seeking affordable and sustainable solutions include Baugruppen in Germany and Austria, Habitat Participatif in France, Community Land Trusts (CLTs) in England, Belgium and France (called 'Organismes de Foncier Solidaire'- OFS), and new residents' cooperatives in Spain or Switzerland (Czischke, 2018).

The affordability of a (collaborative) housing project is highly dependent on *contextual* factors such as the existing regulatory framework (building regulations, policies and government subsidies), market developments (supply and demand, availability of housing financing or innovative financial mechanisms); and societal trends (socio-

demographic shifts, such as aging, migration, and declining number of people per dwelling) (Czischke & Brysch, 2017). However, there is also a variety of factors at project-level that may affect affordability (Czischke & Brysch, 2017). These factors range from the physical features of the housing project (Czischke & Brysch, 2017) to co-production (Czischke, 2018) and collective self-management and -governance (Archer, 2022; Jarvis, 2011; Williams, 2005). Other factors are linked to innovative land access or acquisition (Aernouts & Ryckewaert, 2017; Cabré & Andrés, 2018; Chatterton, 2013; Engelsman, Rowe, & Southern, 2018; Paterson & Dunn, 2009), and collective ownership arrangements (Archer, 2022; Cabré & Andrés, 2018; Ruiu, 2014).

At project-level, the *design phase* is highly relevant, since specific design decisions influence the physical features of the housing project. There is already a robust body of practice-based literature on the design of collective and collaborative housing (see for instance Ledent, Salembier & Vanneste, 2019; Schmid, Eberle & Hugentobler, 2019; LaFond & Tsvetkova, 2017; Kries, Ruby, Ruby, Müller, & Niggli, 2017; Becker, 2015; Ring, 2013; McCamant & Durrett, 1988). Some scholars have assessed how some (participatory) design criteria used in collaborative housing influence social and neighbourhood interaction (Fromm, 2012; Jarvis, 2011; Tummers, 2015; Williams, 2005). However, little is known about the potential of co-design decisions in increasing affordability in housing, by reducing building costs. To recall, building costs correspond to the expensitures incurred during the design and construction process. The design decisions taken to reduce building costs also influence the use costs upon moving in. These use costs are linked to the use of space, energy consumption, and required maintenance. Furthermore, studies of housing affordability tend to overlook the architectural design dimension due to predominant classical theories of housing provision and housing economics.

This research intends to restore the relevance of the design dimension to the study of affordable housing, and to test the assumption that collaborative housing may be affordable through co-design, and even more affordable than mainstream affordable housing. This is because collaborative housing can combine design criteria from mainstream housing with co-design decisions (see Figure 1.5). Mainstream design criteria applied to the reduction of building costs are generally used in collective living layouts. Co-design decisions often reflect the specific needs of the residents and include alternative construction approaches, which may create an extra impact on the overall building building and subsequent use costs. Moreover, in mainstream housing, most developers aim at maximising their profit. This often creates a negative impact in the overall affordability. In the context of collaborative housing, the traditional developer's fees may be avoided. This it is because usually developers are either driven by nonspeculative agendas or inexistent since in many collectively self-organised projects the figure of the developer is discarded.

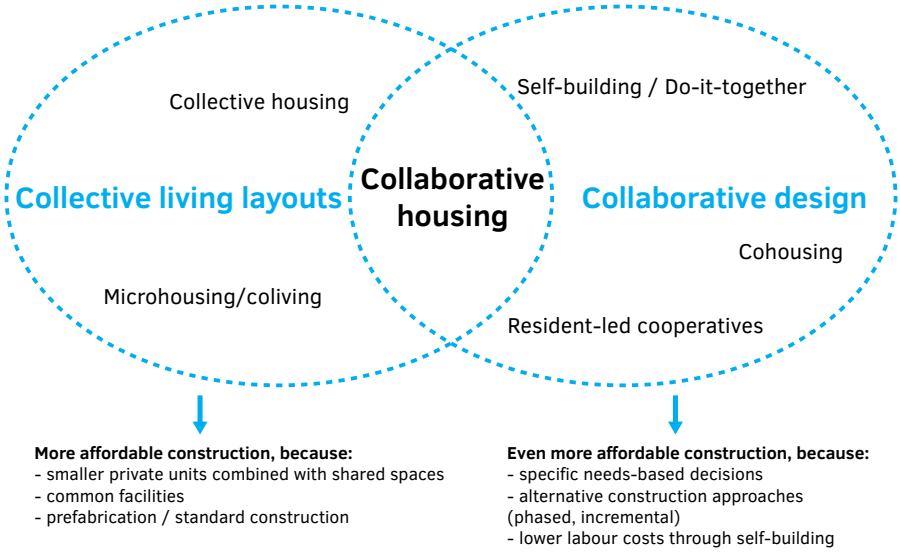


FIG. 1.5 Scheme displaying the research assumption (Source: Author)

Before initiating the primary data collection of this thesis, an exploratory study included visits to eight European collaborative housing projects. These were *Nanterre co-housing*, in Nanterre Paris, *La Borda* in Barcelona, *Sjöfarten*, *Dunderbacken*, *Färdknäppen*, *Rio* and *3Portar* in Stockholm, and *Centraal Wonen* in Delft. The visits involved informal conversations with residents and architects, and photographic documentation. The results suggested that collective efforts, through design and self-organisation, helped to reduce building costs in housing and pointed out to the obsolescence of the building normative in accommodating collaborative ways of living. These preliminary findings emphasised the relevance in pursuing this research.

1.2.2 Research aim and objectives

The aim of this research is to investigate *to what extent* and *how* collaborative housing represents an affordable housing solution through (co-)design. This is done by assessing the impact of the co-design criteria used in collaborative housing in reducing building costs and, therefore, increasing affordability. Here, co-design criteria are defined as design decisions taken collaboratively that are translated into space (the building), encompassing both the design process and the final product (see Figure 1.6). In other words, the research specifically focuses on the

co-design decisions that may reduce construction costs and design process-related costs. Nevertheless, it also alludes to the subsequent use costs that result from the construction process, i.e., those related to the use of space and required housing maintenance. The objectives of this research are:

- to develop a conceptual and analytical framework to assess affordability through design in housing and more specifically, in collaborative housing;
- to identify the design criteria and trends in current affordable housing;
- to identify the design criteria used in collaborative housing to increase affordability;
- to compare the building costs between affordable mainstream housing and affordable collaborative housing;
- to assess the value(s) creation process during the co-design of collaborative housing.

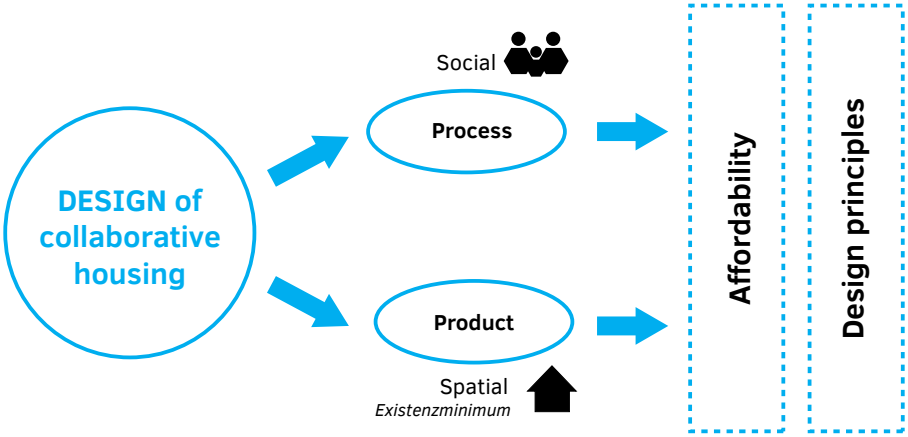


FIG. 1.6 Scope of the research (Source: Author)

The main deliverable is a set of **principles for the design of affordable collaborative housing**. Design principles are here understood as guidelines or parameters that guide the development of a concept from an architectural perspective, both from a product and process point of view.

1.2.3 Research questions

The main question is:

MQ: To what extent and how do the design criteria in European collaborative housing contribute to affordability?

The sub-questions are the following:

SQ1: What principles define the contemporary Existenzmininum?

- What principles define the original Existenzmininum?
- What design criteria are used in current housing to increase affordability?

SQ2: What design criteria are used in collaborative housing to increase affordability?

- What design decisions are taken in collaborative housing projects to reduce building costs?
- How does the design process of collaborative housing projects indirectly contribute to reducing building costs?

SQ3: To what extent and how do co-design decisions influence building costs in housing when compared to mainstream affordable housing design?

- To what extent are these projects affordable, when compared to affordable mainstream housing?
- In what ways do co-design options call into question the existing (minimum) quality standards?

SQ4: How does the co-design process unfold in the face of diverse values amongst (future) residents?

- How are these values translated into co-design decisions?
- What design trade-offs result from conflicting values in a co-design process?

1.3 Research approach

1.3.1 Research paradigm

As a 'basic set of beliefs that guide action' (Guba, 1990, *apud* Creswell, 2009, p. 6), the research paradigm of the present thesis can be summarised in the following components. The starting point is the current problem of lack of affordable housing. Rather than formulating or proposing solutions, it seeks to evaluate possibilities within existing practices. The main focus lies on uncovering the design criteria of affordable collaborative housing through a systematic analysis involving theory (literature review), reality (observation of real cases, document analysis) and 'representations' of reality (simulation).

One of the *practical* goals of this research is to deliver a set of design principles. This entails a deterministic view towards generalisation and replication of the findings, together with the understanding that 'data, evidence, and rational considerations shape knowledge' (Creswell, 2009, p. 7). In this sense, it emphasises a positivist worldview. However, aware that the concepts of (co-)design and affordability are subject to different standpoints and 'weights', this research also draws from the interpretivist perspective, in order to grasp the perceptions of the different stakeholders during the design and decision-making process. The purpose is to 'look for the complexity of views rather than narrowing meanings into a few categories or ideas.' (Creswell, 2009, p. 8)

This thesis is guided by a pragmatic (or pluralistic) worldview, mainly justified by the abovementioned dual epistemological perspective and by the use of different strategies of enquiry. A pragmatic worldview enables the researcher to develop a holistic analysis to fully incorporate numerous relevant factors into the study; and it 'arises out of actions, situations, and consequences rather than antecedent conditions (as in postpositivism)' (Creswell, 2009, p. 10). Pragmatism allows the employment of a mix-methods (Creswell, 2009) or multi-strategy (Bryman, 2006) approach, to enable collecting, analysing and integrating data from both quantitative and qualitative methods (Creswell, 2009). This can help to deepen the understanding of quantitative findings and increase the generalisability of qualitative findings.

The research uses a case study approach, which is considered the most suitable due to 'the opportunity to use many different sources of evidence' (Yin, 2009, p. 97) and

to the qualitative nature of the research. Two different levels of case study may be distinguished. The first one is a broader level – 'light' multiple case study approach – corresponding to a general overview of the design criteria of 16 European collaborative housing recently built in urban contexts, in order to draw 'cross-case' conclusions (Yin, 2009). The second level is more comprehensive – 'in-depth' single case study – where the co-design process of one collaborative housing project is analysed in detail.

Within the mix-methods approach, the research follows a sequential exploratory design (see Figure 1.7), where the initial method of qualitative data collection is used to inform the following quantitative data collection phase of the study, whose purpose is to test or generalise the theory or instrument in question.

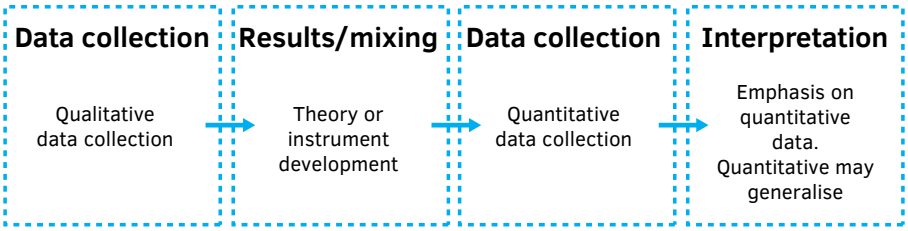


FIG. 1.7 Sequential exploratory design of the research (adapted from original source: https://www.nottingham.ac.uk/)

Qualitative data collection methods such as interviews, (non-statistic) surveys, documents review, and observation are applied in a first phase. The results from the subsequent data analysis serve as a basis to the quantitative part of the research, i.e., a simulation research method (Groat & Wang, 2013) where we apply a basic model to simulate and compare the building costs in collaborative and mainstream housing. This allows a *methodological* triangulation to validate the results, since multiple sources of evidence allow the data to be scanned from different perspectives.

Due to the adopted case study approach, this research can be considered limited in terms of transferability, based on the assumption that case studies cannot enable analysis that produces scientific and replicable results (Flyvbjerg, 2006). However, according to Yin (2009), the use of a case study approach enables analytical (theoretical) generalisation, allowing the obtained results to be transferred to situations outside the analysed case, given the appropriateness of theoretical concepts or principles. Also, according to Groat and Wang (2013, p. 8) 'new

knowledge can also emerge through the relatively small increments of knowledge attained through a variety of means, including assessing the outcome of integrating two previously distinct functional building types (…) or evaluating the success of particular building forms in communicating intended meanings in the public realm.' In this thesis, following this rationale, an analytical generalisation is formalised through a set of design principles, transferable to other similar contexts, by adopting a case study approach and other complementary research methods.

1.3.2 Scope and case study selection

The study scope is Europe, more concretely European urban centres. One of the reasons to restrict the research to Europe is the different conceptualisation of collaborative housing in other contexts outside Europe. For instance, Southern America countries have a distinct understanding and application of the concept (Cortés-Urra, Ersoy, Czischke, & Gruis, in peer-review). This choice is also linked to – and personally motivated by – the development of the Co-Lab Mapping project, a research project that aims at mapping and systematising the different collaborative housing forms across Europe. More specifically, the selected case studies are located within the European Union, as many of the current challenges in housing (affordability, sustainability, etc.) are common to European Union members; and they follow the same EU directives, namely Energy Efficiency Index / EU Energy Label, or European accessibility standards for disabled people. This is particularly relevant in the discussion on the adequacy of the current space standards in the development of collaborative housing projects. However, the proposed principles for the co-design of affordable collaborative housing are conceived to be flexible enough to be applicable to similar, but different, (European) contexts.

The selection of the case studies (multiple and single) is processed by following the criteria displayed in Figure 1.8. Reducing the scope of collaborative housing initiatives to 'recently completed project (after 2000) / in European urban centres', this research collects a number of possible cases, based on literature review, digital databases and personal contacts. Then, the following criteria are used for the selection of a total of 16 projects: be referred to as having affordability as (one of) the project's main driver(s); be the result of a participatory design process (to different extents); and combine private units with collective spaces.

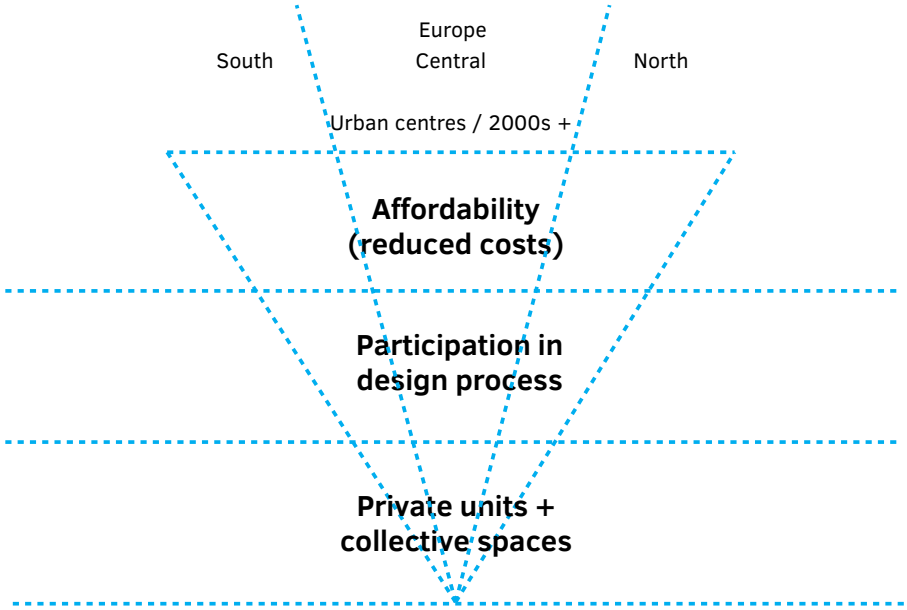


FIG. 1.8 Criteria for the selection of the case studies (Source: Author)

The examples include south, central and north Europe, seeking a balanced geographical coverage, and to provide the opportunity for cross learning between different cultures and backgrounds. Some of the chosen cases are located in countries where collaborative housing initiatives are long established practices and also the birthplace of some models. Others are where collaborative housing is a recent phenomenon but used as a way to tackle the affordable housing crisis, namely Spain (Cabré & Andrés, 2018). The selected multiple case studies are presented in the following table and map (Table 1.1 and Figure 1.9).

From these 16 projects, we have selected one to be the single case study, to deepen the knowledge on co-design processes and decisions, namely the resident-led cooperative housing *La Borda*, located in Barcelona, Spain. This choice is justified by the continued access to the data related to the co-design process of the project throughout the research. These data include architectural drawings, project descriptions, direct input from (future) residents and architects (in 2018, 2020 and 2022), and direct experience of a member of *La Borda* who was actively involved in the co-design process since 2014 and with whom a collaboration was established to co-write an academic paper.

TABLE 1.1 Overview of selected case studies (Source: Author)

Project's name	Year of completion	Location (City, Country)	Number of households
1. Lange Eng	2009	Alberstlund, Denmark (DK)	54
2. Byfællesskabet	2018	Odense, Denmark (DK)	8
3. Sjöfarten	2008	Stockholm, Sweden (SE)	47
4. Dunderbacken	2014	Stockholm, Sweden (SE)	61
5. Sofiefunds	2014	Malmö, Sweden (SE)	45
6. BoAktiv Landgången	2016	Malmö, Sweden (SE)	40
7. Kotisatama	2015	Helsinki, Finland (FI)	63
8. Scarwafa	2016	Amsterdam, The Netherlands (NL)	3
9. Interpares	2010	Hamburg, Germany (DE)	10
10. Spreefeld Berlin eG	2014	Berlin, Germany (DE)	64
11. R50 cohousing	2013	Berlin, Germany (DE)	19
12. Wohnprojekt Wien	2013	Vienna, Austria (AU)	40
13. Wohnprojekt Seestern Aspern	2015	Vienna, Austria (AU)	28
14. Le Village Vertical	2013	Lyon, France (FR)	14
15. La Borda	2018	Barcelona, Spain (ES)	28
16. Borgo Sostenible	2015	Milan, Italy (IT)	321

FIG. 1.9 Map of the selected case studies (Source: Author)

TOC

1.3.3 Research design and methods

Data collection was carried out in two different ways, through desk research (to gather secondary data) and fieldwork (to collect primary data) (see Figure 1.10). Desk research included a literature review, the documentation of the architectural drawings of the cases and websites' visits of the respective projects. Open-ended and semi-structured interviews, a survey and spatial observation were part of primary data collection.

Fieldwork involved site visits to the selected case studies and took place between May and July 2018 and between April and August 2019. It consisted of project visits, photographic documentation, a (web-)survey (average duration of 15-20 minutes) sent to the residents of the projects, and interviews (average duration of one hour) or informal conversations with residents, architects, and facilitators involved in the design phase.

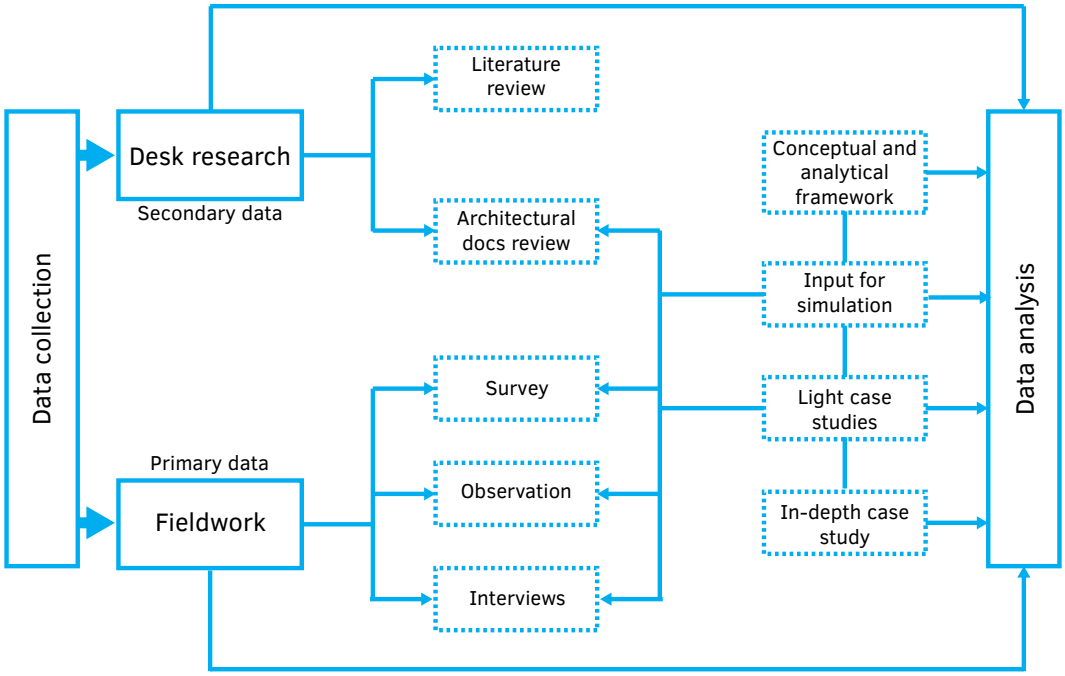


FIG. 1.10 Scheme of data collection and analysis (Source: Author)

TOC

The interviews followed two formats. In 2018, the interviews were conducted with co-designers of *La Borda*, the in-depth single case study, according to a more conventional semi-structured approach. The questions mainly focused on the co-design process organisation and the impact of collective decisions in the building costs (see Appendix 1A). In 2019, the interviews covered all case studies and the respondents were presented with four 'flashcards' at the beginning of the interview with pre-defined key themes: design & construction process; final outcome; affordability; and setbacks (see Figures 1.11 and 1.12). Participants were asked to comment on these topics and answer open-ended questions regarding their housing projects (see Appendix 1B). This strategy framed and guided the whole interview, to avoid deviations from the subject and to allow a more natural narrative.

The survey was applied to the residents of the case studies, and it mainly contained multiple-choice questions related to the above mentioned four key topics (see Appendix 1C). It was translated into English, German, French, Italian and Spanish and distributed accordingly to the residents either digitally (web-survey) or as a hard-copy (letter in the mailbox) during the fieldwork. Although not representative from a statistical perspective, the survey responses provided both factual data about the projects and the residents' perceptions on the co-design of their housing.

This research also includes a building cost simulation, conceived to compare the building costs of mainstream housing with those of collaborative housing, based on their design choices. This took place between June and August 2022 and was carried out in collaboration with Casper Mouissie, advisor at the building costs advisory company MBM Bouwkosten BV, based in Amsterdam, the Netherlands. The calculations were made using the BudsyS software, a parametric system for estimating building costs based on design choices and building typologies (See Figure 1.13).

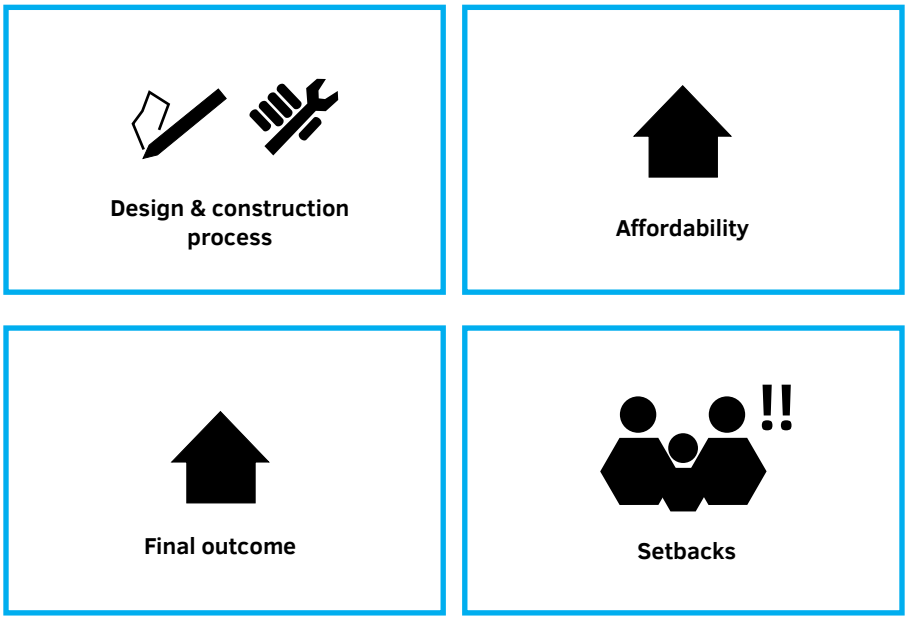


FIG. 1.11 Flashcards used in the interviews (front side) (Source: Author)

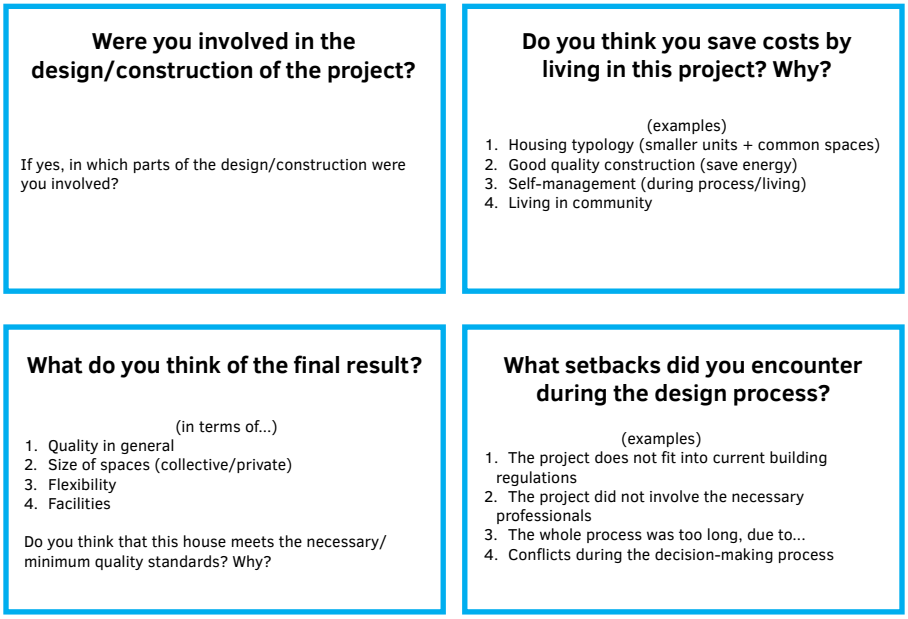


FIG. 1.12 Flashcards used in the interviews (back side) (Source: Author)

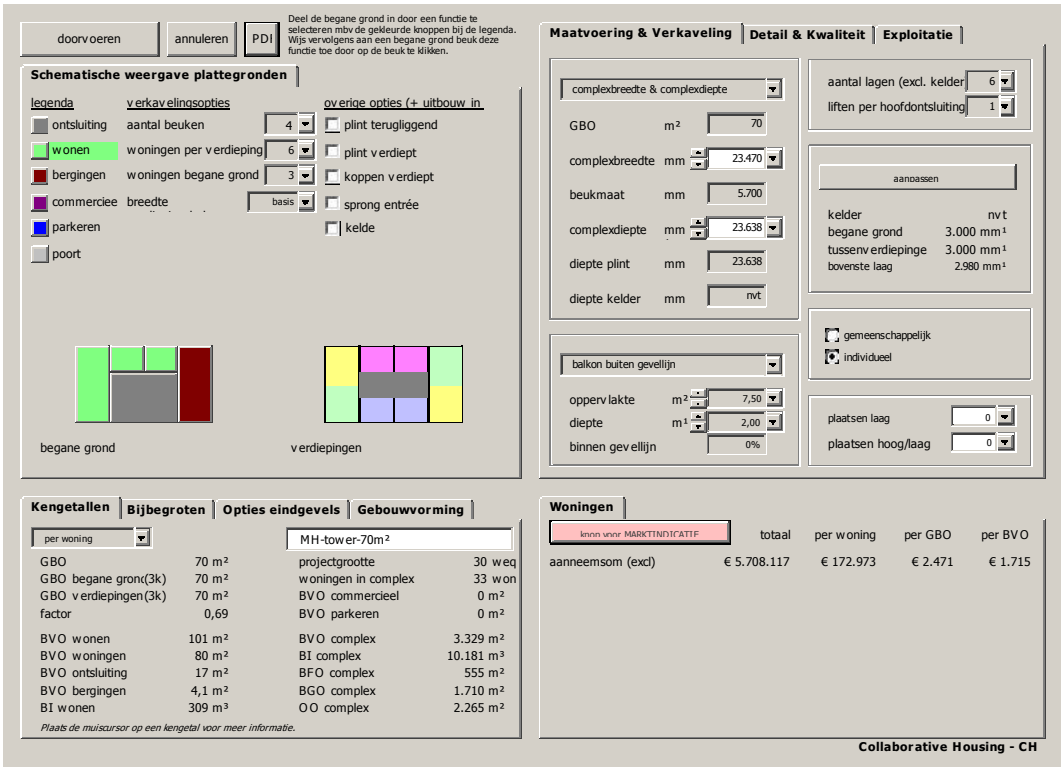


FIG. 1.13 Input for simulation using the BudsyS software (Source: Image courtesy of Casper Mouissie)

Data analysis was divided into four distinct – yet intertwined – studies (see Figure Sum.1). These are directly linked to the sub-questions, framed to deconstruct the main research question. Table 1.2 outlines the studies and their link to the sub-questions guiding this research.

Study 1 conceptualises housing affordability through the lenses of the design concept *Existenzmininum* and identifies current innovative housing design (both collaborative and mainstream solutions). The analysis is based on literature review and aims to answer the sub-question 'What principles define the contemporary *Existenzmininum*?'.

Study 2 specifically focuses on the design of collaborative housing. It follows a light case study approach, with input from the conducted open-ended interviews, a survey, observation, and document analysis. In an attempt to provide answers to the sub-question 'What design criteria are used in collaborative housing to increase affordability?', it proposes an analytical framework to evaluate the design factors that influence building costs in 16 recent European collaborative housing projects.

Study 3 carries a more quantitative perspective to the research. It is based on the results of the previous study and tests the extent to which and how do co-design decisions influence building costs in housing when compared to mainstream affordable housing design. This is done through literature review followed by a building costs simulation model.

Study 4 corresponds to a longitudinal single case-study, which assesses in detail the values that are set in co-design processes. Based on literature review, document analysis, through coding and input from interviews and a focus group, it seeks to provide answers to the question 'How does the co-design process unfold in the face of diverse values amongst (future) residents?'.

TABLE 1.2 Overview of studies linked to the sub-questions (Source: Author)

Study / Paper	Sub-question	Objectives	Approach	Methods
1 (CHAPTER 2) Reinterpreting *Existenzminimum* in Contemporary Affordable Housing Solutions	**SQ1:** What principles define the contemporary *Existenzminimum*? – What principles define the original *Existenzminimum*? – What design criteria are used in current housing to increase affordability?	– develop a conceptual framework to assess housing affordability through design – propose a redefinition for the current *Existenzminimum*	– Literature review – Grey literature review (architectural online magazines)	– Document review
2 (CHAPTER 3) Affordability through design: the role of building costs in collaborative housing	**SQ2:** What design criteria are used in collaborative housing to increase affordability? – What design decisions are taken in collaborative housing projects to reduce building costs? – How does the design process of collaborative housing projects indirectly contribute to reducing building costs?	– develop an analytical framework to assess affordability in collaborative housing through design – identify and describe the design options used in collaborative housing to increase affordability	– Literature review – Light multiple case study	– Document review – Survey – Interviews – Observation

>>>

TABLE 1.2 Overview of studies linked to the sub-questions (Source: Author)

Study / Paper	Sub-question	Objectives	Approach	Methods
3 (CHAPTER 4) Sharing is saving? Building costs simulation of collaborative and mainstream housing designs	**SQ4:** To what extent and how do co-design decisions influence building costs in housing when compared to mainstream affordable housing design? – To what extent are these projects affordable, when compared to affordable mainstream housing? – In what ways do co-design options call into question the existing (minimum) quality standards?	– identify the distinguishing design criteria in collaborative housing and mainstream housing – elaborate a basic simulation model to compare building costs in collaborative housing and mainstream housing	– Literature review – Simulation	– Document review – Building costs simulation model
4 (CHAPTER 5) The process of value setting through co-design: the case of *La Borda*, Barcelona	**SQ3:** How does the co-design process unfold in the face of diverse values amongst (future) residents? – How are these values translated into co-design decisions? – What design trade-offs result from conflicting values in a co-design process?	– develop an analytical tool to unfold the values that are created in the co-design process – uncover the values behind co-design decisions and design trade-offs	– Literature review – In-depth single case study	– Document review – Coding – Interviews – Focus group

1.4 Research impact

1.4.1 Scientific relevance

The scientific relevance of this research lies in the lack of scientific studies focused on the *design* of affordable housing, and more specifically, affordable collaborative housing. As mentioned, housing affordability has been generally researched through housing provision and housing economics theories, which excludes the architectural design dimension. The field of collaborative housing is no exception: existing research mainly focuses on the economic aspects that affect affordability (Bresson & Denèfle, 2015; Cabré & Andrés, 2018; Cariou, 2012; Droste, 2015; Williams, 2005). While a body of knowledge is growing on the design principles used in collaborative housing to increase social interaction (Torres-Antonini, 2001; Williams, 2005), there is still no research focusing on how design, and more specifically co-design, may contribute to increase affordability in collaborative housing. This research intends to fill this knowledge gap and reclaims the crucial role of design in providing affordable housing.

At the same time, this research seeks to provide an alternative perspective to the more paternalistic and technocratic approaches that dominate both theories and practices of architecture design and planning. It does so by emphasising bottom-up approaches and values such as participation and collaboration in housing design. This directly impacts the way the design process is conceptualised (by researchers), learned (by architecture students), and applied (by the involved participants).

1.4.2 Practice and societal relevance

The societal relevance is justified by the urgent need for practical affordable housing solutions for increasing segments of the population. The acute affordable housing crisis that characterised the aftermath of the Global financial and economic crisis of 2008, has worsened with the COVID-19 pandemic and the recent geopolitical conflicts in Europe. The war between Russia and Ukraine has resulted in a general increase of the cost of living across the European Union, which affected housing related expenditures (in particular through the energy costs). The pandemic lockdown has contributed to a series of debates within the housing sector on 'the design and functionality of common areas.' (The state of Housing in EU Report, 2021, p. 6).

All this has called into question the conventional living standards and provision systems, which should affect the way housing is designed and provided. Accordingly, 'significant changes across a variety of professions in response to global economic trends make research on the structure and scope of architectural practice key to the future of the profession.' (Groat & Wang, 2013, p. 9). This thesis aims to explores how the domestic layout has evolved in contemporary housing examples where (future) residents, together with architects, shape their collaborative housing according to their needs and possibilities. It also seeks to provide practical guidance on the co-design of a housing project, which can help to reduce building costs of the future production of collaborative housing, and to sistematise the co-design process.

The gained knowledge can be transferred to policy makers, residents' groups aiming to start affordable collaborative housing projects, architects working in these projects, and other relevant stakeholders. In addition, the findings can be useful to the public entities who set the rules that specify the standards for construction, at national or European level, for an eventual (re)formulation of European Union directives related to quality and space standards in housing in general, and more particularly, in collaborative housing.

1.5 Thesis structure

The structure of the thesis is guided by the conducted studies. Chapters 2, 3, 4, and 5 present the four studies, materialised in academic peer-reviewed papers. The final chapter provides a reflection on the key findings, presents a set of design principles of affordable collaborative housing, and summarises the theoretical and practical implications of this thesis.

- Chapter 2 – Reinterpreting *Existenzminimum* in Contemporary Affordable Housing Solutions
- Chapter 3 – Affordability through design: the role of building costs in collaborativehousing
- Chapter 4 – Sharing is saving? Building costs simulation of collaborative and mainstream housing designs
- Chapter 5 – The process of value setting through co-design: the case of *La Borda*, Barcelona
- Chapter 6 – Conclusions

References

Aernouts, N., & Ryckewaert, M. (2017). Beyond housing: on the role of commoning in the establishment of a Community Land Trust project. *International Journal of Housing Policy*, 1-19. doi:10.1080/19491247.2017.1331592

Alexander, C. (1977). A pattern language: towns, buildings, construction: Oxford university press.

Arbell, Y. (2022). Beyond Affordability: English Cohousing Communities as White Middle-Class Spaces. *Housing, Theory and Society*, 1-22.

Archer, T. (2022). The mechanics of housing collectivism: how forms and functions affect affordability. *Housing Studies, 37*(1), 73-102. doi: 10.1080/02673037.2020.1803798

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of planners, 35*(4), 216-224.

Beck, A. F. (2020). What is co-housing? Developing a conceptual framework from the studies of Danish intergenerational co-housing. *Housing, Theory and Society, 37*(1), 40-64.

Becker, A. (2015). Bauen und Wohnen in Gemeinschaft/Building and Living in Communities: Ideen, Prozesse, Lösungen/Ideas, Processes, Solutions. Basel: Birkhäuser Verlag GmbH.

Bresson, S., & Denèfle, S. (2015). Diversity of self-managed co-housing initiatives in France. *Urban Research & Practice, 8*(1), 5-16. doi:10.1080/17535069.2015.1011423

Bryman, A. (2006). Integrating quantitative and qualitative research: how is it done? *Qualitative research, 6*(1), 97-113.

Brysch, S. (2011). *Existenzminimum. A questão da Habitação Mínima entre o Moderno e o Contemporâneo.* [*Existenzminimum*. The issue of minimum housing between the modern and the contemporary] [Master dissertation, Porto: University of Porto]

Burkhalter, L., & Castells, M. (2009). *Beyond the Crisis: towards a new urban paradigm.* Paper presented at the The 4th International Conference of the International Forum on Urbanism (IFoU), Delft, The Netherlands, 1-26.

Cabré, E., & Andrés, A. (2018). La Borda: a case study on the implementation of cooperative housing in Catalonia. *International Journal of Housing Policy*, *18*(3), 412-432. doi:10.1080/19491247.2017.1331591

Cariou, E. (2012). Habitat groupé et organismes HLM: une utopie réalisable et reproductible? *Revue Internationale de l'Economie Sociale, 91*(323), 29-33.

Carriou, C. (2014). Propriété privée, propriété de soi et sens du collectif. La «coopérative d'habitat Le Grand Portail» à Nanterre (France). *Espaces et sociétés, 1*, 213-227. doi:10.3917/esp.156.0213

Chatterton, P. (2013). Towards an Agenda for Post-carbon Cities: Lessons from Lilac, the UK's First Ecological, Affordable Cohousing Community. *International Journal of Urban and Regional Research, 37*(5), 1654-1674. doi:10.1111/1468-2427.12009

Cortés-Urra, V., Ersoy, A., Czischke, D., & Gruis, V. (in peer-review). The Potential of Collaborative Housing to Tackle the Social Deficit of Housing: The Chilean Case. *Journal of Housing and the Built Environment*.

Creswell, J. (2009). *Research Design. Qualitative, Quantitative, and Mixed Methods Approaches.* California: Sage Publications, Inc.

Czischke, D. (2018). Collaborative housing and housing providers: towards an analytical framework of multi-stakeholder collaboration in housing co-production. *International Journal of Housing Policy, 18*(1), 55-81. doi:10.1080/19491247.2017.1331593

Czischke, D., & Brysch, S. (2017). Collaborative Housing And Affordability: Understanding The Interplay Between Collective Self-Organisation, Design And Affordability. Paper presented at the International Conference of the European Network for Housing Research (ENHR), Tirana, Albania.

Czischke, D., & Huisman, C. J. (2018). Integration through collaborative housing? Dutch starters and refugees forming self-managing communities in Amsterdam. *Urban Planning, 3*(4), 156-165.

Czischke, D., & van Bortel, G. (2018). An exploration of concepts and policies on 'affordable housing'in England, Italy, Poland and The Netherlands. *Journal of Housing and the Built Environment*, *38*(1), 1-21.

Czischke, D., Huisman, C., Brysch, S., Vergara d'Alençon, L. M., & Cortés-Urra, V. (2021). *Mapping Collaborative Housing in Europe – Towards a Systematic Categorisation.* Paper presented at the International Conference of the European Network for Housing Research (ENHR), Nicosia, Cyprus.

Droste, C. (2015). German co-housing: an opportunity for municipalities to foster socially inclusive urban development? *Urban Research & Practice, 8*(1), 79-92. doi:10.1080/17535069.2015.1011428
Engelsman, U., Rowe, M., & Southern, A. (2018). Community Land Trusts, affordable housing and community organising in low-income neighbourhoods. *International Journal of Housing Policy, 18*(1), 103-123.
Fiehn, R., Buchanan, K., & Haward, M. (2023). *Collective Action!: The Power of Collaboration and Co-Design in Architecture*. London: RIBA Publishing.
Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative inquiry, 12*(2), 219-245.
Fromm, D. (1991). Collaborative Communities: Cohousing, Central Living, and Other New Forms of Housing With Shared Facilities. New York: Van Nostrand Reinhold.
Fromm, D. (2012). Seeding Community: Collaborative Housing as a Strategy for Social and Neighbourhood Repair. *Built Environment, 38*(3), 364-394.
Gaete Cruz, M., Ersoy, A., Czischke, D., & Van Bueren, E. (2022). Towards a framework for urban landscape co-design: Linking the participation ladder and the design cycle. *CoDesign*, 1-20. doi: 10.1080/15710882.2022.2123928
Gofen, A. (2012). Entrepreneurial exit response to dissatisfaction with public services. *Public Administration, 90*(4), 1088-1106.
Groat, L., & Wang, D. (2013). *Architectural research methods (second edition)*. New Jersey: John Wiley & Sons.
Gropius, W. (1930). Die soziologischen Grundlagen der Minimalwohnung für die städtische Industriebevölkerung [The sociological foundations of minimum housing for the urban industrial population]. Paper presented at the CIAM II: Die Wohnung für das Existenzminimum, Frankfurt.
Haffner, M., & Heylen, K. (2011). User costs and housing expenses. Towards a more comprehensive approach to affordability. *Housing Studies, 26*(04), 593-614.
Harris, R. (1999). Aided Self-help Housing, a Case of Amnesia: Editor's Introduction. *Housing Studies, 14*(3), 277-280.
Hulchanski, J. D. (1995). The concept of housing affordability: Six contemporary uses of the housing expenditure-to-income ratio. *Housing Studies, 10*(4), 471-491.
Jarvis, H. (2011). Saving space, sharing time: integrated infrastructures of daily life in cohousing. *Environment and Planning A, 43*(3*)*, 560-577. doi:10.1068/a43296
Jarvis, H. (2015). Towards a deeper understanding of the social architecture of co-housing: evidence from the UK, USA and Australia. *Urban Research & Practice, 8*(1), 93-105. doi:10.1080/17535069.2015.1011429
Jarvis, H., & Bonnett, A. (2013). Progressive nostalgia in novel living arrangements: a counterpoint to neo-traditional new urbanism? *Urban Studies, 50*(11), 2349-2370.
Kries, M., Ruby, I., Ruby, A., Müller, M., & Niggli, D., 2017 (Eds.) (2017). Together! the New Architecture of the Collective. Berlin: Vitra Design Museum GmbH.
Landenberger, L., & Gütschow, M. (2019). Project Management for Building Groups: Lessons from Baugemeinschaft Practice. *Built Environment, 45*(3), 296-307.
LaFond, M., & Tsvetkova, L. (2017). CoHousing Inclusive: Self-Organized, Community-Led Housing for All. Berlin: Jovis Verlag GmbH.
Lang, R., Carriou, C., & Czischke, D. (2020). Collaborative Housing Research (1990–2017): A Systematic Review and Thematic Analysis of the Field. *Housing, Theory and Society*, 37(1), 10-39.
Ledent, G., Salembier, C. & Vanneste, D. (Eds.) (2019), Sustainable Dwelling. Between Spatial Polyvalence and Residents' Empowerment. Louvain-la-Neuve: PUL.
Lee, Y. (2008). Design participation tactics: the challenges and new roles for designers in the co-design process. *Co-design, 4*(1), 31-50.
Lerman, D. L., & Reeder, W. J. (1987). The affordability of adequate housing. *Real Estate Economics, 15*(4), 389-404.
McCamant, K., & Durrett, C. (1988). Cohousing - A Contemporary Approach to Housing Ourselves. Berkeley: Habitat Press/Ten Speed Press.
Maclennan, D., & Williams, R. (1990). *Affordable housing in Britain and the United States*. York: Joseph Rowntree Foundation.
Manzini, E. (2016). Design culture and dialogic design. *Design Issues, 32*(1), 52-59.
Mattelmäki, T., & Visser, F. S. (2011). Lost in co-x. *Proceedings of the IASDR2011*.

May, E. (1930). Die Wohnung für das Existenzminimum [The minimum dwelling]. *Das Neue Frankfurt – Monatsschrift für die Probleme moderner Gestaltung, 3. Jahrg*, 209-211.

Montaner, J., & Muxí, Z. (2014). *Arquitectura e política: ensaios para mundos alternativos* [*Architecture and politics: essays for alternative worlds*]. São Paulo: Gustavo Gilli.

Montaner, J. (2001). *Depois do movimento moderno: arquitetura da segunda metade do* século XX [*After the modern movement: architecture of the second half of the 20th century s*]. Barcelona: Gustavo Gili.

Mosayebi, E., & Kraus, M. (Eds.) (2023). *The Renewal of Dwelling: European Housing Construction 1945-1975*. Zurich: Triest Verlag.

Mulliner, E., Smallbone, K., & Maliene, V. (2013). An assessment of sustainable housing affordability using a multiple criteria decision making method. *Omega, 41*(2), 270-279.

Mumford, E. (2002). *The CIAM Discourse on Urbanism, 1928-1960*. Cambridge, Massachusetts: The MIT Press.

Paterson, E., & Dunn, M. (2009). Perspectives on utilising Community Land Trusts as a vehicle for affordable housing provision. *Local Environment, 14*(8), 749-764. doi:10.1080/13549830903096486

Pittini, A., Koessl, G., Dijol, J., Lakatos, E., & Ghekiere, L. (2017). *The State of Housing in the EU Report*. Retrieved from www.housingeurope.eu

Ring, K. (2013). Self made city: Self-Initiated Urban Living and Architectural Interventions Berlin: Jovis Verlag GmbH.

Ruby, A., & Ruby, I. (2011). Min to Max: International Architecture Symposium on the Redefinition of the "minimal subsistence dwelling". Retrieved from http://www.min2max.org/

Ruiu, M. (2016). Participatory processes in designing cohousing communities: the case of the community project. *Housing and Society, 43*(3), 168-181.

Ruiu, M. (2014). Differences between Cohousing and Gated Communities. A Literature Review. *Sociological Inquiry, 84*(2), 316-335. doi:10.1111/soin.12031

Sanders, E., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *Co-design, 4*(1), 5-18.

Sanders, E., & Stappers, P. J. (2012). *Convivial toolbox: Generative research for the front end of design*. Amsterdam: Bis.

Schmid, S., Eberle, D., & Hugentobler, M. (2019). A History of Collective Living: Forms of Shared Living. Basel: Birkhäuser Verlag.

Stenberg, J., Harling, T., & Berglund, A. (2022). Can co-design and co-building help make collaborative housing more affordable? Retrieved from https://codesigncities.se/wp-content/uploads/2023/03/Codesign-affordable-2022.pdf

Stone, M. (1993). *Shelter poverty: New ideas on housing affordability*. Philadelphia: Temple University Press.

Teige, K. (1932/2002). *The Minimum Dwelling* (E. Diuhosch & R. Svacha Eds.). Cambridge, Massachusetts: The MIT Press.

Torres-Antonini, M. (2001). *Our common house: Using the built environment to develop supportive communities.* [Doctoral dissertation, Gainesville: University of Florida]

Trischler, J., Pervan, S. J., Kelly, S. J., & Scott, D. R. (2018). The value of codesign: The effect of customer involvement in service design teams. *Journal of Service Research, 21*(1), 75-100.

Tummers, L. (2015). Understanding co-housing from a planning perspective: why and how? *Urban Research & Practice, 8*(1), 64-78. doi:10.1080/17535069.2015.1011427

Tummers, L. (2016). The re-emergence of self-managed co-housing in Europe- A critical review of co-housing research. *Urban Studies, 53*(10), 2023-2040. doi:10.1177/0042098015586696

Turner, J. (1988). *Building community: a third world case book (B. Turner, Ed.)*. London: Building Community Books.

Van der Velden, M., & Mörtberg, C. (2015). Participatory design and design for values. In J. van den Hoven, P. Vermaas, & I. van de Poel (Eds.), *Handbook of ethics, values, and technological design: Sources, theory, values and application domains* (pp. 41-66). Dordrecht: Springer

Vestbro, D. (2000). From collective housing to cohousing A summary of research. *Journal of Architectural and Planning Research, 17*(2), 164-178.

Vestbro, D. (2010a). Living together-cohousing ideas and realities around the world. Proceedings from the International Collaborative Housing Conference in Stockholm, Royal Institute of Technology in collaboration with Kollektivhus NU.

Vestbro, D. (2010b). Saving by Sharing Collective Housing for Sustainable Lifestyles. Second Conference on "Economic Degrowth for Ecological Sustainability and Social Equity", Barcelona

The State of Housing in the EU Report (2021). Retrieved from https://www.stateofhousing.eu/#p=1

Williams, J. (2005). Designing Neighbourhoods for Social Interaction: The Case of Cohousing. *Journal of Urban Design, 10*(2), 195-227. doi:10.1080/13574800500086998

Yin, R. K. (2009). *Case study research: Design and methods (applied social research methods)*. London and Singapore: Sage.

Zamenopoulos, T., & Alexiou, K. (2018). *Co-design as collaborative research*. Connected Communities Foundation Series. Bristol: Bristol University/AHRC Connected Communities Programme.

Appendix 1A

Interview Protocol
Q1: When did you join the cooperative and what drove you to do it?
Q2: Tell me about the time you spent in the design planning meetings. (Do you have records of that?)
Q3: How was the process of making the final decisions (consensus, democratic vote)? How would you describe the levels of conflict during the meetings (time consuming, demotivation)?
Q4: How did the external stakeholders (La Dinamo, the municipality, Coop57 Bank) affect the whole planning process?
Q5: How did you plan the future maintenance of the apartments/building (DIY, cleaning of common spaces, taking care of common garden)?
Q6: How was your participation in the design decisions (common spaces, individual units' layout, materials, levels of finishes) and what influenced you to decide for that?
(there any design feature that, because of legislation restrictions, was not possible to include?)
Q7: What do you have to say in regard to the size of your individual unit and common spaces? (Too small/ Enough since you have shared rooms?)
Q8: Tell me about your thoughts on the idea that collective design planning can lower costs in general (construction and maintenance).
Q9: Looking back to the whole process, what would you change? (The methods used in the collective design, anything that was supposed to be more affordable and it was not at the end, etc.)

Interview Questions	Background information	Topic		
		Collective design process	Design aspects, collective decisions	Co-design and affordability
Interview Q1	x			
Interview Q2		x		
Interview Q3		x		
Interview Q4		x		
Interview Q5		x	x	
Interview Q6		x	x	
Interview Q7		x	x	
Interview Q8		x	x	x
Interview Q9	x			

Appendix 1B

Interview Protocol with residents/co-designers [Fieldwork April-August 2019]
Topic: Process
(Name / Age / Household / What made you join this project?)
Were you involved in the design of the project?
(NO: Did you meet the architect at any time? Could you decide on something? And then skip the next questions)
In which parts of the design were you involved?
How much time did you spend in the design phase? And since when were you involved in it? *(from the early start, or later, when?)*
Did you make some sort of in-kind work? Do you think it helped to save costs?
Besides the architect, what other professionals were involved in the design process?
Based on your experience, who should always collaborate with the group in order to save costs, save time or avoid future money losses? (e.g.: construction supervisor, moderator)
How did the collective design affect the final outcome? What kind of collective decisions were taken? Do you think that everything should be decided collectively?
Do you think that some collective design decisions contributed to reducing costs in any way? Examples?
Topic: final outcome (spatial features)
When you moved, was the house ready?
Were you involved in the construction (or finishing) of the project? How?
Did you choose alternative construction methods? Did they somehow contribute to reduce the costs?
What do you think of the sizes of spaces? How comfortable do you feel in different spaces?
How often/much time do you use the common kitchen? The common room? The other spaces?
How (spatially) flexible or adaptable is the project? Why did you decide on that?
Do you believe you save costs by living in this project? Why?
(if s/he doesn't mention *design*: Do you think that the way this house was designed helped in saving costs? Why?)
Is there anything in the project that did not fit into the building regulations? Examples?
Do you think that this house meets the necessary quality standards? How would you define "quality standards"?
This idea of collaboration, living together is not new. Some researchers say that this is the "third wave" of collaborative housing. Do you have any idea of why this is happening now?

Interview Protocol with architects/co-designers [Fieldwork April-August 2019]
Topic: Process
How long was the design process? Longer than usual?
How involved were the residents in the design process?
What kind of collective decisions were taken?
How did the collective design affect the final outcome?
Do you think that everything should be decided collectively? Where is the limit?
Do you think that some collective design decisions contributed to reducing costs in any way?
How different were the process and the result compared to more conventional housing projects?
Topic: final outcome (spatial features)
Do you believe that people save costs by living in this project (from a design/use of space perspective)? Why?
Is there anything in the project that did not fit into the building regulations? Examples?
Were some of the spaces letf unfinished? How did the residents respond to that?
Do you think that this house meets the necessary quality standards? How would you define "quality standards"?
How flexible or adaptable is the project? Why did you decide on that?
Did you choose alternative construction methods? Do you think they somehow contributed to reduce the costs?
This idea of collaboration, living together is not new. Some researchers say that this is the "third wave" of collaborative housing. Do you have any idea of why this is happening now?
Final requests
(Number and contact of residents)
General costs
Send Plans of the building / Possibility of changing the layout

Appendix 1C

Short survey: your housing project (further translated into French, Italian, German, and Spanish)

I live in ... *(name of the project and city)*

My birth year is

I decided to live in this project... *(tick all boxes that apply)*

☐ to find an affordable way to live in the city

☐ to create a stronger sense of community

☐ to age in a proactice way

☐ to reduce the burden of housework (such as cooking or cleaning)

☐ Other:

1. Were you involved in the design process of your collective house?

☐ Yes, in the beginning, but the project was mainly managed by the architects.

☐ Yes, in the final phase of the project.

☐ Yes, from the beginning to the end.

☐ No.

☐ Other:

NOTE: If your answer was "No" you may skip to question number 4.

2. In which parts of the design were you involved? *(tick all boxes that apply)*

☐ Own private unit.

☐ Common spaces.

☐ Exterior spaces.

☐ Although I could decide differently, I always agreed with the architects' proposals.

☐ Other:

☐ Any additional comment?

3. Do you think that some collective design decisions helped to reduce the building costs?

☐ Yes.

☐ No.

☐ I do not know.

☐ Please give examples:

4. When you moved, was the house ready?

☐ Yes.

☐ No, some details were not completely finished.

☐ No, some parts were/are to be built at a later stage.

>>>

Short survey: your housing project (further translated into French, Italian, German, and Spanish)

☐ Other:

5. Were you involved in the construction of your collective house?

☐ Yes.

☐ No.

☐ If yes, could you please specify the tasks you were involved in?

6. What do you think of the size of the spaces? *(tick all boxes that apply)*

☐ There is a good balance between private and common spaces.

☐ Private units are too small or do not have the necessary facilities.

☐ Private units are too big.

☐ Common spaces are too small or do not provide the necessary facilities.

☐ Common spaces are not used.

☐ Other:

7. Do you think you save costs by living in this house?

☐ Yes.

☐ No.

☐ Please explain why:

8. Do you think that this house meets the necessary quality standards?

☐ Yes.

☐ No.

9. Do you think that the quality of the house was reduced in order to lower the costs?

☐ Yes.

☐ No.

☐ If yes, please specify:

>>>

Short survey: your housing project (further translated into French, Italian, German, and Spanish)

10. In your opinion, what should be considered a "quality standard"?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
kitchen included in the private unit	☐	☐	☐	☐	☐
kitchenette included in the private unit	☐	☐	☐	☐	☐
bathroom included in the private unit	☐	☐	☐	☐	☐
living room included in the private unit	☐	☐	☐	☐	☐
good ventilation and access to sunlight	☐	☐	☐	☐	☐
good thermal insulation	☐	☐	☐	☐	☐
good acoustic insulation	☐	☐	☐	☐	☐
high-end and expensive materials	☐	☐	☐	☐	☐
environmental sustainable materials	☐	☐	☐	☐	☐
large rooms and high ceilings	☐	☐	☐	☐	☐
exterior spaces (balcony or garden)	☐	☐	☐	☐	☐
passive house* construction	☐	☐	☐	☐	☐
safe neighbourhood	☐	☐	☐	☐	☐
proximity to city centre	☐	☐	☐	☐	☐
proximity to public transport	☐	☐	☐	☐	☐
proximity to public amenities	☐	☐	☐	☐	☐
collective facilities that complement private units	☐	☐	☐	☐	☐
garage (or space for the car)	☐	☐	☐	☐	☐
spaces that promote informal encounters among residents	☐	☐	☐	☐	☐
spaces that can be changed over time	☐	☐	☐	☐	☐
finished spaces or surfaces	☐	☐	☐	☐	☐

* Passive house is a standard for energy efficiency, where the building requires little energy for space heating or cooling.

>>>

Short survey: your housing project (further translated into French, Italian, German, and Spanish)

11. Is there anything in the project that did not fit into the building regulations?

☐ Yes.

☐ Yes, but in the end we managed to get what we wanted and how we wanted it. No.

☐ I do not know.

☐ If yes, can you please give examples?

12. Looking back at the whole process, what difficulties did you encounter? *(tick all boxes that apply)*

☐ No difficulties, the whole process ran smoothly.

☐ There were many conflicts among the group when we had to make final decisions.

☐ The whole process was too long.

☐ We did not involve the sufficient professional expertise in the process.

☐ The design process was ok. The problem was more connected to financial or legal issues.

☐ Other:

2 Reinterpreting Existenzminimum in Contemporary Affordable Housing Solutions

Brysch, S. (2019). Reinterpreting Existenzminimum in contemporary affordable housing solutions. *Urban Planning*, *4*(3), 326-345.
This article is part of the special issue "Housing Builds Cities", edited by Luca Ortelli, Chiara Monterumisi, and Alessandro Porotto (École Polytechnique Fédérale de Lausanne, Switzerland).

ABSTRACT

During the housing crisis of the 1920s, the German concept *Existenzminimum* (minimum dwelling) was developed and applied to the construction of public social housing. It was considered a design laboratory, where research, design, and experimentation would focus on a unique goal: create a space-efficient affordable housing typology, based on minimum quality standards. Empirical evidence indicates a renewed interest in alternative design solutions and minimum dwelling approaches over the last decade: examples include micro-housing solutions and collaborative housing models. This is due to the current affordable crisis and the increasing trend of urbanisation. However, little is known about the current interpretation of *Existenzminimum*. What does the concept entail today and how has it developed? This article investigates if and how *Existenzminimum* is currently applied: first, it unfolds the core design principles of the original *Existenzminimum*. Then, these principles are used to assess if and how existing affordable or low-cost housing approaches are current (re)interpretations of the concept. Finally, the article proposes a definition for a contemporary *Existenzminimum*, arguing that a better

understanding and awareness of the concept can help urban planners, designers, policy-makers and citizens in developing alternative affordable housing solutions.

KEYWORDS affordable housing; alternative design solutions; *Existenzminimum*; housing typology; minimum dwelling

2.1 Introduction

Housing affordability is "concerned with securing some given standard of housing (or different standards) at a price or a rent which does not impose, in the eyes of some third party (usually government) an unreasonable burden on household incomes" (Maclennan & Williams, 1990, p. 9). This definition contains two essential dimensions: (1) a standard of housing quality, and (2) a standard for determining the reasonable relation of price or rent to household income (Haffner & Heylen, 2011). It is therefore related both to minimum quality standards of physical features of housing and to the ability of the household to pay a house that follows these standards of quality. But under which criteria are we able to assess quality in housing? This is where the concept of *Existenzminimum* becomes relevant and links to the concept of affordable housing, since its aim was precisely to define the spatial criteria that would assure a minimum of quality in housing, at a price that would not represent a burden to the households.

Existenzminimum is a concept that was developed in Germany in the early twentieth century to set the conditions for a dignified and healthy existence, including access to food, clothing, medical care, and housing, assured by a defined minimum level of income. It is one of those German concepts that can hardly be translated into other languages; the direct translation into English would be 'minimum subsistence' or 'subsistence level', although these expressions do not accurately illustrate the progressive ideology of the concept. When specifically used in the housing domain, it can be translated as "minimum dwelling" (Teige, 1932/2002). The complete term of the concept is *Die Wohnung für das Existenzminimum* (meaning 'minimum subsistence dwelling'); however, to simplify the reading, the expression will be condensed to *Existenzminimum*.

This approach was widely applied to social housing after World War I, not only to overcome the housing shortage and the unsanitary living conditions in Europe, but also to adapt to the social transformations of the post-war period (e.g., women

entering the labour market, smaller households). Based on socialist premises (Mumford, 2002; Teige, 1932/2002), the concept aimed at establishing high-quality living standards in housing, but at affordable prices to the low-income classes. The result was the mass-production of minimum housing settlements –*Siedlungen*– in the outskirts of many European urban centres, such as Frankfurt and Berlin.

Existenzminimum contributed to establishing the design rules that became the standards of the general production of housing. Today, modernist design concepts "are fully assimilated by the contemporary culture and are inherent in any realisation" (Llinares, 2010, p. 153) (translated from the original "estan completament assimilats per la cultura actual i es troben intrínsecs en qualsevol realització"). But besides these elements that became intrinsic to housing until our days, how did the concept—in its wholeness—evolve to our days? Can we talk about a contemporary *Existenzminimum*?

Currently, Europe is again facing a severe crisis in affordable housing provision: in 2015, 11.3% of the EU population lived in unaffordable housing conditions (Pittini, Koessl, Dijol, Lakatos, & Ghekiere, 2017). Additionally, the current trend of urbanisation is reducing the available space in cities. Recognising both the relevance and urgency of addressing these issues, we suggest that *Existenzminimum* is an imperative design approach for developing new affordable housing solutions. There is evidence of a renewed interest in *Existenzminimum* in the last decade: for instance, the international symposium "Min to Max", held in Berlin in 2011, entitled "Die Wohnung für das *Existenzminimum"* (likewise CIAM II in 1929), aimed at reviving and reinterpreting *Existenzminimum* in contemporary housing. Furthermore, empirical evidence shows recent attempts in redefining the minimum standards in housing complexes. Examples include developer-led micro-housing and co-living projects (McKnight, 2015; Zatarain, 2017), resident-led collaborative housing (Lang, Carriou, & Czischke, 2020[1]), or the recent "Tiny House Movement" (Ford & Gomez-Lanier, 2017).

However, little research has been reported on the current definition and actual use of the concept in housing (Brysch, 2011; Ruby & Ruby, 2011), leading to the following research question: what principles define the contemporary *Existenzminimum*? To answer this question, first we identify and describe the core design principles of the original *Existenzminimum*; then, these principles are tested against current affordable housing approaches, to assess if and how they are still present today and

1 The dates of the references have been updated.

what kind of development they entail. The aim is to propose a more accurate and updated definition of *Existenzminimum* and to illustrate the socio-economic benefits of using this concept in contemporary housing, arguing that a better understanding and awareness of the concept can influence urban planners, designers, policy-makers and citizens to develop alternative affordable housing solutions.

2.2 Methodology

This article is organised in two parts: the first one identifies the design principles of *Existenzminimum* applied to housing in the 1920s, through a literature review of discussions, methods, and outcomes of *Existenzminimum.* Design principles are here defined as parameters that guided the development of the concept from an architectural perspective, and therefore framed within three different architectural dimensions, namely technical, spatial and social, as depicted in Figure 2.1.

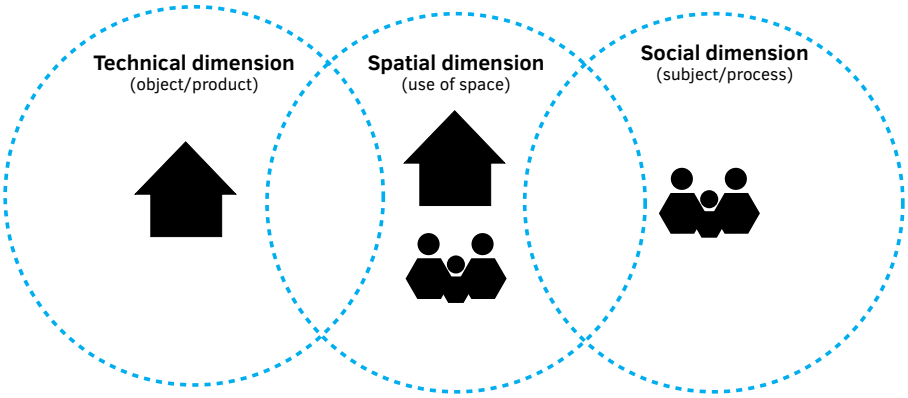


FIG. 2.1 Framework used to identify the design principles of Existenzminimum (Source: Author)

The second part, due to the scarce theoretical work on the contemporary definition of *Existenzminimum,* mainly draws from recent affordable housing projects collected from grey literature (architectural publications and magazines) and empirical evidence from observation carried out by the author. The main purpose is to test the identified principles against contemporary affordable housing approaches, to understand how has *Existenzminimum* evolved until today.

Special attention is paid to the issue 962 (2012) of *Domus* magazine, the follow-up of the above mentioned "Min to Max" international symposium. The panels of the symposium entitled "Spaces for the Collective", "Self-Construction and Social Empowerment", and "Building on the Existing" are also taken into consideration (the correspondent audio-visual material is available at http://www.min2max.org). Both the symposium discussions and the follow-up articles in *Domus* 962 focus on current architectural practices and link them to the role of the architect, at the same time that stress the urgency of addressing the housing crisis through community-oriented and self-organised approaches. These sources are relevant to shed light into current professional approaches and views, although they do not fully provide a thorough reflexion and conceptualisation of what could be considered the contemporary *Existenzminimum*.

At the same time, a review[2] of well-known architectural online magazines was carried out, encompassing a total of 103 publications (52 in *Dezeen*, 29 in *Archdaily*, and 22 in *Designboom*) (see Appendix 2A). The aim was to provide a thorough database of current architecture approaches of affordable housing and to identify their main features and concepts within the social, spatial and technical dimensions. This only considers digital platforms due to the easy filtering related to the thematic: the used keywords were 'affordable housing' and 'low-cost housing', since they are concepts intrinsically connected to *Existenzminimum* and wide enough to encompass all the relevant approaches for the study. Both multi-family housing and individual houses or prototypes were considered. The timespan of the selected publications starts in 2008, linking to the event of the economic and financial crisis of 2008, which worsened the already acute affordable housing crisis; and it ends in 2018, covering the design approaches developed over the past ten years. Table 2.1 shows the results of this review: it lists the features and concepts of current affordable housing and provides the number of articles that mention them. This overview is useful to detect existing patterns or common denominators between the displayed approaches, helping to substantiate the conclusions.

2 Adapted from the originally published 'systematic literature review'.

TABLE 2.1 Features and concepts related to current 'affordable' and 'low-cost' housing, scanned from the systematic literature review (Source: Author)

Dimension	Features/Concepts	No of articles
Technical	Regeneration of disused spaces	11
	3D printing/CNC/open source	7
	Do-it-yourself (DIY)/self-building	15
	Prefabrication/modular construction	57
	Use of containers or water pipes	11
	Unfinished elements/raw materials	8
	Sustainable construction/alternative materials	46
Spatial	Compact living/small spaces	18
	Micro-housing	18
	Tiny houses/tiny capsules	8
	Incremental model	7
	Flexibility	23
	Temporary living	9
Social	Shared living	5
	Participatory or collective design	3
	Co-housing	2
	Co-living	4
	Enhance sense of community	9
	Communal facilities/courtyard	15

2.3 The Original Principles of Existenzminumum

Existenzminimum was developed in a period of significant socio-economic and urban transformation. In Germany, the political agenda of the Weimar Republic focused on implementing urban and housing policies to overcome the housing shortage, the high rents, and the poor and overcrowded living conditions, with the construction of new low-cost social housing. At the same time, the cultural movement *Neue Sachlichkeit* ("New Objectivity") aimed to objectively illustrate the post-war reality.

The rational approach of *Existenzminimum* emerged from this renewed social and political commitment, but its socialist roots date back to the end of the nineteenth century. Indeed, in the previous decades, the housing issue had been already debated among philanthropists and communist philosophers, who were concerned about the poor housing conditions of the proletariat; and among feminists, such as Lily Braun and Christine Frederick, who aimed at improving the efficiency in the domestic space through centralised services and shared facilities (Mumford, 2002). Discussions on housing affordability were also taking place during this period, although under the designation of housing need or housing shortage, when economists began to carry out studies of household budgets and incomes (Hulchanski, 1995). In addition, after the Russian Revolution of 1917, collective housing models such as dom-kommuna were tried out in the Soviet Union, with a particular focus on optimising the domestic space and emphasising the sense of community through a scientific approach towards design (Khan-Magomedov, 1987). All of this helped to shape the way Existenzminimum was explored and defined (Mumford, 2002; Teige, 1932/2002),

The first worldwide comparative study of minimum dwelling was conducted in 1929. The results were presented in Frankfurt in the second International Congress of Modern Architecture (CIAM II, from the French *Congrès Internationaux d'Architecture Moderne*), *Die Wohnung für das Existenzminimum,* whose proceedings were published in 1930. At the end of the event, the participants decided that the minimum unit was the "correct solution" to solve the housing problems of industrial societies (Mumford, 2002, p. 31). This correct solution was the result of many studies, mainly led by the architects Alexander Klein, Ernst May, Le Corbusier, Margarete Schütte-Lihotzky and Walter Gropius.

From the literature review of the main publications on the topic at that time, namely the proceedings from CIAM II and the critical analysis from Karel Teige published in 1932, we identify five main design principles behind the studies and the subsequent design of the minimum dwelling:

- Innovation and cost-effectiveness in construction, by rationalising the (re)production of constructive elements (Corbusier & Jeanneret, 1930; Teige, 1932/2002);
- Minimum quality standards (Bourgeois, 1930; Klein, 1927; May, 1930);
- Redesign of the domestic layout, to make it more suitable to the new family structure (Gropius, 1930; Klein, 1927);
- Relationship between architecture and the city (Gropius, 1930; May, 1930);
- Community building and social concern (Gropius, 1930; May, 1930; Teige, 1932/2002).

These design principles can be organised and intertwined in three architectural dimensions, namely technical, spatial and social (as depicted in Figure 2.2). The following paragraphs elaborate on how each of these principles was applied in the design of *Existenzminimum* housing.

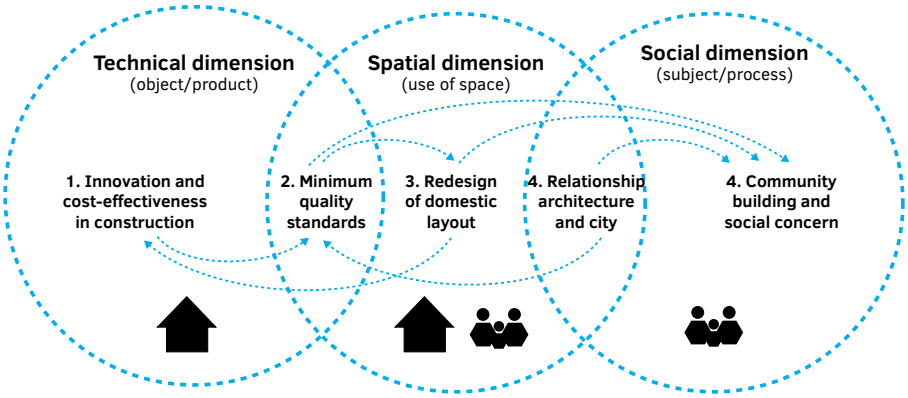


FIG. 2.2 Existenzminimum design principles (Source: Author)

TOC

2.3.1 Innovation and Cost-Effectiveness in Construction

Determining minimum standards for the *Existenzminimum* units was fundamental to the success of their mass production and, consequently, their affordable construction. These standards should lower the construction costs without compromising the quality of the industrialised materials (Teige, 1932/2002). The configuration and organisation of the units should imply rational construction methods to facilitate the industrial production of the constructive elements and accelerate the construction process, at the same time that would increase flexibility in spatial configuration. Almost all the construction elements, ranging from entire structural walls to door handles, were supposed to be (pre)fabricated and, then, assembled in situ. This represented an innovative economic approach to housing construction, taking advantage of technological and industrial progress (Corbusier & Jeanneret, 1930). The *minimum dwelling* unit became the standard dwelling unit, to be used by the emergent post-war society (Gropius, 1930).

Ernst May, state-architect of Frankfurt, determined that housing should not cost more than 25% of the household's income in order to be affordable (Mumford, 2002). However, despite many design attempts to make these new minimum housing settlements as much affordable as possible to the working-class families, they were still inaccessible to a large number of low-income and even middle-class families, due to the general inflation (Teige, 1932/2002). In parallel, self-help or self-building approaches were tried out and encouraged by the state in the form of cooperatives (Henderson, 1999).

2.3.2 Minimum Quality Standards

The socialist premise, advocating that all humans were equal and shared the same needs, influenced the idea of developing a universal housing solution, based on minimum quality standards. On the other hand, housing understood as a biological phenomenon (Corbusier & Jeanneret, 1930; Teige, 1932/2002) should provide at least the minimum of space, air and light required for the vital functions of the human being, as for her or his healthy social life (Gropius, 1930). It was based on:

The mini-max dwelling concept: that is, a minimal space accommodating "maximal life" for the class of the subsistence minimum, defining a dwelling that does not fall below standards needed for biological survival (i.e., below acceptable sanitary and hygienic norms), one that provides its inhabitants with sufficient light, access to sun and air, and a sense of open space. (Teige, 1932/2002, p. 33)

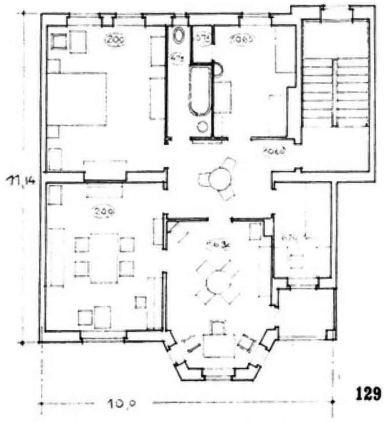
To this end, Alexander Klein, while a member of a governmental research agency in Berlin, developed a scientific methodology to analyse different housing typologies by comparison (see Figure 2.3). The aim was to determine minimum space standards that reflected the most effective and healthier (physically and mentally) environment (for a detailed description of methods and findings see Klein, 1927). This also resonates with the Soviet housing experiments, in which a group of architects advocated the application of scientific methods to determine a standardised value—*Stroikom*—for housing planning and construction (Khan-Magomedov, 1987).

The reduction of the housing unit area was not a goal per se (Aymonino, 1971; Gropius, 1930; Teige, 1932/2002), but rather an outcome of the optimisation studies carried out. In fact, many housing projects based on minimum dwelling turned out to be larger and with higher levels of comfort when compared to the existing housing stock.

2.3.3 Redesign of Domestic Layout

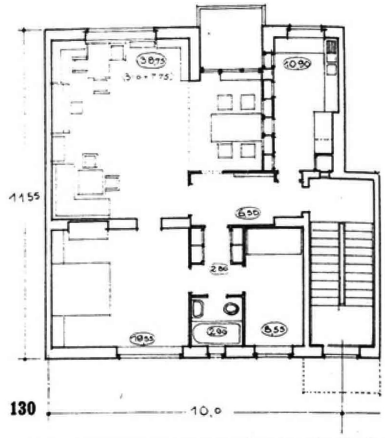
This principle is directly connected to the previous one, insofar as minimum standards were defined according to a new dwelling layout. The pre-war *Wohnkultur* ('culture of dwelling'), based on bourgeois traditions—even among low-income families—went through great transformations due to many factors. These include (1) the increasing number of working mothers, who no longer had time for the usual housekeeping, (2) the low birth rate, leading to smaller households, (3) a "new nomadism of the individuals" (Gropius, 1930, p. 16) (translated from the original: "ein neues nomadentum der individuen"), influenced by the advances of the mobility infrastructure, and (4) the new meaning given to family, from a symbolic and organisational perspective (Gropius, 1930). The new domestic space and its surroundings should reflect the *Wohnkultur* that emerged from these circumstances, and it should be based on high levels of experimentation and freedom (Montaner & Muxí, 2014).

Therefore, as said, the underlying intention of *Existenzminimum* was not a mere reduction of the traditional housing areas, but rather the creation of an upgraded typology. This should be designed to simplify the movements inside the housing unit. Figure 2.3 outlines a study on how a more rational disposition of the rooms results in a more spatially-efficient layout (right side) when compared to a conventional apartment with the same area (left side).



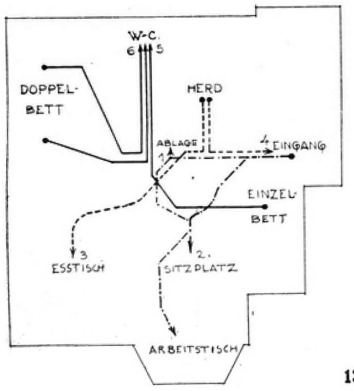
129

Beispiel eines ausgeführten Geschoßgrundrisses. Die Verteilung der Möbel ist die des Originals.



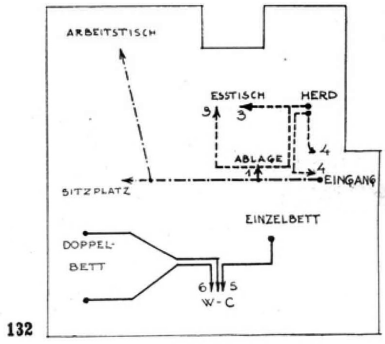
130

Studie des Verfassers zu einem Grundriß der gleichen Größe wie Abb. 129 unter Verwendung der oben angeführten Grundsätze. Treppe umgelegt, um im Erdgeschoß den Durchgang zu vermeiden und den Wohntyp durchführen zu können.



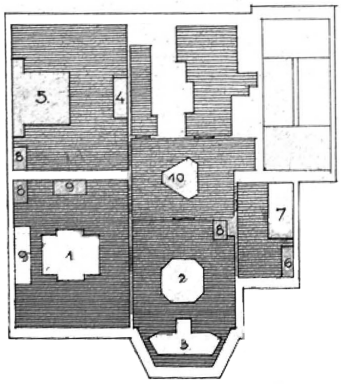
131

Verlauf der Verkehrswege und Ganglinien im angenommenen Beispiel. Alle Lebensfunktionen verlaufen auf sich kreuzenden Wegen.



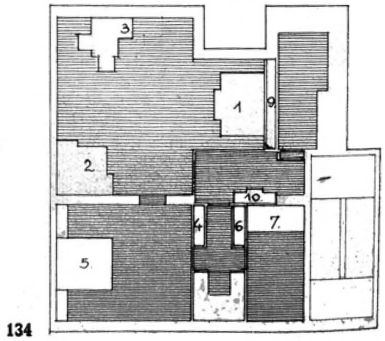
132

Verlauf der Verkehrswege und Ganglinien in der Grundriß-Studie. Die Verkehrswege kreuzen sich nicht, wodurch die ordnungsmäßige Abwicklung der Wohnvorgänge erleichtert wird.



133

Konzentration der Bewegungsflächen im Beispiel. Die verbleibenden Bewegungsflächen sind zersplittert.



134

Konzentration der Bewegungsflächen in der Studie. Die Bewegungsflächen sind konzentriert und stehen in gutem Zusammenhang.

FIG. 2.3 Comparative spatial studies, by Alexander Klein (Source: Klein, 1927)

The *Frankfurter Küche* ('Frankfurt kitchen'), designed by Schütte-Lihotzky, became the standard for the minimum dwelling kitchen. The traditional nineteenth-century kitchen was replaced by a more efficient layout equipped with advanced appliances (see Figure 2.4), more suitable to the working mothers, who no longer had time for long and tiring domestic tasks. The bathroom would become part of the housing unit, equipped with standard sanitary ware; and each person had the right to have an individual room (Gropius, 1930). Many elements, such as sliding doors, movable furniture, or folding beds, were designed to allow some flexibility inside the apartments.

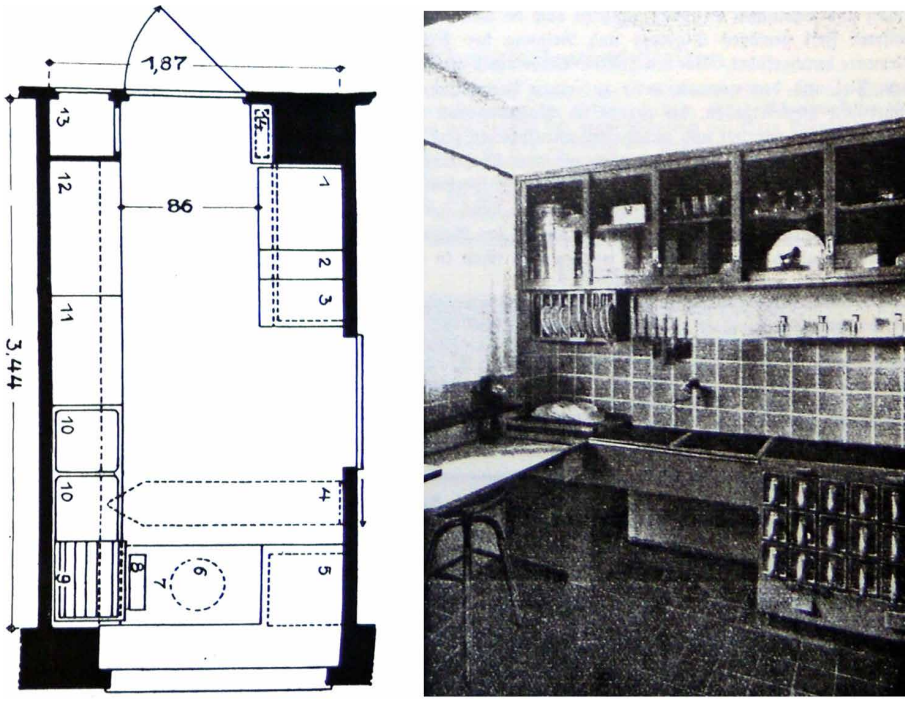


FIG. 2.4 Frankfurt Kitchen, by Schütte-Lihotzky (Source: May, 1926)

TOC

2.3.4 Relationship between Architecture and the City

Existenzminimum was also part of a wider urban strategy. Housing was intrinsically connected to urban planning; therefore, access to public spaces and mobility infrastructure was paramount for the location of the settlements. Following the principles of the garden cities, the main goal was to create self-sufficient communities. Hence, in addition to housing complexes, public spaces and facilities such as gardens, shops, day care centres, churches, community centres and laundries were designed (Mumford, 2002) to transform these settlements into small, autonomous cities. Some settlements, namely *Praunheim* or *Römerstadt* in Frankfurt, were referred to as satellite-cities.

The concerns regarding biological issues that served as the basis for the design of the *Existenzminimum* unit were also considered from an urban perspective: the buildings should be sufficiently separated from each other and correctly orientated, in order to guarantee correct ventilation and access to sunlight. Likewise, the process of standardisation was applied not only to the housing unit but also to the way housing units were grouped to shape the building. This would streamline the construction of the settlements (see Figure 2.5). Different block typologies emerged, namely *Reihenhäuser* ('row houses') and *Mehrfamilienhäuser* ('apartment buildings'), which were organised either in exteriors galleries or around staircases ('sectional housing'). Despite the urban nature of the concept, the architects at the CIAM II did not consider the design of the building and its integration into the urban fabric.

2.3.5 Community Building and Social Concern

Highly influenced by Soviet collective housing, *Existenzminimum* should represent the "negation of the bourgeois family-based household" (Teige, 1932/2002, p. 14). The new housing typology would foster "the concept of collective dwelling, by allowing the individual dwelling unit to be complemented by a scheme of central collective facilities" (Teige, 1932/2002, p. 5). The typical one-family house was gradually replaced by the apartment in a housing complex, which in its turn should become part of a new form of a centralised master household (Gropius, 1930).

The idea of democratising domestic tasks, by adding common amenities in collective housing, advocated the minimisation of individual private spaces since the main activities would be performed collectively (Vestbro, 2000). This idea was mainly applied to other parallel alternative housing approaches, such as the Central Kitchen Buildings, which emerged in the 1920s in many European capitals.

This approach was based on the rationalisation of the domestic work, through employed staff preparing the meals in the central kitchen; and on the minimisation of the apartment areas (Vestbro, 1992). Likewise, the *Hof*, a housing typology for the Viennese working-class families developed in the 1920s based on the *Kleinwohnung* model (Porotto, 2017), often excluded the individual kitchen from the housing unit, replacing it with a central shared kitchen (Montaner & Muxí, 2014); while some hotel-like apartment buildings, mainly developed in USA, combined individual units with collective housekeeping services (Puigjaner, 2014).

FIG. 2.5 Praunheim (left) and Römerstadt (right), Frankfurt, by Ernst May (Source: Author)

However, all these progressive and rational visions towards housing production turned the house into a product, and the dweller into a consumer. In the following decades, the minimum dwelling unit—small, cheap, easy to build—became the gold mine of the capitalist housing market, and started to be reproduced and sold as a commodity, as an isolated element, originating the real estate logic of the city (Aureli, 2016).

Moreover, many social housing programs in the aftermath of World War II continued using *Existenzminimum* design principles, although without considering its intrinsic initial components, such as urban integration or collective living. The former complexity of the concept was simplified to a mere reduction of domestic space and to a low-cost-full-speed production, leading to a progressive social alienation of the housing settlements (Ruby & Ruby, 2011). Therefore, overtime, *Existenzminimum* acquired detractive connotations, not only because of its detachment to the city but also due to its “overly deterministic approach to design” (Lucas, 2016, p. 15).

2.4 The Current Application of Existenzminimum Principles: A Critical Analysis

In the last decades access to affordable housing became a challenge not only to low-income families, but also to the middle-classes, as public and social housing are more and more exclusively targeted to the very poor (Czischke, 2009; Elsinga & Lind, 2013); therefore it is urgent to think of strategies to make housing accessible to larger segments of the population. Woetzel (2014, p. 5) identifies four possible approaches that can narrow the current affordability gap: "securing land for affordable housing at the right location, developing and building housing at lower cost, operating and maintaining properties more efficiently, and improving access to financing for home purchases, development, and rental assistance". By all means, architectural design plays (again) an important role in this endeavour, not only to provide innovative spatial layouts, but also to guarantee that space standards are not corrupted or reduced to fit the market profit-oriented goals.

This section aims at analysing if and how the identified original *Existenzminimum* design principles in the previous section are present in claimed affordable housing solutions from the past decade and what kind of development they entail. From the literature review, as well as the outcomes of the "Min to Max" symposium, we were able to identify additional concepts that may strengthen or challenge the original principles (see Figure 2.6), as it is further described in the following lines.

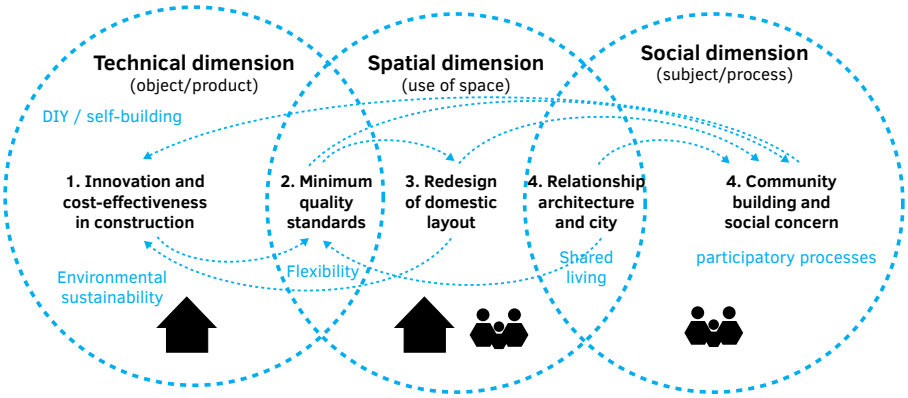


FIG. 2.6 Existenzminimum principles, from a contemporary perspective (Source: Author)

2.4.1 Innovation and Cost-Effectiveness in Construction

The conducted systematic literature review confirms that prefabrication and modular construction are still a core factor in building affordable housing, but not anymore as a means to mass-produce standardised housing units. The use of standard elements is now made in a more flexible and customised way, to avoid a repetitive and impersonal building complex. Today, construction elements include not only prefabricated components, but also recycled ship containers, water pipes and alternative or reused materials (see Figure 2.7).

An innovation present in many experimental projects is the use of 3D printing (often associated with open source software) as a building technique. On the other hand and similar to some alternative approaches developed in the 1920s, many contemporary projects combine modular construction with self-building (Duncan & Rowe, 1993), self-assembly, and DIY (Do-it-Yourself) or DIT (Do-it-Together) approaches (see Figure 2.8). These are often based on a phased construction system. The recent collaborative housing project *La Borda* in Barcelona is an example where the collective decision to leave the common rooms unfinished and programmatically flexible allows the spaces to be completed, adapted and transformed by the residents. The goal was to work towards affordable construction levels (Brysch, 2018).

Environmental sustainability is mentioned quite often as one of the principles that guide the construction of current affordable housing. The correct use of resources, with a focus on maximum energy savings, is a priority when designing the 21st-century housing (Montaner & Muxí, 2010). However, this “ecological re-orientation” requires a full reassessment of the way of designing and building in general (Manzini, 1994, p. 37), in order to decrease energy and resources consumption.

FIG. 2.7 The Urban Rigger, Copenhagen, 2016, by BIG (Source: Author)

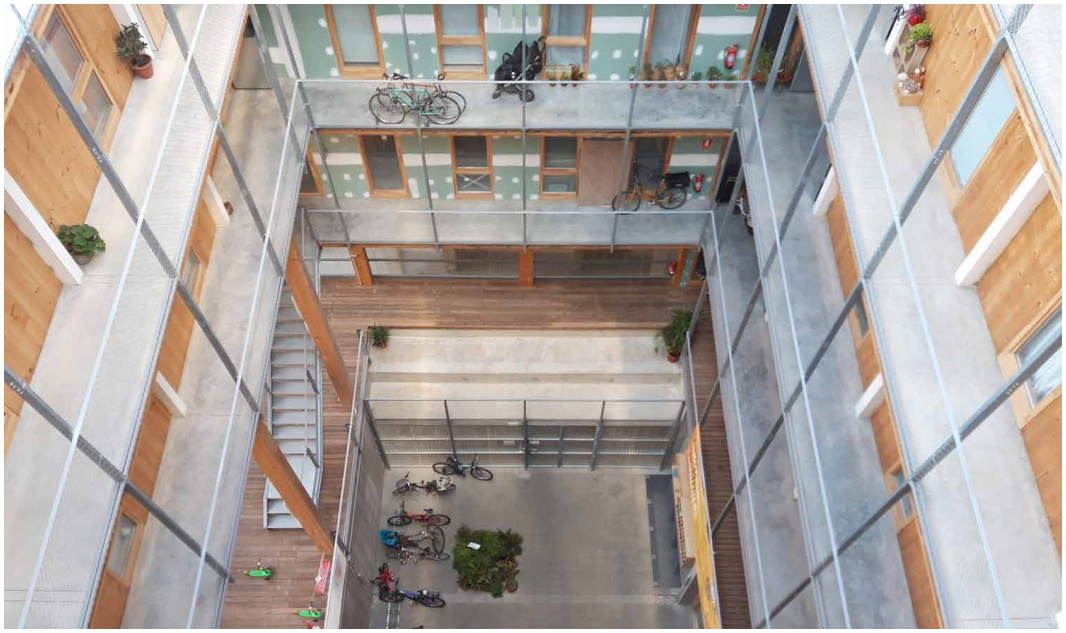


FIG. 2.8 La Borda, Barcelona, 2018, by LaCol Architectura Cooperativa. Note: the image was taken two months after the residents moved into the building and shows the unfinished state of the building, understood as a constant process. (Source: Author)

2.4.2 Minimum Quality Standards

Today, *Existenzminimum* calls upon minimum quality standards in a more versatile and flexible way. The concept of minimum is not only connected to the spatial dimension, but also to services, resources and construction finishes (e.g., fewer individual appliances, unfinished surfaces). In line with this, the current notion of minimum also implies the lower purchase of goods (Millburn & Nicodemus, 2015). Manzini (1994) defends the idea that material possession should undergo a 'non-individual' consumption mode. He believes in the role of design in providing quality, where the "'reduction of needs' can be expressed as an 'increase in social quality'" (Manzini, 1994, p. 40), making a reference to the contribution of *Existenzminimum* in this culture of reduction. In its turn, Aureli (2016) defends the idea of adopting a more 'ascetic' and needs-based posture towards life and consumption, where 'less is enough'. Therefore, the current *Existenzminimum* is related to a new concept of quality of life, less connected to the modern idea of consumption, since the original *Existenzminimum* propaganda focused on consumer-oriented advertising of industrial products that would minimise the domestic work.

This widening of the idea of *minimum* emphasises the qualitative aspects of the concept, where some projects, such as *Baugruppe Schönholzer Strasse 11* in Berlin, are developed to "question the typical standard requirements for a flat and go beyond them" (Kunsmann, 2012, p. 67). In many cases, the idea is to deliver an unfinished house, with no partition walls, no finishes and, sometimes, no flooring. This strategy allows the future residents to customise their own domestic space, promoting not only the basis for a stronger sense of belonging but also an affordable way to have access to good quality housing, compared to average market prices.

As argued, *Existenzminimum* does not mean unconsciously reducing the dwelling areas. In fact, many *Existenzminimum* examples of the 1920s resulted in larger spaces when compared to the existing housing stock. Today, however, due to the increasing number of one-person households and lack of available construction space, many housing units stretch to the limit the notion of minimum space. This means that many projects provide extremely small living spaces, leading back again to the fundamental question of where to draw the line that separates the (physically and socially) adequate and unacceptable minimum. What are the design mechanisms used to avoid falling into the latter situation? How 'small' is 'too small' and how to guarantee quality in minimum spaces in a long term?

Examples where the spatial dimension of the minimum is innovatively explored are (1) the recent "Tiny House Movement", which encourages people to reduce the dwelling area to its minimum and to use environmental-friendly materials (Ford &

Gomez-Lanier, 2017); see Figure 2.9), (2) student-style housing, micro-housing (see Figure 2.10) or co-living (see Figure 2.11), which are proliferating in dense urban centres, based on temporary living, modular construction systems, minimum areas, and shared living arrangements (McKnight, 2015; Zatarain, 2017), and (3) collaborative housing, namely cohousing, where minimum private areas combined with common rooms are collectively designed and managed (Czischke, 2018; Lang et al., 2020) (see Figures 2.12 and 2.13).

All the mentioned approaches—except for most of the Tiny Houses—provide common spaces to compensate or complement the reduced size of private units. Both Tiny Houses and cohousing examples, usually designed and sometimes even built by the end-users, are the direct result of the residents needs and demands; therefore, it is the residents themselves who define their own minimum 'tolerance'. On the other hand, in developer-led projects, such as student-style housing, micro-housing or co-living, the residents have to 'fit' in a specific profile and a pre-established layout, which often includes co-working spaces and other shared facilities. Yet, the design of micro-housing or co-living is based on hotel or student accommodation building normative, meaning that they are still not properly regulated as specific typologies. Therefore, and adding the fact that these projects are mainly profit-oriented, it is necessary to evaluate the actual adequacy of the spaces to the residents' needs and values.

FIG. 2.9 Examples of Tiny Houses. (Sources: Stott, 2015 and Block, 2018).

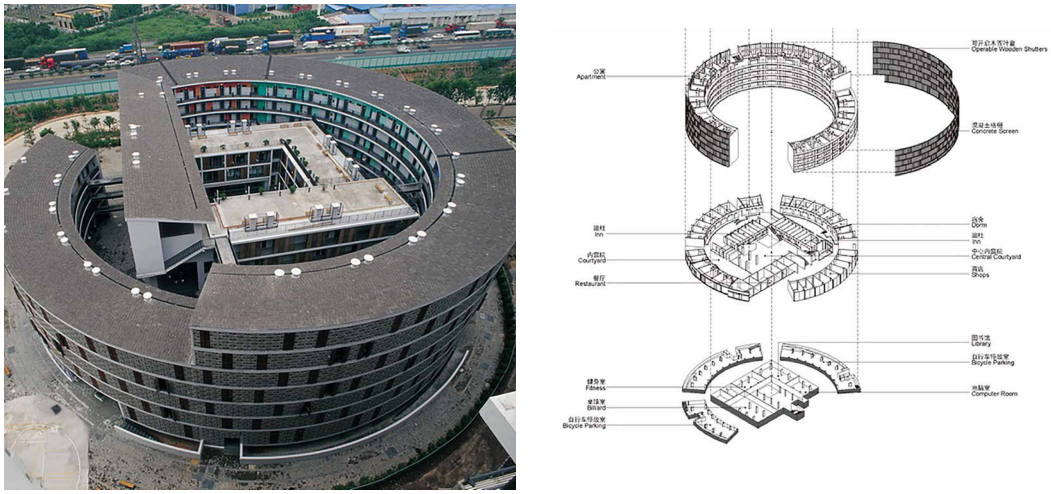


FIG. 2.10 Tulou Collective Housing, Guangdong, 2008, by Urbanus. (Source: Urbanus, n.d.).

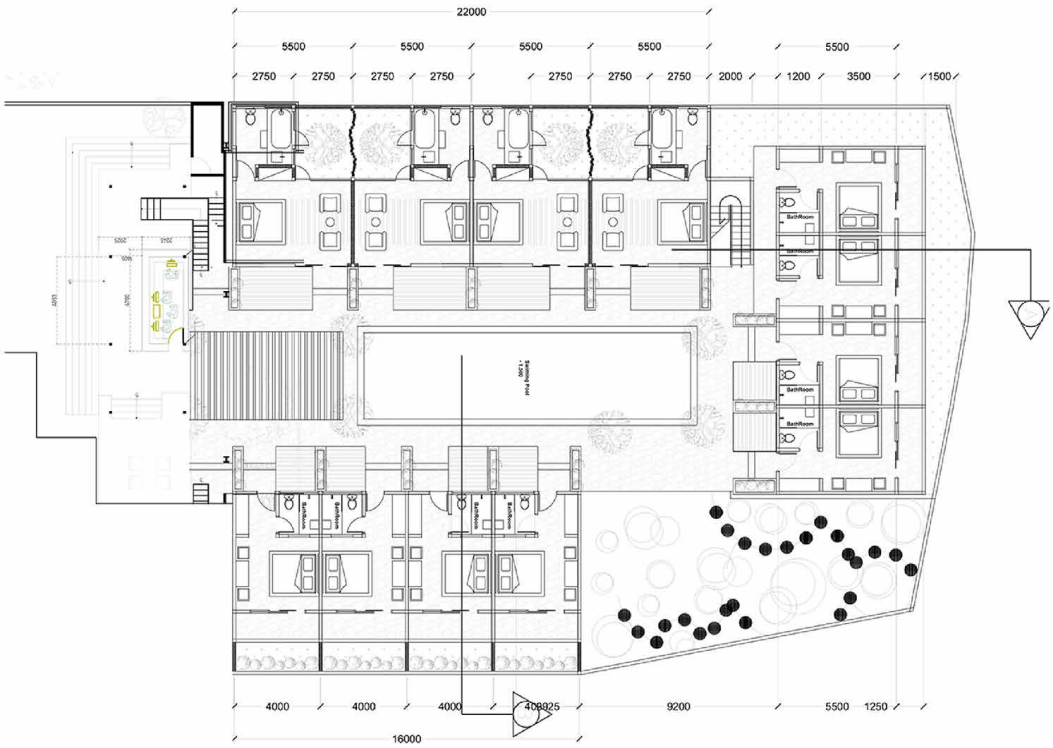


FIG. 2.11 Roam Co-living, Bali, 2015, by Alexis Dornier. Source: Archdaily (2016).

TOC

FIG. 2.12 La Borda (Ground- and first floor), Barcelona, 2018, by LaCol Architectura Cooperativa. Note: the highlighted areas were added by the Author and correspond to the common spaces. (Source: image courtesy of LaCol Architectura Cooperativa)

FIG. 2.13 Spreefeld Genossenschaft (shared kitchen and dining room), Berlin, 2014, by Carpaneto Architekten, Fatkoehl Architekten and BARarchitekten. (Image courtesy of Fatkoehl Architekten)

2.4.3 Redesign of Domestic Layout

The same way the original *Existenzminimum* created a housing unit adapted to the modern family, the current one upgrades the domestic layout according to the shifting consumption models and household structures. The main difference is that, today, many projects are designed and developed not only by professionals (i.e., architects and developers) but also by the residents themselves, through participatory design processes. These are contributing to further develop alternative dwelling terminologies, such as cluster apartments, small private cells organised around a common space with shared facilities (see Figures 2.14 and 2.15); and guest apartments or joker units, designed to accommodate guests or teenagers (e.g., *La Borda*, Barcelona, or *Kalkbreite*, Zurich). In addition, new concepts of use are emerging, namely co-working spaces in the domestic layout, and flexible spaces for temporary uses.

Montaner and Muxí (2010) argue that contemporary minimum housing includes minimum requirements for adaptability. Adaptability—or flexibility—is, here again, an essential component to define the current *Existenzminimum*. In line with this, many contemporary housing projects are linked to concepts such as 'open building' (Habraken & Teicher, 1972), which considers the changing or adapting of the layout overtime, or "incremental housing" (Aravena & Iacobelli, 2012), a temporary minimum, where a potential area is left for future expansion, according to the needs and economic possibilities of the household. A similar approach currently being explored due to the increasing urbanisation process is the "infill model" (Aureli, Giudici, & Issaias, 2012), a flexible framework that allows the end-users to build and customise space. All approaches consider the building not as a finished product, but rather an ongoing process. These approaches directly resonate both to the open floorplan *Dom-ino* structure developed by Le Corbusier, and to the "growing house model" (Wagner, 1932), another approach contemporary to *Existenzminimum* and using similar principles (Hellgardt, 1987).

The minimum dwelling typology promoted by the modern architects is now reinterpreted in a topological way, where space is assumed as an element that is constantly under transformation and adaptation: standards become parameters of a system where everything is interconnected. Yet, the building normative has not been properly readjusted: an exploratory study (Brysch, 2018) shows evidence of the obsolescence of the building normative in accommodating these innovative ways of living. Some outdated standards or even some gaps in the building regulations tend to turn the design of these new community-oriented and adaptable housing schemes into a complex and tiring process.

FIG. 2.14 Mehr als Wohnen (plan of cluster apartment), Zurich, 2015, by Duplex Architekten. Note: the highlighted areas were added and correspond to the shared spaces. (Source: McMaster, 2016)

FIG. 2.15 Spreefeld (axonometry of cluster apartment), Berlin, 2014, by Carpaneto Architekten, Fatkoehl Architekten and BARarchitekten. Note: the highlighted areas correspond to the shared spaces. (Source: image courtesy of Fatkoehl Architekten)

2.4.4 Relationship between Architecture and the City

Empirical evidence suggests that collaborative housing initiatives improve the relationship between (domestic) architecture and the city. Additionally, studies show how this relationship contributes to a more active and dynamic urban interaction (Fromm, 2012; Williams, 2005), since the notion of sharing expands to the surrounding neighbourhood, and progressively to the city level. Examples include cohousing projects in Berlin (e.g., *R50* or *Spreefeld*), Vienna (e.g., *Wohnprojekt Wien*), and Stockholm (e.g., *Sjöfarten)*. These community-oriented housing projects reconfigure the boundaries between private and public, with activities open to the public or by allowing the use of the common rooms by external members for local initiatives (see Figure 2.16). The issue of quality is stressed here again in relation to the urban environment: "housing quality is resolved by the correct resolution of the interior space and the building's contact with the public space in the neighbourhood, through a diversity of gradients that go from the public to the private" (Montaner & Muxí, 2010, p. 82).

Dealing with the existing city is part of the current debate and practice, as highlighted in the panel "Building on the Existing" of the "Min to Max" symposium. While the original *Existenzminimum* was applied to the new construction, today many affordable housing projects result from the refurbishment of the housing stock or even from the reuse of abandoned infrastructure buildings.

FIG. 2.16 Wohnprojekt Wien (plans of ground and underground floors), Vienna, 2013, by Einszueins Architekten. Note: The communal kitchen and the multi-purpose rooms can be used or rented by external groups. (Source: image courtesy of Einszueins Architekten)

2.4.5 Community Building and Social Concern

The political role of the architect in the 1920s targeted low-income families. Currently, however, the need for affordable housing solutions encompasses increasing segments of the population. These segments not only include vulnerable groups, but also middle-class households, which are facing, too, a great decline in their living standards (Parker, 2013). This justifies the wide range of solutions claimed 'affordable', even when not linked to social housing, such as commercial micro living or co-living models. However, very often these models turn out to be unaffordable, due to speculative purposes, although there is generally an added value behind, a 'package' that includes not only access to a private space to live but also to a more community-oriented setup, with additional facilities and sharing experiences (see Figure 2.17). This leads to an understanding of housing as a service, rather than a product or a process, in a similar way as the hotel-like apartments or Central Kitchen Buildings were developed in the beginning of the twentieth century. In its turn, collaborative and cooperative housing are more and more used as an alternative social housing model (Czischke, 2018). Examples are *Le Village Vertical* in Lyon, which combines cooperative and social housing features in one complex, or *La Borda* in Barcelona, where the residents have to meet the requirements to apply for social housing in order to be part of the cooperative.

FIG. 2.17 Usual services included in co-living contracts, Berlin. (Source: Happy-Pigeons, n.d.).

TOC

In the recent decades, the increasing expansion of the sharing economy has gradually questioned the ideas of property and ownership and modified them by the notion of access (Kreiczer-Levy, 2015). Sharing products, services and resources is by no means a new phenomenon, yet it has been widely popularised by technology advancement and increasing consumer awareness. Furthermore, the traditional relationship producer-consumer is being hybridised in a concept recently called "prosumption" (Ritzer & Jurgenson, 2010). Today, architects "do not limit the question of minimal standards to the individual dwelling; they actually conceive housing as an opportunity for social participation in the spatial fabric of the city" (Ruby & Ruby, 2011). This highlights the shift of the architectural focus on the object purported by the CIAM II to the subject, i.e., to the social relations (See Figures 2.18 and 2.19). Some academic research already focuses on the role of collaborative housing approaches in increasing social interaction (Williams, 2005). The presentations at the "Min to Max" symposium, more precisely the panels entitled "Spaces for the Collective" and "Self-Construction and Social Empowerment", emphasised the collective and participatory character of new architectural approaches.

Therefore, the new *Existenzminimum* envisions design as a dynamic and participatory process, directly connected to the users' (changing) needs and more adapted to the different households and lifestyles, thus emphasising the process rather the final outcome. In brief, participatory or collective design (co-design) corresponds to a process where architects and prospective residents (and other involved stakeholders) design the housing project together. In this sense, the architects' role becomes more challenging if compared to the conventional design method used in developer-led housing: the final design must be a logical result of an effective system, reflecting at the same time common motivations and objectives. Hence, a certain flexibility and adaptability for further residents' intervention (transformations, increments, finishes) needs to be factored into the planning.

In examples of high-level participation, collective decisions are taken over spatial configuration, density, use of space, distribution, materials, the ratio of personal-common space, construction systems, and levels of comfort and finishing. Such examples include the *Baugruppen* in Germany and Austria, *Habitat Participatif* in France, *Community Land Trusts* (CLTs) in England and Belgium, and new cohousing cooperatives in Spain and Switzerland (Czischke, 2018). Affordability, environmental sustainability, self-determination, community life are common denominators to all these different models. Figure 2.20 illustrates the variety of projects that result from collective design processes. These processes are based on non-hierarchical structures, although they may differ in their decision-making approach: some groups use the voting system or try to reach consensus, while other base their whole process on sociocratic ideals.

FIG. 2.18 The Collective Co-living, London/New York. Note: this promotional image highlights the community-oriented approach of co-living models. (Source: The Collective, n.d.)

FIG. 2.19 La Borda general assembly, Barcelona. Note: all decisions - from the design to the management of the building - are collectively taken in general assemblies. (Source: image courtesy of La Borda)

FIG. 2.20 Examples of housing projects based on co-design processes: (a) Wohnprojekt Wien, Vienna (Source: Author); (b) R50, Berlin (Sources: exterior image by the Author; image courtesy of ifau); (c) La Borda, Barcelona (Sources: image courtesy of La Borda; exterior image by the Author); (d) Village Vertical, Lyon (Source: Author)

2.5 Conclusion: Towards a New Definition of Existenzminimum

Housing affordability is "a relationship between housing and people" (Stone, 2006), i.e., it is a relative concept that connects people's financial situation with a certain standard of housing. It is then directly connected to housing quality: the physical conditions of housing, which allow the household to achieve a quality living standard, are key to evaluate and provide affordable housing. The previous section confirms that innovative design is showing—once again—its potential towards affordable housing provision and that *Existenzminimum* is a valid concept worth exploring in our days. Yet, while current approaches are still based on the same core principles, the term *Existenzminimum* is rarely mentioned; the only explicit attempt –although superficial– to recover and reinterpret the concept is documented in *Domus 962* (2012), as a follow-up of the "Min to Max" symposium held in 2011 in Berlin.

This study uncovered key features of contemporary affordable housing that are insightful to understand the new meaning of *Existenzminimum*. Based on the findings, current *Existenzminimum* might be an answer for the "acute need for a new dwelling typology associated with the culture and functions of the 21st century city", as Burkhalter and Castells (2009, p. 23) highlighted, at the same time that they foresaw that "[n]ew dwelling forms may require the re-engagement and re-invention of forms of living based on sharing resources" (2009, p. 23). From a technical perspective, current *Existenzminimum* approaches emphasise environmental sustainability and alternative construction methods, such as DIY and self-building (creating a new link with the social dimension). Prefabrication keeps reducing construction costs, but it is used in a more flexible and custom-like manner. The spatial dimension is today very much focused on flexibility, temporary solutions and shared living. The reinterpretation of minimum and the definition of alternative layouts are present in many current housing projects. Compact and small housing complemented with communal facilities enriches the social dimension. At the same time, projects are increasingly involving the residents in the design and construction process, through participatory processes.

Hence, if in the past *Existenzminimum* proved that the *design* helped to develop affordable housing, today *shared living arrangements* and *collective design processes* indicate that they also contribute to achieving more affordable levels in housing. This emphasis on the *social relations* rather than in the *object* is reflected in the re-emergence of community-oriented housing models such as cohousing or cooperative housing, which are much more needs-based, programmatically flexible and adapted to the recent *Wohnkultur*. As Manzini (1994, p. 41) points out: "Today's 'Existenzminimum' must be translated into proposals that can appear to increasingly large segments of the population as opportunities to achieve a higher level of social quality". We may conclude that where the original *Existenzminimum* failed to fully develop—the community aspect of the social dimension—it is today accomplished in a more clear and substantial way.

At all events, in a time "when the status quo, the standard, is questioned" (Schubert, Schuetz, & Streich, 2012, p. 35), these alternative housing typologies demand the readjustment of the current building normative, to prevent emergent layouts or typologies to fall under the minimum quality standards—or, in other words, to make sure that the new market-led minimum housing (easy to build and therefore very profitable for the developer) are properly built and used. This regulatory readjustment should also take into consideration alternative design and construction processes, including guidelines for self-organised groups and residents' cooperatives. The increasing tendency to systematise the housing production within the European Union, through the implementation of EU-directives, namely energy efficiency and accessibility standards, justifies the review of the existing building regulations. In addition, current housing solutions should also be tested against socially acceptable minimum standards. This means that collaborative solutions employing updated principles of the *Existenzminimum* can offer room to include other quality aspects, beyond minimum regulatory standards, without hampering affordability (e.g., social qualities).

All these factors help to frame the new *Existenzminimum* in a more versatile, participative and environmentally-friendly way, without corrupting its initial intention. Gradually, bottom-up initiatives on affordable housing are finding fertile ground to thrive, alongside more conventional top-down solutions. In conclusion, housing providers should start paying more attention to this paradigmatic shift in housing planning, which is more and more based on co-production and ecological and sharing values, and start updating their modus operandi to a more collaborative approach (Czischke, 2018). This contributes not only to housing affordability but also to more sustainable neighbourhoods.

References

Aravena, A., & Iacobelli, A. (2012). Elemental: manual de vivienda incremental y diseno participativo [Elemental: incremental housing manual and participatory design]. Berlin and Stuttgart: Hatje Cantz.

Archdaily. (2016). Roam / Alexis Dornier. Retrieved from https://www.archdaily.com/787696/roam-alexis-dornier

Aureli, P. V. (2016). *Menos es suficiente [Less is enough]*. Barcelona: Editorial GG SL.

Aureli, P. V., Giudici, M. & Issaias, P. (2012). From Dom-ino to Polykatoikia. *Domus, 962*.

Aymonino, C. (1971). L'abitazione razionale: atti dei congressi CIAM 1929-1930 [The rational home: proceedings of the CIAM congresses 1929-1930] (Vol. 10): Marsilio.

Block, I. (2018). Low-cost micro home is made from timber and scavenged materials. Retrieved from https://www.dezeen.com/2018/03/31/invisible-studio-micro-mobile-home-trailer-architecture-bath-uk/

Bourgeois, V. (1930). *L'organisation de L'habitacion minimum [The organisation of the minimum dwelling].* Paper presented at the CIAM II: Die Wohnung für das Existenzminimum, Frankfurt.

Brysch, S. (2011). *Existenzminimum. A questão da Habitação Mínima entre o Moderno e o Contemporâneo.* [*Existenzminimum.* The issue of minimum housing between the modern and the contemporary] [Master dissertation, Porto: University of Porto]

Brysch, S. (2018). *Designing and building housing together: The Spanish case of La Borda.* Paper presented at the Collaborative Housing workshop at European Network of Housing Research conference, Uppsala, Sweden.

Burkhalter, L., & Castells, M. (2009). *Beyond the Crisis: towards a new urban paradigm.* Paper presented at the The 4th International Conference of the International Forum on Urbanism (IFoU), Delft, The Netherlands, 1-26.

Corbusier, L., & Jeanneret, P. (1930). Analyse des éléments fondamentaux du problème de la "Maison Minimum" [Analysis of the fundamental elements of the "Minimum House" issue]. Proceedings of the Congrès Internationaux d'Architecture Moderne (CIAM) II: Die Wohnung für das Existenzminimum, Frankfurt.

Czischke, D. (2009). Managing social rental housing in the EU: A comparative study. *European Journal of Housing Policy, 9*(2), 121-151.

Czischke, D. (2018). Collaborative housing and housing providers: towards an analytical framework of multi-stakeholder collaboration in housing co-production. *International Journal of Housing Policy, 18*(1), 55-81. doi:10.1080/19491247.2017.1331593

Duncan, S. S., & Rowe, A. (1993). Self-provided Housing: The First World's Hidden Housing Arm. *Urban Studies, 30*(8), 1331-1354.

Elsinga, M., & Lind, H. (2013). The effect of EU-legislation on rental systems in Sweden and the Netherlands. *Housing Studies, 28*(7), 960-970.

Ford, J., & Gomez-Lanier, L. (2017). Are Tiny Homes Here to Stay? A Review of Literature on the Tiny House Movement. *Family and Consumer Sciences Research Journal, 45*(4), 394-405.

Fromm, D. (2012). Seeding Community: Collaborative Housing as a Strategy for Social and Neighbourhood Repair. *Built Environment, 38*(3), 364-394.

Gropius, W. (1930). Die soziologischen Grundlagen der Minimalwohnung für die städtische Industriebevölkerung [The sociological foundations of minimum housing for the urban industrial population]. Proceedings of the CIAM II: Die Wohnung für das Existenzminimum, Frankfurt.

Habraken, J., & Teicher, J. (1972). *Supports: an alternative to mass housing.* London: Architectural Press.

Haffner, M., & Heylen, K. (2011). User costs and housing expenses. Towards a more comprehensive approach to affordability. *Housing Studies, 26*(04), 593-614.

Happy-Pigeons. (n.d.). Happy Pigeons Co-Living. Retrieved from https://www.happypigeons.com/

Hellgardt, M. (1987). Martin Wagner: the work of building in the era of its technical reproduction. *Construction History, 3*, 95-114.

Henderson, S. R. (1999). Self-help Housing in the Weimar Republic: The Work of Ernst May. *Housing Studies, 14*(3), 311-328.

Hulchanski, J. D. (1995). The concept of housing affordability: Six contemporary uses of the housing expenditure-to-income ratio. *Housing Studies, 10*(4), 471-491.

Khan-Magomedov, S. O. (1987). *Pioneers of Soviet Architecture* (C. Cooke, Trans.). London: Thames and Hudson Ltd.
Klein, A. (1927). Untersuchungen zur rationellen Gestaltung von Kleinwohnungsgrundrissen [Investigation on the rational design of small apartment layouts]. *Die Baugilde, 14*, 1349-1361.
Kreiczer-Levy, S. (2015). Consumption Property in the Sharing Economy. *Pepperdine Law Review, 43*(61), 61-124.
Kunsmann, J. (2012). Cutting-edge home-owners. *Domus, 962,* 62-71.
Lang, R., Carriou, C., & Czischke, D. (2020). Collaborative Housing Research (1990–2017): A Systematic Review and Thematic Analysis of the Field. *Housing, Theory and Society*, 37(1), 10-39.
Llinares, E. B. (2010). *Existenzminimum* i habitatge actual [*Existenzminimum* and current housing]. [Doctoral dissertation, Universitat Politècnica de Catalunya].
Lucas, R. (2016). *Research methods for architecture.* London: Laurence King Publishing.
Maclennan, D., & Williams, R. (1990). *Affordable housing in Britain and the United States.* York: Joseph Rowntree Foundation.
Manzini, E. (1994). Design, Environment and Social Quality: From" Existenzminimum" to" Quality Maximum". *Design Issues, 10*(1), 37-43.
May, E. (1926). Mechanisierung des Wohnungsbaues in Frankfurt a. M. [Mechanisation of Housing in Frankfurt a. M]. *Die Bauwelt* 45, 1085-1091.
May, E. (1930). *Die Wohnung für das Existenzminimum [The minimum dwelling].* Proceedings of the CIAM II: Die Wohnung für das Existenzminimum, Frankfurt.
McKnight, J. (2015). New York's first micro-apartment building to be completed in December. Retrieved from https://www.dezeen.com/2015/10/21/narchitects-my-micro-ny-modular-residential-tower-affordable-housing-new-york-usa-adapt-nyc/
McMaster, J. (2016). Mehr Als Wohnen [More Than Living]. Retrieved from https://arcspace.com/feature/mehr-als-wohnen/
Millburn, J. F., & Nicodemus, R. (2015). *Minimalism: Live a Meaningful Life*: Asymmetrical Press.
Montaner, J., & Muxí, Z. (2010). Reflexiones para proyectar viviendas del siglo XXI. *Dearq. Revista de Arquitectura* (6), 82-99.
Montaner, J., & Muxí, Z. (2014). *Arquitectura e política: ensaios para mundos alternativos* [*Architecture and politics: essays for alternative worlds*]. São Paulo: Gustavo Gilli.
Mumford, E. (2002). *The CIAM Discourse on Urbanism, 1928-1960.* Cambridge, Massachusetts: The MIT Press.
Parker, S. (Ed.) (2013). *The squeezed middle: The pressure on ordinary workers in America and Britain.* Bristol: Policy Press.
Pittini, A., Koessl, G., Dijol, J., Lakatos, E., & Ghekiere, L. (2017). *State of Housing in the EU Report.* Retrieved from www.housingeurope.eu
Porotto, A. (2017). *Kleinwohnung vs Existenzminimum: Social Housing Types from Inter-War Years.* Paper presented at the Abstract Book 7th Annual International Conference on Architecture, Athens, Greece.
Puigjaner, A. (2014). Ciudad sin cocina. El Waldorf Astoria. Apartamentos con servicios domésticos colectivos en Nueva York 1871-1929 [City without kitchen. The Waldorf Astoria. Apartments with collective domestic services in New York 1871-1929]. [Doctoral dissertation, Universitat Politècnica de Catalunya - ESTSAB]
Ritzer, G., & Jurgenson, N. (2010). Production, consumption, prosumption: The nature of capitalism in the age of the digital 'prosumer'. *Journal of consumer culture, 10*(1), 13-36.
Ruby, A., & Ruby, I. (2011). Min to Max: International Architecture Symposium on the Redefinition of the "minimal subsistence dwelling". Retrieved from http://www.min2max.org/
Schubert, J., Schuetz, E., & Streich, L. (2012). Long live the crisis! *Domus, 962,* 29-35.
Stone, M. E. (2006). What is housing affordability? The case for the residual income approach. *Housing policy debate, 17*(1), 151-184.
Stott, R. (2015). 5 Things the Tiny House Movement Can Learn from Post War Architecture. Retrieved from https://www.archdaily.com/771596/5-things-the-tiny-house-movement-can-learn-from-post-war-architecture
Teige, K. (1932/2002). *The Minimum Dwelling* (E. Diuhosch & R. Svacha, Eds.). Cambridge, Massachusetts: The MIT Press.
The-Collective. (n.d.). The Collective Co-Living. Retrieved from https://www.thecollective.com/

Urbanus. (n.d.). Tulou Collective Housing. Retrieved from http://www.urbanus.com.cn/projects/tulou-collective-housing/?lang=en

Vestbro, D. U. (1992). From Central kitchen to community co-operation. Development of Collective Housing in Sweden. *Open House International, 17*(2), 30-38.

Vestbro, D. U. (2000). From collective housing to cohousing A summary of research. *Journal of Architectural and Planning Research, 17*(2), 164-178.

Wagner, M. (1932). Das „wachsende Haus" der Arbeitsgemeinschaft [The "growing house" of the working association]. *Deutsche Bauzeitung, 66*, 41-44.

Williams, J. (2005). Designing Neighbourhoods for Social Interaction: The Case of Cohousing. *Journal of Urban Design, 10*(2), 195-227. doi:10.1080/13574800500086998

Woetzel, J. R. (2014). A blueprint for addressing the global affordable housing challenge. Executive Summary: McKinsey Global Institute.

Zatarain, K. (2017). IKEA's SPACE10 Future-Living Lab is Researching the Future of "Co-Living". Retrieved from https://www.archdaily.com/883694/

Appendix 2A

Complete review of the architectural online magazines was carried out (103 publications: 52 in Dezeen, 29 in Archdaily, and 22 in Designboom)																							
Articles/News related to the design of 'affordable housing' or 'low-cost housing'			Social dimension								Spatial dimension						Technical dimension						
Magazine	Title	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
dezeen	BIG builds "winding wall" of affordable housing in Copenhagen	2018		x																x		x	
dezeen	Elon Musk reveals plans to create bricks for low-cost housing	2018		x																			x
dezeen	Micro homes inside water pipes could take advantage of unused urban space	2018		x								x				x					x		
dezeen	Matt Lucraft proposes modular building system to tackle housing scarcity	2018		x									x					x	x	x			
dezeen	Yesul Jang designs storage bed for compact living	2018	x		x						x	x								x			
dezeen	Ecological Living Module is a UN-backed, off-grid tiny home	2018	x									x	x							x			x
dezeen	Low-cost micro home is made from timber and scavenged materials	2018	x									x	x						x				x
dezeen	Affordable brick housing built for Argentinian teachers	2018		x						x													
dezeen	Plugin House built in Boston to demonstrate potential for use in US backyards	2018	x								x		x							x			
dezeen	Affordable homes are built above Sydney streets in proposal by NIKA	2018																		x			
dezeen	Prefab metal structures form True North housing complex in Detroit by EC3	2018		x																x			
dezeen	Affordable housing and studio concept wins RIBA contest for decommissioned gasholders	2018		x													x			x			x

1: individual house, **2**: housing complex, **3**: shared living, **4**: participatory/ collective design, **5**: cohousing, **6**: coliving, **7**: enhance sense of community, **8**: communal facilities/courtyard, **9**: compact living/ small spaces, **10**: micro-housing, **11**: tiny houses/ tiny capsules, **12**: incremental model, **13**: flexibility, **14**: temporary living, **15**: regeneration of disused spaces, **16**: 3D printing/ CNC /open source, **17**: DIY / self-building, **18**: prefab/ modular construction, **19**: containers, water pipes, **20**: unfinished elements/ raw state materials, **21**: sustainable construction/ alternative materials.

>>>

Complete review of the architectural online magazines was carried out (103 publications: 52 in Dezeen, 29 in Archdaily, and 22 in Designboom)																							
Articles/News related to the design of 'affordable housing' or 'low-cost housing'			Social dimension								Spatial dimension						Technical dimension						
Magazine	Title	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
dezeen	The SHED Project offers micro-homes inside vacant London properties	2017	x									x				x			x				x
dezeen	Urban-Think Tank develops low-cost housing for South African slum	2017		x							x							x		x			x
dezeen	Llywelyn James proposes affordable cantilevered housing for London's brownfield sites	2017		x																			
dezeen	Eda Kutluozen proposes affordable housing above tube stations for London's key workers	2017		x							x						x						
dezeen	Chequerboard facades front Andreas Martin-Löf Arkitekter's affordable housing in Stockholm	2017		x						x										x			
dezeen	10 innovative homes built on extremely tight budgets	2017	x									x								x		x	x
dezeen	Kodasema launches tiny prefab home for £150k in UK	2017	x									x				x	x		x	x			x
dezeen	Brooks + Scarpa completes The Six housing for LA's homeless and disabled veterans	2017		x						x													x
dezeen	Modular affordable housing envisioned for "abandoned" New York airspace	2017		x						x							x			x			
dezeen	MINI presents shared living spaces as a solution to the affordable housing crisis in cities	2016		x	x			x		x		x								x			
dezeen	Millennials want experiences not possessions, say co-living entrepreneurs	2016			x			x		x		x											
dezeen	Three architecture studios complete low-cost housing complex in San Francisco	2016		x						x													

1: individual house, **2**: housing complex, **3**: shared living, **4**: participatory/ collective design, **5**: cohousing, **6**: coliving, **7**: enhance sense of community, **8**: communal facilities/courtyard, **9**: compact living/ small spaces, **10**: micro-housing, **11**: tiny houses/ tiny capsules, **12**: incremental model, **13**: flexibility, **14**: temporary living, **15**: regeneration of disused spaces, **16**: 3D printing/ CNC /open source, **17**: DIY / self-building, **18**: prefab/ modular construction, **19**: containers, water pipes, **20**: unfinished elements/ raw state materials, **21**: sustainable construction/ alternative materials.

>>>

Complete review of the architectural online magazines was carried out (103 publications: 52 in Dezeen, 29 in Archdaily, and 22 in Designboom)																							
Articles/News related to the design of 'affordable housing' or 'low-cost housing'			Social dimension								Spatial dimension						Technical dimension						
Magazine	Title	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
dezeen	Alexander Gorlin creates colourful affordable housing for single adults in The Bronx	2016		x						x		x											x
dezeen	SCI-Arc students build affordable home in low-income Los Angeles neighbourhood	2016	x																				x
dezeen	Shotgun Chameleon house in Houston designed to help its owners offset their mortgage	2016	x							x					x								x
dezeen	New York's first micro-apartment building to be completed in December	2015		x						x		x								x			
dezeen	Richard Rogers' prefabricated housing for homeless people opens in south London	2015		x								x				x				x	x		
dezeen	Cedar-clad house by Yale students could serve as a model for affordable housing	2015	x												x								
dezeen	Vo Trong Nghia Architects' low-cost housing moves towards mass production	2015	x												x					x			x
dezeen	Casa Invisibile by Delugan Meissl is a low-cost portable house prototype clad in mirrors	2015	x												x					x	x		x
dezeen	Zanderroth Architekten designs cb19 apartments without internal walls to create flexible layouts	2015		x			x								x					x			
dezeen	Patrick Dillon's SaLo House is an off-grid forest dwelling overlooking the Pacific Ocean	2015	x																			x	x
dezeen	Triendl und Fessler Architekten plans low-cost family home around a secret courtyard	2015	x																			x	

1: individual house, **2**: housing complex, **3**: shared living, **4**: participatory/ collective design, **5**: cohousing, **6**: coliving, **7**: enhance sense of community, **8**: communal facilities/courtyard, **9**: compact living/ small spaces, **10**: micro-housing, **11**: tiny houses/ tiny capsules, **12**: incremental model, **13**: flexibility, **14**: temporary living, **15**: regeneration of disused spaces, **16**: 3D printing/ CNC /open source, **17**: DIY / self-building, **18**: prefab/ modular construction, **19**: containers, water pipes, **20**: unfinished elements/ raw state materials, **21**: sustainable construction/ alternative materials.

>>>

Complete review of the architectural online magazines was carried out (103 publications: 52 in Dezeen, 29 in Archdaily, and 22 in Designboom)																							
Articles/News related to the design of 'affordable housing' or 'low-cost housing'			Social dimension								Spatial dimension						Technical dimension						
Magazine	Title	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
dezeen	EFFEKT's Villa One is a low-cost home designed to suit a growing family	2015	x												x					x			
dezeen	UCLA research lab unveils micro dwelling to help combat affordable housing crisis	2015	x										x		x	x							x
dezeen	Student-style accommodation for adults "is going to be the next market" says Naomi Cleaver	2015		x	x					x	x	x											
dezeen	Kevin Daly Architects builds a low-cost housing community in Santa Monica	2015		x						x													x
dezeen	JYA-rchitects develops affordable homes for low-income families in South Korea	2015	x								x					x				x	x		
dezeen	S-AR's Casa Caja is a prototype for low-cost homes that can be built by their owners	2015	x							x												x	
dezeen	Sigurd Larsen completes low-cost family house in Copenhagen	2014	x								x									x			
dezeen	Low-cost house by Enrique Mora Alvarado built using rainforest wood and bamboo	2014	x																				x
dezeen	Vo Trong Nghia unveils second prototype for low-cost Vietnamese housing	2014	x																x	x			x
dezeen	Happy Cheap house by Tommy Carlsson is a prototype for low-cost prefab homes	2014	x								x									x			
dezeen	Bamboo micro homes could be slotted inside Hong Kong's old factories	2014	x							x		x			x	x	x			x			x
dezeen	Post-Tsunami Housing by Shigeru Ban	2013	x												x								x

1: individual house, **2**: housing complex, **3**: shared living, **4**: participatory/ collective design, **5**: cohousing, **6**: coliving, **7**: enhance sense of community, **8**: communal facilities/courtyard, **9**: compact living/ small spaces, **10**: micro-housing, **11**: tiny houses/ tiny capsules, **12**: incremental model, **13**: flexibility, **14**: temporary living, **15**: regeneration of disused spaces, **16**: 3D printing/ CNC /open source, **17**: DIY / self-building, **18**: prefab/ modular construction, **19**: containers, water pipes, **20**: unfinished elements/ raw state materials, **21**: sustainable construction/ alternative materials.

>>>

Complete review of the architectural online magazines was carried out (103 publications: 52 in Dezeen, 29 in Archdaily, and 22 in Designboom)																							
Articles/News related to the design of 'affordable housing' or 'low-cost housing'			Social dimension								Spatial dimension						Technical dimension						
Magazine	Title	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
dezeen	Prototyping UH by General Design	2013	x																	x			
dezeen	Pop-up housing in garages by Levitt Bernstein	2012	x	x									x				x		x	x			
dezeen	MIMA House by MIMA Architects	2011	x								x				x			x		x			
dezeen	Multi-storey Temporary Housing by Shigeru Ban Architects	2011		x							x					x					x		
dezeen	Housing for New Orleans by David Adjaye, Morphosis, MVRDV, Shigeru Ban and others	2008	x																	x			x
archdaily	L.A. Plans to Repurpose General Hospital as Affordable Housing	2018		x													x						
archdaily	Will Open-Source, Technological Solutions Ever Lead to the Dream of Universal Affordable Housing?	2018	x	x								x		x	x			x	x	x			x
archdaily	In World's First 3-D Printed Home Community, Houses will be Built in a Day for $4000	2018	x															x					
archdaily	Adjaye Associates Among Team of Britain's Top Designers Commissioned by Startup to Help Solve the UK's Housing Crisis	2018	x																x	x			
archdaily	The Future of Housing: Drones, Automation and Co-Habitation	2018		x				x				x								x			x
archdaily	7 Lessons from New York's New Affordable Housing Design Guide	2018		x																			
archdaily	Architects Propose 120 Incremental Social Houses for Iquitos, Peru	2018	x											x	x					x			x

1: individual house, **2**: housing complex, **3**: shared living, **4**: participatory/ collective design, **5**: cohousing, **6**: coliving, **7**: enhance sense of community, **8**: communal facilities/courtyard, **9**: compact living/ small spaces, **10**: micro-housing, **11**: tiny houses/ tiny capsules, **12**: incremental model, **13**: flexibility, **14**: temporary living, **15**: regeneration of disused spaces, **16**: 3D printing/ CNC /open source, **17**: DIY / self-building, **18**: prefab/ modular construction, **19**: containers, water pipes, **20**: unfinished elements/ raw state materials, **21**: sustainable construction/ alternative materials.

>>>

Complete review of the architectural online magazines was carried out (103 publications: 52 in Dezeen, 29 in Archdaily, and 22 in Designboom)																							
Articles/News related to the design of 'affordable housing' or 'low-cost housing'			Social dimension								Spatial dimension						Technical dimension						
Magazine	Title	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
archdaily	IKEA's SPACE10 Future-Living Lab is Researching the Future of "Co-Living"	2017		x	x			x															x
archdaily	Speculative Project Seeks to Take Advantage of NYC Air Rights for Affordable Housing	2017		x													x						
archdaily	UK's First "Naked House" Proposal Aims to Bring Affordability to London's Housing Market	2017	x	x							x			x	x				x			x	
archdaily	WXY and BLA Unveil New York Affordable Housing Development	2017		x																			
archdaily	Bee Breeders Reveal New York Affordable Housing Challenge Winners	2017		x					x						x					x			
archdaily	Even in Wealthy Cities, Architects Must Work for Social Justice in Every Way Possible	2017		x					x														
archdaily	Innovative Affordable Housing Solutions From Brazil	2017	x	x																x	x		
archdaily	Construct the Future	2016				x												x					x
archdaily	Real Takes on Real(ly Successful) Housing Experiments	2016		x			x																
archdaily	Half A House Builds A Whole Community: Elemental's Controversial Social Housing	2016		x							x			x					x	x		x	
archdaily	ELEMENTAL Releases Plans of 4 Housing Projects for Open-Source Use	2016		x														x					
archdaily	How the "Moladi" System is Making Affordable Housing More Accessible in South Africa	2015	x																				x

1: individual house, **2**: housing complex, **3**: shared living, **4**: participatory/ collective design, **5**: cohousing, **6**: coliving, **7**: enhance sense of community, **8**: communal facilities/courtyard, **9**: compact living/ small spaces, **10**: micro-housing, **11**: tiny houses/ tiny capsules, **12**: incremental model, **13**: flexibility, **14**: temporary living, **15**: regeneration of disused spaces, **16**: 3D printing/ CNC /open source, **17**: DIY / self-building, **18**: prefab/ modular construction, **19**: containers, water pipes, **20**: unfinished elements/ raw state materials, **21**: sustainable construction/ alternative materials.

>>>

Complete review of the architectural online magazines was carried out (103 publications: 52 in Dezeen, 29 in Archdaily, and 22 in Designboom)																							
Articles/News related to the design of 'affordable housing' or 'low-cost housing'			Social dimension								Spatial dimension						Technical dimension						
Magazine	Title	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
archdaily	Designing Affordability: Quicker, Smarter, More Efficient Housing Now	2015												x						x			
archdaily	ODA Unveils Plans for Brooklyn Bridge Park Residential Towers	2015		x					x											x			
archdaily	George Lucas Unveils Plan for Bay Area's Largest Affordable Housing Project	2015							x	x													
archdaily	HHbR Develop A "Palladian Model" For Contemporary Affordable Housing	2015		x					x	x													
archdaily	The Other "Green Way": Why Can't New York Build More Quality Affordable Housing?	2014		x						x													x
archdaily	Solar Decathlon 2013: Stanford University Places Fifth Overall, Ties First in Affordability	2014	x																	x			x
archdaily	Trading Parking Lots for Affordable Housing	2014	x	x								x					x						
archdaily	Bloomberg to Announce Mega-Redevelopment of NYC's Lower East Side	2013		x																			
archdaily	Rogers Stirk Harbour + Partners' Unveil Homeshell Prototype at London's RA	2013	x												x					x			x
archdaily	Affordable Housing for the Future Competition entry	2010		x						x										x			x
designboom	TACO's affordable housing module in mexico is a small-scale space for social activity	2018	x										x									x	x
designboom	KTGY converts vacant big-box stores into housing for homeless individuals	2018		x						x	x		x				x						x
designboom	concrete pipes offer space for microhome tube housing of the future	2018		x							x	x			x					x	x		

1: individual house, **2**: housing complex, **3**: shared living, **4**: participatory/ collective design, **5**: cohousing, **6**: coliving, **7**: enhance sense of community, **8**: communal facilities/courtyard, **9**: compact living/ small spaces, **10**: micro-housing, **11**: tiny houses/ tiny capsules, **12**: incremental model, **13**: flexibility, **14**: temporary living, **15**: regeneration of disused spaces, **16**: 3D printing/ CNC /open source, **17**: DIY / self-building, **18**: prefab/ modular construction, **19**: containers, water pipes, **20**: unfinished elements/ raw state materials, **21**: sustainable construction/ alternative materials.

>>>

Complete review of the architectural online magazines was carried out (103 publications: 52 in Dezeen, 29 in Archdaily, and 22 in Designboom)																							
Articles/News related to the design of 'affordable housing' or 'low-cost housing'			Social dimension								Spatial dimension						Technical dimension						
Magazine	Title	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
designboom	ANTNA's 'un cuarto mas' expansion prototype aims to solve the housing crisis in mexico	2018	x	x													x			x			x
designboom	critical concrete's first summer program aims at reviving affordable housing in porto	2017	x			x													x				x
designboom	arianna fornasiero + paolo turconi's flexible housing plan fits ethiopian social-frame	2017		x										x	x				x	x			x
designboom	BIG's urban rigger uses shipping containers to offer floating student housing	2016		x						x	x									x	x		x
designboom	RSH+P continues to examine the housing crisis with 'saving the city' at the venice biennale	2016		x											x					x	x		x
designboom	SPACE architects' affordable housing in india emphasizes simplicity through color	2016		x																x			x
designboom	MVRDV reconsiders suburban living with plans to transform army barracks in germany	2016	x	x					x										x	x			
designboom	tatiana bilbao uses concrete blocks and wooden pallets for sustainable housing prototype	2015	x			x								x	x				x	x			x
designboom	3XN presents la tour residential tower in aarhus, denmark	2014		x					x											x			
designboom	TOP 10 housing projects of 2014	2014		x						x										x			x
designboom	affordable community housing at pico place by brooks + scarpa	2014		x					x	x										x			x

1: individual house, **2**: housing complex, **3**: shared living, **4**: participatory/ collective design, **5**: cohousing, **6**: coliving, **7**: enhance sense of community, **8**: communal facilities/courtyard, **9**: compact living/ small spaces, **10**: micro-housing, **11**: tiny houses/ tiny capsules, **12**: incremental model, **13**: flexibility, **14**: temporary living, **15**: regeneration of disused spaces, **16**: 3D printing/ CNC /open source, **17**: DIY / self-building, **18**: prefab/ modular construction, **19**: containers, water pipes, **20**: unfinished elements/ raw state materials, **21**: sustainable construction/ alternative materials.

>>>

Complete review of the architectural online magazines was carried out (103 publications: 52 in Dezeen, 29 in Archdaily, and 22 in Designboom)																							
Articles/News related to the design of 'affordable housing' or 'low-cost housing'			Social dimension								Spatial dimension						Technical dimension						
Magazine	Title	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
designboom	enrique abascal arquitectos: social housing building at poligono aeropuerto	2013		x											x								x
designboom	casalata proposal for urban social housing in cape verde	2013													x				x	x			x
designboom	messequartier housing project by pernthaler architecture	2013		x						x										x			
designboom	low-cost prefab cement wood-board housing by abaton	2013	x								x					x				x	x		
designboom	untercio arquitectura: vallecas 47 social housing project, madrid	2013		x					x	x	x				x								
designboom	fangcheng architects: affordable housing proposal	2012		x																x			
designboom	LAN architecture: collective housing units begles, france	2010		x											x					x	x		x
designboom	solos: tulou/affordable housing for china	2009		x						x	x												

1: individual house, **2**: housing complex, **3**: shared living, **4**: participatory/ collective design, **5**: cohousing, **6**: coliving, **7**: enhance sense of community, **8**: communal facilities/courtyard, **9**: compact living/ small spaces, **10**: micro-housing, **11**: tiny houses/ tiny capsules, **12**: incremental model, **13**: flexibility, **14**: temporary living, **15**: regeneration of disused spaces, **16**: 3D printing/ CNC /open source, **17**: DIY / self-building, **18**: prefab/ modular construction, **19**: containers, water pipes, **20**: unfinished elements/ raw state materials, **21**: sustainable construction/ alternative materials.

Source: Author

3 Affordability through design

The role of building costs in collaborative housing

Brysch, S., & Czischke, D. (2022). Affordability through design: the role of building costs in collaborative housing. *Housing Studies, 37*(10), 1800-1820.
This article is part of the special issue "Housing affordability crisis", edited by Peter A. Kemp and Vincent J. Reina.

ABSTRACT

Against the background of the current housing affordability crisis, a new wave of 'collaborative housing' (CH) is developing in many European cities. In this paper, CH refers to housing projects where residents choose to share certain spaces and are involved in the design phase. While many authors point to the alleged economic benefits of living in CH, the (collaborative) design dimension is rarely mentioned in relation to affordability. This paper seeks to fill this knowledge gap by identifying design criteria used in CH to reduce building costs, increasing this way its affordability. We carry out a comparative case study research, where we assess the design phase of 16 CH projects in different European cities. Findings suggest that collaborative design processes increase the chances of improving housing affordability, mainly due to the often-applied needs-based approach and the redefinition of minimum housing standards.

KEYWORDS

collaborative housing; housing affordability; collaborative design processes; design criteria; building costs.

3.1 Introduction

New models and institutions have emerged to tackle the housing affordability crisis over the past decades. These comprise innovative hybrid arrangements, where public agencies and private and not-for-profit actors collaborate (Czischke & van Bortel, 2018; van Bortel & Gruis, 2019). These collaborative processes include the citizens' involvement in the provision of their housing and are increasingly encouraged due to their alleged benefits.

In line with the above, collaborative housing (CH) has been (re)gaining momentum in the past years in many European countries and referred to as a 'new wave' (Sandstedt & Westin, 2015, p. 134) or 'third wave' (Williams, 2005, p. 202). Despite the lack of reliable statistics on the number of people living in CH in the countries under study, studies estimate a growing demand for these housing types, particularly amongst seniors and young families (Lang, Carriou & Czischke, 2020).

Scholars define CH as including a wide range of housing forms, such as cohousing, residents' cooperatives, self-building initiatives, among others (Fromm, 1991; Lang et al., 2020; Vestbro, 2010). These forms are often collectively self-organised and based on 'a significant level of collaboration amongst (future) residents, and between them and external actors and stakeholders, with a view to realizing the housing project.' (Czischke, Carriou, & Lang, 2020). Additionally, the shared intention of the users to live together (Vestbro, 2010) is usually reflected in the housing layout, where private units are complemented by collective spaces (Fromm, 2012; Jarvis, 2011; Vestbro, 2010). In short, in this paper, CH refers to projects characterised by resident participation and collaboration with professionals in the design phase, aimed at creating housing projects in which residents intentionally share spaces.

Examples of CH initiatives seeking affordable and sustainable solutions include Baugruppen in Germany and Austria, Habitat Participatif in France, Community Land Trusts (CLTs) in England, Belgium and more recently in France (called 'Organismes de Foncier Solidaire'- OFS), and new residents' cooperatives in Spain or Switzerland (Czischke, 2018). In recent years, a new scholarly strand has developed within the CH field, mainly 'focused on emerging CH models and their innovative and radical potential to address the lack of affordable housing options.' (Lang et al., 2020, p. 22). Research alleging the economic benefits of providing CH mainly focuses on how certain approaches can contribute to reducing costs through co-production (Czischke, 2018), innovative land access or acquisition (Aernouts &

Ryckewaert, 2017; Cabré & Andrés, 2018; Chatterton, 2013; Engelsman, Rowe, & Southern, 2018; Paterson & Dunn, 2009), collective ownership (e.g., cooperatives) (Archer, 2022[3]; Cabré & Andrés, 2018) and collective self-management and -governance (Archer, 2022; Jarvis, 2011; Williams, 2005). However, little attention has been paid to how the design of CH influences affordability, notably due to its potential to reduce building costs.

High building costs are widely acknowledged as posing severe challenges to the provision of affordable housing (Pittini, Koessl, Dijol, Lakatos, & Ghekiere, 2017; Wetzstein, 2017). Woetzel (2014, p. 5) suggests that 'developing and building housing at lower cost' and 'operating and maintaining properties more efficiently' are possible approaches to narrow the current affordability gap. However, building low-cost housing is not enough to provide affordable housing. In the past, design approaches such as *Existenzminimum* (minimum dwelling) showed that certain design criteria helped deliver affordable housing by reducing building costs while improving its quality. Today, a renewed interest in *Existenzminimum* is expressed in innovative minimum dwelling solutions as a way to provide affordable housing and increase social interaction (Brysch, 2019; Ruby & Ruby, 2011), combining small and less-equipped private units with collective and flexible spaces.

CH often shares these spatial features, with the difference that design decisions are taken collectively, reflecting the specific needs and demands of the residents' group. This collective design process may in itself indirectly affect final costs due to factors such as in-kind investment by future residents and the redefinition of roles due to its self-organisation. Thus, under specific conditions, the design phase in CH is likely to play an important role in reducing building costs and – consequently – increasing affordability. Building costs are understood here as expenditures incurred during the design and construction of a housing project.

In this paper, we assess *affordability* at a project-level and in line with a recent research strand committed to broadening the concept by including other values that transcend the economic focus, such as quality, sustainability, and community building (Mulliner, Smallbone, & Maliene, 2013). Indeed, the concept of affordability is concerned not only with prices or rents and incomes but also with quality standards (Haffner & Heylen, 2011; Maclennan & Williams, 1990). This does not imply that affordability could no longer be assessed, but rather it cannot be accurately measured and compared. At the same time, our understanding of *housing*

3 The dates of the references have been updated.

goes beyond the market-driven and capitalist perspective that considers it purely an object, an asset. We follow Turner's premise that housing is both a product (object, a noun) and a process (subject, a verb) (Turner, 1972), inseparable from each other. Accordingly, we look at both factors that influence building costs related to the design outcome ('the building as a product') and the design process.

The aim of this paper is to identify the design criteria that may reduce building costs in CH projects and, consequently, increase affordability. The main research question 'What[4] design criteria are used in CH to increase affordability?' is followed by two sub-questions, namely 'What[5] design decisions are taken in CH projects to reduce building costs?' and 'How does the design process of CH projects indirectly contribute to reducing building costs?'. Our method consists of an international comparative case study, where we assess the design phase of 16 recent CH European projects in which affordability has been referred to as a key driver. To this end, we developed an analytical framework to evaluate the factors that influence building costs in CH. We employed this to refine the operational questions we formulate throughout section 3 for the analysis of the empirical findings from the case studies.

Fieldwork was carried out between May and July 2018 and April and August 2019 in 12 European cities. Primary and secondary data provided factual data about the project (*product* and *process*-wise) as well as perceptions on the affordability of the project. Findings, therefore, combine survey-respondents and interviewees' perceptions with researchers' observation and review of the literature and architectural plans.

This paper is structured as follows: first, we describe our methodological approach and list the selection criteria of the case studies. We then propose an analytical framework to identify the design criteria that may influence building costs in CH. This is followed by a section where we present and discuss our findings, after which we conclude by outlining further steps for our research.

4 Adapted from the originally published 'Which'

5 Adapted from the originally published 'Which'

3.2 Methodological approach

This research adopted an international comparative case study approach to provide an overview of the design process of recently built CH projects in 12 European cities, namely Stockholm and *Malmö* (Sweden), Helsinki (Finland), Odense and Albertslund-Copenhagen (Denmark), Berlin and Hamburg (Germany), Amsterdam (The Netherlands), Vienna (Austria), Lyon (France), Milan (Italy), and Barcelona (Spain).

Despite their different geographies, all these countries are bound by the same EU directives in environmental sustainability (e.g., Energy Efficiency Index, integration of environmental aspects into European standardisation, etc.) and base their housing provision on regulations for space and quality (minimum) standards. While in some countries, CH initiatives have long-established practices (Sweden and Denmark are the birthplaces of some models), in others, CH has recently developed to tackle the housing affordability crisis (e.g., Spain, France). By covering 16 projects located in the south, central and north Europe, the study sought to bring together a rich diversity of cultural, geographical, and housing systems. The criteria used to select the cases were the following:

- Be the result of a collaborative design process (i.e., a collaboration between residents and professionals);
- Combine private units with collective spaces;
- Be a recently completed project (after 2000);
- Be referred to as having affordability as (one of) the project's main driver(s).

The cases were identified through literature review, internet websites, and personal contacts. Fieldwork took place between May and July 2018 and April and August 2019. It consisted of project visits, photographic documentation, a (web-)survey (average duration of 15-20min) sent to the residents of the projects, and interviews (average duration of 1h) or informal conversations with residents, architects, and facilitators involved in the design phase. In parallel, secondary sources were reviewed, such as architectural drawings and websites of the respective projects. Appendix 3A lists the selected cases and the data collection methods applied to each case.

Residents' and architects' input was relevant to a) uncovering physical features undetectable through the review of the architectural drawings, visits, and photographic documentation; and b) grasping the residents' perceptions regarding the suitability of the project to their needs and expectations and their notion of

minimum quality. Input from architects, facilitators, and residents involved in the design phase was useful to a) gather both information and impressions about the design process (participation level, time, decision-making methods); and b) identify which design factors were perceived as the most influential in affecting the affordability of the project.

The interviews (input from 33 individuals; see Appendix 3A for break-down by case) followed two formats. In 2018, the interviews were conducted according to a more conventional semi-structured approach. In 2019, the respondents were presented with four 'flashcards' at the beginning of the interview, each of them related to a pre-defined key theme: (1) design & construction process, (2) final outcome, (3) affordability, and (4) setbacks. They were asked to comment on these topics and answer open-ended questions regarding the housing projects they were involved. This strategy framed and guided the whole interview, avoiding deviations from the subject and allowing a more natural narrative.

The survey was translated into English, German, French, Italian and Spanish and distributed accordingly to the residents either digitally (web-survey) or as a hard-copy (letter in the mailbox) during the project visits. The survey questions were mainly multiple-choice and were related to the abovementioned four key topics. Out of the questionnaires sent to the 16 cases (a total of 845 households: 134 as hard-copy and 11 digitally sent to the contact person, who would forward it to the residents), we received 84 responses (see Appendix 3A for break-down by case). The survey is (statistically) not representative, as the responses are scarce and uneven from case to case. Yet, it provides relevant input for the research: for instance, it uncovers that not all residents had participated in the design process, as they joined the project at a later stage. Moreover, input from the 84 residents that replied to the survey is useful to assess findings related to the product. In contrast, information from residents involved in the design process that replied to the survey, 50 out of 84, is considered to analyse process-related findings. In each project (except for two cases), at least one resident claims no cost savings by living there.

3.3 Analytical framework: identifying the design criteria influencing building costs in collaborative housing

This paper seeks to provide a theoretical and qualitative assessment of affordability in CH, focusing on the design phase and its impact on building costs. We propose an analytical framework to understand affordability at a project-level from the perspective of the design process (subject / social level) and the consequent product (object / spatial and technical level) as inseparable parts of a whole: housing. Building on Brysch (2019), who analyses housing affordability in relation to design through the concept of Existenzminimum, we consolidate the framework through a literature review on building costs, participation, and self-organisation in housing.

Literature on mainstream housing mainly connects building costs with typological issues, namely the building configuration, and with construction approaches. Simple shapes with 5 to 6 storeys are less expensive to build (Belniak, Leśniak, Plebankiewicz, & Zima, 2013; Chau, Wong, Yau, & Yeung, 2007; Seeley, 1983). Prefabrication and standardisation are widely described as cost-savers, as they are based on low production costs and speed in assembling (Brysch, 2019; Seeley, 1983). Flexibility also can positively impact final costs (De Paris & Lopes, 2018; Slaughter, 2001). The choice of materials also influences building costs, considering their quality and their sustainability level. Minimum quality standards, established to guarantee dignified housing, prevent building situations under the set limits. Besides regulatory standards (e.g., have at least one bathroom with a bathtub, or parking lots), 'socially-acceptable' minimum standards are also considered to meet mainstream cultural expectations (e.g., include laundries in private units). Architectural design plays, therefore, an essential role in providing housing solutions where costs and quality do not compromise each other (Brysch, 2019).

Current research on the development and design of CH focuses on resident 'participation' and collective 'self-organisation' (Czischke, 2018; Ruiu, 2016), where residents often take on roles of housing professionals (Duncan & Rowe, 1993; Palmer, 2019). This collective process raises the issue of 'time', not only spent on voluntary tasks but also on issues related to the level of participation, decision-making, and conflict (Jarvis, 2011; Williams, 2005), which affects the duration of the whole process and influences the final product.

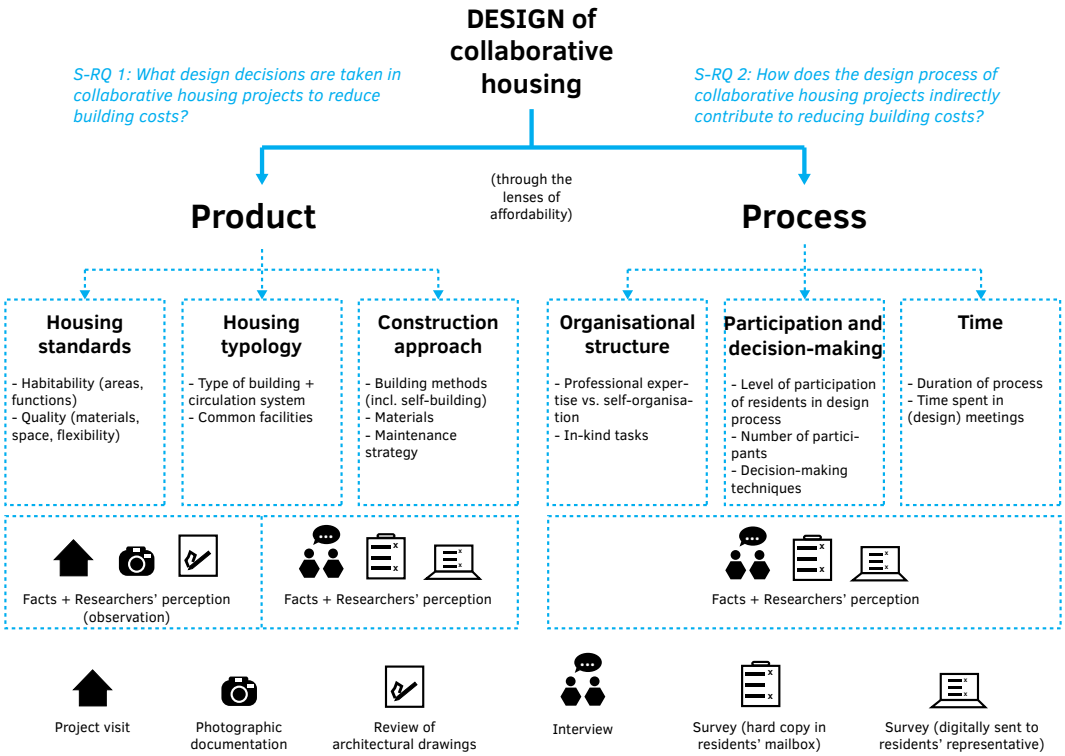


FIG. 3.1 Analytical framework (Source: Authors)

Our framework distinguishes six factors that might influence building costs in CH: (1) minimum standards, (2) housing typology, (3) construction approach, (4) organisational structure, (5) participation and decision-making, and (6) time. While the first three are linked to the product, the last three are related to the collaborative design process. Yet, they are all interconnected and often overlap. The general approach to 'minimum (quality) standards' influences the building configuration ('typology'), which is then materialised through a certain 'construction approach'. These factors apply to housing in general, but their link to a collaborative design process makes them specific to CH, as residents' 'participation' is the crucial factor determining the final decisions on those product-related factors. The 'organisational structure' of the process, based on collective self-organisation, includes the voluntary execution of tasks by the residents, for instance, self-building, creating a link with the 'construction approach'. The 'time' that is dedicated or offered (i.e., spent in working hours) by the residents in the design phase may impact the level of 'participation', which then influences final design decisions (at product level) and associated costs.

Therefore, rather than 'quantifying' the relevance of each factor, we aim at identifying the factors that, in combination with each other, create an impact on building costs.

Other project-level factors that may indirectly influence design decisions are land acquisition costs, financial mechanisms, or tenure types. Examples include subsidies to build energy-efficient buildings or land lease agreements that reduce the financial burden, allowing more design options. However, this study focuses on the factors immediately linked to the design process. Next, we discuss these six factors in more detail and derive operational questions concerning their potential impact on building costs in the specific case of CH. Figure 3.1 outlines the proposed analytical framework and illustrates the applied methods to provide input to each one.

3.3.1 Minimum standards

Within the legal possibilities - or sometimes contesting them -, residents themselves define their own minimum 'threshold' in CH projects concerning space and quality standards (areas, domestic functions, level of finishing). According to the values they prioritise, residents also define their own set of 'socially-acceptable' standards. In this sense, CH contrasts with mainstream housing, where housing is delivered as a finished product according to conventional standards and established expectations. First, the built form of CH reflects the decisions that are (collectively) made during the design process to accommodate the exact required space as a direct result of their needs and aspirations. Second, residents of CH often move into an unfinished building, with spaces and surfaces to be completed later. Third, in CH, it is common to 'strip all nonessential or infrequent space needs out of the individual dwelling' (Jarvis, 2011, p. 567) and reduce the area of the private units (Jarvis, 2011; Williams, 2005) to the (legally accepted) minimum. This allows to include collective spaces without an increase in construction costs (Vestbro, 2008). However, the simple reduction and 'transference' of a private area to a bigger collective one do not necessarily reduce costs since the higher costs are usually at the infrastructure and services level (Hellgardt, 1987). It is the number of appliances or in the private sphere that needs to reduce to save costs.

So, the question arises: How are space and quality standards perceived and applied in CH, and how do they affect building costs?

3.3.2 Housing typology

In a similar way to mainstream housing, the building costs of CH are also influenced by the configuration, shape, and height of the building. The internal layout of CH is often based on small private units combined with collective spaces (sometimes also made available to the wider neighbourhood. Also, many CH examples are based on the high flexibility and adaptability of spaces to allow different uses. Circulation systems such as interior cores (staircase and elevator) are usually chosen due to their compact and effective spatial distribution. Yet, galleries are also often used as a design strategy to compensate for the reduced areas of private units without increasing the overall surface area. They are occasionally merged with 'private' balconies and assume the function of meeting spaces. Therefore, a correct balance between private and collective is relevant to keeping costs under control and promoting values such as social interaction, sharing and community building.

This leads us to the question: What kind of (typological) design decisions and compromises are made in CH to reduce final building costs?

3.3.3 Construction approach

In CH projects, the building is often not considered a finished product but rather an ongoing process, as the end-users can change and expand their housing units. These approaches resonate with the concepts of *open building* (Habraken & Teicher, 1972), further developed by Frans van der Werf, and *incremental housing* (Aravena & Iacobelli, 2012). Unfinished surfaces, unpainted walls, unassembled kitchen cabinets and window blinds are examples of construction elements to be completed by the residents upon their arrival through 'self-building' and DIY (Do-it-yourself) or DIT (Do-it-together) processes (Brysch, 2018). Duncan and Rowe (1993) point to the potential of self-provision and self-building in reducing costs due to labour savings in construction works and white-collar tasks and the absence of speculative profit. In this paper, the term self-building is used to describe hands-on construction tasks carried out by some residents. On the other hand, CH is often characterised by its 'custom-made solutions' (Tummers, 2016, p. 2024) and decisions about materials or are often made to achieve higher environmentally-friendly and energy-efficiency standards (Tummers, 2016).

The above raises the questions: To what extent can these alternative construction approaches reduce the overall building costs in the particular case of CH? What are the design trade-offs to ensure these high standards and keep costs down?

3.3.4 Organisational structure

Self-organisation is usually a key feature of a CH project. This may impact costs since the residents' group voluntarily takes on tasks traditionally undertaken by professionals, namely the developer (Palmer, 2019) or builders and contractors (Duncan and Rowe, 1993). This 'sweat equity' of unpaid work implies a redistribution among residents of roles and responsibilities (Czischke, 2018). The degree to which residents are capable to (self-)organise and be actively involved in the process may be related to the size of the group, as often 'small groups are more efficient and viable than large ones' in taking collective action to achieve a common goal (Olson, 1965). In addition, by undertaking various management tasks in the housing project, residents can lower service costs regarding maintenance, operation, and administration.

At the same time, the group may also hire other professionals due to the complexity of developing a CH project, thus potentially raising costs. These include project managers (Landenberger & Gütschow, 2019), facilitators (to moderate the meetings), and financial or legal advisors.

We, therefore, ask: How does this redefinition of roles affect the costs? And how does the group size influence self-organisation and residents' participation?

3.3.5 Participation and decision-making

Manzini (2016) distinguishes *expert design* (involving the professionals), *diffuse design* (involving the end-users), and *co-design*, which is the interaction between professionals and end-users. For Sanders and Stappers (2008, p. 6), co-design refers 'to the creativity of designers and people not trained in design working together in the design development process.' In the context of co-production and existing partnerships in CH, Czischke (2018, p. 8) defines a framework for a 'continuum of user involvement' in housing provision, ranging from residents' consultation (lowest level) to the 'entrepreneurial exit' level (Gofen, 2012), where end-users take full initiative and responsibility in providing housing.

Considering these notions together with the seminal work developed by Arnstein (1969), we define five levels of participation in the design phase (see Table 3.1): non-participation (no collaboration, 100% expert-led), minor participation, medium participation, high participation (co-design), and full participation (no collaboration, 100% user-led). In cases with a high level of participation, collective decisions range from the overall spatial configuration to the finishing levels.

TABLE 3.1 Different levels of citizen/end-user participation (Source: Authors)

Levels of participation			
by Arnstein (1969)	by other authors	by the authors	
Manipulation / Therapy 'enable powerholders to "educate" or "cure" the participants' (Arnstein, 1969, p. 217)	*Expert design* (Manzini, 2016)	Non-participation (no collaboration, 100% expert-led)	No involvement of the residents in any part of the design process. Architects have total control over the design.
Informing / Consultation 'citizens may indeed hear and be heard (…) but they lack the power to ensure that their views will be heeded by the powerful' (Arnstein, 1969, p. 217)	*Pseudo-participation* (Sanoff, 2010) Residents' consultation (Czischke, 2018)	Minor participation	Residual participation of the residents with no influence on the overall project (e.g., decisions on furniture or functions of common spaces)
Placation 'allow citizens to advise or plan ad infinitum but retain for powerholders the right to judge the legitimacy or feasibility of the advice.' (Arnstein, 1969, p. 220)		Medium participation	Punctual involvement of the residents, so it influences the overall project, but the project is mainly designed by professionals
Partnership 'power is redistributed through negociation between citizens and powerholders' (Arnstein, 1969, p. 221)	Co-design (Manzini, 2016; Sanders & Stappers, 2008)	High participation (co-design)	Active involvement of both architects and residents, from the beginning to the end of the process, it may involve future self-building/DIY approaches
Delegated Power / Citizen Control Citizens have 'dominant decision-making authority over a particular plan' (Arnstein, 1969, p. 222)	*Diffuse design* (Manzini, 2016) Entrepreneurial exit (Gofen, 2012)	*Full participation* (no collaboration, 100% user-led)	All the decisions taken unilaterally by the residents. Architects act as consultants or advisors.

In examples of medium or minor participation, residents are usually asked about their preferences and provide some guidelines, but final design decisions still belong to professionals. In this research, we discard the first and last levels, as all the selected case studies result from a collaboration between residents and professionals.

In CH, there are different non-hierarchical decision-making techniques, such as dynamic governance or sociocracy (Jarvis, 2015), consensus and voting (Jarvis, 2011; Ruiu, 2016; Williams, 2005). Consensus, considered the ideal decision-making technique by Landenberger and Gütschow (2019), is applied in most cases. However, it demands a long time to reach a common agreement (Ruiu, 2016). Also, the participation of residents in the decision-making process might increase the level of conflict among residents (Jarvis, 2011; Williams, 2005), thus delaying the whole process.

Considering the above, we ask: How do the level of participation and decision-making techniques influence building costs?

3.3.6 Time

While time is a crucial factor when analysing building costs in general (Cunningham, 2013), in CH, it acquires an even more prominent position. CH is often characterised by its long initiation phase and decision-making processes (Ruiu, 2016) besides the active involvement of the residents' group in in-kind tasks. Following the capitalist premise 'time is money', the amount of time the residents voluntarily dedicate to the project should be factored. This includes not only the carried-out tasks but also the time spent in reaching consensus in the meetings. However, CH is also based on other values, such as community building and internal solidarity (Sørvoll & Bengtsson, 2020), where time plays a pivotal role. Therefore, rather than simply translate time into 'working hours' to evaluate eventual costs or savings, it is relevant to raise the question 'How do the involved participants perceive their devoted time and effort?'.

3.4 Identifying the design criteria influencing building costs in collaborative housing: findings

This section describes the empirical findings from the 16 cases (summarised in Table 3.2) according to the theoretically-derived design factors from our analytical framework. Product-related findings uncover the physical features of the cases, considering both the factors that influence building costs in general and those specific to CH projects (e.g., self-building, alternative layouts). Process-related findings are helpful to understand the impact of participation and self-organisation in the final 'product' and evaluate the effectiveness and organisation level of the design process.

TABLE 3.2 Summary of the findings applying the analytical framework, related to the 16 selected cases.

PRODUCT (Input from 84 survey respondents, interviews, observation, and review of arch. plans)			
Minimum standards	Housing typology	Construction approach	
Space/quality standards – Kitchen, bathroom and a living room considered by residents as minimum standards for private units *(survey)* – Reduced surface areas of private units (8 projects) *(observation, arch. plans)* – Reduction of number of bathrooms in larger apartments (1 project) and number of elevators and staircases from 3 to 1 (2 projects). *(observation, arch. plans, interviews, survey)* – Unfinished spaces or surfaces (11 projects) *(observation, interviews, survey)* **Building normative:** – Forego/repurpose of car parking garage (4 projects) – change of municipal legislation (1 project) *(observation, interviews, survey)*	**Shape/size/height** – Courtyard-typology (7 projects) and block-typology (9 projects) *(observation, arch. plans)* – 5 to 7-storey high buildings (11 projects) *(observation, arch. plans)* **Circulation system** – use of exterior galleries (5 projects) and interior core of staircase and elevator (9 projects) *(observation, arch. plans)* **Internal layout** – Standard and flexible private units, with few partition walls, allowing personalisation *(observation, arch. plans, interviews)* – Centrality of common spaces: located on the ground floor (14 projects) and rooftop (10 projects) *(observation, arch. plans)* – Spaces open to the neighbourhood (7 projects) *(observation, interviews)*	**Materials** – Reduction of quality or price in materials/ construction elements (4 projects) *(observation, interviews, survey)* – Use of same materials in all private units *(observation, interviews, survey)* **Building methods or techniques** – Standard construction *(arch. plans)* – Environmental-friendly construction (12 projects) / Higher energy efficiency standards (8 projects) *(observation, interviews, survey)* – Phased construction (11 projects) *(interviews, survey)* – Hands-on approaches in finishing tasks (9 projects) and removal of demolition waste (*Inter-Pares*) *(interviews, survey)*	

Source: Authors

	PROCESS (input from 50/84 survey respondents – participants in the design phase –, and interviews)		
	Organisational structure	Participation and Decision-making	Time
	Resident group size – 5 small size (3-19 households) – 7 medium size (28-54 households) – 4 big size (61-321 households) *(websites)* **Professional expertise vs. self-organisation** – 4/50 claim 'We did not include sufficient professional expertise in the process.' *(survey)* – self-organisation/ in-kind tasks mainly in organisation/ coordination and construction level *(interviews, survey)* **Building maintenance strategy** – Partial or total collective maintenance of the building (12 projects) *(interviews, survey)*	**Resident participation level** – 10 projects ranked as 'high participation' – 4 as 'medium participation' – 2 as 'minor participation' *(interviews, survey)* – Different perceptions among participants in the same design process – Use of 'architecture working' groups (7 projects) *(interviews, survey)* **Decision-making** – Use of consensus, voting only in extreme cases (9 projects); and use of consent/ sociocratic principles (3 projects) *(interviews, survey)* – 12/50 claim 'There were (many) conflicts during decision-making.' *(survey)* – 1st phase: decisions about the common concept; 2nd phase: decisions about individual space (5 projects) *(interviews)*	**Duration of process** – Average of 4-5 years process (from initiation to completion). *(interviews, websites)* **Time spent in design/building phase** Design meetings: – 31/50 less than 50h – 12/50 more than 50h – (7/50 no response) *(survey)* – 13/50 claim 'The whole process was too long' – 15/50 'No difficulties, the whole process ran smoothly.' – 16/50 'The design process was ok. The problem was more connected to financial or legal issues.' *(survey)*

3.4.1 Minimum standards

The responses of the applied survey showed some patterns of what residents perceive as acceptable minimum standards (Figure 3.2). While reducing the size of the private areas and the number of partition walls is commonly accepted, some functions within the private unit, such as living rooms and complete kitchens, are not willingly sacrificed. This puts into question the idea that residents in CH progressively reduce their privacy levels (Durret *apud* Jarvis, 2011). Large rooms and high-end materials/finishing are not valued as essential requirements; instead, high energy-efficient standards that increase comfort are considered more relevant.

In most cases, this conception is translated into the design of their respective housing: certain collective design decisions include leaving some spaces unfinished (detected in 11 projects), minimising the area of private units (in at least 8 projects), and reducing - or even excluding - some housing infrastructure (e.g., reduce the number of lifts or staircases in 2 projects, or forego/repurpose the car parking garage in 4 projects). For instance, in *La Borda* (Barcelona), private units range from 40m^2 (up to 2 residents) to 76m^2 (up to 4 residents); similarly, *Sofielunds* (Malmö) accommodates units ranging from 35,6m^2 (1-bedroom units) to 75,8m^2 (3-bedroom units) (Figure 3.3). All this suggests not only a lowering of the building costs but also a shift in the idea of quality or value in housing. As one resident said: 'people's expectations have changed, people accept different standards' (personal communication, July 19, 2019). Nevertheless, outdated building norms tend to hamper this process of redefining standards; *La Borda,* Barcelona represents a ground-breaking example, as residents refused to build a car parking garage and negotiated the conditions to change the municipal legislation.

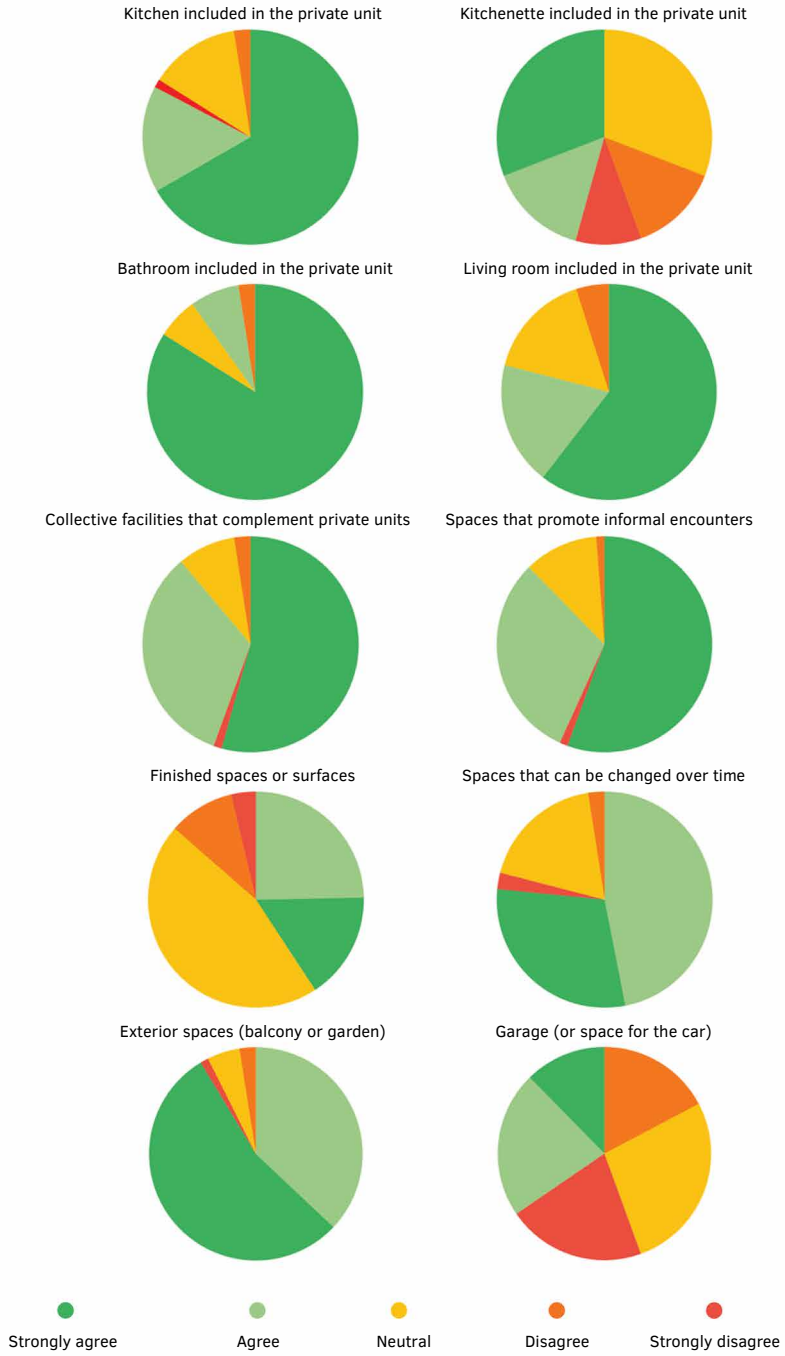


FIG. 3.2 Residents perceptions on what should be considered a minimum standard (Source: Authors)

TOC

3.4.2 Housing typology

We have categorised the layout of the 16 projects into two different typologies: courtyard (organised around a shared courtyard), used in 7 projects, and block (compact rectangular building), applied in 9 projects. Both typologies are adequate for the highly-dense urban fabric in most cases due to their compactness. Accordingly, 11 projects are 5 to 7-storey high. This focus on simplicity and economies of scale help reduce building costs.

All projects combine private units with collective spaces. Laundries, communal kitchens, dining, living, and guestrooms are the most common collective spaces; and are mainly located on the ground floor (in 14 projects) and/or rooftop (in 10 projects). This allowed reducing the infrastructure and surface areas in the private units. These are generally standardised but flexible, with few partition walls (see Figure 3.3). While 9 projects use interior cores (staircase and elevator) as the primary circulation system, 5 adopt exterior galleries. Opening the project to the neighbourhood (neighbours may rent the collective spaces), detected in at least 7 projects, also translates into some economic benefits as 'it creates some revenue for the group' (resident, personal communication, July 1, 2018). This decision increases affordability or at least compensates for the eventual extra costs of building collective spaces.

Sofiefunds, Malmö: units range from 35,6m2 (1-bedroom apartments) to 75,8m2 (3-bedroom apartments)

La Borda, Barcelona: units range from 40m2 (S) to 76m2 (L)

FIG. 3.3 Right: floor plans of Sofielunds, Malmö (Source: image courtesy of Kanozi Architects). Left: La Borda, Barcelona (Source: image courtesy of Lacol Arquitectura Cooperativa). Note: In Sofielunds, units range from 35,6m2 (1-bedroom apartments) to 75,8m2 (3-bedroom apartments); in La Borda, units range from 40m2 ('S') to 76m2 ('L').

In general, residents agree that there is a correct balance between private and collective spaces. In the cases where residents claimed that they do not save costs by living in their CH project (in comparison to market prices in the same area) they recognise the value of living with such extra facilities and the quality of comfort and convivial time. The following survey excerpts confirm: 'we get a lot for it', 'it is worth all the money' and 'we have more benefits due to the much larger common areas'. This highlights the other (sometimes conflicting) values that drive the development of CH and the required trade-offs to accommodate them.

3.4.3 Construction approach

On the one hand, residents from 4 projects mentioned using low-quality materials to save costs. However, over time those materials had to be repaired or replaced. On the other hand, 12 projects adopted environmentally-friendly approaches, and half of the projects are described as having higher energy-efficiency standards than those legally defined. According to the residents, this represented a higher initial investment but compensated long-term by reducing the energy consumption and general maintenance costs. In all cases, there was an effort to define a standard structural scheme for the whole building to rationalise its construction, even in cases where private units are more flexible and customised (in 8 projects).

At least 11 projects are built through a phased construction, leaving some parts to be finished at a later stage, in a clear link with *incremental housing* approaches. The use of 'self-building' or DIY approaches can be seen in at least 9 projects. Examples include hands-on tasks such as finishing, painting, setting up the shared yard, and coordination and support tasks (e.g., cooking for self-builders). Some respondents do not believe that building costs are necessarily lower if self-building is carried out at an individual level; others think that, although time-consuming, self-building contributes to keeping costs under control by reducing the initial investment, saving on labour costs and collectively purchasing the materials. Moreover, according to one resident, the quality of 'identification' with the place or 'sense of belonging' increases with DIY approaches. However, if the decision to leave spaces unfinished upon moving is imposed in a top-down manner, the residents might not accept it (personal communication, July 19, 2019).

3.4.4 Organisational structure

The size of the resident groups varies significantly: 5 small-size (3-19 households), 7 medium-size (28-54 households) and 4 big-size (61-231 households). There is an apparent relationship between the level of participation and the group size: projects formed by small to medium groups indicate a higher involvement in the design process, while larger groups show a lower participation level. Accordingly, one architect stated that '50 to 80 adults have better group dynamics and work more efficiently' (personal communication, June 14, 2019).

Overall, self-organisation, including in-kind tasks carried out by the residents, was mainly at a coordination/organisational level, namely the planning of meetings, setting up legal status for the group, research, formulation of rules, and at a construction level, as mentioned. 4/50 residents claim they did not include sufficient professional expertise during the process. Partial or total collective self-maintenance of the building (e.g., cleaning, repairing, gardening) was found in at least 12 projects; according to the residents' testimonials, this resulted in lower costs since the group does the necessary tasks to avoid hiring personnel.

3.4.5 Participation and decision-making

The survey applied to the residents uncovered that participation in the design process was not a feature shared by all since 34/84 respondents joined the project at a later stage. Consequently, the apparent relationship between the size of the group and the level of participation is irrelevant if we ignore the exact number of participants in the design process. Therefore, when a project is 'ranked' with a certain level of participation, this may only apply to an initial core group, as sometimes not all residents participate in the design phase. This means that participation is assessed based on the 'intensity' of participation of those actively involved in the design phase rather than the number of participants. With this in mind and according to our categorisation system (see Table 3.1), 10 projects are ranked as 'high participation', 4 as 'medium participation', and 2 as 'minor participation'.

In at least 4 projects, ranked as 'high participation', the adopted design strategy was 'from the common to the private': first, residents and architects defined a common concept and the collective spaces; then – aware that many of the facilities were no longer necessary inside the private units – they decided the layout of the individual spaces. This highlights the *collective* in detriment of the *individual* and avoids redundant construction and unnecessary costs.

In at least 7 projects, residents decided to make use of 'architecture working groups', where a representative number of residents meet regularly (with and without the architects) to discuss design and construction matters. The use of consensus was detected in at least 9 projects, followed by consent in 3 projects. Interestingly, findings also show different perceptions about participation levels among residents of the same project. 12/50 respondents complained that 'there were many conflicts among the group during decision-making'.

3.4.6 Time

Among the 16 cases, there is an average of 4-5 years from initiation to completion, being the formation of the group the longest stage. More than half of the survey respondents involved in the design claimed to have spent in total less than 50 hours in design meetings. When asked about the general difficulties encountered during the process, 13/50 respondents referred that 'the process was too long', 15/50 stated 'no difficulties, the whole process ran smoothly' and 16/50: 'the design process was OK and the problem was more connected to financial or legal issues'.

Finally, findings also confirm the arguments pointed by existing literature on affordability and CH, namely the economic benefits of the collective activities (e.g., shared meals, collective maintenance) and legal-related issues (e.g., non-speculative ownership or leaseholds models). And although these are not necessarily specific to CH, their combination with the design factors may have an additional impact on the project's affordability. They also provide insight on the (other) reasons that allowed these projects to be considered affordable, raising the question of the actual impact of the design-related ones.

3.5 Discussion

The proposed analytical framework applied to the 16 CH projects proved to be suitable for qualitatively exploring the influence of certain design factors in building costs. Cross-case patterns are most evident at the *product* level, from space and quality standards to the chosen typology features. Findings related to the *process* turned out to be subjective and non-consensual: perceptions about time, conflict level, or level of participation differ among participants in the same design process. Nevertheless, we detected some patterns, such as consensus as a decision-making technique, an average of 4-5 years' process duration, and the type of in-kind tasks carried out by residents.

At the same time, we recognise the methodological challenge of analysing the perceptions of the involved participants in the design phase. They were useful to understand the nuances and the values that dominated the design *process* and provided factual information about the project that enriched the analysis of the final *product*. However, the residents' perception does not entirely reflect the reality, as they may be unaware of the 'damage' of some decisions. For instance, none of the residents from *La Borda* mentioned the implications of not hiring one main contractor; however, the architects regret this decision since it meant extra coordination from their side and possibly some miscommunication during the building process. This and other examples, therefore, prevent us from formulating an accurate idea about the actual effectiveness of the process.

3.5.1 The building as a 'product' of a collective 'process'

Findings related to *product* demonstrate that the CH cases share many features with more general forms of collective 'affordable' housing. Examples include smaller private units combined with collective spaces, the chosen housing typology, spatial flexibility, the choice for low-cost materials, and the general use of standardised and prefabricated construction. This last feature somehow contradicts the general assumption that custom-made layouts are typical features of CH. At least when affordability is at stake, residents agree on defining a standard structural scheme to streamline the construction and therefore keep costs down.

On the other hand, findings also uncover other factors – not usually present in conventional 'affordable' housing – that played a decisive role in reducing building costs. For instance, testimonials indicate that hands-on construction approaches

may indeed contribute to increasing affordability, as long as they are organised collectively and the time spent is not considered a tiring burden. Findings also point to a redefinition of minimum quality standards, in a combination of factors that include a) the reduction of surface area and infrastructure in private spaces, b) accepting unfinished spaces or surfaces, c) questioning some building norms, and d) valuing concepts such as sustainability and high-energy efficiency. In this sense, groups determined what they would need in reality, often through a two-step process where they first decided about the common concept and then about each private space. All this resulted in needs-based layouts, avoiding duplication of functions or unused spaces.

These features are only possible due to a collaborative design process. Indeed, findings suggest that cases indicating a high level of resident participation correspond to outputs with more efficient use of space: the higher participation (when actual co-design takes place) detected in the small-medium groups is, in most cases, translated into a needs-based design, preserving the quality and the suitability to residents' needs. The acceptance of smaller units, fewer facilities, and unfinished spaces or surfaces may also result from a high level of resident participation. This study also provides input on how the process itself was organised and carried out. We detected a general lack of consensus about the process setbacks, which is understandable, as we deal with many different personal perceptions. Still, we may derive some assumptions on how process-related factors incur additional costs or, on the contrary, reduce the overall costs. For instance, overall, the processes were not considered too long, with relatively low conflict levels. This goes against the general idea of the long and conflicted decision-making processes in CH and suggests a clear and structured design process. Self-organisation through in-kind work by the residents was said to save costs. However, excluding professional expertise may cause unexpected costs due to delays or building mistakes.

3.5.2 Trade-offs between costs and other values

In principle, additional collective spaces combined with high levels of privacy and higher energy efficiency standards would increase building costs. To avoid this, residents often compromised and showed a high tolerance to 'lowering' their standards in other aspects. Examples include the reduction or withdrawal of appliances or infrastructure, the incompletion of spaces upon moving in, and the overall reduction of private surface areas.

The use of low-quality materials was identified in some cases as another trade-off to allow some cost savings. However, this turned out to hamper affordability in the long term (due to the eventual repair or replacement). On the other hand, the increased initial investment to achieve higher energy efficiency standards is said to compensate in the long run, as they help reduce the monthly energy bills. This 'new' idea of *minimum standards,* valuing quality and the environment, increases building costs, but it also increases affordability in the long term. At the same time, it shows that the apparent conflict between environmental sustainability and affordability becomes less evident over time.

Moreover, to save costs, residents agree to carry out voluntary tasks. This is at the expense of their time and energy. However, quantifying the working hours is less relevant than assessing the actual residents' perception of their spent time, considering that other values, such as community building and a sense of belonging, justify their dedication. This also relates to the needs-based design, where design approaches that tend to raise building costs are traded off with others to achieve an affordable compromise.

3.6 Conclusions

This paper underscores the role of architectural design and building costs as key components in the study of housing affordability. By conducting an international comparative case study encompassing 16 CH projects, we argued that collaborative design processes are likely to play an essential role in increasing affordability.

Based on the evidence presented in this paper, we conclude that strategic design decisions and self-organised activities aiming to reduce building costs indeed increase the affordability of the project. These decisions highlight the trade-offs between lowering costs and preserving (or improving) quality in housing, as well as the relevance of the residents' participation in the design process since they are the ones who have to set the conditions for these trade-offs. These compromises also show that, in CH, the issue of affordability never comes alone: environmental sustainability and community building are other core values in CH, which may clash with each other.

We have identified several design criteria used in CH to increase affordability, namely: a) the adoption of a 'common concept' and use of standardised construction; b) the often-applied needs-based approach, where space is designed according to the residents' actual needs and demands, which is based on c) the redefinition of minimum housing standards by the residents themselves (e.g., accepting smaller, less-equipped and unfinished private units if combined with collective spaces, and valuing environmentally-friendly and high energy-efficiency standards to improve thermal comfort and long-term savings). Our analysis also shows that some design decisions in CH increase affordability even when it results in higher building costs. From a *process* perspective, some factors that we found influencing collective decisions and positively impacting the affordability of the project are: a) the high level of participation in the design phase; b) the allocation of specific in-kind tasks, together with c) strategic (un)involvement of professionals; and d) structured and time-efficient process. These can avoid time-consuming conflicts, streamline decision-making processes and save on labour and managerial costs.

In sum, while some findings contradict general assumptions associated with CH (e.g., highly customised layouts, low levels of privacy), others uncover the economic benefits of co-design and self-organisation (needs-based design, redefinition of minimum standards, in-kind tasks). By considering *product* and *process* as inseparable dimensions of a whole, we demonstrated that building costs are dependent not only on the final physical outcome but also on the way the design process is collectively organised and managed.

This initial study sheds light on how design matters for affordability in CH and can inform and benefit residents' groups, architects working in CH projects, and other relevant stakeholders. It may complement existing research on more general factors impacting affordability, such as tenure models, land acquisition, and funding mechanisms. Moreover, the proposed analytical framework can assist more quantitative studies linking building costs and collaborative housing. Future research can further explore the existing correlations between perceptions on minimum standards and the actual built form of CH and deepen the understanding of the role of the co-design *process* in reducing building costs.

References

Aernouts, N., & Ryckewaert, M. (2017). Beyond housing: on the role of commoning in the establishment of a Community Land Trust project. *International Journal of Housing Policy*, 1-19. doi:10.1080/19491247.2017.1331592

Aravena, A., & Iacobelli, A. (2012). Elemental: manual de vivienda incremental y diseno participativo [Elemental: incremental housing manual and participatory design]. Berlin and Stuttgart: Hatje Cantz.

Archer, T. (2022). The mechanics of housing collectivism: how forms and functions affect affordability. *Housing Studies, 37*(1), 73-102. doi: 10.1080/02673037.2020.1803798

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of planners, 35*(4), 216-224.

Belniak, S., Leśniak, A., Plebankiewicz, E., & Zima, K. (2013). The influence of the building shape on the costs of its construction. *Journal of financial Management of property and construction*, *18*(1), 90-102. doi:10.1108/13664381311305096

Brysch, S. (2018). *Designing and building housing together: The Spanish case of La Borda.* Paper presented at the International Conference European Network of Housing Research conference, Uppsala, Sweden.

Brysch, S. (2019). Reinterpreting Existenzminimum in contemporary affordable housing solutions. *Urban Planning, 4*(3), 326-345.

Cabré, E., & Andrés, A. (2018). La Borda: a case study on the implementation of cooperative housing in Catalonia. *International Journal of Housing Policy*, *18*(3), 412-432. doi:10.1080/19491247.2017.1331591

Chatterton, P. (2013). Towards an Agenda for Post-carbon Cities: Lessons from Lilac, the UK's First Ecological, Affordable Cohousing Community. *International Journal of Urban and Regional Research, 37*(5), 1654-1674. doi:10.1111/1468-2427.12009

Chau, K.-W., Wong, S. K., Yau, Y., & Yeung, A. (2007). Determining optimal building height. *Urban Studies, 44*(3), 591-607.

Cunningham, T. (2013). Factors affecting the cost of building work-an overview. Dublin Institute of Technology.

Czischke, D. (2018). Collaborative housing and housing providers: towards an analytical framework of multi-stakeholder collaboration in housing co-production. *International Journal of Housing Policy, 18*(1), 55-81. doi:10.1080/19491247.2017.1331593

Czischke, D., Carriou, C., & Lang, R. (2020). Collaborative housing in Europe: Conceptualizing the field. *Housing, Theory and Society, 37*(1), 1-9.

Czischke, D., & van Bortel, G. (2018). An exploration of concepts and polices on 'affordable housing'in England, Italy, Poland and The Netherlands. *Journal of Housing and the Built Environment*, *38*(1), 1-21.

De Paris, S. R., & Lopes, C. N. L. (2018). Housing flexibility problem: Review of recent limitations and solutions. *Frontiers of Architectural Research, 7*(1), 80-91.

Duncan, S., & Rowe, A. (1993). Self-provided housing: the first world's hidden housing arm. *Urban Studies, 30*(8), 1331-1354.

Engelsman, U., Rowe, M., & Southern, A. (2018). Community Land Trusts, affordable housing and community organising in low-income neighbourhoods. *International Journal of Housing Policy, 18*(1), 103-123.

Fromm, D. (1991). *Collaborative Communities: Cohousing, Central Living, and Other New Forms of Housing With Shared Facilities.* New York: Van Nostrand Reinhold.

Fromm, D. (2012). Seeding Community: Collaborative Housing as a Strategy for Social and Neighbourhood Repair. *Built Environment, 38*(3), 364-394.

Gofen, A. (2012). Entrepreneurial exit response to dissatisfaction with public services. *Public Administration, 90*(4), 1088-1106.

Habraken, J., & Teicher, J. (1972). *Supports: an alternative to mass housing.* London: Architectural Press.

Haffner, M., & Heylen, K. (2011). User costs and housing expenses. Towards a more comprehensive approach to affordability. *Housing Studies, 26*(04), 593-614.

Hellgardt, M. (1987). Martin Wagner: the work of building in the era of its technical reproduction. *Construction History, 3*, 95-114.

Jarvis, H. (2011). Saving space, sharing time: integrated infrastructures of daily life in cohousing. *Environment and Planning A, 43*, 560-577. doi:10.1068/a43296

Jarvis, H. (2015). Towards a deeper understanding of the social architecture of co-housing: evidence from the UK, USA and Australia. *Urban Research & Practice, 8*(1), 93-105. doi:10.1080/17535069.2015.1011429

Landenberger, L., & Gütschow, M. (2019). Project Management for Building Groups: Lessons from Baugemeinschaft Practice. *Built Environment, 45*(3), 296-307.

Lang, R., Carriou, C., & Czischke, D. (2020). Collaborative Housing Research (1990–2017): A Systematic Review and Thematic Analysis of the Field. *Housing, Theory and Society*, 37(1), 10-39.

Maclennan, D., & Williams, R. (1990). *Affordable housing in Britain and the United States*. York: Joseph Rowntree Foundation.

Manzini, E. (2016). Design culture and dialogic design. *Design Issues, 32*(1), 52-59.

Mulliner, E., Smallbone, K., & Maliene, V. (2013). An assessment of sustainable housing affordability using a multiple criteria decision making method. *Omega, 41*(2), 270-279.

Olson, M. (1965). The Logic of Collective Action: Public Goods and the Theory of Groups. Cambridge: Harvard University Press.

Palmer, J. (2019). 'Without the Developer, Who Develops?'Collaborative Self-Development Experiences in Australian Cities. *Built Environment, 45*(3), 308-331.

Paterson, E., & Dunn, M. (2009). Perspectives on utilising Community Land Trusts as a vehicle for affordable housing provision. *Local Environment, 14*(8), 749-764. doi:10.1080/13549830903096486

Pittini, A., Koessl, G., Dijol, J., Lakatos, E., & Ghekiere, L. (2017). *State of Housing in the EU Report*. Retrieved from www.housingeurope.eu

Ruby, A., & Ruby, I. (2011). Min to Max: International Architecture Symposium on the Redefinition of the "minimal subsistence dwelling". Retrieved from http://www.min2max.org/

Ruiu, M. (2016). Participatory processes in designing cohousing communities: the case of the community project. *Housing and Society, 43*(3), 168-181.

Sanders, E. B.-N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *Co-design, 4*(1), 5-18.

Sandstedt, E., & Westin, S. (2015). Beyond Gemeinschaft and Gesellschaft. Cohousing Life in Contemporary Sweden. *Housing, Theory and Society, 32*(2), 131-150. doi:10.1080/14036096.2015.1011687

Sanoff, H. (2010) Democratic design: Participation case studies in urban and small town en- vironments. Retrieved from https://www.academia.edu/8154922/Democratic_Design_ Participation_case_Studies_in_Urban_and_Small_Town_Environments

Seeley, I. H. (1983). Cost Implications of Design Variables. In *Building Economics: Appraisal and control of building design cost and efficiency (Third edition)* (pp. 18-37). London: MACMILLAN PRESS LTD.

Slaughter, E. S. (2001). Design strategies to increase building flexibility. *Building Research & Information, 29*(3), 208-217.

Sørvoll, J., & Bengtsson, B. (2020). Mechanisms of solidarity in collaborative housing–The case of co-operative housing in Denmark 1980–2017. *Housing, Theory and Society, 37*(1), 65-81.

Tummers, L. (2016). The re-emergence of self-managed co-housing in Europe- A critical review of co-housing research. *Urban Studies, 53*(10), 2023-2040. doi:10.1177/0042098015586696

Turner, J. F. (1972). Housing as a verb. *Freedom to build*, 148-175.

van Bortel, G., & Gruis, V. (2019). Innovative Arrangements between Public and Private Actors in Affordable Housing Provision: Examples from Austria, England and Italy. *Urban Science, 3*(52), 1-14.

Vestbro, D. (2008). History of Cohousing - internationally and in Sweden.

Vestbro, D. (2010). Living together-cohousing ideas and realities around the world: proceedings from the International Collaborative Housing Conference in Stockholm 5-9 May 2010: Division of Urban and Regional Studies, Royal Institute of Technology in collaboration with Kollektivhus NU.

Wetzstein, S. (2017). The global urban housing affordability crisis. *Urban Studies, 54*(14), 3159-3177.

Williams, J. (2005). Designing Neighbourhoods for Social Interaction: The Case of Cohousing. *Journal of Urban Design, 10*(2), 195-227. doi:10.1080/13574800500086998

Woetzel, J. R. (2014). A blueprint for addressing the global affordable housing challenge. Executive Summary: McKinsey Global Institute.

Appendix 3A

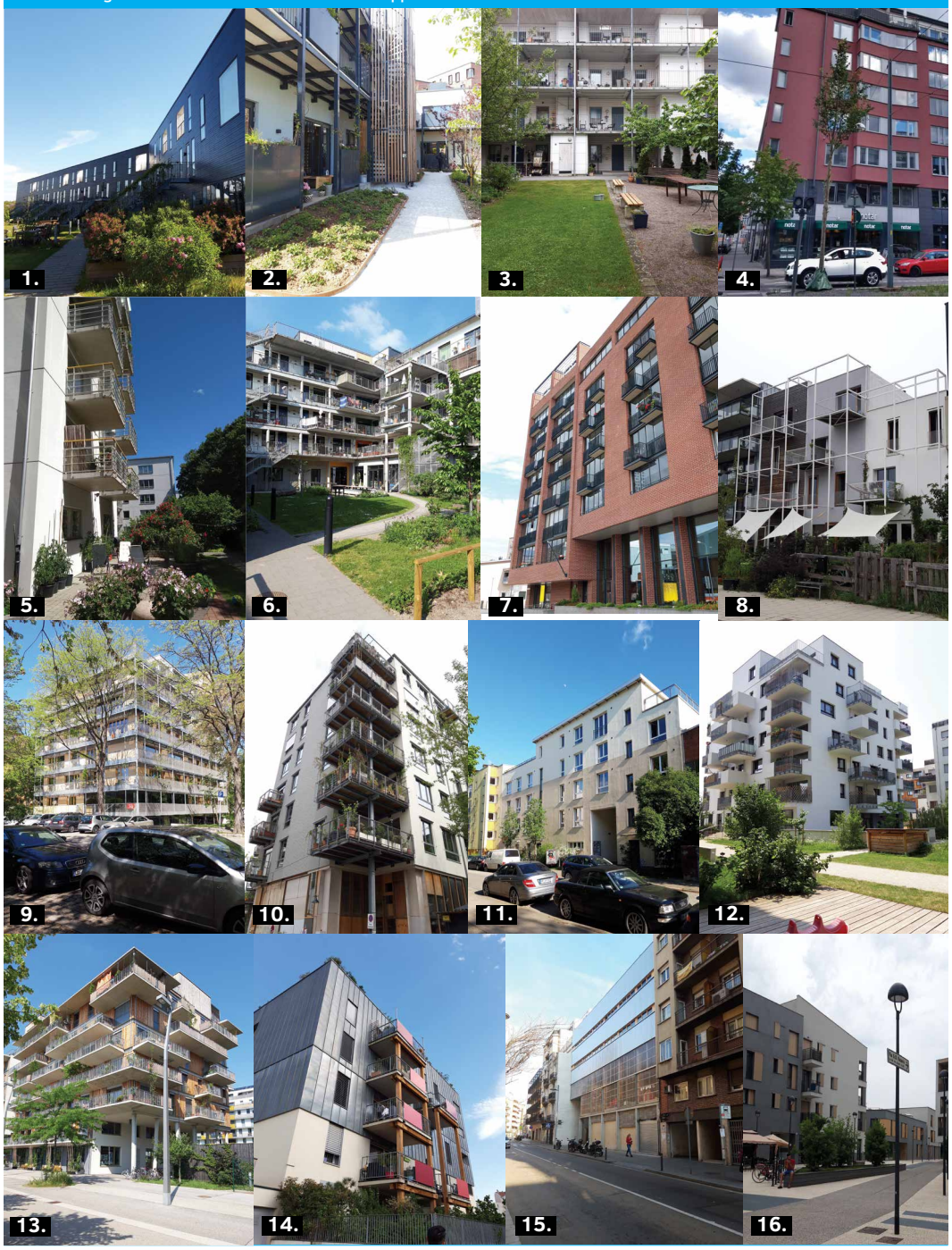
List and images of selected case studies and the applied data collection methods						
Project, Year of completion, Location (number of households)	Data collection methods					
	Project visit	Interview	Survey (hard copy in residents' mailbox)	Survey (digitally sent to residents' representative)	Photographic documentation	Review of architectural drawings
1. Lange Eng, 2009, Alberstlund, Denmark (54 households)	✓ exterior		✓ 10 resp.		✓	✓
2. Byfællesskabet, 2018, Odense, Denmark (8 households)	✓	✓ 1 resident		✓ 1 resp.	✓	✓
3. Sjöfarten, 2008, Stockholm, Sweden (47 households)	✓	✓ 2 residents		✓ 1 resp.	✓	✓
4. Dunderbacken, 2014, Stockholm, Sweden (61 households)	✓	✓ group interview: 5 residents		✓ 18 resp.	✓	✓
5. Sofiefund, 2014, Malmö, Sweden (45 households)	✓	✓ 2 residents + 1 architect		✓ 6 resp.	✓	✓
6. BoAktiv Landgången, 2016, Malmö, Sweden (40 households)	✓	✓ 2 residents	0 resp.		✓	
7. Kotisatama, 2015, Helsinki, Finland (63 households)	✓	✓ 1 architect		✓ 13 resp.	✓	✓
8. Scarwafa, 2016, Amsterdam, The Netherlands (3 households)	✓	✓ 1 resident + 1 architect		0 resp.	✓	✓
9. Interpares, 2010, Hamburg, Germany (10 households)	✓	✓ 1 resident	✓ 3 resp.		✓	✓
10. Spreefeld Berlin eG, 2014, Berlin, Germany (64 households)	✓	✓ 1 resident + 1 architect	✓ 4 resp.		✓	✓

>>>

List and images of selected case studies and the applied data collection methods						
Project, Year of completion, Location (number of households)	Data collection methods					
	Project visit	Interview	Survey (hard copy in residents' mailbox)	Survey (digitally sent to residents' representative)	Photographic documentation	Review of architectural drawings
11. R50 cohousing, 2013, Berlin, Germany (19 households)	✓ exterior	✓ 1 architect		✓ 5 resp.	✓	✓
12. Wohnprojekt Wien, 2013, Vienna, Austria (40 households)	✓	✓ 1 resident + 1 architect		0 resp.	✓	✓
13. Wohnprojekt Seestern Aspern, 2015, Vienna, Austria (28 households)	✓	✓ 1 resident + 1 architect		✓ 6 resp.	✓	✓
14. Le Village Vertical, 2013, Lyon, France (14 households)	✓		✓ 2 resp.		✓	✓
15. La Borda, 2018, Barcelona, Spain (28 households)	✓	✓ 4 residents + 1 architect		✓ 7 resp.	✓	✓
16. Borgo Sostenible, 2015, Milan, Italy (321 households)	✓	✓ 1 facilitator + group interview: 3 residents		✓ 8 resp.	✓	✓

Source: Authors

List and images of selected case studies and the applied data collection methods



4 Sharing is saving?

Building costs simulation of collaborative and mainstream housing designs

Brysch, S., Gruis, V., & Czischke, D. (2023). Sharing Is Saving? Building Costs Simulation of Collaborative and Mainstream Housing Designs. *Buildings*, 13(3), 821, 1-18.

ABSTRACT Building costs play a significant role in determining the affordability of a housing project, and these depend to a large extent on design choices. This paper is based on the premise that collaborative design processes, or co-design, used in collaborative housing (CH) in Europe reduce building costs and consequently increase the affordability of these housing projects. However, research remains scarce on the extent to which CH is an affordable solution from a design perspective compared to affordable mainstream housing (MH), in which no co-design is used. Therefore, this paper aims to fill this knowledge gap by assessing the impact of design choices on building costs in CH and MH. To this end, we developed a simulation model to compare the building costs of CH with MH based on their design choices. Findings indicate that CH represents a more affordable and space-efficient solution when compared to MH, if we look at the building costs per unit. This is because CH provides less expensive units while it includes larger common spaces and extra quality. These results help to refute existing claims about the unaffordability of CH design solutions.

KEYWORDS housing affordability; collaborative housing; co-design; building costs; simulation

4.1 Introduction

Building costs play a significant role in determining the affordability of a housing project (Brysch & Czischke, 2022; Pittini, Koessl, Dijol, Lakatos, & Ghekiere, 2017; Wetzstein, 2017). They are understood as 'expenditures incurred during the design and construction of a housing project' [3] (p. 2). These include hard costs such as materials (structure, infrastructure, finishing, and fixtures), equipment, land, contract costs (labour, overhead, profit) and soft costs, namely fees, insurances and taxes. Nevertheless, building costs and other project-level factors, such as energy consumption and housing maintenance, are often overlooked in housing affordability studies, in contrast to context factors, such as market developments, demographic changes and subsidies (Brysch & Czischke, 2017). These contextual factors, however, have no direct link to the actual construction of the housing estates and are, therefore, harder to influence by the (prospective) residents. Building costs, on the other hand, depend to a large extent on the design choices that shape the housing projects.

In this paper, affordable housing is assessed from a design perspective. We refer to housing projects designed to achieve affordable building costs and that comply with at least the minimum standards for adequate housing. We differentiate affordable from low-cost, as low-cost is linked to cheap building solutions, often low quality, and reduced upfront costs, whereas affordable takes into consideration concepts such as quality and life-cycle consequences. For instance, affordable design solutions may consider higher initial building costs, if these will be compensated on the long run, by savings on low-maintenance or energy costs. This study encompasses affordable housing solutions for low and middle-income households in line with Czischke and van Bortel (2018, p. 2) who defined affordable housing as 'open to a broader range of household incomes than social housing'. This widening of the concept acknowledges the scope of the housing crisis, which is affecting not only the most vulnerable groups but also the middle-classes (Bresson & Labit 2020; Czischke &van Bortel, 2018). The geographic scope is Europe, although we include many design options linked to affordable housing design that are also applied and applicable outside Europe.

Affordable mainstream housing (MH) is conventionally supplied in a top-down fashion by either private developers or public housing providers. This type of housing project is developer- and architect-led, and future residents play no role in the design process, as they are usually unknown until they move in. The design criteria for MH are usually based on standard solutions to streamline the construction and keep building costs down.

In parallel, collective self-organised housing models, such as collaborative housing (CH) forms, are re-emerging, including cohousing initiatives, resident-led cooperatives, and self-built housing, among others (Lang, Carriou, & Czischke, 2020). In a nutshell, 'CH refers to projects characterised by resident participation and collaboration with professionals in the design phase, aimed at creating housing projects in which residents intentionally share spaces.' (Brysch & Czischke, 2022, p. 1801). This collaboration process is called co-design. On the one hand, some CH forms are often linked to well-educated middle-high classes (Arbell, 2022; Tummers, 2015). Its tailor- or custom-made design approach (Droste, 2015; Tummers, 2016), the additional construction of common spaces (Sayers, n.d.), and the time and resources required in self-organisation (Sayers, n.d.), are some (design) factors influencing this view. On the other hand, CH has been recently studied as an affordable housing solution, not only due to its alternative ownership models or collective self-management (Archer, 2022; Cabré & Andrés, 2018; Czischke, 2018; Jarvis, 2011; Williams, 2005), but also due to co-design choices that may help to reduce building costs (Brysch & Czischke, 2022; Winter & Durrett, 2013).

We propose that co-design decisions made in CH, if combined with design criteria used in MH to reduce building costs, can lead to solutions that are even more affordable than MH. However, to our knowledge, comparative studies considering the design decisions and associated costs in MH and CH are non-existent. Our study aims to fill this knowledge gap by assessing the impact of design choices on building costs in CH and MH, considering their different design processes.

To what extent and how do co-design decisions influence building costs in collaborative housing when compared to affordable mainstream housing design? To answer this question we start by identifying the main distinctive design features between affordable MH and CH through a literature review and an empirical study conducted by Brysch and Czischke (2022) on the design criteria of affordable CH. This first part provides the basis for the development of a simulation model in which we compare the different design scenarios and consequent building costs of CH in relation to MH. Then, by looking at the findings, we reflect on the influence of co-design decisions often used in CH on the building costs and, therefore, impacting the affordability of the project.

4.2 Distinguishing the Design Criteria behind Affordable- Mainstream Housing (MH) and Collaborative Housing (CH)

Literature linking design with building costs mainly refers to spatial and typological issues, i.e., the formal configuration and internal layouts of the building, and to construction approaches (e.g., quality of materials, economies of scale through prefabrication and standardisation, level of finishing) (Belniak, Leśniak, Plebankiewicz, & Zima, 2013; Chau, Wong, Yau, & Yeung, 2007; Seeley, 1983). Building regulations indirectly affect costs (Mitchell, 1976), as far as they are based on specific standards that, in principle, cannot be disregarded. These standards and building codes are highly influenced by cultural values and expectations (Mitchell, 1976; Visscher & Meijer, 2006). Besides these costs linked to design choices, there are others such as labour costs, and contractor and developers profit margins.

The design of affordable housing is intrinsically linked to the concept of Existenzminimum, which was applied to public housing in the interwar period based on design experimentation, spatial optimisation, and definition of minimum standards. The aim of Existenzminimum was to develop a standard dwelling, suitable for the circumstances of that time, considering the new household structures, lifestyles, and the technological advancements. This concept has been so pivotal in the architectural field that '[n]o interpretation can be made about the present and the immediate future of collective housing without taking into account the broad tradition that begins in the rationalist experiments of the Existenzminimum' (Montaner, 2001, p. 13, translated by the authors from the original 'No se puede hacer ninguna interpretación sobre el presente y el futuro inmeditato de la vivienda colectiva sin tener en cuenta la amplia tradición que arranca en los experimentos racionalistas del Existenzminimum'.).

This concept was an approach to produce a standard solution, or the standard, as it became the basis for what we know today as MH. We can argue that, ironically, current MH represent an obsolete version of Existenzminimum, as MH is often deemed inadequate (Appolloni & D'Alessandro, 2021) and based on outdated layouts, where 'people have to fit in rigid, pre-existing dwelling forms that are either the expression of obsolete forms of living or, more often, the product of speculative calculations that force people to fit in whatever dwelling forms are most profitable for the developers and easier to control for the bureaucrats.' (Burkhalter & Castells, 2009, p. 23).

Throughout the 20th century, 'neo-liberal thinking included a move away from thinking about what dwellings and neighbourhoods should look like toward the efficiency of policies to make housing affordable.' (Elsinga et al., 2020, p. 11). This resulted in a progressive detachment of most affordable MH from any architectural or social value. For instance, between 1960 and 1975, the Netherlands (as with many other European countries) saw 'the construction of a large number of houses, sometimes entailing a certain schematism, by repeating previously tested formulas, or following theoretical principles regardless of the size and location of the action.' (Moya, 2008, p. 95). (Translated by the authors from the original 'la construcción de gran cantidad de viviendas, a veces acarreando un cierto esquematismo, al repetir fórmulas previamente ensayadas, o seguir principios teóricos independientemente del tamaño y ubicación de la actuación.').

MH is generally provided by either private developers or public housing entities. They act as the 'substitute client' (Van der Linden, Dong, & Heylighen, 2017) when a project is commissioned, since the end-users (i.e., the future residents) are usually unknown during the entire design and construction process. In such a conventional setup, a standard building of fully-equipped units is delivered finished and ready to accommodate the average one-family household: 'most contract forms and building regulations are based on the one-family unit model.' (Tummers, 2015, p. 70). To keep upfront building costs down, many developers and contractors opt for low-cost (and low-quality) materials, seeking 'the cheapest way to make the most appealing (marketable) project.' (Scotthanson & Scotthanson, 2005, p. 130). In such a development process, 'open bids can force architects and contractors in rivalling roles, where architects try to realise what they perceive as quality and contractors try to cut costs, leading to the pursuit of different goals instead of a shared ambition.' (Van der Linden et al., 2017, p. 178).

Towers, blocks or slabs are often the chosen residential building typologies for dense urban centres, as they allow to maximise the number of dwellings per building (Todorovic, 2016). This construction optimisation goes back to the 1920s, when Existenziminum was developed. In the Netherlands and France, for instance, the most typical collective housing typologies are the gallery slab or block (Moya, 2008; Rigolon, 1990), where units are aligned along an exterior open corridor. The tower has a high-rise configuration and a core with staircases and lifts, and it is generally associated with many European social housing estates. Unless building norms do not require it, MH is usually provided with car parking and individual storage. Spatial flexibility and more environmentally-friendly solutions (besides the regulatory minimum standards) are being considered in more innovative MH design solutions (Bican, 2020; Montaner, 2001), but remain absent in most cases.

In recent decades, the re-emergence of CH has been challenging the more conventional modus operandi of housing provision through a more inclusive, resident-led and collaborative model, where end-users are actively involved. This represents a paradigm shift in housing provision and management (Czischke, 2018), as the role of residents is redefined, who no longer are mere 'consumers', as well as the role of the involved professionals, namely architects or municipalities (Czischke, 2018; Ledent, 2022). Housing becomes a collaborative process and product, combining the professionals' expertise with a high level of resident participation. Such a process is often referred to as co-design, where 'future users of a design participate as co-designers in the design process' (Van der Velden & Mörtberg, 2015, p. 41). At the same time, in most CH cases there is an intention to live together as a group, without hampering the households' privacy (Czischke, 2018; Fromm, 2012; Vestbro, 2010). Accordingly, CH, and more specifically cohousing, is usually characterised by higher quality and environmentally-friendly buildings and smaller-than-average private dwellings, which are complemented by common spaces (Jarvis, 2011; Fromm, 2012; Vestbro, 2010).

Patterns in design decisions used in 16 European CH projects were uncovered by Brysch and Czischke (2022) – not usually present in affordable MH – that played a decisive role in increasing affordability, and were only possible due to a co-design process and design trade-offs between the co-designers. These are mainly linked to a collective redefinition of minimum quality standards: minimising the surface area and infrastructure in private spaces, spatial flexibility, accepting unfinished spaces or surfaces, questioning (and updating) some building norms (e.g., regarding car parking), valuing environmentally-friendly and high energy-efficiency standards (to improve thermal comfort and long-term savings), hands-on construction tasks/ self-building approaches (e.g., assembling kitchen cabinets, painting, flooring, carrying out small electronic works), as long as they are organised collectively and the time spent is not considered too much of a burden. The common spaces usually correspond to laundries, living rooms and kitchens. Buffer areas (Torres-Antonini, 2001; Williams, 2005) or transition spaces between the private and the collective, such as corridors and porches, are also a design strategy to overcome the reduced surface areas in private units and to promote social interaction. In CH examples using the gallery typology, the corridors 'are occasionally merged with "private" balconies and assume the function of meeting spaces.' (Brysch & Czischke, 2022, p. 1806).

The above shows that collaborative processes and collective living arrangements lead to distinct design solutions from the MH ones. UP-4 Can Battló and La Borda are two examples that contextually showcase some of the design differences of MH and CH (see Appendix 4.A at the end of the paper for more detailed information).

These two housing projects are located in the same block in Sants (Barcelona, Catalonia); UP-4 Can Battló is a municipal social housing and the result of a conventional architect-led design approach, whereas La Borda is a resident-led cooperative housing based on co-design processes. Besides their location, they share the same target group (social/affordable housing), a similar building completion year (2017–2018), a similar project size (26–28 housing units), and a similar residential building typology (courtyard, compact, six-storey building).

In the case of La Borda, some co-design decisions were additionally taken that contribute to reduce costs, namely opting for smaller private units complemented by shared facilities, no car parking, and unfinished surfaces and spaces that are to be completed through self-building approaches. Ten percent of the total area is allocated to common spaces (besides common circulation). Other co-design decisions ended up increasing the up-front building costs, such as the use of a timber structure and passive house elements (e.g., the greenhouse). However, these decisions were made in order to guarantee affordability in the long term, through low maintenance and energy cost savings.

There is no 'formula' to calculate or determine quality and space standards for CH, as the surface areas are dependent on the available land/space and residents' needs. Notwithstanding, Bo i Gemenskap ('Live in community') or BIG, a group of Swedish women who focused on developing a cohousing model in Sweden, argued that reducing 10% of the surface area in a conventional apartment would allow inclusion of a significant area for common spaces without increasing building costs (Vestbro & Horelli, 2012). Furthermore, the quantitative analysis of CH in Europe conducted by Ledent (2022) shows that the common areas in the CH projects with 30–50 units correspond to an average of 10% of the total built area.

From a purely design perspective, a CH layout may be similar to other mainstream (more alternative) collective housing forms, such as student-style housing, micro-housing or commercial co-living. This is because they are also based on minimum private living units combined with shared facilities, and spatial flexibility (Brysch, 2019). However, while these design decisions may contribute to reduce building costs and, in principle, increase the affordability of the housing projects, the (speculative) business model behind these market-led housing developments makes them unaffordable for large segments of the population, as some studies indicate (Qualive, 2020; Rissik, 2019). Moreover, most of these housing forms do not involve the future residents in either the design process or housing management. This is due to the conventional top-down design process and temporary rental contracts, which condition any intervention from the inhabitants, pre- and post-occupancy. They 'have to "fit" in a specific profile and a pre-established layout.' (Brysch, 2019, p. 335).

In contrast, through a co-design process, residents in CH are able to decide on what is essential in their project and what is redundant and can be left out through a process of (re)defining their notions of minimum and quality (Brysch & Czischke, 2022). CH projects turn out to be 'much more needs-based, programmatically flexible and adapted to the recent Wohnkultur.' (Brysch, 2019, p. 343). According to Brysch and Czischke (2022), this mainly applies to small-medium CH, where the participation levels of end-users in the design process are higher. This is line with Ledent (2022), who state that the design of small to medium-sized projects is highly based the residents' needs, whereas in larger scale CH the design is less specific, yet it reflects 'qualities common to all'. Residents' involvement in the design, efficient construction, spatial adaptability, 'right-sized' units and efficient common spaces are some design examples pointed out by Winter and Durrett (2013) that keep costs down in CH.

Besides reducing building costs (and improving affordability), this represents a shift in the generalised idea of quality and standard. In this sense, due to the unconventional design criteria in CH, sometimes these models clash with the prevailing space standards and building regulations (Brysch & Czischke, 2022; Tummers, 2016). This often requires creative interpretations of (or an apparent compliance with) the building regulations. For instance, some CH projects are strategically designated as dorms or residential homes to take advantage of less restrictive building regulations, such as reduced number of required parking lots (e.g., Sargfabrik in Vienna, Austria), or ultimately use the outdoor parking as a garden (e.g., The Centraal Wonen in Delft, The Netherlands). To be officially approved, a cluster apartment, which is a set of minimum fully-equipped living units organised around open common spaces, must be licensed as conventional family-type apartments (e.g., Mehr als Wonen in Zurich, Switzerland). Moreover, the overall financing required for construction often ends up influencing the design solutions, as '[b]anks lend money based on what they understand. You may be required, for instance, to include laundry hook ups or more bathrooms just to get a construction loan.' (Scotthanson & Scotthanson, 2005, p. 133). Table 4.1 lists the main distinguishing design criteria of affordable MH and CH.

TABLE 4.1 Distinguishing design criteria of affordable MH and CH (Source: Authors)

Design Criteria	
Mainstream Housing (MH)	Collaborative Housing (CH)
– Developer- and architect-led design process	– Collaborative design process
– Average/family-type dwelling surface areas (2-bedroom units)	– Smaller-than-average dwelling surface areas/minimum required
– 'standardised repetitive designs' of housing units – Fully-equipped kitchen within private unit – Washing machine/laundry space within private unit	– Standard units combined with flexibility and possibility for personalisation – Minimum kitchen – No washing machine or laundry space – Buffer areas and wider circulation corridors to be used as meeting spaces
– Shared spaces: circulation and exterior spaces	– Shared spaces, besides circulation and exterior spaces: kitchen, laundry, living room, etc.
– Standard compliance with the building regulations	– Innovative compliance with- or challenging the building regulations
– 'Standard' delivery quality (finished state upon moving)	– Alternative delivery quality (often unfinished state upon moving) – Spaces to be completed overtime – Purposeful unfinished state of surfaces (raw materials, no layers)
– Minimum energy-efficiency standards, no environmental concern besides the required minimum	– High energy-efficiency standards
– Conventional construction systems (concrete and brick) + minimum insulation + finishes. Low-cost construction	– Alternative, sustainable construction, towards neutral CO2 construction
– No self-building approaches	– Self-building/hands-on tasks

4.3 Building costs simulation model

In this study, we develop a basic simulation model to compare the building costs of MH with those of CH. Simulation as a research technique allows modeling and testing of different scenarios or hypotheses (Groat & Wang, 2013; Sinha, Paredis, Liang, & Khosla, 2001) 'without going through the ethical barriers, physical dangers, or financial expense of the actual conditions.' (Groat & Wang, 2013, p. 360). This is particularly relevant in the (housing) design field, considering the high costs of real-world construction. Moreover, 'simulation research can help test, or at least enact (…) [a] conceptual system in an empirical venue' or be used 'in the development of broadly conceived design guidelines' (Groat & Wang, 2013, p. 363). Although the outcome of this study is not the formulation of design guidelines, the results may provide knowledge on some design generations useful to co-designers, who are interested in designing an affordable housing project.

At the same time, we acknowledge the methodological challenges of choosing such technique, such as the 'completeness of data input, [and] accuracy of the replication' (Groat & Wang, 2013, p. 365). Hence, we stress the elementary nature of this simulation: rather than conducting a comprehensive analysis of all the factors that affect the final building costs in housing, the aim is to test some general assumptions linked to a number of design choices. In addition, assessing building costs through this simulation by merely looking at the numbers may be misleading. Therefore, we conduct the assessment from a design perspective, with a closer look at the effect of the different design choices on the building costs. Rather than comparing the building costs of two types of projects, the aim with this simulation is to assess the relative costs of two housing models. This part of the study is to be understood as an abstract exercise and the basis for a wider discussion about the fundamental differences behind the design of CH and MH. The previous analysis (presented in Section 4.2) provides the general design input for the simulation model.

The simulation was carried out from June to August 2022 in collaboration with Casper Mouissie, advisor at the building costs advisory company MBM Bouwkosten BV, based in Amsterdam, the Netherlands. In this study, we used the Dutch context as a reference and the prevailing Dutch building costs for social housing (as for June 2022). The Dutch approach to define space standards follows a more qualitative or performative formulation (Appolloni & D'Alessandro, 2021; Visscher & Meijer, 2006), unlike other EU countries that are rather prescriptive, with specific spatial requirements, such as Italy, Portugal or France (Appolloni & D'Alessandro, 2021). The Dutch approach is adequate for the purpose of this study, as it does not restrict the design freedom to simulate different design scenarios. According to Casper Mouissie, who has professionally conducted building costs estimations for numerous Dutch social housing projects, in the Netherlands, social MH is generally delivered with low levels of finishing, minimum domestic services, no partition walls between kitchens and living rooms, and no car parking.

These features resonate with CH (co-)design choices taken to reduce building costs (see previous section). Thus, we can apply the same construction and finishing standards in both housing models and conduct a more accurate comparison between them. This means that the level of finishing, the quality of materials, the infrastructural elements, and the sanitary and kitchen ware are the same. However, we considered different space standards when defining the surface areas for MH and CH. As mentioned above, the actual final numbers from the simulation are irrelevant, and serve for the relative assessment of the results. In this sense, this approach allows for the eventual development of design generalisations (Groat & Wang, 2013), rather than restricting the findings to the Dutch market at a specific point in time.

Figure 4.1 illustrates the different design solutions or scenarios applied in the simulation, and informs how findings are organised and presented. First, we chose two unit types to cover two plausible options when providing affordable housing designs: a more average (A) or family-type, which corresponds to a 2-bedroom unit (70 m^2 in MH, and 60 m^2 in CH); and a minimum type (M), a 1-bedroom/studio unit. The 1-bedroom unit type in MH has 50 m^2; the studio in CH has 40 m^2. At the same time, we selected two distinct residential building typologies, the tower (T) with one circulation core (with lift and staircase) and the gallery (G) with two circulation cores. We then assigned a typology to each unit type to end up with four 'categories' to be applied to MH and CH: the average-tower (AT), the average-gallery (AG), the minimum-tower (MT), and the minimum-gallery (MG).

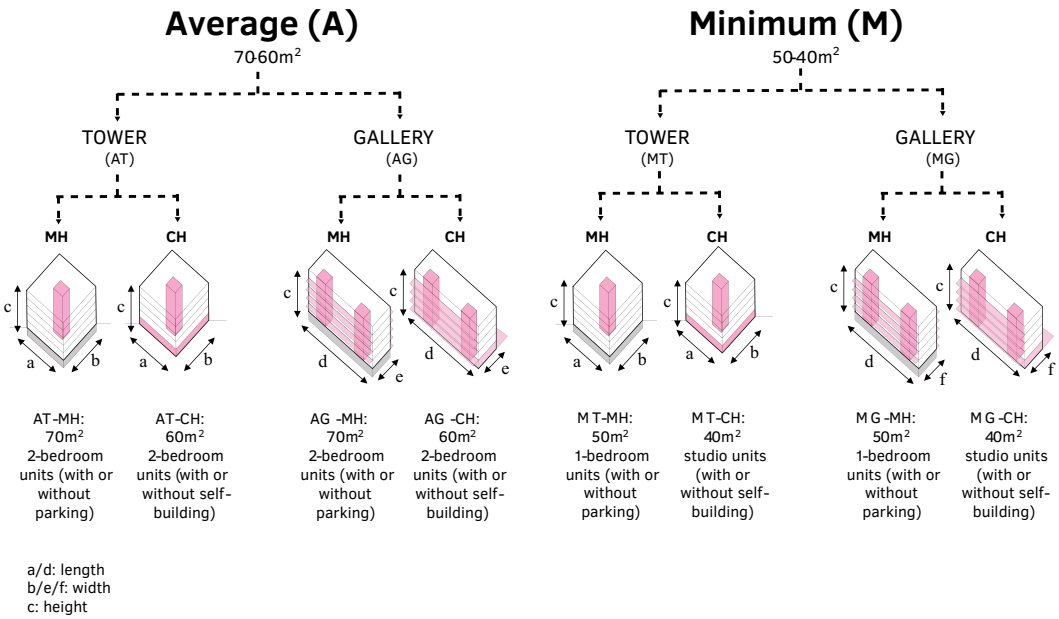


FIG. 4.1 Diagram illustrating the chosen typologies and dwelling types used in the simulation (Source: Authors).

To guarantee a fair comparison between the MH and CH models, the simulated buildings for each category share the same width, length, height and number of floors (resulting in the same gross floor area and volume). In addition, we made an overall effort to have the same or a similar gross floor area across all cases, to enable a comparative assessment between the four categories: AT and MT have the exact same configuration, whereas AG is slightly wider than MG.

We provide two variants for each model. In the MH cases, there is one variant that does not include car parking (as current social housing in the Netherlands rarely includes car parking), and another one that contemplates the construction of underground car parking (to illustrate the more conventional social housing in Europe). The CH cases distinguish CH that is conventionally built by a contractor (likewise MH) from CH that considers self-building approaches in some hands-on construction tasks, such as electricity installations, ceiling finishes, and partition walls. To translate these 'self-building approaches' into building costs, the calculation model included sub-contractors' costs (which are higher than single contractor costs, used in the other options) and excluded the labour costs from the calculations.

These variants were included to allow a more thorough analysis and to better 'play' with the design (e.g., by presenting the costs of underground car parking as a separate option, we can easily test a scenario where CH also contemplates parking). Finally, we included the following distinctive design features in CH, in relation to MH:

- Smaller private units (10 m^2 smaller than MH) without laundries. AT-CH and AG-CH units have 15% less surface area than in the average MH units; in MT-CH and MG-CH units, this number increases to 20% in comparison to minimum MH.
- Smaller private balconies in the tower (T) typology (1.5 m^2 smaller than MH).
- No private balconies in the gallery (G) typology. Calculations include the widening of the exterior gallery instead (from the standard 1.5 m to 2 m) and French balconies in the opposite façade.
- Extra common spaces (besides common entrance, storage and bike parking) to complement the private units, to reach a surface area of approximately 10% of the total area. These spaces include a common laundry (40 m^2), and a common room with kitchen, living space, and two toilets (120 m^2). These were selected because they may be considered the basic common spaces to be generally included in CH. To keep the simplicity of the model, the same amount and surface area of extra common spaces was applied to all CH options. The costs associated with these spaces include floor finish, ceiling finish, partition walls, wall finish (tiling + plaster spray), front doors, electricity, mechanical ventilation, furnishing banks, etc., washing machines etc. (in the laundry) and two toilets, and facilities kitchen/pantry (in the common room), and the market surplus.
- (Possibility to include) extra quality in the building envelope: extra quality of windows, extra quality of façade materials, and extra quality of thermal façade insulation.
- (Possibility to include) extra quality in the exterior garden: besides the standard provision of grass and tiles, extra elements that promote social interaction, such as benches and tables.

The results were calculated using BudsyS software, a parametric system for estimating building costs based on design choices and building typologies in the software. Figures 4.2 and 4.3 demonstrate how the software simulates the building costs, considering the different design options for MH and CH.

Costs were estimated considering material costs (structure, infrastructure, finishing), contingency costs, general construction site costs, and contractor costs (labour, overhead, profit). Land costs, architectural and engineering fees, developer profit margins, and taxes were excluded from the model. The simulation model was structured to calculate the following results:

- Total costs (basic structure/shell).
- Total costs (whole construction).
- Costs per unit (cost of each unit + respective % of common spaces).
- Costs per m^2 UFA/unit. UFA stands for usable floor area, i.e., the actual space that a household occupies within a building; it excludes lobbies, staircases, lifts, structure, and infrastructure, parking space.
- Costs per m^2 GFA/unit. GFA stands for gross floor area, which is the total floor area within the building envelope, including the external walls.

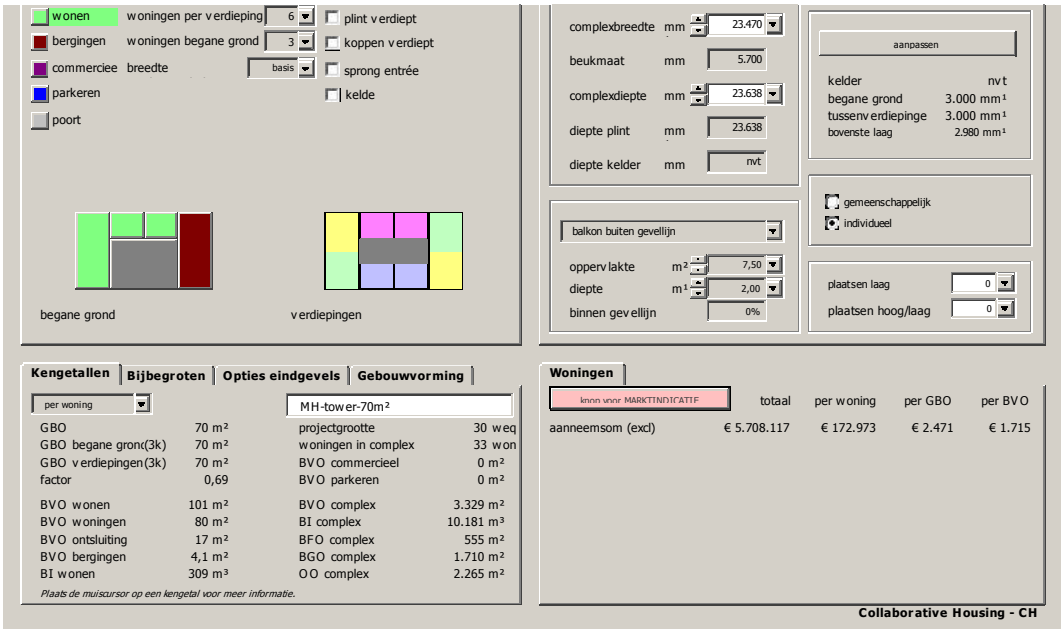


FIG. 4.2 Snapshot of the design specifications and resulting building costs for AT-MH (Source: Image courtesy of Casper Mouissie)

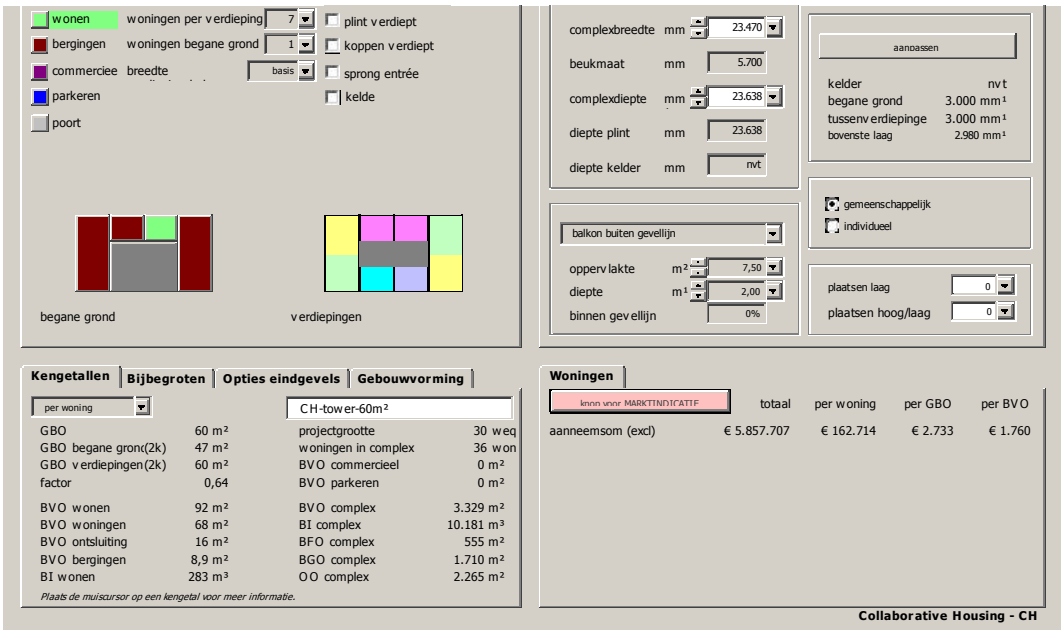


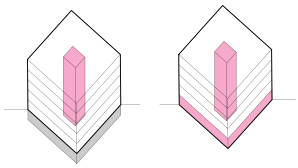
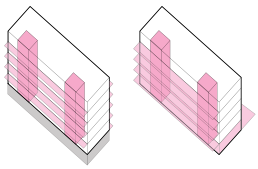
FIG. 4.3 Snapshot of the design specifications and resulting building costs for AT-CH (Source: Image courtesy of Casper Mouissie)

4.4 Results: comparing mainstream housing (MH) and collaborative housing (CH) building costs from a design perspective

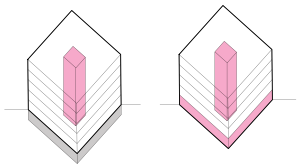
This section presents the results of the conducted simulation to compare the building costs of CH and MH based on design decisions. Table 2 displays a simplified version of the results (see Appendix 4.B at the end of the paper for the complete table). From this simulation exercise we derive the following insights:

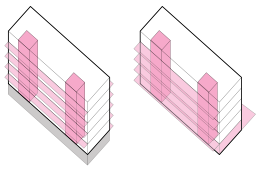
- CH always accommodates more units than MH.
- MH presents the lowest total costs and per m^2 UFA/unit, if parking is not considered. MH with parking has the highest total costs, but the lowest costs per m^2 GFA/unit.
- CH presents the lowest costs per unit (even with 'extra quality features'), but the highest per m^2 UFA/unit.
- CH with self-building has the lowest costs per unit in comparison to all the options and has similar total costs and costs per m^2 GFA/unit as those of MH.
- CH with higher quality, delivered unfinished (with some hands-on tasks taken by the residents), present similar total costs as MH with lower quality, delivered finished, and built by a single contractor.

TABLE 4.2 Summary of the building costs simulation results.

Summary of the building costs simulation results								
								
	Average Tower (AT)				Average Gallery (AG)			
	MH / 70m²		CH / 60m²		MH / 70m²		CH / 60m²	
		Parking		Self-build		Parking		Self-build
nº private units	33	33	36	36	41	41	43	43
total user surface (m² UFA)	2,310	2,310	2,144	2,144	2,868	2,860	2,591	2,591
total residence area (m² GFA)	3,329	3,939	3,329	3,329	3,610	4,395	3,610	3,610
user surface per unit (m² UFA/unit)	70	70	60	60	70	70	60	60
residence area per unit (m² GFA/unit)	101	119	92	92	88	107	84	84
circulation area (m² GFA)	570	570	570	570	268	268	268	268
common spaces (m² GFA)	135	135	321	321	123	123	408	408
parking space (m² GFA)	excl	532	excl	excl	excl	746	excl	excl
net direct - basic structure (shell)	3,987,281	4,526,311	4,104,214	3,085,305	4,603,706	5,399,302	4,688,326	3,884,078
SUBTOTAL excl. VAT (without extra quality in CH)	**5,501,622**	**6,274,259**	**5,733,120**	**5,263,132**	**6,299,519**	**7,416,178**	**6,492,243**	**6,339,816**
contract price per unit	166,716	190,129	159,253	146,198	153,647	180,882	150,982	147,438
contract price per m² UFA/unit	2,382	2,716	2,675	2,455	2,197	2,593	2,505	2,447
contract price per m² GFA/unit	1,653	1,593	1,722	1,581	1,745	1,687	1,798	1,756
extra quality façade openings	excl	excl	18,200	18,200	na	na	20,700	20,700
extra quality dense façade	excl	excl	40,900	40,900	na	na	38,800	38,800
additional façade insulation750	excl	excl	27,000	27,000	na	na	32,250	32,250
extra quality common garden25 000	na	na	25,000	12,500	na	na	25,000	12,500
SUBTOTAL excl. VAT (with extra quality in CH)	**5,501,622**	**6,274,259**	**5,866,491**	**5,381,498**	**6,488,698**	**7,638,460**	**6,678,658**	**6,521,855**
contract price per unit	166,716	190,129	162,958	149,486	158,261	186,304	155 318	151,671
contract price per m² UFA/unit	2,382	2,716	2,737	2,511	2,263	2,671	2,577	2,517
contract price per m² GFA/unit	1,653	1,593	1,762	1,617	1,797	1,738	1,850	1,807

Source: courtesy of Casper Mouissie, edited by Authors





	Minimum Tower (MT)				Minimum Gallery (MG)			
	MH / 50m²		CH / 40m²		MH / 50m²		CH / 40m²	
		Parking		Self-build		Parking		Self-build
	45	45	53	53	45	45	52	52
	2,255	2,255	2,133	2,133	2,246	2,246	2,075	2,075
	3,328	3,938	3,328	3,328	2,979	3,725	2,979	2,979
	50	50	40	40	50	50	40	40
	74	88	63	63	66	83	57	57
	570	570	570	570	249	249	249	249
	187	187	321	321	152	152	312	312
	excl	532	excl	excl	excl	709	excl	excl
	4,450,984	5,040,317	4,767,109	3,497,596	4,550,357	5,358,911	4,816,066	3,691,579
	6,058,171	**6,891,178**	**6,528,784**	**6,059,747**	**6,105,535**	**7,199,772**	**6,515,624**	**6,132,586**
	134,626	153,137	123,185	114,335	135,679	159,995	125,300	117,934
	2,687	3,056	3,061	2,841	2,718	3,206	3,139	2,955
	1,820	1,750	1,962	1,821	2,050	1,933	2,187	2,059
	excl	excl	16,100	16,100	excl	excl	21,500	21,500
	excl	excl	35,700	35,700	excl	excl	40,300	40,300
	excl	excl	39,750	39,750	excl	excl	39,000	39,000
	na	na	25,000	12,500	na	na	25,000	12,500
	6,225,195	**7,080,783**	**6,682,693**	**6,202,599**	**6,274,137**	**7,398,008**	**6,672,438**	**6,280,181**
	138,338	157,351	126,089	117,030	139,425	164,400	128,316	120,773
	2,761	3,140	3,133	2,908	2,793	3,294	3,215	3,026
	1,870	1,798	2,008	1,864	2,106	1,986	2,240	2,108

4.5 Discussion

The conducted simulation shows that depending on what we look at, the results are different; hence, we analysed the numbers (costs) without disregarding the underlying design decisions. If we focus on total costs and costs per m^2 per unit, CH is costlier than MH. However, if we look at the costs per unit, CH solutions present lower building costs compared to MH. This is because CH units are smaller and can be built in a greater number within the same building volume, depending on the ratio of common-private areas.

The results of the simulation indicate that, from a design perspective, smaller units do not mean less space. CH provides, in fact, larger areas to the households, since smaller units are complemented with more shared spaces than MH. For instance, in the simulation, the CH units with 60 m^2 have in fact 160 m^2 of extra space (to be shared with other households), whereas in the comparable MH options households are entitled to privately use a total of 70 m^2. In addition, the "merging" of private balconies with the exterior galleries in the AG-CH and MG-CH types, through the widening of the galleries, allows for building costs savings without compromising the usable space too much.

While some design decisions used in CH may be applicable to non-CH models, as we mentioned, such as combining smaller units with common spaces or spatial flexibility, others are more exclusive to CH, particularly self-building. The use of self-building in CH creates an additional impact on the costs. Carrying out some hands-on tasks represents a compromise that co-designers make to reduce costs at the expense of residents' time and resources. At the same time, to compensate, residents may choose to add extra quality in the construction materials. These are common design trade-offs to keep costs down while increasing the housing quality, performance and long-term affordability (Brysch & Czischke, 2022).

In addition, as mentioned in Section 2, decisions such as excluding some spaces from the project, or reducing the level of finishing, also contribute to reduce costs. In the simulation, we considered minimum finishing levels and the option of not including parking in both CH and MH. This is because the model is based on the Dutch social housing standards. However, the same standards do not apply in other EU countries, where a more prescriptive approach is employed; higher finishing levels and the construction of car parking are examples of unavoidable features in many housing projects outside the Netherlands. This raises the issue of the adequacy of the existing regulatory framework in some EU countries to build CH projects. Currently, many examples of alternative layouts or specific (co-)design decisions often do not fit into

the existing building regulations. This either constrains the possible design solutions or requires an extra effort to find creative ways of going around the legislation (Brysch & Czischke, 2022). When linked to the concept of Existenzminimum, the design solutions applied in CH call for the reassessment of the current design standards in housing to include specific design parameters for CH, together with a 'further harmonisation of building regulations in Europe' (Visscher & Meijer, 2006, para. 1).

Our results bring into light the risk of design solutions typically applied in CH being appropriated by market-driven developers who may want to profit from these types of buildings. This happened in the past, when the concept of Existenzminimum was perverted by developers and 'the minimum dwelling unit—small, cheap, easy to build—became the gold mine of the capitalist housing market, and started to be reproduced and sold as a commodity, as an isolated element, originating the real estate logic of the city (Aureli, 2016).' (Brysch, 2019, p. 333). Today, developers are taking advantage of the cost-efficiency of building shared and small housing and applying similar design criteria in commercial co-living projects (Rissik, 2019).

Therefore, the design of CH and its link to affordability needs to be assessed in combination with other factors that help ensuring housing affordability. If a housing project is built according to spatial criteria that help to reduce building costs, but is based on speculative market-driven purposes, then affordability is at stake: affordability through design should never be detached from the overarching purpose behind affordable housing provision. Design can help to reduce costs and increase affordability; co-design may help even more. Nevertheless, it is the combination of these design criteria with non-speculative approaches that helps CH to guarantee long-term affordability.

4.6 Conclusions

Is collaborative housing an affordable housing design solution? Can CH be considered more affordable than mainstream housing, thanks to co-design? If so, under what conditions? This study assessed the impact of design decisions on building costs in CH, when compared to MH. We departed from the premise that CH, as a result of a co-design process, is even more affordable than affordable MH. This is because CH can combine the 'mainstream' design criteria used to reduce building costs with specific co-design decisions and trade-offs that can only be achieved through collaboration and active involvement of the end-users. We modelled a basic building costs simulation to compare MH with CH based on their design choices. For both models, we applied the same typologies, the same volume and shape, the same circulation surface areas, and the same construction and finishing standards. They mainly differ in their space and quality standards: CH considers smaller private units and larger common spaces than MH, with the possibility to increase the construction quality. Furthermore, we included the option of self-building approaches, which is commonly used in CH.

The simulation shows that the total costs of building a CH project are overall higher compared to MH. The same applies if we look at the gross surface areas per unit (m2 GFA/unit). However, CH accommodates more units; therefore, a direct comparison of these costs is not helpful for the purpose of this study. Focusing on the costs per unit, CH has lower building costs compared to MH. From this point of view, we may then conclude that CH is more affordable and space-efficient than MH, since CH provides units that cost less and includes extra common spaces and extra building quality. These results contribute to refute existing claims about the unaffordability of CH projects (see Introduction).

Although co-design is a process to be conducted (and studied) on a case-by-case basis, this paper provides some design indicators for residents' groups or design professionals in the field who aim to co-design an affordable CH project. We used the Dutch context as a reference for the building costs and standards for social housing in the Netherlands. Future simulations applying this model as a basis and considering other contexts (with different standards) can provide additional insights and complement this analysis. Adapting this model to a concrete CH project with specific co-design decisions may deepen the knowledge of the impact of co-design in building costs. Finally, relating to the concept of Existenzminimum, this study also highlights the need for updating housing design standards in general, and of formulating design standards for CH, to guarantee that minimum living conditions are met and that there is space for resident input in housing design.

Acknowledgments

The authors would like to express their deepest gratitude to Casper Mouissie, for his availability and patience to build and refine the building costs simulation model, without which this study would have been incomplete or even unaccomplished.

References

Appolloni, L., & D'Alessandro, D. (2021). Housing spaces in nine European countries: A comparison of dimensional requirements. *International Journal of Environmental Research and Public Health, 18*(8), 4278.

Arbell, Y. (2022). Beyond Affordability: English Cohousing Communities as White Middle-Class Spaces. *Housing, Theory and Society*, *39*(4), 442-463

Archer, T. (2022). The mechanics of housing collectivism: how forms and functions affect affordability. *Housing Studies*, *37*(1), 73-102. doi: 10.1080/02673037.2020.1803798

Belniak, S., Leśniak, A., Plebankiewicz, E., & Zima, K. (2013). The influence of the building shape on the costs of its construction. *Journal of financial Management of property and construction*, *18*(1), 90-102. doi:10.1108/13664381311305096

Bican, N. B. (2020). Comparative analysis of three innovative housing models in Copenhagen for social mix. *A| Z ITU Mimarlık Fakültesi Dergisi, 17*(1), 37-53.

Bresson, S., & Labit, A. (2020). How does collaborative housing address the issue of social inclusion? A French perspective. *Housing, Theory and Society, 37*(1), 118-138.

Brysch, S. (2019). Reinterpreting Existenzminimum in contemporary affordable housing solutions. *Urban Planning, 4*(3), 326-345. doi:10.17645/up.v4i3.2121

Brysch, S., & Czischke, D. (2022). Affordability through design: The role of building costs in collaborative housing. *Housing studies, 37*(10), 1800-1820. doi:10.1080/02673037.2021.2009778

Burkhalter, L., & Castells, M. (2009). *Beyond the Crisis: towards a new urban paradigm.* Paper presented at the The 4th International Conference of the International Forum on Urbanism (IFoU), Delft, The Netherlands, 1-26.

Cabré, E., & Andrés, A. (2018). La Borda: a case study on the implementation of cooperative housing in Catalonia. *International Journal of Housing Policy*, 18(3), 412-432. doi:10.1080/19491247.2017.1331591

Chau, K.-W., Wong, S. K., Yau, Y., & Yeung, A. (2007). Determining optimal building height. *Urban Studies, 44*(3), 591-607.

Czischke, D., & Brysch, S. (2017). *Collaborative Housing And Affordability: Understanding The Interplay Between Collective Self-Organisation, Design And Affordability*. Paper presented at the International Conference European Network for Housing Research (ENHR), Tirana, Albania.

Czischke, D., & van Bortel, G. (2018). An exploration of concepts and polices on 'affordable housing'in England, Italy, Poland and The Netherlands. *Journal of Housing and the Built Environment*, *38*(1), 1-21.

Czischke, D. (2018). Collaborative housing and housing providers: towards an analytical framework of multi-stakeholder collaboration in housing co-production. *International Journal of Housing Policy, 18*(1), 55-81. doi:10.1080/19491247.2017.1331593

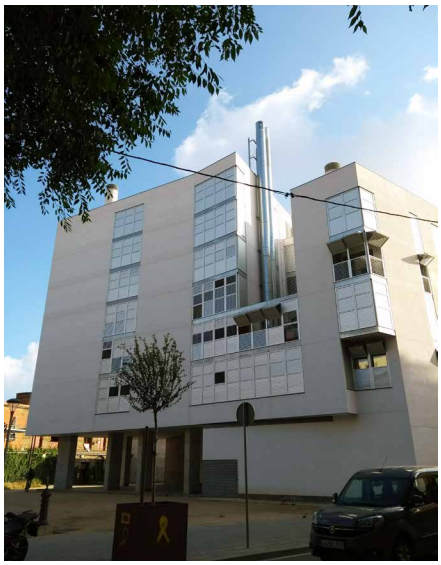
Droste, C. (2015). German co-housing: an opportunity for municipalities to foster socially inclusive urban development? *Urban Research & Practice, 8*(1), 79-92.

Elsinga, M., Hoekstra, J., Sedighi, M., & Taebi, B. (2020). Toward Sustainable and Inclusive Housing: Underpinning Housing Policy as Design for Values. *Sustainability, 12*(5), 1920, 1-19.

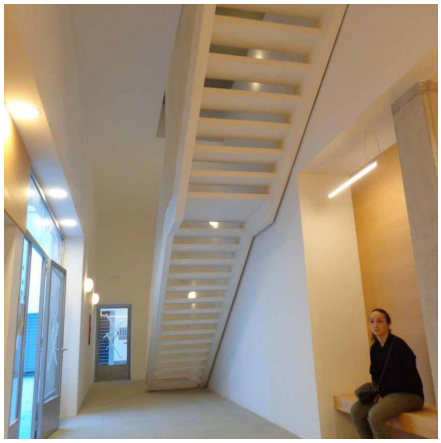
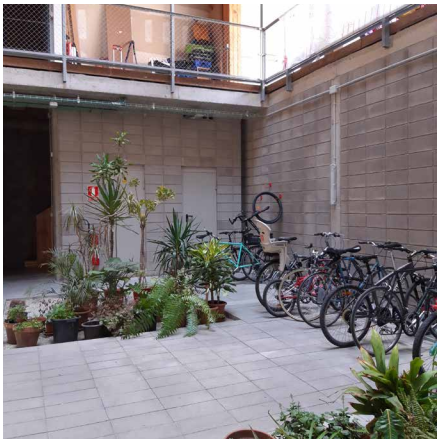
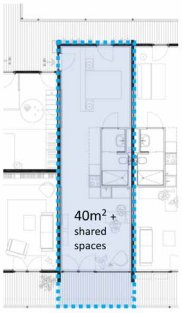
Fromm, D. (2012). Seeding Community: Collaborative Housing as a Strategy for Social and Neighbourhood Repair. *Built Environment, 38*(3), 364-394.

Groat, L., & Wang, D. (2013). *Architectural research methods (second edition)*. New Jersey: John Wiley & Sons.
Jarvis, H. (2011). Saving space, sharing time: integrated infrastructures of daily life in cohousing. *Environment and Planning A, 43*(3), 560-577. doi:10.1068/a43296
Lang, R., Carriou, C., & Czischke, D. (2020). Collaborative Housing Research (1990–2017): A Systematic Review and Thematic Analysis of the Field. *Housing, Theory and Society*, 37(1), 10-39.
Ledent, G. (2022). Size matters. how does the number of dwellings affect housing co-production? *Journal of Housing and the Built Environment, 37*(2), 889-907.
Mitchell, R. E. (1976). Cultural and health influences on building, housing, and community standards: Cost implications for the human habitat. *Human Ecology, 4*(4), 297-330.
Montaner, J. (2001). *Depois do movimento moderno: arquitetura da segunda metade do século XX* [*After the modern movement: architecture of the second half of the 20th century s*]. Barcelona: Gustavo Gili.
Moya, L. (Ed.) (2008). *La vivienda social en Europa. Alemania, Francia y Paises Bajos desde 1945*. Madrid: Mairea Libros.
Qualive. (2020). Affordability, convenience, and flexibility - which thesis of co-living holds truth? Retrieved from https://www.qualive.co/post/affordability-convenience-and-flexibility-which-thesis-of-co-living-hold-truth (accessed on 5 February 2023).
Rigolon, A. (1990). European housing standards. *European housing concepts 2010*, 48-51.
Rissik, L. (2019). XS> XL: The emerging concept of commercial co-living and its influence on users-affordability and developers-profitability. [Master dissertation, Delft: Delft University of Technology]
Sayers, K. (n.d.). Five reasons urban cohousing isn't more affordable. Retrieved from https://www.oururbanvillage.ca/five-reasons-urban-cohousing-isnt-more-affordable (accessed on 14 December 2022).
Scotthanson, C., & Scotthanson, K. (2005). *The Cohousing Handbook. Building a Place for Community*. Gabriola Island, Canada: New Society Publishers.
Seeley, I. H. (1983). Cost Implications of Design Variables. In *Building Economics: Appraisal and control of building design cost and efficiency (Third edition)* (pp. 18-37). London: MACMILLAN PRESS LTD.
Sinha, R., Paredis, C. J., Liang, V.-C., & Khosla, P. K. (2001). Modeling and simulation methods for design of engineering systems. *J. Comput. Inf. Sci. Eng., 1*(1), 84-91.
Pittini, A., Koessl, G., Dijol, J., Lakatos, E., & Ghekiere, L. (2017). *The State of Housing in the EU Report*. Retrieved from www.housingeurope.eu
Todorovic, M. (2016). New type of residential building configuration. *Facta Universitatis. Series: Architecture and Civil Engineering, 14*(1), 47-58.
Tummers, L. (2015). Understanding co-housing from a planning perspective: why and how? *Urban Research & Practice, 8*(1), 64-78. doi:10.1080/17535069.2015.1011427
Tummers, L. (2016). The re-emergence of self-managed co-housing in Europe- A critical review of co-housing research. *Urban Studies, 53*(10), 2023-2040. doi:10.1177/0042098015586696
Van der Linden, V., Dong, H., & Heylighen, A. (2017). The good client: How architect-client dynamics mediate attention to users. *Professional Practices in the Built Environment*, 174-183.
Van der Velden, M., & Mörtberg, C. (2015). Participatory design and design for values. In J. van den Hoven, P. Vermaas, & I. van de Poel (Eds.). *Handbook of ethics, values, and technological design: Sources, theory, values and application domains* (pp. 41-66). Dordrecht: Springer
Vestbro, D. (2010). Living together-cohousing ideas and realities around the world. Proceedings from the International Collaborative Housing Conference in Stockholm, Royal Institute of Technology in collaboration with Kollektivhus NU.
Vestbro, D., & Horelli, L. (2012). Design for gender equality: The history of co-housing ideas and realities. *Built Environment, 38*(3), 315-335.
Visscher, H., & Meijer, F. (2006). *Building regulations for housing quality in Europe*. Paper presented at the ENHR conference 2006: Housing in an expanding Europe. Theory, policy, implementation and participation, Ljubljana
Wetzstein, S. (2017). The global urban housing affordability crisis. *Urban Studies, 54*(14), 3159-3177.
Williams, J. (2005). Designing Neighbourhoods for Social Interaction: The Case of Cohousing. *Journal of Urban Design, 10*(2), 195-227. doi:10.1080/13574800500086998
Winter, J., & Durrett, C. (2013). Achieving affordability with cohousing. *Communities 158*, 34-74.

Appendix 4A

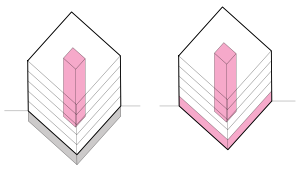
General Information about the Design Features and Costs of UP-4 Can Batlló (MH) and La Borda (CH)		
	Mainstream Housing (MH) Social Housing *UP-4 Can Batlló*	Collaborative Housing (CH) Resident-Led Cooperative *La Borda*
General information	*Location*: Can Battló, Barcelona, Spain *Design*: Joana Ayxendri y Pilar Salinas *Construction times*: Jan 2015–May 2017 *Move in*: Feb 2018 *Surface built area*: 4,786.90 m^2 (3,255.30 m^2 + 1,531.60 m^2 of underground car parking) *Number of units*: 26 *Typology*: Compact, U-shape, courtyard-type 6-storey high + 2 underground parking (32 lots) + 1 commercial space	*Location*: Can Battló, Barcelona, Spain *Design*: Lacol Arquitectura + residents *Construction times*: June 2017–Dec 2018 *Move in*: Dec 2018 *Surface built area*: 2922 m^2 (10% are common spaces) No car parking *Number of units*: 28 (+ guest unit) *Typology*: Compact, U-shape, courtyard-type 6-storey high (no car parking) +1 commercial space
	Plot costs: public land (-) *Total building costs*: 3,089,291.26 € *Building costs per m^2*: 645.36 €/m^2	*Plot costs:* public land (annual fee) *Total building costs:* 2,340,000.00 € (+ 120,000 € municipal subsidy for self-building) *Building costs per m^2*: 841.88 €/m^2
	 (a) Street view	 (b) Street view

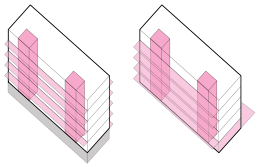
>>>

General Information about the Design Features and Costs of UP-4 Can Batlló (MH) and La Borda (CH)		
	Mainstream Housing (MH) Social Housing *UP-4 Can Batlló*	Collaborative Housing (CH) Resident-Led Cooperative *La Borda*
Construction methods and finishing levels	 (c) Main entrance	 (d) Main entrance
	- minimum environmental standards - finished state of building upon moving in - no self-building approaches - concrete structure	- passive house standards - 'raw' appearance of materials (no layers), unfinished surfaces and spaces upon moving in - phased construction and use of self-building approaches - timber structure (the raw material is more expensive than concrete, yet is faster to assembly in situ)
Private units	 (e) floorplan of smallest private unit: 2-bedroom unit	 (f) floorplan of smallest private unit: studio
	- no studios or 1-bedroom units; 2-room units with 62–74 m², 3-bedroom units with 81–84 m², 4-bedroom units with 100 m² - no guest units - medium level of flexibility or possibility to change layout	- three unit types: S (studios with 40 m²), M (1-bedroom units with 58 m²), and L (2-bedroom units with 76 m²) - guest units - high level of flexibility or possibility to change layout

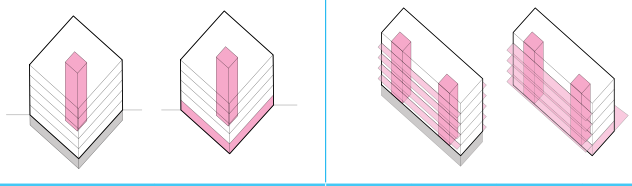
Appendix 4B

Complete Final Results of the Building Costs Simulation





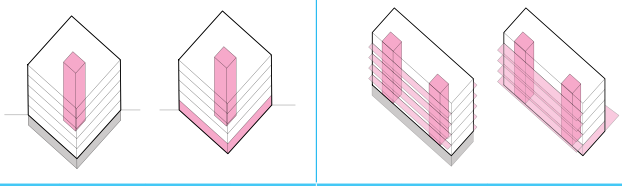
	Average Tower (AT)				Average Gallery (AG)			
	MH / 70m²		CH / 60m²		MH / 70m²		CH / 60m²	
		Park.		Self-build		Park.		Self-build
nº private units	33	33	36	36	41	41	43	43
total user surface (m² UFA)	2,310	2,310	2,144	2,144	2,868	2,860	2,591	2,591
total residence area (m² GFA)	3,329	3,939	3,329	3,329	3,610	4,395	3,610	3,610
user surface per unit (m² UFA/unit)	70	70	60	60	70	70	60	60
residence area per unit (m² GFA/unit)	101	119	92	92	88	107	84	84
circulation area (m² GFA)	570	570	570	570	268	268	268	268
common spaces (m² GFA)	135	135	321	321	123	123	408	408
parking space (m² GFA)	excl	532	excl	excl	excl	746	excl	excl
net direct - basic structure (shell)	3,987,281	4,526,311	4,104,214	3,085,305	4,603,706	5,399,302	4,688,326	3,884,078
floor finish - screed	incl	incl	incl	incl	incl	incl	incl	incl
wall finish - wallpaper ready	incl	incl	incl	incl	incl	incl	incl	incl
ceiling finish - spray plaster	incl	incl	incl	8,574	incl	incl	incl	10,365
installations cupboard	incl	incl	incl	incl	incl	incl	incl	incl
pipes underfloor heating	incl	incl	incl	incl	incl	incl	incl	incl
Bathroom – 4,000	incl	incl	incl	99,000	incl	incl	incl	118,250
surcharge toilet in bathroom – 1,100	incl	incl	incl	32,400	incl	incl	incl	38,700
surcharge for separate toilets – 1,100	incl	incl	incl	30,600	incl	incl	incl	36,550
kitchen (open) – 1,700	incl	incl	incl	61,200	incl	incl	incl	73,100
interior walls / layout	incl	incl	incl	81,770	incl	incl	incl	65,455
installations: plumbing	incl	incl	incl	-	incl	incl	incl	-
installations: heat generation	incl	incl	incl	-	incl	incl	incl	-
installations: electricity in the unit – 3,900	incl	incl	incl	91,260	incl	incl	incl	109,005
installations: solar panels per unit – 1,500	incl	incl	incl	30,600	incl	incl	incl	36,550
widening gallery due to outdoor space	na	na	na	na	na	na	na	na
balconies 5m²/unit / French balconies – 4,700	7,5m²	7,5m²	5m²	169,200	7,5m²	7,5m²	5m²	202,100



	Minimum Tower (MT)				Minimum Gallery (MG)			
	MH / 50m²		CH / 40m²		MH / 50m²		CH / 40m²	
		Park.		Self-build		Park.		Self-build
	45	45	53	53	45	45	52	52
	2,255	2,255	2,133	2,133	2,246	2,246	2,075	2,075
	3,328	3,938	3,328	3,328	2,979	3,725	2,979	2,979
	50	50	40	40	50	50	40	40
	74	88	63	63	66	83	57	57
	570	570	570	570	249	249	249	249
	187	187	321	321	152	152	312	312
	excl	532	excl	excl	excl	709	excl	excl
	4,450,984	5,040,317	4,767,109	3,497,596	4,550,357	5,358,911	4,816,066	3,691,579
	incl	incl	incl	incl	incl	incl	incl	incl
	incl	incl	incl	incl	incl	incl	incl	incl
	incl	incl	incl	8,531	incl	incl	incl	8,302
	incl	incl	incl	incl	incl	incl	incl	incl
	incl	incl	incl	incl	incl	incl	incl	incl
	incl	incl	incl	145,750	incl	incl	incl	143,000
	incl	incl	incl	47,700	incl	incl	incl	46,800
	incl	incl	incl	45,050	incl	incl	incl	44,200
	incl	incl	incl	90,100	incl	incl	incl	88,400
	incl	incl	incl	91,065	incl	incl	incl	73,190
	incl	incl	incl	-	incl	incl	incl	-
	incl	incl	incl	-	incl	incl	incl	-
	incl	incl	incl	134,355	incl	incl	incl	131,820
	incl	incl	incl	45,050	incl	incl	incl	44,200
	na	na	na	na	na	na	na	na
	7,5m²	7,5m²	5m²	249,100	7,5m²	7,5m²	5m²	244,400

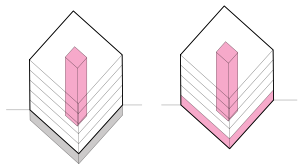
>>>

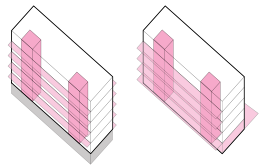
Complete Final Results of the Building Costs Simulation



	Average Tower (AT)				Average Gallery (AG)			
	MH / 70m²		CH / 60m²		MH / 70m²		CH / 60m²	
		Park.		Self-build		Park.		Self-build
finishing entrance	incl	incl	incl	64,700	incl	incl	incl	29,100
central laundry room	na	na	22 000	13,300	na	na	22,000	13,300
central living room	na	na	53,900	33,200	na	na	53,900	33,200
common garden - basic	25,000	25,000	25,000	12,500	25,000	25,000	25,000	12,500
net direct – sub-complete	4,012,281	4,551,311	4,205,114	3,813,610	4,628,706	5,424,302	4,789,226	4,662,253
further plan elaboration / unforeseen – 5%	200,614	227,566	210,256	190,680	231,435	271,215	239,461	233,113
general construction site costs	599,159	708,973	599,167	599,167	649,803	791,125	649,825	649,825
operational costs / profit and risk – 11%	529,326	603,664	551,599	506,380	606,094	713,531	624,636	609,971
reservation price changes (50%) during construction – 3%	160,241	182,745	166,984	153,295	183,481	216,005	189,094	184,655
SUBTOTAL excl. VAT (without extra quality in CH)	**5,501,622**	**6,274,259**	**5,733,120**	**5,263,132**	**6,299,519**	**7,416,178**	**6,492,243**	**6,339,816**
contract price per unit	166,716	190,129	159,253	146,198	153,647	180,882	150,982	147,438
contract price per m² UFA/unit	2,382	2,716	2,675	2,455	2,197	2,593	2,505	2,447
contract price per m² GFA/unit	1,653	1,593	1,722	1,581	1,745	1,687	1,798	1,756
extra quality façade openings	excl	excl	18,200	18,200	na	na	20,700	20,700
extra quality dense façade	excl	excl	40,900	40,900	na	na	38,800	38,800
additional façade insulation750	excl	excl	27,000	27,000	na	na	32,250	32,250
extra quality common garden25 000	na	na	25,000	12,500	na	na	25,000	12,500
net direct – sub-complete	4,012,281	4,551,311	4,316,214	3,912,210	4,786,294	5,609,465	4,944,512	4,813,893
further plan elaboration / unforeseen – 5%	200,614	227,566	215,811		239,315	280,473	247,226	240,695
general construction site costs	599,159	708,973	599,167	599,167	649,803	791,125	649,825	649,825
operational costs / profit and risk – 11%	529,326	603,664	564,431	517,769	624,295	734,917	642,572	627,485
reservation price changes (50%) during construction – 3%	160,241	182,745	170,869	156,743	188,991	222,479	194,524	189,957
SUBTOTAL excl. VAT (with extra quality in CH)	**5,501,622**	**6,274,259**	**5,866,491**	**5,381,498**	**6,488,698**	**7,638,460**	**6,678,658**	**6,521,855**
contract price per unit	166,716	190,129	162,958	149,486	158,261	186,304	155 318	151,671
contract price per m² UFA/unit	2,382	2,716	2,737	2,511	2,263	2,671	2,577	2,517
contract price per m² GFA/unit	1,653	1,593	1,762	1,617	1,797	1,738	1,850	1,807

Source: Courtesy of Casper Mouissie, Edited by Authors





	Minimum Tower (MT)				Minimum Gallery (MG)			
	MH / 50m²		CH / 40m²		MH / 50m²		CH / 40m²	
		Park.		Self-build		Park.		Self-build
	incl	incl	incl	64,000	incl	incl	incl	23,000
	na	na	22,000	13,300	na	na	22,000	13,300
	na	na	53,900	33,200	na	na	53,900	33,200
	25,000	25,000	25,000	12,500	25,000	na	25,000	12,500
	4,475,984	5,065,317	4,868,009	4,477,297	4,575,357	5,358,911	4,916,966	4,597,891
	223,799	253,266	243,400	223,865	228,768	267,946	245,848	229,895
	599,064	708,862	599,064	599,064	536,149	670,504	536,149	536,149
	582,873	663,019	628,152	583,025	587,430	692,710	626,886	590,033
	176,452	200,714	190,159	176,497	177,831	209,702	189,775	178,619
	6,058,171	**6,891,178**	**6,528,784**	**6,059,747**	**6,105,535**	**7,199,772**	**6,515,624**	**6,132,586**
	134,626	153,137	123,185	114,335	135,679	159,995	125,300	117,934
	2,687	3,056	3,061	2,841	2,718	3,206	3,139	2,955
	1,820	1,750	1,962	1,821	2,050	1,933	2,187	2,059
	excl	excl	16,100	16,100	excl	excl	21,500	21,500
	excl	excl	35,700	35,700	excl	excl	40,300	40,300
	excl	excl	39,750	39,750	excl	excl	39,000	39,000
	na	na	25,000	12,500	na	na	25,000	12,500
	4,615,117	5,223,260	4,996,217	4,596,294	4,715,804	5,524,044	5,047,593	4,720,839
	230,756	261,163	249,811	229,815	235,790	276,202	252,380	236,042
	599,064	708,862	599,064	599,064	536,149	670,504	536,149	536,149
	598,943	681,261	642,960	596,769	603,652	711,783	641,973	604,233
	181,316	206,236	194,642	180,658	182,742	215,476	194,343	182,918
	6,225,195	**7,080,783**	**6,682,693**	**6,202,599**	**6,274,137**	**7,398,008**	**6,672,438**	**6,280,181**
	138,338	157,351	126,089	117,030	139,425	164,400	128,316	120,773
	2,761	3,140	3,133	2,908	2,793	3,294	3,215	3,026
	1,870	1,798	2,008	1,864	2,106	1,986	2,240	2,108

5 The process of value setting through co-design

The case of La Borda, Barcelona

Brysch, S., Garcia i Mateu, A.., & Czischke, D. (2023). The process of value setting through co-design: the case of La Borda, Barcelona. *CoDesign*

ABSTRACT Against the increasing commodification of housing, a new kind of housing cooperatives has emerged in Catalonia in the last decade. These cooperatives fall within the wider concept of collaborative housing (CH), i.e., they are collectively self-organised projects based on a collaborative design process, or 'co-design'. In such a process, residents need to adjust their individual expectations and demands in order to reach a collective set of values to realise their housing project. The aim of this paper is to assess how values are set through co-design and translated into a housing project. To do so, we develop an analytical framework to conduct a longitudinal single case-study that traces back the co-design process of the resident-led housing cooperative *La Borda,* in Barcelona. Our findings shed light on how co-design unfolds and uncover trade-offs carried out to overcome tensions mostly between individual and collective demands, and between building costs and quality.

KEYWORDS collaborative housing, cooperative housing, co-design process, design for values, La Borda

5.1 Introduction

A new kind of housing cooperative in Catalonia has developed in the past decade as a response to the lack of affordable, suitable and sustainable housing. Because they are resident-led and collectively self-organised, these cooperatives fit within the wider concept of collaborative housing (CH), an umbrella term (Fromm 1991; Lang, Carriou, & Czischke, 2020) for housing projects that involve collaboration in their development and management. *La Borda,* a housing project built in public land, was the pilot that has spearheaded the grant-of-use housing cooperative model in Catalonia. This model appears 'as an alternative to both the capitalist market economy and the state' (Larsen, 2019, p. 83) and contrasts with previous waves of housing cooperatives merely focused on the construction phase (Cabré & Andrés, 2018; Larsen, 2019; Scheller & Larsen, 2019).

CH is often based on collaborative design processes, or co-design. This approach resonates with the tradition of participatory design and goes beyond the user-centred approach (Sanders & Stappers, 2008) where designers focus on end-users' needs. In a co-design process of a CH project, residents (the end-users) 'participate as co-designers in the design process' (Van der Velden & Mörtberg, 2015, p. 41) in collaboration with professionals (Mattelmäki & Visser, 2011; Sanders & Stappers, 2008), namely architects. Cohousing is a CH form that often combines co-design processes with collective living arrangements. Hereupon, residents have to adjust their individual expectations and demands to reach a collective set of values, to be materialised in the housing project. Values are, therefore, at the core of the co-design or participatory design negotiations and compromises (Agid & Chin, 2019; Molnar & Palmås, 2022; Iversen, Halskov, & Leong, 2010; Le Bail, Baker & Détienne, 2022; Van der Velden & Mörtberg, 2015).

However, 'there is still insufficient emphasis on how user values can drive the design process as it unfolds' (Halloran, Hornecker, Stringer, Harris, & Fitzpatrick 2009, p. 246). Moreover, scientific studies linking co-design and values in the field of housing design remain inexistent to our knowledge. How does the co-design process unfold in the face of diverse values amongst (future) residents? How are these values translated into co-design decisions? What design trade-offs result from conflicting values in a co-design process? To answer these questions, we conduct a longitudinal single case-study that traces the co-design process of the recently built resident-led housing cooperative *La Borda*, Barcelona. The aim is to assess how values are set, evolve and are materialised in a housing project through co-design. Our conception of co-design is based on the premise that product and process are equally important

(Van der Velden & Mörtberg, 2015) and inseparable dimensions in a housing project (Brysch & Czischke, 2022). In this study, *housing project* encompasses the physical result of the process – 'architectural design' – and the way residents shaped their social and convivial practices as a group living together – 'social design'. We employ an analytical framework to operationalise the translation of values into design outcomes (and vice-versa), which helps to visualise the value setting process in the context of co-design. This framework is an adaptation of the *Value Hierarchy Model* (van de Poel, 2013), as applied in the *Design for Values* (DfV) approach (Elsinga, Hoekstra, Sedighi, & Taebi, 2020), which highlights the role of values in housing design, making them more explicit.

5.2 A value-hierarchy analytical framework to assess co-design in collaborative housing (CH)

According to the Oxford dictionary, the term *value* relates to the judgement of what is important in life. In the housing field, values refer to 'an estimate of the worth of a concept that guides decision making about housing' (McCray & Day, 1977, p. 245) and 'are different from individual preferences, wishes, and desires, in that they relate to a common good' (Elsinga et al., 2020, p. 3). Values can therefore be taken as the *driving forces* for or the *ideals* behind decision-making and further action, i.e., materialisation in the final design output. In this sense, what prompts action are the incentive values of the likely outcomes of one's actions. In the context of CH, the required (collective) action to co-design raises the question of how these 'incentive values' are collectively set. This is done either implicitly or explicitly (Van der Velden & Mörtberg, 2015; Halloran et al., 2009).

In CH, 'each individual choice, which might produce effects on the collective life, is supposed to be shared and negotiated by the whole group.' (Ruiu, 2016, p. 170). These negotiations and eventual trade-offs take place because values are sometimes in conflict with each other. High levels of conflict may be disruptive, time-consuming and lead to the withdrawal of some future residents or even the dissolution of the group (Ruiu, 2016; Williams, 2005). However, conflicts and conflict management may act not as an inconvenience which should eliminate differences and force consensus but as a tool to promote the dialogue about those differences.

Conflicts or design 'dilemmas' can also be seen as an opportunity for 'creative leaps' (Iversen et al., 2010, p. 5). Conflicts are therefore useful in the design process for the identification, clarification, and (re)negotiation of values (Van der Velden & Mörtberg, 2015) and can be overcome over time (Le Bail et al., 2022) through constant deliberation, negotiation and settlement (Castro, 2021). In line with this, values are dynamic and prone to change during a co-design process (Gaete Cruz, Ersoy, Czischke, and Van Bueren, 2022a, 2022b; Halloran et al., 2009; Iversen et al., 2010). According to Trischler, Pervan, Kelly, and Scott (2018) and Antonini (2021), there is an added value to co-design as it may foster design creativity and innovation, in contrast to conventional design processes. This is particularly relevant in the housing field, considering that many current housing solutions are based on outdated layouts (Burkhalter & Castells, 2009).

Some scholars identify housing values as linked to the private living unit, namely comfort, convenience, and privacy (McCray & Day 1977). Others also consider values such as sustainability, quality and community building (Mulliner, Smallbone & Maliene, 2013). Specific literature on CH shows that these initiatives are mainly anchored in community and sustainability values. Solidarity, mutual aid, sharing, collaboration, resident democracy, community and well-being (Sørvoll & Bengtsson, 2020, Lang et al., 2020; Czischke, 2018; Vestbro, 2010) and sustainability, either social- (Lang, 2019) or environmental- (Sørvoll & Bengtsson, 2020; Lang et al., 2020; Tummers, 2016) are often mentioned when describing CH projects. Elsinga et al. (2020) provide a holistic perspective towards values in housing, within the *Design for Values* (DfV) approach. These values are 'ontological security' (*safety*, *affordability*), 'autonomy' (*freedom of choice*, *autarky*), 'well-being' (*safety*, *health*), 'inclusiveness' (*accessibility*, *affordability*), 'sustainability' (*environmental* and *social sustainability*, *resilience*), 'social stability/order' (*sense of community*, *place making*), and 'market efficiency' (*resource efficiency*, *optimisation*).

The DfV approach considers the *Value Hierarchy Model* (van de Poel, 2013), which was developed to operationalise the translation of values into specific design outcomes. It appears as a conventional hierarchical pyramid where *inherent* and *operational values* (Elsinga et al., 2020) are at the top, followed by *norms,* with tangible *design requirements* at the basis (see Figure 5.1). Norms are 'all kinds of prescriptions for, and restrictions on, action' (van de Poel, 2013, p. 258) and may take the form of objectives or constraints. Usually, it is at this level where value conflicts and required trade-offs are expressed. Design requirements (at the bottom) represent the more tangible 'properties, attributes or capabilities that the designed artefact, system or process should possess' (van de Poel, 2013, p. 254). Linking to the initial definition, values are the *why* (driving forces), norms are the

how, while design requirements are the *what* (action). Here, hierarchies can be built top-down and bottom-up, where two types of relations are determined, namely *for the sake of* and *specification*. This duality 'might then be used to assess whether the design requirements sufficiently cover the value on which they are based and may potentially lead to new design requirements or the reformulation of existing design requirements (or the reformulation of the value).' (van de Poel. 2013, p. 260-261).

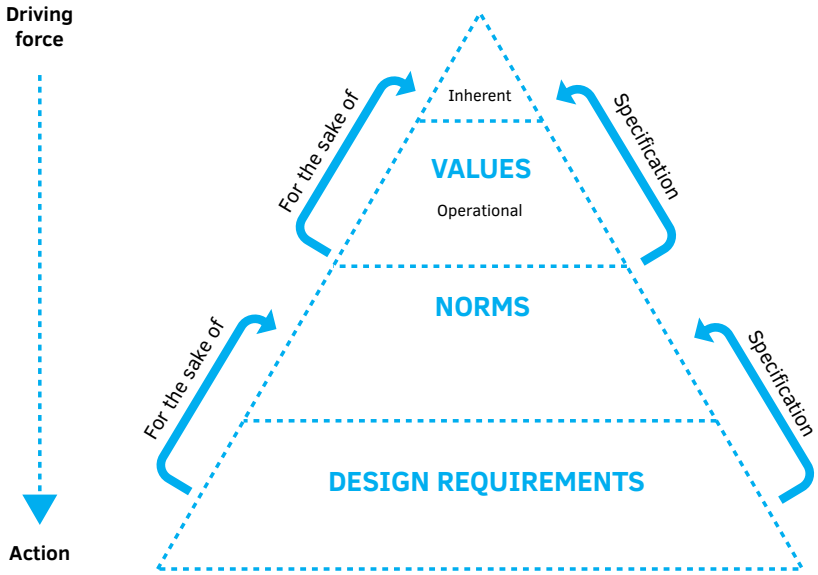


FIG. 5.1 Value Hierarchy Model adapted from Van de Poel, 2013 and Elsinga et al., 2020 (Source: Authors)

The frameworks developed by Van de Poel (2013) and Elsinga et al. (2020) primarily target a conventional design process and focus on how values are translated into a final *product*. As they are now, they do not contemplate the essential aspect that, in a co-design setting, the *process* itself is also based on values. Participation and democracy are *sine qua non* values of co-design processes (Andersen, Danholt, Halskov, Hansen, & Lauritsen, 2015; Van der Velden & Mörtberg, 2015). These, together with other specific values set by the group of co-designers, generate a work ethic that guides the whole process. This is in line with the early participatory design tradition aiming at combining democratic principles with participation (Iversen et al., 2010). Co-design as a *process* becomes more than merely an instrument to achieve a final design of a product, since 'other goals are accomplished, such as mutual learning, reflection, and skill acquisition, which have a value that is independent of the final outcome of the process.' (Van der Velden & Mörtberg, 2015, p. 62).

The following section describes how we adapt the frameworks to our analysis on co-design, emphasising the role of 'process-related' values in the definition of the key values guiding the housing project. Similarly, we incorporate the *inherent* value of collaboration, due to the collaborative nature of our case-study.

5.3 Case and methods

We conducted a single case-study, namely the resident-led cooperative *La Borda*. This is a six-storey cohousing project with 28 housing units (around 60 residents) and several shared spaces such as laundry, common kitchen, and guest rooms (see Figures 5.2 to 5.7). We adopted a qualitative longitudinal approach, which involves repeated observations of the same variables over a period of time. This is justified by the need to track back the co-design process of *La Borda*. Although the process has its roots in 2012, the actual co-design process intensified in 2014, when the group formally became a cooperative. The co-design process was more active between 2014 and 2015, when most of the design decisions were taken. Residents moved in by the end of 2018. We refrain from stating 'the end of the process' or 'completion of the building', because *La Borda*, such as many other CH projects, was left unfinished upon moving (see Figure 5.6). It is based on a phased construction and self-building approaches carried out over time. For this reason, our analysis also takes the living period into consideration.

Research methods include document analysis, interviews (carried out in 2018 and 2020) and a validation focus group (in 2022) with five co-designers. Informed consent was provided by the participants to take part in this study and to the way the collected data is processed and managed. This research benefits from the direct experience of one of the co-authors, who has been a member of *La Borda* since 2014 and was actively involved in the co-design process.

FIG. 5.2 La Borda's general assembly during the design phase (Source: image courtesy of La Borda)

FIG. 5.3 Ground floor and first floor plans of La Borda (Source: image courtesy of Lacol)

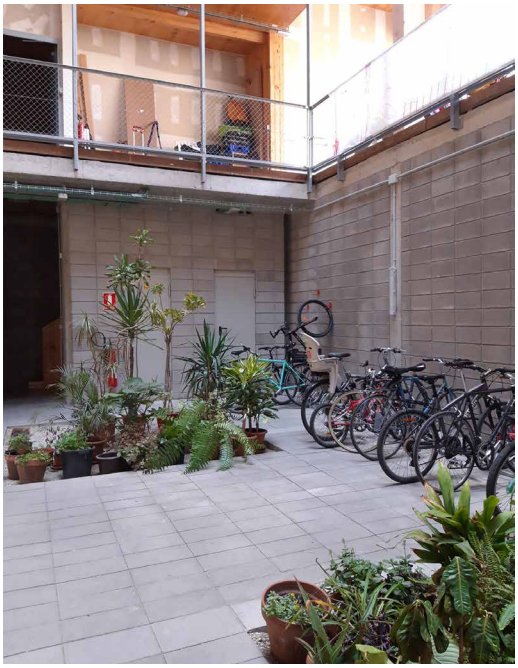


FIG. 5.4 La Borda during the living phase (Source: Authors)

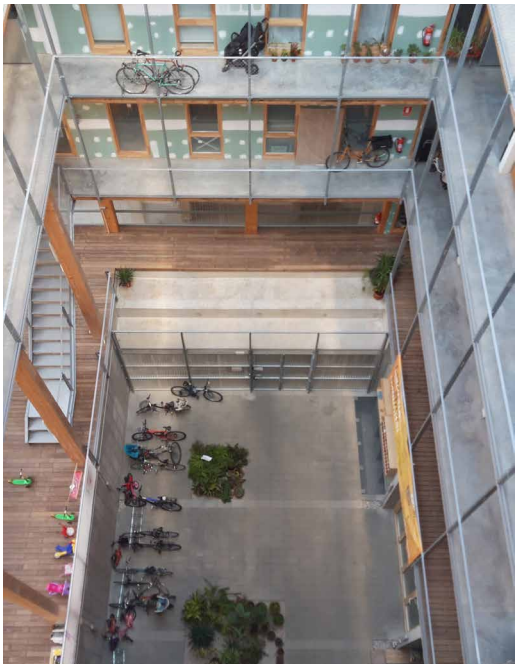


FIG. 5.5 La Borda during the living phase (Source: Authors)

FIG. 5.6 La Borda during the living phase (Source: image courtesy of La Borda)

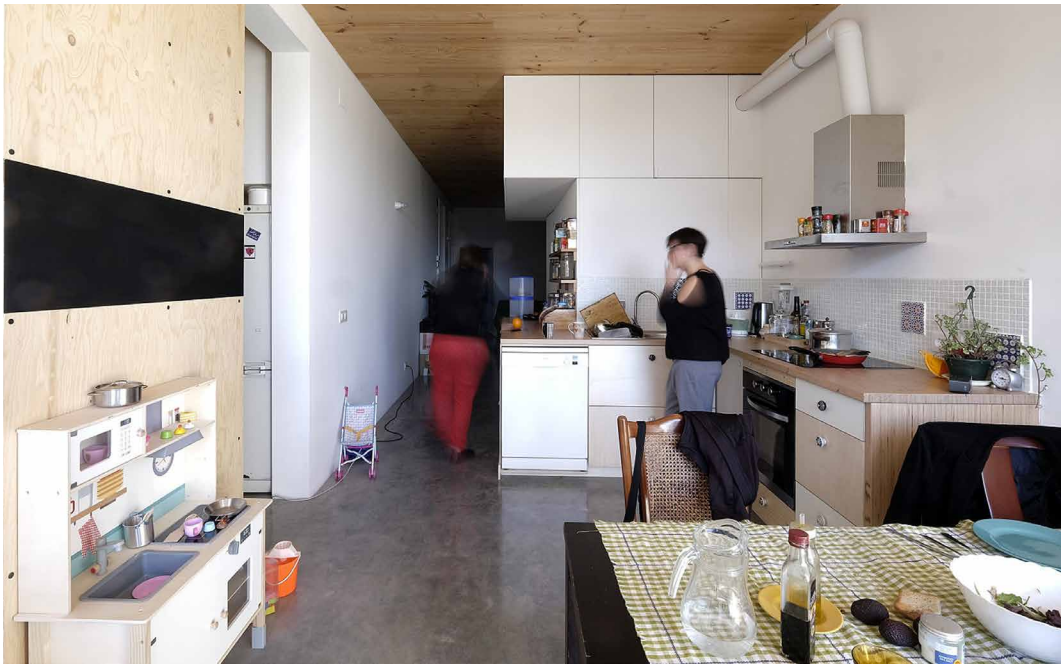


FIG. 5.7 La Borda during the living phase (Source: image courtesy of La Borda)

We selected the events or occurrences during the process whose purpose was to deliberately and *explicitly* name and document the goals, principles, guidelines or values linked to the project. These – we call them 'value-setting events' – encompass legal statutes, project descriptions, presentations, and communication material. In addition, from the documents and interviews, we have identified 'co-design decisions' to set the project design. These decisions are related to both the architectural design (building), led by an 'architectural committee' and the social design (conviviality practices), oriented by a 'conviviality committee'. These two analytical domains form an integrated socio-spatial experience (Lefebvre, 1991). We have identified a total of ten 'value-setting events' and six pivotal moments where 'co-design decisions' were expressed (see Appendix 5A for full description at the end of the chapter). We have grouped them in three sets or phases, according to their occurrence in time (see Figure 5.8)

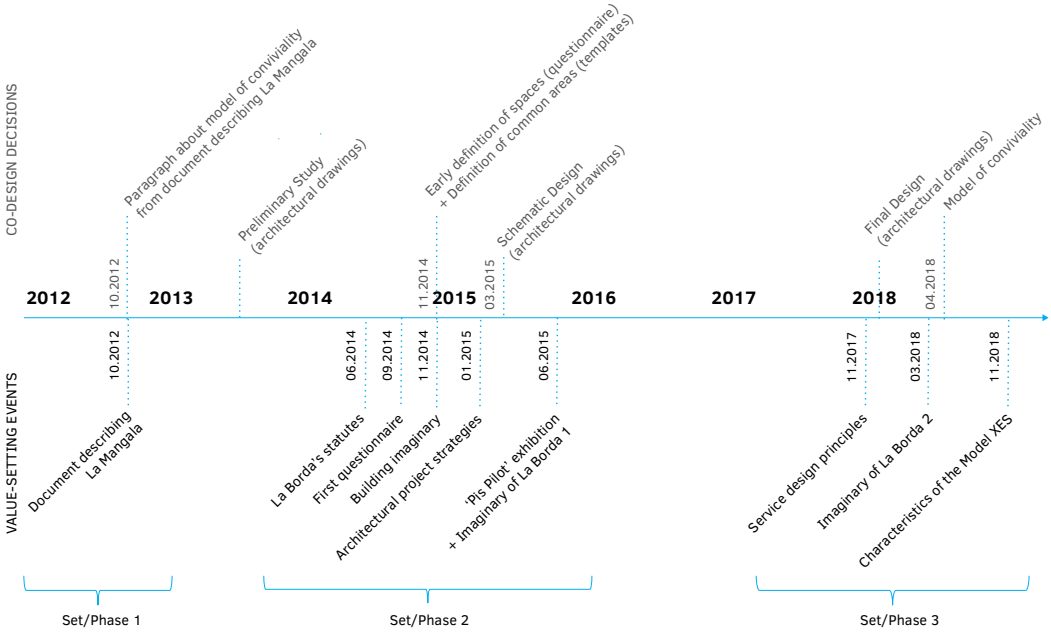


FIG. 5.8 Timeline with data sources for 'value-setting events' and 'co-design decisions' (Source: Authors)

5.3.1 Data analysis

The first phase of data analysis used as reference the *Value Hierarchy Model* (van de Poel, 2013) and the pre-set of housing values as listed by Elsinga et al. (2020) (see previous section). By combining the principles of provisional- and values- coding (Saldaña, 2013), values were uncovered and listed from the reviewed documents. Here, we either directly extracted the *operational* and *inherent* values from textual excerpts of the reviewed documents (when values were explicit) or we converted the detected *norms* or *design requirements* into values (see snapshot in Table 5.1 and Appendix 5B at the end of the chapter for entire dataset).

In the second phase of analysis, we visually displayed the identified values in what we call 'value footprints', through relationship maps, a visual tool inspired by word clouds and cognitive maps (Eden, 1988). These maps position the values according to the links established among them. If they appear in the same document source, a link is created; if they appear in the same paragraph, another link is created. The number of value mentions influence the 'size' of the value in the footprint: the

TOC

more mentions in the data sources the larger the circles that represent the values, determining their relevance in the footprint. The purpose was to provide a more graphic overview of the evolution of the value setting throughout the process and to illustrate relationships and potential hierarchies between values. Figure 5.9 (see next section) illustrates the footprints that resulted from the assessment of the three 'value-setting events' data sets.

TABLE 5.1 Snapshot of the first analytical step: coding (Source: Authors)

Inherent value	Operational value	Entry (in catalan)	Entry (in english)	Level	Source	Date
Well-being	decent housing	Garantir l'accés a un habitatge digne i assequible	Ensuring access to decent and affordable housing	Norms	Cooperativa d'habitatges en cessió d'ús la Mangala	01/10/2012
Inclusiveness	affordability					
Inclusiveness	non-speculation	Desmercantil-itzar l'habitatge per a evitar-ne usos especu-latius	Take homes out of free market to avoid speculative uses	Norms	Cooperativa d'habitatges en cessió d'ús la Mangala	01/10/2012
Inclusiveness	intergeneration	Generar noves formes de convivència comunitària i fomentar la rel-ació intergener-acional	Generate new forms of community conviviality and foster inter-generational relationships	Norms	Cooperativa d'habitatges en cessió d'ús la Mangala	01/10/2012
Social stability/ order	conviviality					
Social stability/ order	place making	Construir un barri a escala humana	Build a neighborhood on a human scale	Norms	Cooperativa d'habitatges en cessió d'ús la Mangala	01/10/2012
Well-being	human scale					
Collaboration	collective process	Generar un procés col·lectiu de definició d'un nou model de producció, gestió i tinença de l'habitatge alternatiu a l'existent actualment	Generate a collective process of defining a new model of production, management and ownership of alternative housing to the existing one	Norms	Cooperativa d'habitatges en cessió d'ús la Mangala	01/10/2012
Social stability/ order	housing model innovation					

As ‘co-design decisions’ we considered specific design aspects linked to the cohousing model (e.g., collective spaces, shared meals) and/or situations indicating a conflict between values. To identify the prevailing values, tensions and trade-offs in these decisions, we conducted the analysis in two different ways. For the cases where the data source was textual, we used the same coding system as for the ‘value-setting’ events. When the data were mainly graphic (e.g., visual presentations, architectural drawings), we crossed-checked the documents with input from interviews and general assemblies’ minutes to detect the design features. These can be labelled as *design requirements*, following van de Poel’s (2013) terminology. Then, we attributed underlying *operational values* to each design requirement. We also detected tensions between values when a decision was collectively made. This was done to better understand which values prevailed in the end and which design trade-offs were set to meet both equally-important values. Here, a table was used instead to outline the findings (see Table 5.1), given the difficulty to accurately ‘quantify’ the relevance of values from co-design decisions due to the graphic nature of some data sources.

To validate our findings, we conducted a focus group with five members (co-designers) of *La Borda*. The 90-minutes-long event was carried out in *La Borda*’s shared kitchen in January 2022. The participants, after providing informed consent, were asked to name the key values they believed have guided the whole project and to identify the co-design decisions they recall as ‘relevant’ and/or ‘conflicting’. Then, after sharing our findings we asked them if they recognised them in the process of *La Borda*. The results generally confirmed our analysis: participants mentioned the same key values and listed the same or similar architectural and conviviality decisions to the ones we identified. Moreover, they agreed with the flexible and fluid nature of values and the relevance of conflicts to make values visible and operable.

5.4 Findings

5.4.1 Value footprints

The resulting 'value footprints' of the three 'value-setting events' sets (see Figure 5.9) display which values were set in the three 'phases' of the process and how they evolved, i.e. which values increased or decreased their relevance over time. Inclusiveness, sustainability, social stability/order, and collaboration were identified as the key *inherent* values established at the beginning. The initial footprint is highly representative of the values that were prioritised throughout the process, showing that these values set the scene for the overall project. The second footprint is the most complex as it corresponds to when the co-design process was more active (i.e., when most decisions were taken), encompassing more value-setting events. This suggests that the most present values, namely environmental sustainability and resource efficiency, were central in the collective decision-making process. Non-speculation and solidarity dominate the final footprint, indicating a shift in the focus towards the end of the process.

5.4.2 Values and trade-offs in co-design decisions

The findings linked to the 'co-design decisions' and their respective values are illustrated in Table 5.2. From an architectural perspective, the decisions taken in an early design phase - before the more intense co-design process – highlight the relevance given to *community* and *place making*. As the co-design process developed, design trade-offs revolved around the actual needs of the group, and reducing both the building's ecological impact and building costs. The conflicting (in itself) decision of foregoing the underground car parking took a two-year long process to first reach a consensus among the group and then negotiate with the municipality to change the building regulations.

Further design decisions contributed to the emergence of *flexibility* and *graduality* during the process: both private units and collective spaces became more flexible and open, and were delivered unfinished upon moving in (see Figure 5.6) to be finalised over time through self-building or *do-it-yourself* approaches. According to one (future) resident/co-designer, the fact that the kitchens would not be completely

delivered upon moving in represented a cultural shock for some people and required a change of mentality and some time to accept it. In many cases, a 'maturation time' was needed by the residents to accept compromises or readjust the priority given to some collective values, as mentioned by one architect/co-designer. After some burglary attempts during the living period, the more commonly preached values of *flexibility* or *community* became less central and, instantaneously, *privacy* and *physical security* increased their relevance.

Collective decisions taken under the direction of the 'conviviality committee' were mainly around the use of collective services. The initial general focus on collective values shifted to finding a balance between *conviviality* and (individual) *convenience*. The main tensions initially emerged around *self-managed* maintenance and *gender equality* (as cleaning tasks are conventionally linked to women). In the final co-design phase, 'social' decisions acquired a more practical character on specific aspects of the common services and convivial practices. Similarly, tensions moved to more practical decisions around washing machines optimisation and booking times, for example, highlighting the difficulty of changing everyday habits. Nevertheless, for more general design aspects, collective values were prioritised over future dwellers perceptions of (individual) *convenience*.

Finally, additional sources such as general assemblies' minutes also uncovered the work ethic behind the whole co-design process. They mainly highlight the efforts in supporting collective values, namely 'stand for the group values', 'look for the common good', and creating an open, flexible and safe environment for discussion and decision-making, with 'active listening and non-violent communication', 'be open to dialogue', 'be inclusive'. Strategies to optimise the process were also set up, e.g., 'decide just what is necessary right now', 'prevent – not necessary avoid – conflict/tensions', 'do not spend too much time in conflicting situations during general meetings', 'aim at consensus', 'pay attention to constraints on time, money, ability to work, and resources'.

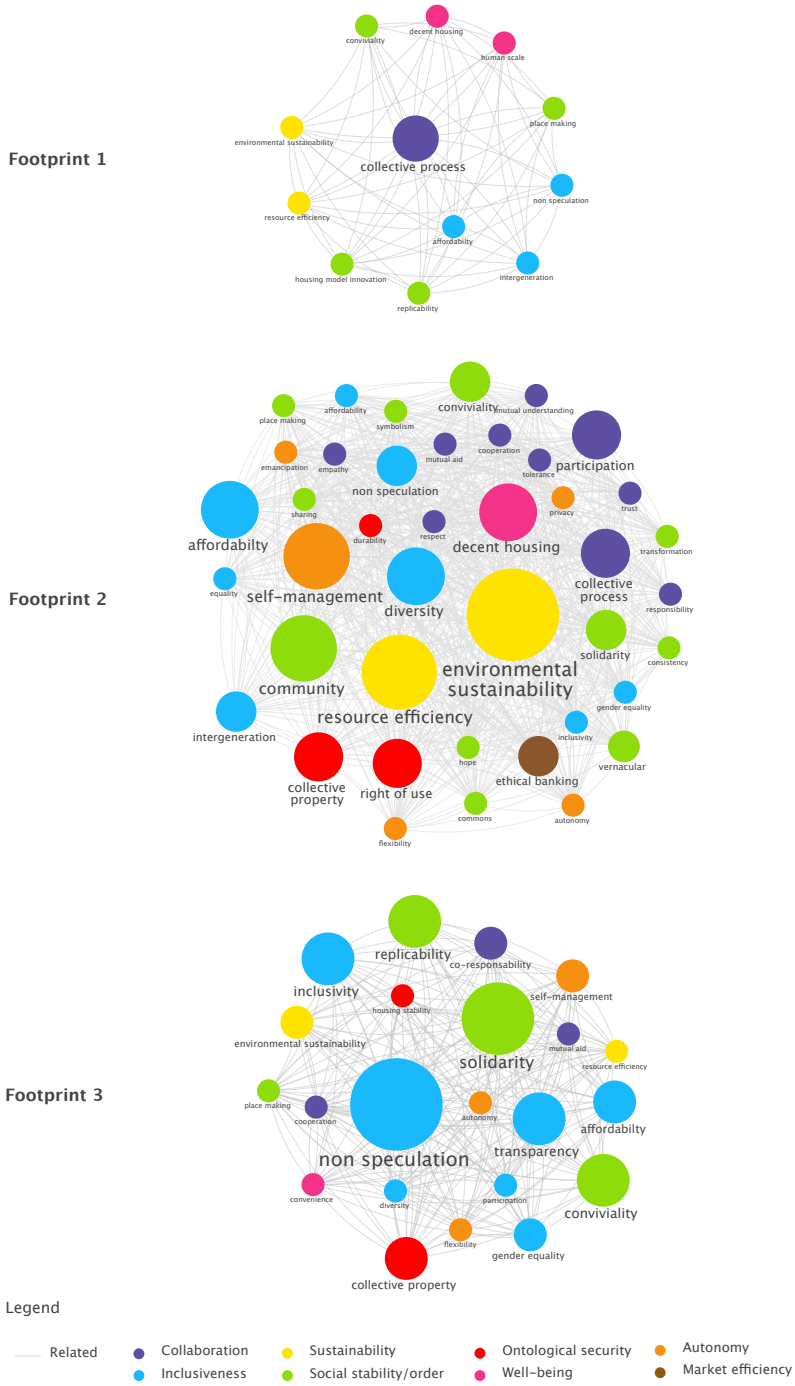


FIG. 5.9 Value footprints of 'value-setting events' 1, 2 and 3 (Source: Authors)

TOC

TABLE 5.2 Values, tensions and trade-offs detected in co-design decisions (Source: Authors)

Co-design decision – 'Design requirement' (listed chronologically)	Values (prioritised, if not equally relevant as values in tension)	Values (in tension)	Design trade-off
collective spaces	*community, conviviality*	*affordability*	minimum living units compensated for the building costs of the collective spaces
vernacular typology 'corrala', with galleries as circulation	*community, conviviality, place making*		
connecting project to the wider neighbourhood	*community, place making*	*privacy, physical security, safety (after moving in and burglary attempts, the priority was given to these values)*	
passive house and high-energy efficiency standards, timber structure	*environmental sustainability*	*affordability*	the use of low-cost materials in the façade, minimum acoustic standards, and minimum finishing allowed a higher initial investment in an energy-efficient and CO2-neutral building
internal (self-managed) cleaning services	*self-management, autonomy*	*long-term maintenance, resource efficiency, gender equality*	*self-management* prevailed in the end under the condition that *gender equality* would be guaranteed
initial common dinners just two days a week and adapted to children and vegetarians	*graduality, flexibility, inclusivity, diversity*		
possibility to take home the common meal	*flexibility, convenience*	*collective process, conviviality*	
shared laundry (equipped with industrial machines)	*sharing, housing model innovation, resource efficiency*	*convenience*	
typified and minimum living units (S, M, L)	*affordability, optimisation*	*flexibility, sense of belonging*	a high degree of space *flexibility* allowed personalisation of typified units
living unit: no partition walls, freedom to place the kitchen, possibility to change unit size (e.g., turn S into M)	*flexibility, self-management, convenience, graduality*		
forego of underground car parking (and individual storage rooms)	*affordability, environmental sustainability, housing model innovation*	*convenience*	
more flexible and open collective spaces	*affordability, optimisation, conviviality, graduality, flexibility*		
electric stoves in all the living units, schedules for window openings	*environmental sustainability, cooperation, housing model innovation*	*convenience, autonomy*	

>>>

TABLE 5.2 Values, tensions and trade-offs detected in co-design decisions (Source: Authors)

Co-design decision – 'Design requirement' (listed chronologically)	Values (prioritised, if not equally relevant as values in tension)	Values (in tension)	Design trade-off
incomplete state of the building (upon moving)	*affordability, graduality*	*convenience*	
self-building approaches / phased construction	*affordability, graduality, participation, cooperation, self-management, sense of belonging*	*resource efficiency*	the energy and time spent by self-builders would be compensated by the first-order values
initial mix of new industrial washing machines and old domestic ones	*graduality, resource efficiency*		
reduced washing machine booking times	*community, housing model innovation, optimisation*	*convenience*	
private provision of goods	*autonomy, convenience*	*resource efficiency*	

5.5 Discussion: value setting in a co-design process

5.5.1 Co-adaptation between values and co-design decisions

How can values be faithfully reflected in the building and internal agreements on how to live together? One thing is to abstractly define sustainability as one of the main project values, and a different thing is to translate it into tangible design features, without interfering with other guiding values. Or, to do so without reaching necessary compromises, which may shake established social or design conventions. Suddenly, residents have to 'accept' the consequences of their worldview in their daily routine. In a way, it confirms the idea that 'values shape or constrain the space of action for future users' (Elsinga et al., 2020, p. 2).

Findings indicate that structural decisions affecting the whole concept of the project ended up reflecting the main pre-set values. The car parking situation, the choice for minimum and flexible spaces and services, or the restriction of some individual actions in favour of the community portray that. Although many decisions were the result of long decision-making processes, 'these processes also generate consciousness', as one interviewed architect had put it, leading to the ultimate prevalence of the mentioned key values.

Conversely, findings also suggest that some co-design decisions may have impacted the relevance given to some pre-established values. For instance, the growing 'size' of *affordability* in the value footprints can be explained by the increasing need of keeping building costs down, which translated into specific design features. *Environmental sustainability* and *resource efficiency* were highly represented in the second footprint, when co-design decisions related to energy-efficiency and sustainable construction were taken. Some of these concrete decisions may also have helped to strengthen the values that concerned the most and make them more explicit, for those more difficult or highly conflicting decision-making moments. This indicates how the co-evolution of values operates as well from the specificity of design detailing to the general establishment of values.

Although other values prevailed over *convenience* in 'architectural co-design decisions', this was not the case for the 'social co-design' ones. This may seem conflicting but in fact it is justified by the different degrees of detailing in the two types of setting events and its order of attendance: architecture matters (and decisions) acquired a more generic character over time, while issues related to collective services and conviviality became more specific and practical. Decisions resulting from situations like the burglary attempts appear to create a 'temporary' hierarchy between values that may not entirely reflect the overall 'value footprint' of the project. These results strengthen existing theories on the dynamic and context-dependent nature of values in a co-design process (Halloran et al., 2009; Gaete Cruz et al., 2022a, 2022b) and illustrate 'how values and the design process co-evolve' (Le Bail et al., 2022, p. 165).

5.5.2 The role of conflict in value setting

Findings show that, on many occasions, *conflict* was useful to promote the debate about the different values at stake and to, ultimately, emphasise the key collective values of the project. This underlines the positive role of conflict in the consolidation of values (Van der Velden & Mörtberg, 2015; Iversen et al., 2010). One key evidence is the decision around the car parking, where co-designers eventually realised that reducing the ecological footprint and the building costs was more important than the advantages of individual convenience.

However, corroborating with Le Bail at al. (2022) who concludes that *time* is necessary to reshape the relevance given to values, this case study has shown that residents required more time than the duration of the co-design meetings to reach some collective compromises. These were mainly related to decisions that would directly and individually affect the daily life of the end-users, from 'small' decisions such as opting for electric instead of gas stoves or the restrictive use of washing machines, to 'bigger' ones namely the car parking or the unfinished state of the building upon moving.

5.5.3 The role of co-design in value setting

In a co-design process of a cohousing project, some values are 'automatically' activated, due to its collective nature. *Community*, *conviviality*, *participation*, *democracy*, are, in principle, *apriori* values of such projects, present in both the 'process' and the 'product'. Our study shows that in most occasions collective-oriented values prevailed over individual values of *convenience* and private *comfort*.

The way the co-design process of *La Borda* was shaped, around *trust*, *participation* and *cooperation*, may indeed have contributed to validate and reinforce project-related values, such as *conviviality*, *community* and *flexibility*. The design process itself set the basis for the collective living outcome, expressed in the building and related social practices (Van der Velden & Mörtberg, 2015). In addition, if values were not collectively discussed and (re)set during the process, they would not be clear enough when hard decisions were to take place, risking other less-relevant values to prevail.

Many CH projects provide alternative ways of living, based on values that frequently clash with social and design conventions (Brysch and Czischke, 2022). This study displays how this clash arose during the co-design, with constant internal and external negotiations to overcome some established preconceptions and satisfy the needs as a group and as individuals. At the same time, it highlights how co-design may contribute to design innovation (Trischler et al., 2018; Antonini, 2021).

5.6 Conclusions

The co-design process in the context of CH is an under-researched topic worth exploring, considering the current systemic housing crisis and the urge to find possible alternatives. A co-designed housing project may represent a more suitable and affordable outcome, since it reflects the specific needs and values of the residents, in contrast with more conventional or mainstream solutions (Brysch & Czischke, 2022). The applied longitudinal case-study approach, which involved access to extensive data, allowed us to examine the co-design process of *La Borda* through different 'value-setting events' and specific 'co-design decisions'.

The analysis unfolds the process in which values were set, evolved and were finally translated into co-design decisions. Findings highlight a mutual adaptation between values and co-design decisions, confirming the co-evolutive and context-dependent nature of values. In addition, the research stressed the role of *conflict* in the process of value (trans)formation, and the role of *time* in the process of acceptance or prioritisation of some values by all the co-designers. The conflicts between values, exposed by tensions between certain co-design features, were either solved by a collective decision of prioritising one value over the other, or by reaching a compromise between them, formalised in a design trade-off. Detected design trade-offs were mainly between individual and collective demands, and between building costs and quality. Findings also suggest that the co-design in itself, guided by specific process-related values such as *participation* helped to reinforce values that are then reflected in the final project.

This case study enhances the power of values and collaboration in design in challenging established standards and social conventions. The identified key co-design decisions reveal their unconventional character compared to mainstream housing where residents are absent during the design process. *La Borda,* as a collective product, resulted in a sustainable building, based on alternative *minimum* quality standards combined with a high degree of flexibility for a gradual upgrading and personalisation, through self-building.

This paper provides empirical evidence that feeds into the body of knowledge on co-design and values from a housing design perspective. Moreover, the proposed analytical framework allows for a systematic assessment that may be useful in further studies focused on values in co-design processes. In this way, it may consolidate similar approaches that focus on the emergence, development and grounding of values in participatory processes (Iversen et al., 2010). Further

research could explore the specific role of professionals participating in the co-design (architects, designers, etc.) in the value setting process, particularly in similar cases where members play both the role of professionals and residents.

References

Agid, S., & Chin, E. (2019). Making and negotiating value: design and collaboration with community led groups. *CoDesign, 15*(1), 75-89.

Andersen, L. B., Danholt, P., Halskov, K., Hansen, N. B., & Lauritsen, P. (2015). Participation as a matter of concern in participatory design. *CoDesign, 11*(3-4), 250-261.

Antonini, M. (2021). An overview of co-design: advantages, challenges and perspectives of users' involvement in the design process. Journal of Design Thinking, 2(1), 45-60.

Brysch, S., & Czischke, D. (2022). Affordability through design: The role of building costs in collaborative housing. Housing studies, 37(10), 1800-1820. doi:10.1080/02673037.2021.2009778

Cabré, E., & Andrés, A. (2018). La Borda: a case study on the implementation of cooperative housing in Catalonia. *International Journal of Housing Policy*, *18*(3), 412-432. doi:10.1080/19491247.2017.1331591

Castro, D. (2021). Argumentation and Persistent Disagreement. Informal Logic, 41(2), 245-280. doi:10.22329/il.v41i2.5580

Czischke, D. (2018). Collaborative housing and housing providers: towards an analytical framework of multi-stakeholder collaboration in housing co-production. *International Journal of Housing Policy, 18*(1), 55-81. doi:10.1080/19491247.2017.1331593

Eden, Colin. "Cognitive mapping". *European Journal of Operational Research* 36, no. 1, (1988): 1–13.

Elsinga, M., Hoekstra, J., Sedighi, M., & Taebi, B. (2020). Toward sustainable and inclusive housing: Underpinning housing policy as design for values. Sustainability, 12(5), 1920, 1-19

Fromm, D. (1991). Collaborative Communities: Cohousing, Central Living, and Other New Forms of Housing With Shared Facilities. New York: Van Nostrand Reinhold.

Gaete Cruz, M., Ersoy, A., Czischke, D., & Van Bueren, E. (2022a). Towards a framework for urban landscape co-design: Linking the participation ladder and the design cycle. *CoDesign*, 1-20. doi: 10.1080/15710882.2022.2123928

Gaete Cruz, M., Ersoy, A., Czischke, D., & van Bueren, E. (2022b). A Framework for Co-Design Processes and Visual Collaborative Methods: An Action Research Through Design in Chile. Urban Planning, 7(3), 363-378.

Garcia i Mateu, Adrià (2016). Designing with transitioning communities—the case of la borda. *EINA Centre, Universitari de Disseny i Art de Barcelona, Barcelona*

Halloran, J., Hornecker, E., Stringer, M., Harris, E., & Fitzpatrick, G. (2009). The value of values: Resourcing co-design of ubiquitous computing. *CoDesign, 5*(4), 245-273.

Iversen, O. S., Halskov, K., & Leong, T. W. (2010, November). Rekindling values in participatory design. In Proceedings of the 11th biennial participatory design conference, Sidney, Australia, 1-10.

Lang, R. (2019). Social sustainability and collaborative housing: Lessons from an international comparative study. In M. Shirazi, & R. Keivani (Eds.), *Urban Social Sustainability* (pp. 193-215). London and New York: Routledge

Lang, R., Carriou, C., & Czischke, D. (2020). Collaborative Housing Research (1990–2017): A Systematic Review and Thematic Analysis of the Field. *Housing, Theory and Society*, 37(1), 10-39.

Larsen, H. (2019). Barcelona: Housing Crisis and Urban Activism. In P. Hagbert, H. Larsen, H. Thörn, & C. Wasshede (Eds.), *Contemporary Co-Housing in Europe, Towards Sustainable Cities?* (pp. 74-94). London and New York: Routledge

Le Bail, C., Baker, M., & Détienne, F. (2022). Values and argumentation in collaborative design. *CoDesign, 18*(2), 165-185. doi:10.1080/15710882.2020.1782437.

Lefebvre, H. (1991). *The_Production_of_Space.* (D. Nicholson-Smith, Trans.). Oxford: Basil Blackwell, Ltd, 1991.

Mattelmäki, T., & Visser, F. S. (2011). "Lost in Co-X." Proceedings of the Conference IASDR2011

McCray, J. W., & Day, S. S. (1977). Housing values, aspirations, and satisfactions as indicators of housing needs. *Home economics research journal, 5*(4), 244-254.

Molnar, S., & Palmås, K. (2022). Dissonance and diplomacy: coordination of conflicting values in urban co-design. CoDesign, 18(4), 416-430. doi: 10.1080/15710882.2021.1968441

Mulliner, E., Smallbone, K., & Maliene, V. (2013). An assessment of sustainable housing affordability using a multiple criteria decision making method. *Omega, 41*(2), 270-279.

Ruiu, M. (2016). Participatory processes in designing cohousing communities: the case of the community project. *Housing and Society, 43*(3), 168-181.

Saldaña, J. (2013). *The coding manual for qualitative researchers (second edition)*. London: Sage.

Sanders, E. B. N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *Co-design, 4*(1), 5-18.

Scheller, D., & Larsen, H. (2019). Urban activism and co-housing. In P. Hagbert, H. Larsen, H. Thörn, & C. Wasshede (Eds.), *Contemporary Co-Housing in Europe, Towards Sustainable Cities?* (pp. 120-139). London and New York: Routledge

Sørvoll, J., & Bengtsson, B. (2020). Mechanisms of solidarity in collaborative housing–The case of co-operative housing in Denmark 1980–2017. *Housing, Theory and Society, 37*(1), 65-81.

Trischler, J., Pervan, S. J., Kelly, S. J., & Scott, D. R. (2018). The value of codesign: The effect of customer involvement in service design teams. *Journal of Service Research, 21*(1), 75-100.

Tummers, L. (2016). The re-emergence of self-managed co-housing in Europe- A critical review of co-housing research. *Urban Studies, 53*(10), 2023-2040. doi:10.1177/0042098015586696

Van de Poel, I. (2013). Translating values into design requirements. In D.P. Michelfelder. N. McCarthy, & D. Goldberg (Eds.), Philosophy and Engineering: Reflections on Practice, Principles and Process (pp. 253-266). Dordrecht: Springer, 2013.

Van der Velden, M., & Mörtberg, C. (2015). Participatory design and design for values. In J. van den Hoven, P. Vermaas, & I. van de Poel (Eds.), *Handbook of ethics, values, and technological design: Sources, theory, values and application domains* (pp. 41-66). Dordrecht: Springer

Vestbro, D. (2010). Saving by Sharing Collective Housing for Sustainable Lifestyles. Second Conference on "Economic Degrowth for Ecological Sustainability and Social Equity", Barcelona

Williams, J. (2005). Designing Neighbourhoods for Social Interaction: The Case of Cohousing. *Journal of Urban Design, 10*(2), 195-227. doi:10.1080/13574800500086998

Appendix 5A

Description of the 'value-setting events' and the pivotal moments where 'co-design decisions' were taken
The first set of 'value-setting events' includes 'La Mangala Cooperativa d'habitatges en cessió d'ús', which outlines key values in the form of objectives in a descriptive document of the project for its evaluation in a general assembly at Can Batlló in 2012. The second set encompasses documents and presentations developed between 2014 and 2015: the official version of La Borda's statutes; a 'first questionnaire' focused on the general representative project values; a 'building imaginary', where members listed general building-related values through pictures; 'architectural project strategies', with programmatic drivers for the building; a poster describing the main values of the cooperative housing model displayed at 'Pis Pilot', an exhibition at the Centre de Cultura Contemporània de Barcelona; and the 'Imaginary of La Borda 1', a document highlighting general 'values' extracted from the first questionnaire, and concrete values of the cooperative model (from poster at 'Pis Pilot'), and a description of the concrete 'housing project and everyday decisions' (Garcia i Mateu, 2016). The final set groups the following data sources created between 2017 and 2018: 'Service design principles'; 'Imaginary of La Borda 2', a revision of the previous one conducted in 2015; and the 'Characteristics of the Model La Xarxa d'Economia Solidària de Catalunya (XES)', a document linked to the wider housing sector and the grant-of-use cooperative housing movement in Catalonia where *La Borda* was a founding member.
The 'co-design decisions' refer to 'architectural' and 'social'. The 'architectural' ones are drawn from architectural documents produced by the 'architecture committee' and interviews carried out in 2017 with one architect/(future) resident of the project, in 2018 with (future) residents, and in 2020 with two architects/residents. The architecture drawings correspond to a 'preliminary study' made before 2014, a 'schematic design' in 2015, and the 'final design' in 2017. The 'social co-design decisions' are identified from textual passages and graphic material from the 'conviviality committee' workshops. Textual input includes a paragraph about the 'Model of conviviality' from the document 'La Mangala' (2012), a questionnaire for an 'Early definition of spaces' (2014), and the 'Model of conviviality 1.0' (2018). The templates used for the 'Definition of common areas' (2014) represent the collected graphic material. Access to the data was granted by *La Borda* (e.g., legal documents), the design cooperative *Holon* (service design material) and the architecture cooperative *Lacol* (architectural drawings).

Appendix 5B

Complete dataset analysis			
Inherent value	Operational value	Entry (in catalan)	
Well-being	decent housing	Garantir l'accés a un habitatge digne i assequible	
Inclusiveness	affordabilty		
Inclusiveness	non speculation	Desmercantilitzar l'habitatge per a evitar-ne usos especulatius	
Inclusiveness	intergeneration	Generar noves formes de convivència comunitària i fomentar la relació intergeneracional	
Social stability/order	conviviality		
Social stability/order	place making	Construir un barri a escala humana	
Well-being	human scale		
Collaboration	collective process	Generar un procés col·lectiu de definició d'un nou model de producció, gestió i tinença de l'habitatge alternatiu a l'existent actualment	
Social stability/order	housing model innovation		
Collaboration	collective process	Tendir a que el treball entre tècnics i usuaris, en el projecte i la realització dels habitatges, sigui de caire igualitari i col·laboratiu	
Replicability	replicability	Esdevenir una alternativa generalitzable en l'àmbit de l'habitatge públic	
Sustainability	resource efficiency	Aprofitar al màxim els recursos existents i reutiltzar-los d'una forma ecològica i sostenible	
Ontological security	collective property	Millorar l'accés a l'habitatge mitjançant un model no especulatiu segons el qual la propietat, la cessió o els drets del sòl i dels immobles recauen en la Cooperativa, mentre que les seves sòcies i socis cooperativistes disposen del dret d'ús indefinit de cadascun dels espais privats i de les parts comunes.	
Inclusiveness	affordabilty		
Ontological security	ethical banking	Eliminar els beneficis purament especulatius i aconseguir de forma preferent finançament ètic i solidari per dur a terme les seves operacions.	
Inclusiveness	non speculation		
Ontological security	right of use	Promoure habitatge digne sense que aquest passi pels circuits convencionals del mercat immobiliari, generant formes de titularitat col·lectiva, posant el focus en l'ús efectiu de l'habitatge.	
Well-being	decent housing		
Autonomy	self-management	Fer les gestions oportunes per a l'obtenció dels recursos necessaris per dur a terme la seva activitat, inclosos els préstecs, subvencions o participacions en el capital, ja sigui per part d'organismes públics com privats, així com les tasques derivades de la seva amortització i cancel·lació.	

	Entry (in english)	Level	Source	Date
	Ensuring access to decent and affordable housing	Norms	Cooperativa d'habitatges en cessió d'ús la Mangala	01/10/2012
	Take homes out of free market to avoid speculative uses	Norms	Cooperativa d'habitatges en cessió d'ús la Mangala	01/10/2012
	Generate new forms of community conviviality and foster intergenerational relationships	Norms	Cooperativa d'habitatges en cessió d'ús la Mangala	01/10/2012
	Build a neighborhood on a human scale	Norms	Cooperativa d'habitatges en cessió d'ús la Mangala	01/10/2012
	Generate a collective process of defining a new model of production, management and ownership of alternative housing to the existing one	Norms	Cooperativa d'habitatges en cessió d'ús la Mangala	01/10/2012
	Tend to a work between technicians and users, in the project and the realisation of the houses, based on a egalitarian and collaborative character	Norms	Cooperativa d'habitatges en cessió d'ús la Mangala	01/10/2012
	Become a generalisable alternative in the field of public housing	Norms	Cooperativa d'habitatges en cessió d'ús la Mangala	01/10/2012
	Make the most of existing resources and reuse them in an ecological and sustainable way	Norms	Cooperativa d'habitatges en cessió d'ús la Mangala	01/10/2012
	Improve access to housing through a non-speculative model according to which the ownership, assignment or rights of land and real estate fall with the Cooperative, while its members have the right of indefinite use of each of the private spaces and the common parts.	Norms	Current version of statutes of La Borda	06/2014
	Eliminate purely speculative profits and preferentially obtain ethical and solidarity financing to carry out their operations	Norms	Current version of statutes of La Borda	06/2014
	Promote decent housing without it going through the conventional circuits of the real estate market, generating forms of collective ownership, focusing on the effective use of housing	Norms	Current version of statutes of La Borda	06/2014
	Make the appropriate arrangements to obtain the resources necessary to carry out its activity, including loans, grants or participations in capital, either by public or private bodies, as well as the tasks arising from its amortisation and cancellation	Norms	Current version of statutes of La Borda	06/2014

>>>

Complete dataset analysis			
Inherent value	Operational value	Entry (in catalan)	
Autonomy	self-management	Dur a terme l'administració i garantir el bon manteniment dels edificis sobre els quals la Cooperativa exerceix la titularitat, així com el cobrament d'amortitzacions, interessos i quotes a les seves sòcies i socis, per la prestació de serveis generals que les edificacions requereixin.	
Ontological security	durability		
Inclusiveness	diversity	Fomentar la diversitat cultural, econòmica i generacional de les diferents persones, i la seva interrelació a través d'espais comuns que permetin desenvolupar activitats lúdiques, comercials o de serveis que enriqueixin la convivència social, respectin el medi ambient i cobreixin mancances de serveis per a la comunitat	
Autonomy	self-management	Fomentar l'autogestió, la participació i la codecisió en el disseny, la construcció, la gestió i el manteniment de l'habitatge, eliminant, en la mesura del possible, costos d'intermediaris i fomentant una implicació activa dels usuaris i usuàries.	
Collaboration	collective process		
Sustainability	environmental sustainability	Donar prioritat a l'aspecte ambiental, econòmicament assolible a través d'habitatges de disseny passiu o de baix consum energètic, amb la generació local, descentralitzada i autogestionada d'energia renovable. I, en el mateix sentit, fomentar durant la vida de l'habitatge l'assoliment de cicles locals i tancats d'energia, aigua i residus.	
Inclusiveness	affordabilty	Atendre les necessitats específiques de determinats col·lectius, com ara la gent gran, amb diversitat funcional o amb necessitats especials, a l'hora de construir o rehabilitar habitatges, podent comprometre un percentatge dels habitatges per ús i gaudi en condicions de dignitat per a persones incloses en aquests col·lectius.	
Well-being	decent housing		
Well-being	decent housing	Proveir o facilitar a les sòcies i socis usuaris aquells serveis o productes que puguin millorar les seves condicions de vida en els diferents estadis de la seva vida dins els habitatges gestionats per la Cooperativa	
Collaboration	respect	Respecte	
Collaboration	tolerance	Tolerància	
Collaboration	empathy	Empatia	
Social stability/order	community	Comunitat	

	Entry (in english)	Level	Source	Date
	Carry out the administration and guarantee the good maintenance of the buildings over which the Cooperative exercises the ownership, as well as the collection of amortisations, interests and quotas to its members, for the provision of general services that the buildings require	Norms	Current version of statutes of La Borda	06/2014
	Foster the cultural, economic and generational diversity of different people, and their interrelationship through common spaces that allow the development of leisure, commercial or service activities that enrich social coexistence, respect the environment and cover lack of services for the community.	Norms	Current version of statutes of La Borda	06/2014
	Encourage self-management, participation and co-decision in the design, construction, management and maintenance of housing, eliminating, as far as possible, the costs of intermediaries and encouraging the active involvement of users			
		Norms	Current version of statutes of La Borda	06/2014
	Give priority to the environmental aspect, economically achievable through homes of passive design or low energy consumption, with the local, decentralised and self-managed generation of renewable energy. And, in the same sense, to encourage the achievement of local and closed cycles of energy, water and waste during the life of the house	Norms	Current version of statutes of La Borda	06/2014
	Address the specific needs of certain groups, such as the elderly, with functional diversity or special needs, when building or rehabilitating housing, and may commit a percentage of housing for use and enjoyment in conditions of dignity for people included in these groups	Norms	Current version of statutes of La Borda	06/2014
	Provide or facilitate to members members those services or products that can improve their living conditions in the different stages of their lives in the homes managed by the Cooperative	Norms	Current version of statutes of La Borda	06/2014
	Respect	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Tolerance	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Empathy	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Community	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014

>>>

Complete dataset analysis			
Inherent value	Operational value	Entry (in catalan)	
Collaboration	mutual aid	Suport	
Social stability/order	solidarity	Solidaritat	
Collaboration	co-responsibility	Co-responsabilitat	
Collaboration	mutual understanding	Comprensió	
Social stability/order	consistency	Coherència	
Social stability/order	hope	Esperança	
Social stability/order	transformation	Transformació	
Autonomy	emancipation	Emancipació	
Inclusiveness	diversity	Diversitat	
Collaboration	cooperation	Cooperar	
Social stability/order	sharing	Compartir	
Social stability/order	conviviality	Conviure	
Social stability/order	commons	Procomú	
Inclusiveness	equality	Equitat	
Collaboration	trust	Confiança	
Sustainability	environmental sustainability		
Sustainability	environmental sustainability		
Social stability/order	vernacular	arquitectura popular	

	Entry (in english)	Level	Source	Date
	Mutual aid	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Solidarity	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Co-responsibility	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Mutual understanding	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Consistency	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Hope	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Transformation	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Emancipation	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Diversity	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Cooperation	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Sharing	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Conviviality	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Commons	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Equality	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
	Trust	Operational values	Conviviality comission first questionnaire (La Borda)	01/09/2014
		Sostenibilitat	environmental sustainability	Operational values
		aigua	water	Design requirements
	popular architecture	Design require-ments	Building imaginary (La Borda)	01/11/2014

>>>

Complete dataset analysis			
Inherent value	Operational value	Entry (in catalan)	
Well-being	decent housing	exterior/balcons	
Social stability/order	community	col.lectiu	
Sustainability	resource efficiency	energia	
Autonomy	privacy	interior/privat	
Well-being	decent housing	materialitat	
Social stability/order	community	patis	
Social stability/order	community	espai transició	
Collaboration	collective process	treball collectiu	
Sustainability	environmental sustainability	reciclatge	
Sustainability	environmental sustainability	vegetació	
Social stability/order	symbolism	simbòlic	
Inclusiveness	inclusivity	animals	
Sustainability	environmental sustainability	edifici passiu	
Collaboration	participation	participació	
Autonomy	flexibility	edifici obert	
Social stability/order	community	construir comunitat	
Social stability/order	place making	construir barri	
Inclusiveness	gender equality	prespectiva de gènere	
Sustainability	resource efficiency	economia de mitjans	
Social stability/order	vernacular	arquitectura popular	
Sustainability	environmental sustainability	vegetació	
Inclusiveness	non speculation	Model no especulatiu d'accés a l'habitatge	

	Entry (in english)	Level	Source	Date
	exterior / balconies	Design requirements	Building imaginary (La Borda)	01/11/2014
	collective	Operational values	Building imaginary (La Borda)	01/11/2014
	energy	Design requirements	Building imaginary (La Borda)	01/11/2014
	interior / private	Design requirements	Building imaginary (La Borda)	01/11/2014
	materiality	Design requirements	Building imaginary (La Borda)	01/11/2014
	Patio	Design requirements	Building imaginary (La Borda)	01/11/2014
	transition space	Design requirements	Building imaginary (La Borda)	01/11/2014
	collective work	Design requirements	Building imaginary (La Borda)	01/11/2014
	recycling	Design requirements	Building imaginary (La Borda)	01/11/2014
	vegetation	Design requirements	Building imaginary (La Borda)	01/11/2014
	symbolic	Design requirements	Building imaginary (La Borda)	01/11/2014
	animals	Design requirements	Building imaginary (La Borda)	01/11/2014
	passive building	Design requirements	Architectural project strategies (La Borda)	01/01/2015
	participation	Operational values	Architectural project strategies (La Borda)	01/01/2015
	open building	Design requirements	Architectural project strategies (La Borda)	01/01/2015
	to build community	Operational values	Architectural project strategies (La Borda)	01/01/2015
	to build neighborhood	Operational values	Architectural project strategies (La Borda)	01/01/2015
	gender perspective	Operational values	Architectural project strategies (La Borda)	01/01/2015
	economy of resources	Operational values	Architectural project strategies (La Borda)	01/01/2015
	popular architecture	Design requirements	Architectural project strategies (La Borda)	01/01/2015
	vegetation	Design requirements	Architectural project strategies (La Borda)	01/01/2015
	Non-speculative model of access to housing	Operational values	Pis Pilot exhibition (La Borda)	01/06/2015

>>>

Complete dataset analysis			
Inherent value	Operational value	Entry (in catalan)	
Ontological security	collective property	Propietat col·lectiva	
Ontological security	right of use	Dret d'ús sobre un dels habitatges	
Inclusiveness	affordabilty	Quota assequible	
Autonomy	self-promotion	Autopromoció	
Collaboration	collective process	Disseny col·lectiu	
Autonomy	self-management	Vida comunitaria i optimització de recursos a través d'autogestió i serveis comuns	
Sustainability	resource efficiency		
Social stability/order	conviviality		
Inclusiveness	intergeneration	Comunitat intergeneracional i diversa socioeconòmicament	
Inclusiveness	solidarity	Projecte dins l'economia social i solidaria	
Market efficiency	ethical banking	Finançament a través de Banca Ètica.	
Inclusiveness	non speculation	Model no especulatiu d'accés a l'habitatge	
Ontological security	collective property	Propietat col·lectiva	
Ontological security	right of use	Dret d'ús sobre un dels habitatges	
Inclusiveness	affordability	Quota assequible	
Autonomy	autonomy	Autogestió i autopromoció	
Collaboration	collective process	Disseny col·lectiu	
Social stability/order	conviviality	Vida comunitaria i serveis comuns	
Sustainability	resource efficiency	Optimització de recursos i sostenibilitat	
Inclusiveness	intergeneration	Comunitat intergeneracional i diversa socioeconòmicament	
Inclusiveness	solidarity	Projecte dins l'economia social i solidaria	
Autonomy	ethical banking	Finançament a través de Banca Ètica.	
Well-being	convenience	Intuitiu (De fàcil navegació, visible quan és necessari)	
Social stability/order	conviviality	Vida comunitaria (Promoure la socialització de qualitat)	
Inclusiveness	inclusivity	Disseny per totes (prespectiva de gènere, inclusió)	
Sustainability	environmental sustainability	Hàbits sostenibles (Centrat en les pràctiques diàries)	
Sustainability	resource efficiency	Economia de recursos	
Autonomy	flexibility	Servei viu (Estructures sensibles i com a base de dinàmiques emergents)	
Replicability	replicability	Replicabilitat del model	

	Entry (in english)	Level	Source	Date
	Collective ownership	Operational values	Pis Pilot exhibition (La Borda)	01/06/2015
	Right of use over one of the houses	Operational values	Pis Pilot exhibition (La Borda)	01/06/2015
	Affordable fee	Norms	Pis Pilot exhibition (La Borda)	01/06/2015
	Self-promotion	Norms	Pis Pilot exhibition (La Borda)	01/06/2015
	Collective design	Norms	Pis Pilot exhibition (La Borda)	01/06/2015
	Community life and optimisation of resources through self-management and common services	Norms	Pis Pilot exhibition (La Borda)	01/06/2015
	Intergenerational and socioeconomically diverse community	Norms	Pis Pilot exhibition (La Borda)	01/06/2015
	Project within the social and solidarity economy	Norms	Pis Pilot exhibition (La Borda)	01/06/2015
	Financing through Ethical Banking	Norms	Pis Pilot exhibition (La Borda)	01/06/2015
	Non-speculative model of access to housing	Norms	Imaginary of La Borda (La Borda)	01/07/2015
	Collective ownership	Norms	Imaginary of La Borda (La Borda)	01/07/2015
	Right of use over one of the houses	Norms	Imaginary of La Borda (La Borda)	01/07/2015
	Affordable fee	Norms	Imaginary of La Borda (La Borda)	01/07/2015
	Self-management and self-promotion	Norms	Imaginary of La Borda (La Borda)	01/07/2015
	Collective design	Norms	Imaginary of La Borda (La Borda)	01/07/2015
	Community life and common services	Norms	Imaginary of La Borda (La Borda)	01/07/2015
	Resource optimisation and sustainability	Operational values / Norms	Imaginary of La Borda (La Borda)	01/07/2015
	Intergenerational and socioeconomically diverse community	Norms	Imaginary of La Borda (La Borda)	01/07/2015
	Project within the social and solidarity economy	Norms	Imaginary of La Borda (La Borda)	01/07/2015
	Financing through Ethical Banking.	Norms	Imaginary of La Borda (La Borda)	01/07/2015
	Intuitive (Easy to navigate, visible when needed)	Norms	Service principles (La Borda)	01/11/2017
	Community life (Promoting quality socialisation)	Operational values / Norms	Service principles (La Borda)	01/11/2017
	Design for all (gender perspective, inclusion)	Operational values / Norms	Service principles (La Borda)	01/11/2017
	Sustainable habits (Focused on everyday practices)	Operational values / Norms	Service principles (La Borda)	01/11/2017
	Economy of resources	Operational values / Norms	Service principles (La Borda)	01/11/2017
	Alive service (Sensitive structures and as a basis for emerging dynamics)	Norms	Service principles (La Borda)	01/11/2017
	Replicability of the model	Operational values	Imaginary of La Borda (La Borda)	01/11/2017

>>>

Complete dataset analysis			
Inherent value	Operational value	Entry (in catalan)	
Ontological security	collective property	No lucre i propietat col·lectiva	
Inclusiveness	non speculation		
Ontological security	housing stability	Es manté la propietat col·lectiva al llarg del temps, de durada indefinida.	
Autonomy	collective property		
Inclusiveness	non speculation	Cooperatives sense ànim de lucre.	
Inclusiveness	non speculation	No hi ha recuperació de la quota d'ús	
Inclusiveness	non speculation	Limitar el capital social retornable respecte el total de la inversió.	
Ontological security	collective property	Finançament col·lectiu	
Inclusiveness	inclusivity	No heretabilitat del dret d'ús, exceptuant situacions de convivència prèvia.	
Inclusiveness	non speculation	Es promou un ús social dels locals i no se'n permet especulació.	
Inclusiveness	non speculation	Es fomenta que les sòcies donin ús social a altres immobles que puguin tenir, i no se'n permet l'especulació	
Inclusiveness	non speculation	Evitar elements d'individualització (no divisió horitzontal...)	
Social stability/order	conviviality	Autogestió i comunitat	
Autonomy	self-management		
Inclusiveness	participation	Totes les persones habitants són sòcies.	
Autonomy	self-management	Responsabilitat i projecte liderat per les persones sòcies habitants, de forma voluntària	
Autonomy	autonomy	Esforç en l'apoderament i formació de les sòcies	
Collaboration	mutual aid	Intenció de vida comunitària, mínim de suport mutu	
Social stability/order	conviviality		
Inclusiveness	transparency	Transparència cap a l'entorn.	
Social stability/order	conviviality	Incorporació d'espais comunitaris i altres recursos compartits	
Inclusiveness	affordabilty	Habitatge assequible i inclusiu	
Inclusiveness	non speculation	Traspàs de l'ús de l'habitatge a través de la cooperativa.	
Inclusiveness	transparency	Criteris d'accés transparents	
Inclusiveness	affordabilty	Es manté l'assequibilitat al llarg del temps.	
Inclusiveness	affordabilty	Limitar l'aportació inicial per facilitar l'accessibilitat.	
Inclusiveness	inclusivity	Inclusiu i divers (gènere, diversitat funcional, orígens, tipologies d'UEC's...)	

	Entry (in english)	Level	Source	Date
	Non-profit and collective ownership	Norms	Characteristics of the Model (XES)	01/11/2018
	Collective ownership is maintained over time, of indefinite duration.	Norms	Characteristics of the Model (XES)	01/11/2018
	Non-profit cooperatives.	Norms	Characteristics of the Model (XES)	01/11/2018
	There is no recovery of usage fee	Norms	Characteristics of the Model (XES)	01/11/2018
	Limit the returnable share capital with respect to the total investment.	Norms	Characteristics of the Model (XES)	01/11/2018
	Collective financing	Norms	Characteristics of the Model (XES)	01/11/2018
	Non-heritability of the right of use, except in situations of previous cohabitation.	Norms	Characteristics of the Model (XES)	01/11/2018
	Social use of the premises is promoted and no speculation is allowed.	Norms	Characteristics of the Model (XES)	01/11/2018
	Members are encouraged to give social use to other properties they may have, and speculation is not allowed.	Norms	Characteristics of the Model (XES)	01/11/2018
	Avoid elements of individualisation (not horizontal division ...)	Norms	Characteristics of the Model (XES)	01/11/2018
	Self-management and community	Operational values	Characteristics of the Model (XES)	01/11/2018
	All the inhabitants are members.	Norms	Characteristics of the Model (XES)	01/11/2018
	Responsibility and project led by resident members, on a voluntary basis	Norms	Characteristics of the Model (XES)	01/11/2018
	Effort in empowering and training members	Norms	Characteristics of the Model (XES)	01/11/2018
	Intention of community life, minimum of mutual support	Norms	Characteristics of the Model (XES)	01/11/2018
	Transparency towards society	Operational values	Characteristics of the Model (XES)	01/11/2018
	Incorporation of community spaces and other shared resources	Norms	Characteristics of the Model (XES)	01/11/2018
	Affordable and inclusive housing	Operational values	Characteristics of the Model (XES)	01/11/2018
	Transfer of the use of the house through the cooperative.	Norms	Characteristics of the Model (XES)	01/11/2018
	Transparent access criteria	Operational values / Norms	Characteristics of the Model (XES)	01/11/2018
	Affordability is maintained over time.	Operational values / Norms	Characteristics of the Model (XES)	01/11/2018
	Limit the initial contribution to facilitate accessibility.	Norms	Characteristics of the Model (XES)	01/11/2018
	Inclusive and diverse (gender, functional diversity, origins, types of UEC's...)	Operational values / Norms	Characteristics of the Model (XES)	01/11/2018

>>>

Complete dataset analysis			
Inherent value	Operational value	Entry (in catalan)	
Social stability/order	solidarity	Mecanismes de suport mutu en l'àmbit econòmic (despesa inicial, quotes...).	
Replicability	replicability	Creixement i replicabilitat del model	
Inclusiveness	transparency	Es comparteixen els coneixements amb el sector i a l'entorn.	
Replicability	replicability	Accions per fomentar i difondre el model.	
Replicability	replicability	Fons col·lectiu per fomentar el model i nous projectes (o a nivell d'entitat/projecte o a nivell de sectorial)	
Collaboration	co-responsability	Corresponsabilitat amb l'entorn i dret a l'habitatge	
Inclusiveness	solidarity		
Inclusiveness	solidarity	Ser membres de la Xarxa d'Economia Solidària.	
Social stability/order	place making	Intencionalitat de corresponsabilitat amb l'entorn i vinculació al territori	
Collaboration	co-responsability		
Inclusiveness	solidarity		
Inclusiveness	solidarity	Implicació en la lluita pel dret a l'habitatge.	
Inclusiveness	transparency	Fer Balanç social de la XES	
Collaboration	cooperation	Intercooperació i fomentar el mercat social	
Inclusiveness	solidarity		
Sustainability	environmental sustainability	Aposta per la sostenibilitat mediambiental	

Source: Authors

	Entry (in english)	Level	Source	Date
	Mutual support mechanisms in the economic field (initial expenditure, fees, etc).	Operational values / Norms	Characteristics of the Model (XES)	01/11/2018
	Growth and replicability of the model	Operational values	Characteristics of the Model (XES)	01/11/2018
	Knowledge is shared with the industry and society	Norms	Characteristics of the Model (XES)	01/11/2018
	Actions to promote and disseminate the model.	Norms	Characteristics of the Model (XES)	01/11/2018
	Collective fund to promote the model and new projects (either at entity / project level or at sector level)	Norms	Characteristics of the Model (XES)	01/11/2018
	Co-responsibility with the society and the right to housing	Operational values	Characteristics of the Model (XES)	01/11/2018
	Be a member of the Solidarity Economy Network.	Norms	Characteristics of the Model (XES)	01/11/2018
	Intentionality of co-responsibility with the society and connection to the territory	Norms	Characteristics of the Model (XES)	01/11/2018
	Involvement in the fight for the right to housing.	Norms	Characteristics of the Model (XES)	01/11/2018
	Do the Social Reporting of La XES	Norms	Characteristics of the Model (XES)	01/11/2018
	Intercooperation and promotion of the social market	Operational values / Norms	Characteristics of the Model (XES)	01/11/2018
	Commitment to environmental sustainability	Operational values / Norms	Characteristics of the Model (XES)	01/11/2018

6 Conclusion

At the beginning of this PhD journey, I set myself the challenge to observe and test the synergies between the concepts 'housing', 'affordability', 'design', and 'collaboration' as a response to the current affordable housing crisis (see Figure 1.1 in the Introduction section). While the relation between 'housing', 'affordability', and 'design' had already been explored at the beginning of the 20th century, under the name of *Existenzminimum,* there were no robust literature and studies including collaboration in this effort of providing affordable housing through design.

This thesis started from the premise that co-design processes applied in collaborative housing may reduce building costs, thereby making these housing projects not only affordable, but even more affordable than mainstream housing. Affordability was assessed at a project-level and from the perspective of design and building costs. 'To what extent and how do the design criteria used in European collaborative housing contribute to affordability?', was the main research question guiding the thesis. A case-study approach was adopted, geographically scoping European urban centres. The research focused on the design factors that influence building costs related to the design outcome (product) and the design process in collaborative housing projects. To complement the empirical case studies, a building costs simulation was carried out to test the extent to which collaborative housing design solutions contribute to affordability in comparison to affordable mainstream housing, based on conventional design criteria.

In this final chapter, the key findings of the four studies are summarised (section 6.1), which together provide an answer to our main research question. In addition, it provides as well a practical deliverable, namely a compilation of principles to apply in the design of affordable collaborative housing projects (section 6.2). Section 6.3 refers to the implications of this research, from an academic and a practical perspective.

6.1 Summary of key findings

This research has shown that co-design processes used in collaborative housing can *de facto* contribute to reducing building costs when affordability is a key value. Moreover, findings show that collaborative housing may become more affordable to build than mainstream affordable housing, provided a specific set of co-design decisions is taken. These decisions are mainly linked to a collective redefinition of minimum and quality standards, efficient private-common ratios, and self-organisation of building tasks, as a result of a co-design process and design trade-offs. The following sub-sections describe the findings of each of the conducted studies.

6.1.1 What design criteria are used in current housing to increase affordability? [Chapter 2]

Based on the original concept of *Existenzminimum*, of which the purpose was to provide affordable housing through design, a review of current architectural design solutions was conducted to provide an overview of the general design criteria currently used in innovative housing considered affordable. First, it revisited the principles behind the original *Existenzminimum*, framed in three main design dimensions: technical, spatial and social. Second, it uncovered key features of contemporary affordable housing, in order to grasp the understanding of *Existenzminimum* today.

Findings were that, from a technical point of view, environmental sustainability and alternative construction methods (e.g., DIY and self-building approaches) and 'customised' prefabrication describe current affordable housing solutions. The spatial dimension is today very much focused on flexibility, temporary solutions and shared living arrangements. Many housing projects currently consist of small housing dwellings complemented with shared spaces, which contributes to the reinterpretation of minimum standards and the definition of alternative layouts. At the same time this enriches the social dimension, together with the fact that projects are increasingly involving the residents in the design and construction process through participatory and co-design processes. All of this suggests a more flexible, participative and environmentally-friendly understanding of *Existenzminimum,* without corrupting its initial intention. In its turn, this new *Existenzminimum* resonates with collaborative housing forms, indicating that shared living and collaborative design processes contribute to achieving more affordable housing.

6.1.2 What design criteria are used in collaborative housing to increase affordability? [Chapter 3]

To fill the knowledge gap of the role of the (co-)design to increase the affordability of housing projects, a case study research was conducted – encompassing 16 collaborative housing projects recently built in Europe – to identify the design criteria used to reduce building costs. This second study consolidated and enriched the initial analysis (Chapter 2) through a literature review on building costs, participation, and self-organisation in housing. The resulting analytical framework distinguishes six product- and process-related factors that might influence building costs in collaborative housing, namely minimum standards, housing typology, construction approach, organisational structure, participation and decision-making, and time.

Findings uncovered the economic benefits of co-design and self-organisation in housing provision. They indicate that strategic design decisions and trade-offs, together with self-organised activities aiming to reduce building costs indeed contribute to increase the affordability of the project. Some product-related criteria include the definition of a 'common concept', use of standardised construction, spaces that reflect the exact needs and demands of the residents, smaller, less-equipped and unfinished private units combined with collective spaces, and high energy-efficiency standards which ultimately lead to long-term savings. From a process point of view, the high level of participation in the design phase through a structured and time-efficient process, and specific voluntary tasks together with a strategic (un)involvement of professionals were identified as criteria that positively impacted affordability. The results of this study reinforce the theory that *product* and *process* are inseparable dimensions of a whole, considering that building costs are dependent not only on the final physical outcome but also on the way the design process is collectively organised and managed.

6.1.3 To what extent and how do co-design decisions influence building costs in housing when compared to mainstream affordable housing design? [Chapter 4]

After identifying how co-design decisions may influence affordability, the next question was about the extent to which they actually contribute to reducing building costs. This required a comparative study between the building costs of collaborative housing and mainstream housing that is considered affordable. To this end, a building costs simulation was applied to compare these two different models, based on their design choices. For both models, the same typology, volume and

configuration, circulation surface areas, and the construction and finishing standards were considered. They differ mainly in terms of space and quality standards. This means that for the collaborative housing option, the model simulated smaller private units and larger common spaces than mainstream housing, with the possibility to increase the construction quality. In addition, the model included the option of self-building approaches, commonly used in collaborative housing. However, other co-design decisions, which are project-specific and dependent on the particular needs of the residents, were disregarded in the model, due to the abstract nature of the simulation.

In this exercise, collaborative housing ends up providing more units that are smaller and cost less, while it includes larger common spaces and extra quality. These results demonstrate that building costs per unit are lower in collaborative housing when compared to mainstream housing. More generally, the study concludes that collaborative housing can be considered more affordable and more space-efficient than mainstream housing, refuting in this way existing claims about the unaffordability of collaborative housing design solutions. This is because collaborative housing may combine 'mainstream' design criteria used to reduce building costs with specific co-design decisions and trade-offs that are only possible to be made thanks to collaboration and active involvement of the (future) residents.

6.1.4 How does the co-design process unfold in the face of diverse values amongst (future) residents? [Chapter 5]

The last study mainly deconstructed the process of value(s) creation during the co-design of a housing project. The aim was to provide a better understanding of the nature of housing values in the context of collaborative housing, and the influence of a co-design process in formulating and materialising these values. More specifically, it aimed to assess how affordability coexists with other (conflicting) values in a collaborative housing project and what kind of trade-offs are made. Through a longitudinal single case-study approach, this study traced back the co-design process of the resident-led cohousing cooperative *La Borda,* in Barcelona. It did so by applying an analytical framework to identify the prevailing values that guided the housing project and to assess how and why they were set and adapted overtime. This framework allowed to translate design requirements into values (and the other way around) – often including collective compromises – but also to visualise the relevance given to certain values at a certain point in the process.

Detected design trade-offs during the co-design process were mainly between individual and collective demands, and between building costs and quality. The analysis also uncovered a mutual adaptation between pre-set values and co-design decisions, confirming the co-evolutive and context-dependent nature of values. Moreover, this study stresses the roles of *conflict* and *time* in the process of value (trans)formation, and indicates that the co-design in itself, guided by specific process-related values such as participation, helped to reinforce project-related values reflected in the final housing design.

6.2 Defining principles for the co-design of affordable collaborative housing

As a result of this research, a number of design principles were derived that can guide future affordable collaborative housing developments, from a product and process perspective. This set of principles combines the generally applicable principles to reduce building costs in multi-family mainstream housing with co-design specific ones that can add to this effort, taking advantage of the involvement of the residents in the process. These costs correspond to those incurred during the design and construction process (including process-related fees).

These principles aim to provide general guidelines for the design process for future co-designers who aim to realise an affordable collaborative housing project. They are collaborative by nature, simultaneously targeting groups of residents willing to develop a collaborative project and act as co-designers, and involved architects who are willing to act as co-designers as well. Rather than proposing principles to promote the autonomy of resident groups, the aim is to foster collaboration between these two parties. They should not be understood as a one-size-fits-all solution. In addition, while the geographical scope of the research was restricted to Europe the principles are meant to be adaptable and applicable to different contexts. Figure 6.1 displays the proposed design principles and the synergies between them. The following paragraphs describe these more in detail and provide concrete examples of their application.

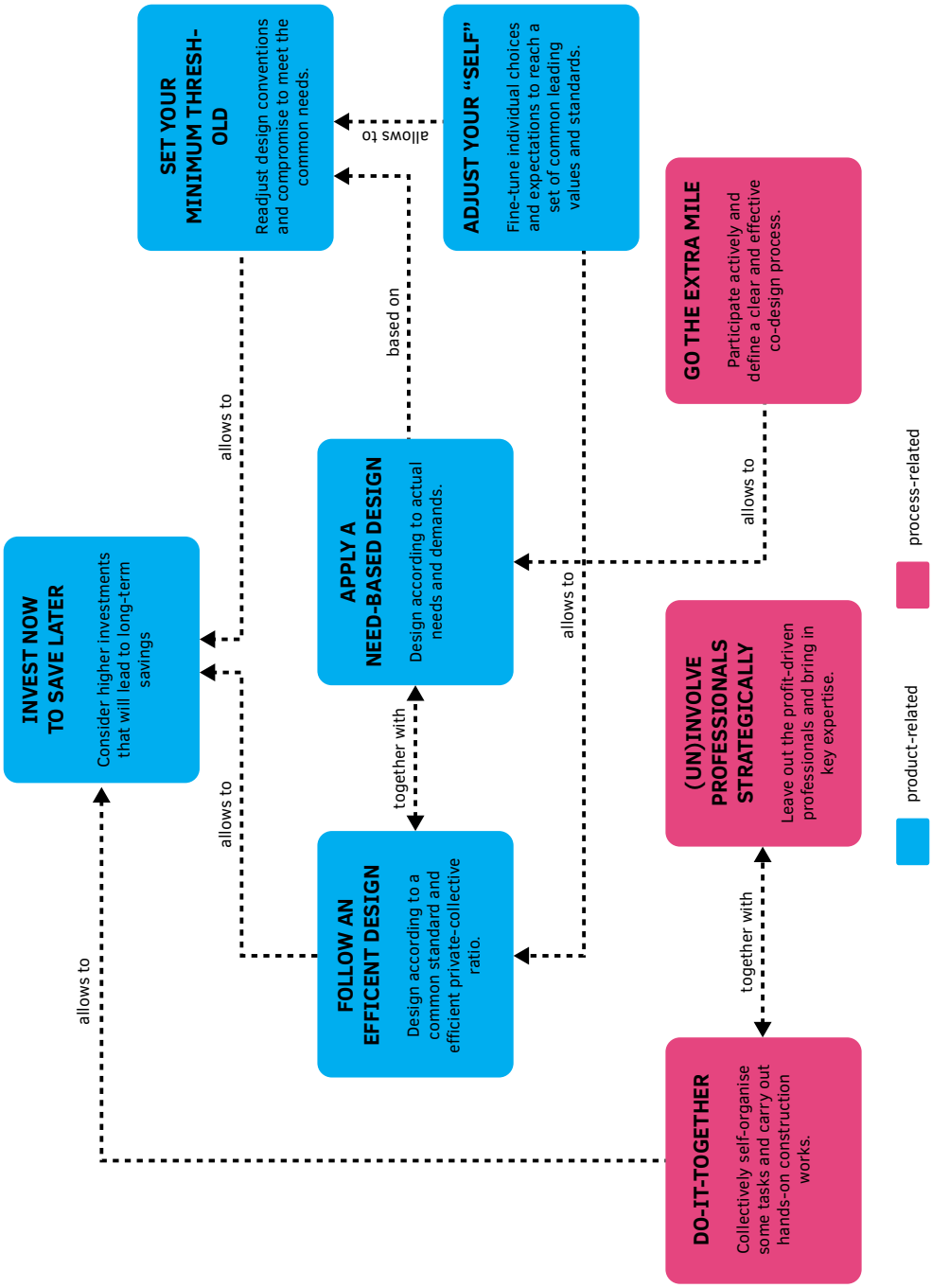


FIG. 6.1 The proposed design principles and synergies between them (Source: Author)

TOC

6.2.1 Adjust your "self"

Fine-tune individual choices and expectations to reach a set of common values and standards that will lead the housing project

Affordability never comes alone, other (often conflicting) values are also at play in the design of a collaborative housing project. This requires some design trade-offs and compromises. A clear common view is useful when conflict arises among the group of co-designers. A two-fold design strategy may here be applied here, from the common to the private: first, the common features (or standards) and the programme of the shared spaces. Then, since many of the facilities are no longer necessary inside the private units, the focus goes to the layout of the individual spaces. This avoids unnecessary construction, both in private and collective spaces (link to principle 'Apply a need-based design'), and prevents high levels of customisation of the private units, allowing co-designers to 'Follow an efficient design'.

Examples: common grid for the building's structure, common standard system. (See Figures 2.12, 3.3, 5.3, and 5.6.)

6.2.2 Set your minimum threshold

Readjust design conventions and compromise to meet the common needs

Co-designers are able to decide on what is essential (link to principle 'Apply a need-based design') through a process of (re)defining their notions of *minimum standards* and *quality*. Establishing a minimum threshold does not mean that all the design decisions are set for the bare minimum. Higher standards may be collectively defined, when co-designers 'Adjust their selves' in order to improve the building performance and long-term savings (creating a link to 'Invest now to save later'). The resulting collective minimum threshold is also the result of some design trade-offs, i.e., reduce here to gain there. Some collective decisions aiming to achieve an 'alternative' minimum may require a creative interpretation, or legal reformulation, of the prevailing building regulations.

Examples: smaller, less-equipped private units (if combined with collective spaces), forego of car parking or private laundry space, unfinished state of spaces upon moving, minimum finishing levels, high energy-efficiency and environmentally-friendly standards. (See Figures 2.13, 2.14, 2.15, 3.3, Appendix 4A, 5,3, 5.4, 5.5, and 5.6.)

6.2.3 Apply a need-based design

Design according to the actual needs and demands

Taking into account the exact needs and requirements may avoid the over-sizing of rooms or redundant construction that lead to unused spaces. The application of this principle is highly related to 'Set your minimum threshold'. While some specific domestic functions may be collectivised in order to optimise the surface of private areas, other spaces typically used in mainstream housing may be excluded in collaborative housing. In addition, considering a certain flexibility in some spaces also allows for eventual adaptation over time (short and long term), when residents' needs change or new residents move in. This helps to guarantee that the housing keeps responding to the residents' needs over time.

Examples: right-sized private units (if combined with collective spaces), shared laundries, guest units, spatial flexibility to allow different uses and spatial configurations over time, exclusion of car parking or private laundry space if not required. (See Figures 2.14, 2.15, 2.16, 3.3, Appendix 4A, 5.3, 5.6, and 5.7.)

6.2.4 Follow an efficient design

Design according to a common standard and efficient private-collective ratio

This principle is applicable (and applied) to housing in general. However, the design of collaborative housing differs from mainstream housing, as it involves direct input from residents and community-oriented layouts. This carries the risks of high customisation levels and higher costs due to the 'extra' construction of common spaces. Collaborative housing aiming to achieve affordable building costs should be based on this principle, which can be achieved after adjusting individual expectations and by collectively defining a common concept for the project. Moreover, in affordable collaborative housing, an efficient ratio between private and collective is necessary, so collective spaces are not considered an additional financial burden. Some design choices based on this principle, while reducing building costs, may also allow for specific upfront investments to improve the quality and performance of the building ('Invest now to save later').

Examples: standard construction, prefabricated building components, definition of private unit types, multi-storey buildings, smaller private units to compensate for the larger common spaces. (See Figures 2.12, and 2.15.)

6.2.5 Invest now to save later

Consider higher investments that will lead to long-term savings

By considering higher upfront costs, future residents are able to invest in better quality materials and higher energy efficiency standards. This can be compensated in the long run, as it will lead to low maintenance or repair/replacement levels and low energy consumption costs. This upfront investment may be possible thanks to compromises and trade-offs made in the application of other principles to reduce building costs, namely when co-designers set their minimum threshold, apply efficient design strategies and actively carry out some voluntary tasks. If this initial higher investment is not possible, phased construction and incremental housing approaches could be considered in the project design to guarantee the necessary conditions for the future investment or improvement. Some of these future building tasks may be carried out by the residents over time, through 'Do-it-together' approaches.

Examples: high quality and low maintenance materials, high-energy efficiency measures, roof prepared to accommodate solar panels in the future, available space for future expansion. (See Figures 5.6, and 5.7.)

6.2.6 Go the extra mile

Participate actively and define a clear and effective co-design process

Higher levels of resident participation in the design phase can contribute to a more 'need-based design'. However, from a process perspective, this requires more time and resources from the residents and supporting professionals than mainstream housing. Also, there is a higher risk of conflicts, due to the collective nature of decision-making. Therefore, a clear and time-efficient process with effective co-design tools is required to optimise the process and avoid group fatigue and excessive use of resources. Effective tools refer to co-design practices that are accessible to people not used to the design *language* and that provide useful input for the professional to translate it into an architectural blueprint.

Examples: limited number of co-design workshops, creation of a design working group (with only a few members of the overall group), application of user-friendly co-design tools, such as mind maps, collages, and story-telling. (See Figures 2.19, and 2.20.)

6.2.7 Do-it-Together

Self-organise some tasks and carry out hands-on construction works

Adopting a phased construction approach and allowing the unfinished state of some spaces upon moving, to be completed over time by the residents. This can be done through self-building and Do-it-Yourself and Do-it-Together approaches, contributing to keeping costs under control. At the expense of residents' time and resources, this is achieved by reducing the initial investment, saving on labour costs and collectively purchasing the materials.

Examples: small electricity works, finishing, painting, setting up the shared yard, coordination and support tasks (for instance cooking for self-builders). (See Figures 5.5, and 5.6.)

6.2.8 (Un)involve professionals strategically

Leave out profit-driven professionals and focus on key expertise

A co-design process of a collectively self-organised housing project is different from a conventional housing design process. In such a setting, residents may voluntarily assume some of the tasks usually carried out by professionals, such as some construction and administrative works (link to 'To-it-together'). Profit-driven professionals may be left out of the process; the absence of their profit margins translates into savings for the residents. The choice of self-organising certain tasks and uninvolving certain professionals need to be carefully taken to avoid unexpected mistakes or costs. Some expertise may be necessary for an effective process and group management, namely group mediators or facilitators.

Examples: excluding of developers, managers, and real estate agents from the process, hiring of a group facilitator, voluntary tasks by the residents. (See Figures 2.19, and 2.20.)

6.3 Research contribution

6.3.1 Implications for policy: Towards a new Existenzminimum

This research has shown that values often disregarded in affordable housing designs, since the conception of *Existenzminimum*, are again explored in collaborative housing projects (Chapters 2 and 3). Future residents, through co-design, can decide on what is essential in their project and what is redundant and can be left out, by re-defining their notions of *minimum standards* and *quality* (Chapter 3). This is done through a constant negotiation process and trade-offs among the group and between residents and external entities and stakeholders (Chapter 5). Co-designers in collaborative housing can overcome some established building norms, and satisfy the specific needs of the residents, as a group and as individuals (Chapter 3, 4 and 5). Thus, collaborative housing offers more need-based solutions, programmatically flexible and better adapted to the recent *Wohnkultur*. Also, this research has shown that, similarly to what happened to the original Existenzminimum, the risks of taking advantage of minimum design solutions to increase the developer's profit are high. Some commercial co-living developments are an example of this.

Considering the above, this research draws attention to the general outdated status of the current building regulations and space and quality standards in Europe – and more specifically, the European Union – which often hampers design innovation and experimentation to adapt to the needs of the contemporary dweller. The conducted studies highlight the fact that many collaborative housing projects are based on values that frequently clash with social and design conventions and emphasise the need for a review and adjustment of the current building regulations. This is necessary not only to better accommodate innovative and alternative housing solutions, but also to prevent the same solutions from falling below the minimum quality standards. The increasing tendency to standardise the housing production within the European Union, through the implementation of EU-directives such as energy efficiency and accessibility standards, further justifies this need of regulations' revision.

Therefore, on the one hand, a regulatory update is required to make sure that the (also emergent) profit-driven minimum and collective housing, namely commercial co-living, are correctly applying the minimum standards. On the other hand, regulatory readjustment should also consider a certain flexibility to accommodate

alternative and collaborative design and construction processes. This can include guidelines for groups that aim to co-design and collectively self-build their housing project. Current housing solutions should also be tested against socially acceptable minimum standards. This means that collaborative solutions employing updated principles of the Existenzminimum can offer room to include other quality aspects, beyond minimum regulatory standards, without hampering affordability.

6.3.2 Scientific contribution

This thesis contributes to filling two knowledge gaps. First, more broadly, it highlights the understated role of architectural design and building costs as key components in the study and provision of affordable housing. It does so by focusing on the project-level and by revisiting the concept of *Existenzminimum* in contemporary housing design solutions (Chapter 2), including collaborative housing forms. In this way, it complements the recent research strand that seeks to broaden the concept of affordable housing by including other values beyond the economic (Mulliner, Smallbone, & Maliene, 2013) and by encompassing both low- and middle-income households as target groups (Czischke & van Bortel, 2018). Ultimately, it contributes to the body of knowledge on the general design criteria for affordable housing, linking design choices and building costs (Chapter 3 and 4).

Second, more specifically, it complements the existing research on affordable collaborative housing, which is mainly focused on how alternative ownership models and self-organisation may contribute to increase affordability (Aernouts & Ryckewaert, 2017; Archer, 2022; Cabré & Andrés, 2018; Chatterton, 2013; Engelsman, Rowe, & Southern, 2018). It brings the design dimension to the fore again (Chapter 2) and explores the potential of co-design in influencing the affordability by reducing building costs (Chapter 3 and 4). Moreover, it deepens the understanding of the complexity of co-design processes in the specific field of housing design, which is still an under-researched topic within co-design studies (Chapter 5).

From a methodological point of view, a different kind of contribution is the development of analytical frameworks to assess the design of collaborative housing projects through the lens of affordability. Within the case-study approach, the proposed analytical framework focused on the design criteria to reduce building costs in housing (Chapter 3) can be useful to further studies aiming to assess affordability through design in the context of collaborative housing. In addition, the development of a simulation model to compare building costs of mainstream- and collaborative housing based on design choices (Chapter 4) may be adapted for similar studies.

Finally, this research contributes to counteract the prevailing paternatlistic approach towards architecture and planning. The input present in this thesis may academically inspire and support the exploration of co-design processes and collective living layouts in faculties of architecture. This can provide the students – future architects – with the necessary tools, soft-skills, and design knowledge on shared and minimum housing, ultimately leading to an architecture practice based on collaboration and participation.

6.3.3 Practice and societal contribution

The original *Existenzminimum* was an attempt to put design at the service of the population, through the optimisation of the domestic layout and the implementation of minimum standards. The ethos was that high quality affordable housing design should be accessible to everybody. Here, the figure of the architect with a social awareness was central (Chapter 2). In many contemporary collaborative housing projects, architects recover a more 'interventionist' role and contribute to the process of jointly reshaping the domestic space into more suitable layouts. In parallel, architects – as co-designers – are also faced with two professional challenges: first, they have to adapt their typically top-down *modus operandi* to accommodate the collective input of the (future) residents; second, they often have to act as moderators in co-design workshops. This research represents a direct contribution to architecture practice: it provides useful insights on co-design and the challenges it may carry; and it presents general guidelines that support the co-design of affordable collaborative housing led by both residents and architects.

Do the application of these principles guarantee the affordability of a future collaborative housing project? Of course not. As stated before, there are other factors influencing affordability in a (collaborative) housing project, namely tenure models, land acquisition and funding mechanisms; not to mention the more contextual factors, transversal to housing in general and difficult to control by the residents. However, when it comes to design, residents as co-designers have agency to influence the final design outcome and, to certain extent, the subsequent building costs. The proposed co-design principles may increase the co-designers' chances of creating a positive impact in the overall project affordability.

Although out of the scope of this research, attention is drawn to the 'affordable for whom?' issue, i.e., the actual chances of making collaborative housing affordable to low-income and vulnerable households. The same applies to the chances of assuring that co-design is accessible and inclusive to all. What are the real possibilities for

low-income groups to participate and co-design actively, considering its time-consuming nature and necessary resources (i.e., financial and social capital)? These are some of the limitations that co-design may carry. This research increases the possibilities of streamlining and optimising the co-design process, contributing this way to make co-design approachable to larger segments of the population. Nevertheless, further research is required to identify the more effective tools and strategies to make co-design accessible to everyone. Additionally, future research – or practice – testing the principles in both Europe and other geographical contexts could help to validate and improve the presented results.

Why would someone choose to live in collaborative housing and engage in a co-design process? This thesis contributes to demystify some prejudice still linked to collaborative housing, at the same times that optimises the process of designing a collaborative housing project. It does so by deepening the understanding of the concept in its design dimension and by relativising the idea of a complex and long (co-)design process. The results of the conducted studies and the proposed design principles may carry positive implications for professionals supporting co-design and, more importantly, for the people who want to design, build and live collaboratively. Moreover, by shedding light on the concept of collaborative housing and providing guidelines for the co-design process, it may clarify and incentivise people who are (still) not convinced of the benefits and implications of designing and living in such a setting.

References

Aernouts, N., & Ryckewaert, M. (2017). Beyond housing: on the role of commoning in the establishment of a Community Land Trust project. *International Journal of Housing Policy*, 1-19. doi:10.1080/19491247.2017.1331592

Archer, T. (2022). The mechanics of housing collectivism: how forms and functions affect affordability. *Housing Studies*, *37*(1), 73-102. doi: 10.1080/02673037.2020.1803798

Cabré, E., & Andrés, A. (2018). La Borda: a case study on the implementation of cooperative housing in Catalonia. *International Journal of Housing Policy*, *18*(3), 412-432. doi:10.1080/19491247.2017.1331591

Chatterton, P. (2013). Towards an Agenda for Post-carbon Cities: Lessons from Lilac, the UK's First Ecological, Affordable Cohousing Community. *International Journal of Urban and Regional Research, 37*(5), 1654-1674. doi:10.1111/1468-2427.12009

Czischke, D., & van Bortel, G. (2018). An exploration of concepts and policies on 'affordable housing'in England, Italy, Poland and The Netherlands. *Journal of Housing and the Built Environment*, *38*(1), 1-21.

Engelsman, U., Rowe, M., & Southern, A. (2018). Community Land Trusts, affordable housing and community organising in low-income neighbourhoods. *International Journal of Housing Policy, 18*(1), 103-123.

Mulliner, E., Smallbone, K., & Maliene, V. (2013). An assessment of sustainable housing affordability using a multiple criteria decision making method. *Omega, 41*(2), 270-279.

Curriculum Vitae

Sara Brysch

Academic and professional experience

Jun 2023 – today	**Member of a collective self-organised working group**, created to set up the first Community Land Trust (CLT) in Portugal
Jun – Dec 2022	**Invited member of a working group about cooperatives**, organised by the Portuguese Secretary of State for Housing, to discuss and define the necessary instruments to facilitate the development of the cooperative sector in Portugal
Sep 2022 – today	**Invited member of Lab2050**, a project led by Plan APP - Centro de Competências de Planeamento, de Políticas e de Prospetiva da Administração Pública of Portugal, to debate how to organise the collaborative debate about the Portugal of 2050

2018-2023	**PhD candidate,** Management in the Built Environment, *Faculty of Architecture and the Built Environment*, Delft University of Technology - PhD dissertation: 'Towards a new *Existenzminimum*: defining the principles for the co-design of affordable collaborative housing' - Coordination of the Co-Lab Mapping project, a research project led by Dr Darinka Czischke to categorise and map the different collaborative housing forms in Europe - Co-writing, with Dr Darinka Czischke (main author) and Marije Peute, of the book entitled 'Together towards collaborative living', nai010 - Co-organisation of the International Conference 'Cohousing in Portugal. Sustainable Living', at *Faculty of Eengineering*, University of Porto - Evaluation committee member of third-year architecture students' final projects, under the topic of collaborative housing, at *Institute Universidade de Lisboa* (ISCTE)
Jul 2016	**Assistant of Tatiana Bilbao in *Summer School Porto Academy*,** *Faculty of Architecture*, *University of Porto*, Porto - Monitoring of twenty international students in the development of their proposals
2015-2016	**Architect at *Tatiana Bilbao ESTUDIO*,** Mexico City, Mexico
2012-2015	**Architect at *Heim Balp Architekten GmbH*,** Berlin, Germany
2009-2010	**Architecture intern at *NOARQ*,** Porto, Portugal

2005-2011

Master Degree in Architecture, *Faculty of Architecture*, University of Porto, *Porto*
Master Thesis entitled '*Existenzminimum*: the minimum dwelling issue between the modern and the contemporary'
Master Thesis Grade: Excellent - 18 (out of 20)
Final Grade: 15 (out of 20)
Erasmus Programme at Architecture in *Technischen Universität (TU)* Berlin

Awards and Honours

2019

Awarded with **First Prize** with article 'What is affordable housing?', Bee Breeders competition, *ARCHHIVE*

2018-2023

Awarded with doctoral **scholarship** by Fundação da Ciência e Tecnologia (FTC)

2012

Awarded with **Second Prize** (Portuguese selection) of the Film competition *DISS: Done in 60 Seconds*

2012

Awarded with **First Prize** of the Design competition *Front Row Society*

2010

Awarded with **First Prize** of the Architecture competition *Secil University Awards*, with the final design project

2009

Awarded with **best academic work** at *Faculty of Architecture*, University of Porto, with the *Portuguese Architecture History* research and survey (team work)

2006

Awarded with **best academic work** at *Faculty of Architecture*, University of Porto, with the final design project, hand drawings, photographic work and a paper in Anthropology

2005

Awarded as one of the **10 best students** from *Liceu Santa Maria Maior, Viana do Castelo*

Public Presentations and Lectures (Selection)

Nov 2023	**Presentation about new cooperative housing models** at “Porto urban rehabilitation week", Vila Nova de Gaia
Feb 2023	**Guest opening lecture** of the third-year architecture studio on collaborative housing, University Institute of Lisboa (ISCTE)
Jan 2023	**Presentation about collaborative housing** at “Let’s talk legal”, Domus Social, Porto
Nov 2022 + Mar 2023	**Guest lecture** at 1st and 2nd edition of the course ‘Innovation in Housing’, *Faculty of Architecture*, University of Lisboa ‘The design of cohousing and co-living models’ (online)
Oct 2022	**Presentation** at Fórum da Habitação: Cartas municipais 1ª Geração, *Casa da Música*, Porto
Oct 2022	**Presentation** at the Project Together! seminar, *Faculty of Architecture and the Built Environment*, Delft University of Technology ‘The Co-Lab Mapping project: a visualisation tool for collaborative housing in Europe’
Feb 2022	**Guest lecture** to students from the *Faculty of Architecture*, Mendrisio ‘The design principles of shared and collaborative housing’(online)
Sep 2021	**Participation** at debate within the framework of the New European Bauhaus (NEB) Goes South, at the *Faculty of Architecture*, University of Porto (online)
Mar 2021 + Mar 2022	**Guest lecture** to master students from the *Faculty of Architecture*, University of Coimbra ‘A Arquitetura da Co-habitação’ (online) and ‘Os princípios de arquitetura da co-habitação’ (online)

Mar + May 2021	**Participation** in bottom-up academic-practice working group entitled “Lugar comum”, to discuss the potential of exploring collaborative housing in Portugal (online)
Feb 2019	**Presentation** at the International Conference “Cohousing in Portugal. Sustainable Living”, *Faculty of Eengineering*, University of Porto ‘Co-Lab Research hub e a investigação sobre habitação colaborativa na Europa’
Sep + Nov 2018	**Presentation** at the workshops organised by Hac.Ora - Senior Cohousing Association ‘Cohousing: an intergenerational housing solution for Portugal’ and ‘The evolution of cohousing initiatives in Europe’

TOC

List of publications

Peer-Reviewed Journal Papers and Books

Czischke, D., Peute, M., & **Brysch, S**. (2023). *Together towards collaborative living.* Nai010 Publishers

Brysch, S., Garcia I Mateu, A. & Czischke, D. (2023). The process of value setting through co-design: the case of *La Borda*, Barcelona. *CoDesign.* DOI: 10.1080/15710882.2023.2277724

Brysch, S., Gruis, V. & Czischke, D. (2023). Sharing Is Saving? Building Costs Simulation of Collaborative and Mainstream Housing Designs. *Buildings*, 13(3), 821. https://doi.org/10.3390/buildings13030821

Brysch, S. & Czischke, D. (2022). Affordability through design: the role of building costs in collaborative housing. *Housing studies*, *37*(10), 1800-1820. https://doi.org/10.1080/02673037.2021.2009778

Brysch, S. (2019). Reinterpreting *Existenzminimum* in Contemporary Affordable Housing Solutions. *Urban Planning, 4(3),* 326–345. https://doi.org/10.17645/up.v4i3.2121

Conference Papers (with public presentations) and non-academic outputs

Brysch, S., Gruis, V. & Czischke, D. (2022). Collaborating is saving? A scenario analysis of the effects of co-design on building costs in housing. Paper presented at the European Network for Housing Research International Conference 2022 " The struggle for the right to housing. The pressures of globalisation and affordability in cities today", *ETSAB-UPC,* Barcelona, Spain, 29 Aug-2 Sep

Czischke, D., Huisman, C.J., **Brysch, S.**, Vergara, L.M. & V.A. Cortés Urra (2021). Mapping Collaborative Housing in Europe – Towards a Systematic Categorisation. Paper presented at the European Network for Housing Research (ENHR) International Conference 2021 "Unsettled Settlements: Housing In Unstable Contexts", Nicosia, Cyprus, 30 Aug-2 Sep

Brysch, S. (2020). Modelos de habitação colaborativa. Pensar o Eco-bairro, publication by the association Eco-Bairros

Brysch, S. (2019). What is affordable housing? Bee Breeders competition. *ARCHHIVE* (awarded article)

Brysch, S. & Czischke, D. (2019). Designing Collaborative Housing: Assessing Affordability at Project-Level. Paper presented at the ENHR International Conference 2019 "Housing For The Next European Social Model", Harokopio University, Athens, Greece, 27–30 August

Brysch, S. (2018). Designing and building housing together: the Spanish case of *La Borda*. Paper presented at the ENHR International Conference 2018 "More together, more apart: Migration, densification and segregation", *Uppsala University*, Uppsala, Sweden, 26-29 June

Brysch, S. (2018, March). Por uma habitação colaborativa em Portugal. *Revista Punkto.* Available at www.revistapunkto.com

Czischke, D. & **Brysch, S.** (2017). Collaborative Housing and Affordability: Understanding the interplay between collective self-organisation, design and affordability. Paper presented at the ENHR International Conference 2017 "Affordable Housing for All!" in Tirana, Albania, 4-6 September

Press (Interviews)

Interviewed by Nascimento, Cristina (31 May, 2023). Coliving e habitação colaborativa. "Há falta de crédito" para financiar projetos. *Renascença.* Available at https://rr.sapo.pt/artigo/compromisso-verde/2023/05/31/coliving-e-habitacao-colaborativa-ha-falta-de-credito-para-financiar-projetos/333598/

Interviewed by Monteiro, Fábio (6 December, 2022). Coliving. Um co-problema ou uma co-solução para a habitação? on the concept of collaborative and cooperative housing in Europe and Portugal. *Renascença.* Available at https://rr.sapo.pt/fotoreportagem/pais/2022/12/06/coliving-um-co-problema-ou-uma-co-solucao-para-a-habitacao/310355/

Interviewed by Baptista, Sofia (3 Agosto, 2022) about the concept of collaborative housing in Europe and Portugal. *Expresso Newspaper*

Interviewed by António Gomes about collaborative housing forms (1 March 2019), Radio Duplo. Available at https://www.youtube.com/watch?v=6oM71vNoNHo&feature=share

Interviewed by Pereira, Ana Cristina (1 September, 2019). A arte de viver em comunidade sem perder a privacidade. *Público Newspaper*

Interviewed by van den Beld, Johan (2019). Collaborative housing als antwoord op woningtekort en klimaatcrisis. *CorporatieGids Magazine*

23#23

Towards a new Existenzminimum

Defining principles for the co-design of affordable collaborative housing

Sara Brysch

This thesis brings forward the design dimension, and, more specifically, co-design, to the study of housing affordability. Co-design occurs when end-users and professionals work together towards a common goal. It is a process often applied in collaborative housing, an umbrella concept encompassing different housing forms based on collective self-organisation and collaboration, where residents choose to share certain spaces. The aim of this research is to assess if and how co-design processes applied in collaborative housing may reduce building costs, thereby making these housing projects not only affordable, but even more affordable than mainstream housing. It does so by combining a case study approach with a building costs simulation. Findings indicate that co-design decisions based on a collective self-redefinition of Existenzminimum (minimum dwelling) affect the housing layout and contribute to reduce building costs. By conceptualising housing design through the lenses of affordability, this thesis highlights the understated role of architectural design and building costs as key components in the study and provision of affordable housing solutions; and enriches the existing body of knowledge on affordable collaborative housing. Moreover, it draws attention to the way some outdated building regulations and standards hamper design innovation in housing. This research ends up with a set of general principles for the co-design of affordable collaborative housing. These design principles may assist professionals supporting co-design and, more importantly, people who want to design, build and live in a collaborative manner.

A+BE | Architecture and the Built Environment | TU Delft BK