



Ute Christina Groba

TIMBER TALES

A Qualitative Study of Timber Materiality in Housing Projects

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Abstract

This qualitative study addresses how architects and residents employ, experience and value wooden building materials in housing projects, arguing that buildings that are loved last longer and thus contribute to both ecological and social sustainability. Qualitative aspects are underrepresented in the common argumentation for an increased use of wooden construction materials as well as in current timber research; they are also generally absent from building codes and technical guidelines, as the main focus is on quantifiable benefits. In addition, professional views are dominant while the users' expectations and experiences receive little attention. This thesis aims to foster a more holistic take on sustainability and to re-incorporate architectural themes into the consideration of wooden building materials. To do so, it gathers professional perspectives from academia and from practice, as well as including the views of inhabitants, who are most often laypeople. It seeks to answer the following research questions: How have materiality and particularly concepts related to wooden materials been discussed in architectural history and theory? How do contemporary architects view wooden materiality's contribution to their architectural ambitions? How do inhabitants perceive and value the materiality of wooden constructions in the buildings they inhabit? How do these perspectives converge or diverge? In three 'timber tales', an overview of architectural theory related to materiality provides generalized approaches to designing with timber, which are then investigated in the contextualized built reality of recent precedents in Norway and Central Europe. Contemporary timber architects' conception of the materiality in their housing projects is complemented by how inhabitants of these buildings experience the wooden materiality. The results of literature studies, document analyses, qualitative interviews, site visits and insights gained teaching two master's studio courses substantiate new approaches to everyday timber architecture. They also furnish a vocabulary with which to discuss the often tacit qualities of architectural design. Furthermore, the findings reveal the untapped potential and mutual benefits of improved communication between architects and inhabitants. Although location, size or price tend to dominate the choice of a home, qualitative aspects are able to 'up-value' a place of residence for inhabitants; even more so if architecture is not left to speaking for itself, but when the realisation of qualities results from intersubjective processes between expert and user, such as communication by way of words or images, or participatory design processes. Regarding design, the tectonic disclosure of timber's affordances (e.g. ways to use or modify it) should be balanced with its atmospheric and sensory qualities. This may contribute to reducing the longing for constant renewal and augmented possession and help redefine desire as a source of inspiration instead. Furthermore, architects are part of actively shaping the frameworks for the production and general reception of timber architecture. This thesis prompts the reimagining of qualities and values that contribute to more loveable built environments and raises awareness of the larger contexts with which they interact. It aspires to provide a multi-faceted background that will inspire and inform design decisions in future timber projects whilst enriching and broadening architectural discourse and education.

Acknowledgements

This research endeavour would have never reached completed – let alone started – without the personal dedication, professional input, generous support, friendly encouragement and motivating trust of my supervisors. My deep gratitude goes to Marius Nygaard (AHO) and to Martina Keitsch (NTNU). Also Anne Beim (KADK) has contributed through her role as an external examiner in a midterm review and as a reader of this thesis. Her professional competence and passionate interest are inspiring and greatly appreciated. I would also like to thank the other architects and researchers who have dedicated time and attention to discuss different dispositions, methods and other doubts and choices throughout the last years – among them Cheryl Ball, Jérémie McGowan, Tatjana Schneider, Søren Nielsen, Walter Unterrainer and Julia Schlegel in the initial research stages; Thomas McQuillan as the research neared completion; and Justina Bartoli for her language editing.

Furthermore, I am grateful for the openness and trust of the architects and inhabitants whom I was able to interview for this research. Seven architects generously shared their convictions and ideas, interests and queries with me. Furthermore, 27 inhabitants from timber housing projects in Norway, Austria and Germany invited me into their homes, their everyday realities and personal thoughts. Thank you all.

Thank you also to my students and co-teachers during these years for your dedicated commitment and inspiring discussions; to my other teacher colleagues for creating a sense of belonging in times of isolated writing; to the AHO library staff for your friendly and tireless service; as well as to my colleagues and companions at AHO and elsewhere, for our shared ‘nerd’ lunches and discussions.

And what would I have done without my friends old and new, in the neighbourhood and on other continents – without the deep and the casual conversations, without your sympathy and support? I am graced to have you in my life. Natalia, Birgit and Karen deserve special mention.

Finally, and most importantly, I would like to express my immense gratitude to my family: to my brother and sister, to my extended family, and above all to my parents. Thank you for believing in me and for being there for me, as well as for those closest to my heart: Benjamin and Jonathan, you have grown with me and this project. Just as little seedlings grow towards the light, you helped me to see the light when things were difficult and at the same time you’ve kept me firmly rooted in other realities than academia. Thank you for your giggles and your cuddles, for your questions and your demands. Moritz, without you, so many important things in my life would not have happened. Thank you for bearing with me, for enduring my absence and my doubts, and for celebrating smaller and larger victories with me – also beyond the covers of this book. The three of you mean the world to me.

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Preface

Personal background and research environment

Two framing conditions have influenced both the set-up and the outcome of this thesis from the outset: my own professional background and interest in architectural practice and education; and the suggested project focus in a call for a PhD fellowship at The Oslo School of Architecture and Design (AHO).

My interest in the architectural role of timber beyond its load-bearing capacity and its potential for CO₂-reduction or other assessable or quantifiable aspects has its roots in half a decade of practical experience with wooden architecture as an employee at Helen & Hard in Norway. In addition to my work as a practising architect, I have taught and co-taught a number of master's studio courses with a focus on timber construction at AHO. Encounters and contacts from previous professional activities, the eagerness to fill my own knowledge gaps and satisfy my personal curiosity, and a desire to bring knowledge relevant for the practice to the draughting table and the classroom have all been important in guiding this research journey.

The call for the research position of which this thesis is a result was associated with the interdisciplinary research project *Wood Be Better*, led by and coordinated at AHO. Based on the contemporary (and growing) societal interest in wooden constructions, the project aimed at facilitating increased use of timber in urban building projects. It focused on contemporary timber building technology and on timber buildings at the present time in areas with temperate climate.

The original title for the research position was somewhat cumbersome: 'Low-rise high-density prefabricated timber housing'. I grew to understand that this title alone encompasses at least three potential dissertation topics in different disciplines – focusing for example on material science and production technology, on urban morphology, or on social aspects related to housing. In its final disposition, the present research focuses on qualitative aspects of timber materiality. The morphological and programmatic aspects suggested in the original project title have been chosen as selection criteria for the precedents (built examples) to be studied.

Teaching

Being responsible for two master's studio courses at AHO provided important test grounds for the communication of ideas and their application in various contexts. Generalized knowledge could be contextualized through the students's projects. *Low-rise high-density urban timber housing* in the fall of 2016 focused on the reconcilability of

architectural qualities and increased urban densities.¹ *Housing Individuals* in the fall of 2020 explored the capacity of generic timber construction systems to answer to a unique context and thereby to attain individual expression and form, and the ways in which these wooden systems facilitate housing individual inhabitants, adapting to their different and potentially changing needs.²

Funding

This research took shape over the course of five and a half years (September 2015-March 2021), four of which were exclusively dedicated to the thesis. Three years were funded by The Institute of Architecture and partly extended by running the two master's studio courses mentioned above as a full-time responsible, the co-organisation of a timber conference (*Trearkitektur, den 6. Nasjonale Konferansen 2018*) and a number of external presentations, lectures and conference contributions.

It is my hope that the results of this research will contribute to a more holistic architectural and sustainability discourse; to better informed and more broadly inspired design decisions; to appreciating inhabitants as true participants in design processes; and to more depth and breadth when 'teaching timber'.

Oslo, March 2021

¹ Ute Groba, ed., *AHO Master's Studio Course Fall 2016: Making a Case for Urban Timber Housing* (Oslo, Norway: The Oslo School of Architecture and Design, 2017).

² Ute Groba, ed., *AHO Master's Studio Course Fall 2020: Housing Individuals* (Oslo, Norway: The Oslo School of Architecture and Design, 2020).



Mühlweg (A)

1

A Qualitative Take on Timber

Making buildings from wood may seem like a rather medieval idea. But there is a very modern issue that is driving cities and architects to turn to treated timber as a resource: climate change.³

(The Guardian, February 2019)

Wood is taking over from steel and concrete as the architectural wonder material of the 21st century, with architects praising its sustainability, quality and speed of construction.⁴

(Dezeen, November 2015)

The image of wood as a building material is changing rapidly. In the past, 'wood' as a keyword called forth associations with mountain cabins and field barns, flimsily walled emergency barracks and simple American housing estate homes. Today timber construction has gained in solidity and precision, and adopted more contemporary forms both technically and in terms of design.⁵

(Goethe Institute, January 2017)

The only thing is, there are not yet that many buildings made of CLT, or one of its cousins, that fully realise the transformative powers with which it is credited. Quite a lot look much like steel or concrete buildings that happen to be made of wood. They tend to be a bit boxy. Often the timber gets covered with other materials. If engineered timber is truly the material of the future, its architectural possibilities are only just beginning to be discovered.⁶

(The Observer, January 2018)

³ Fiona Harvey, 'Ply in the Sky: The New Materials to Take Us beyond Concrete | Fiona Harvey', *The Guardian*, 27 February 2019, sec. Cities, <https://www.theguardian.com/world/2019/feb/27/ply-sky-new-materials-take-beyond-concrete-carbon-dioxide>.

⁴ Amy Frearson, 'Architects Embrace "The Beginning of the Timber Age"', *Dezeen*, 9 November 2015, <https://www.dezeen.com/2015/11/09/cross-laminated-timber-construction-architecture-timber-age/>.

⁵ 'Timber Construction in the City', Goethe-Institut, January 2017, <https://www.goethe.de/en/kul/arc/20900290.html>.

⁶ Rowan Moore, 'Why Wood Is Back at the Top of the Tree for Architects', *The Observer*, 28 January 2018, sec. Art and Design, <https://www.theguardian.com/artanddesign/2018/jan/28/wood-engineered-timber-housing-needs>.

This thesis departs from a perceived lack of qualitative discourse specific to contemporary timber architecture, and from the view that the user's perspective on such a discourse is underrepresented.

The above quotes represent a number of different recent views on timber. Generally, a great deal of attention is directed towards its quantitative contribution to reduced emissions, lower energy use and less waste production. In addition, technical development and adapted building codes allow for a broader application of timber constructions in urban areas than before, with some hailing the dawn of a 'timber age', and wood as the 'wonder material' of the 21st century.⁷

Technical guidelines and construction handbooks inform about the available constructive systems for wooden materials, wall and roof build-ups, cladding principles, etc. Timber conferences host the presentation of new products, new joining techniques, digital tools, and their application in building projects.

A speaker's side note at one of the *Forum Holzbau* timber conferences in Garmisch Partenkirchen, Germany has become a central point for this thesis: Now that so many things are technically realisable, it is important to return to a discussion of architecture itself again if a broader audience is to be convinced of the advantages of wood. However, as the speaker also indicated, apart from the 'hard facts', the qualities of timber are difficult to communicate and defend with confidence. Following this thought-provoking presentation, the unofficial working title of this doctoral research project became *Yes, we can – but how do we want to?* How do we want to design with wooden construction materials to produce housing projects that are appreciated today and will maintain their value over time? On what should design decisions be based, beyond technical appropriateness and correct execution? How do the quantifiable aspects related to wooden construction materials interact with the tacit qualities of architecture?

Some of the topics touched upon briefly above should be addressed more closely in order to contextualize this research. Two of the concepts mentioned – *sustainability* and *architectural quality* – have grown so broad and ubiquitous that they mean something to everyone, but a concise, universally accepted and exhaustive definition of either is difficult. Both concepts are frequently a topic of controversy and debate – if they are not avoided altogether. They are, however, central to a more holistic architectural debate. In the following, these concepts will be introduced as a backdrop for the research questions.

Together with an account of the research approach in Section 1.4 and a presentation of the research cases in Section 1.5, this outlines a research field from the perspective of a practicing architect and university educator.

⁷ Frearson, 'Architects Embrace "The Beginning of the Timber Age"'.

1.1 Timber architecture in the age of sustainability

Sustainable architecture

In the light of omnipresent and ever-growing environmental concerns, sustainability has become an integral part of the development, discussion and assessment of architecture, as the building sector is responsible for the largest share of global greenhouse gas emissions, a substantial percentage of global energy consumption, and up to a third of globally-produced waste.⁸ The term sustainability was established in forestry during a timber shortage in the early 18th century; it was used to describe ideas about limiting the rate at which trees were cut down to correspond to the rate at which they could be replanted to ensure a continuous wood supply.⁹ In its current interpretation, sustainability refers to a balanced and equitable handling of resources in general, and it comprises environmental, economic and social aspects.¹⁰

Rating systems like LEED, BREEAM or DGNB are intended to both provide assistance in the planning phase of a project and to assess the overall sustainability achieved in a building. Several of these sustainability assessment methods have also started to include qualitative aspects in their evaluation criteria. These aspects are appraised by a group of experts, whose evaluation is based on their professional expertise and dependent on the topics they choose to discuss; as opposed to quantitative values or facts that can be calculated or measured. The building's overall sustainability is judged according to a combination of quantitative and qualitative criteria.

As an example, the German Sustainable Building Council DGNB has defined 40 different assessment criteria sorted into the following areas of sustainability: environmental quality, economic quality, sociocultural and functional quality, technical

⁸ 'Construction and Demolition Waste - Environment - European Commission', accessed 17 June 2019, http://ec.europa.eu/environment/waste/construction_demolition.htm; 'Sustainable Buildings', UN Environment, n.d., accessed 5 February 2018; 'Assessing Europe's Building Stock', European Climate Foundation, n.d., accessed 4 May 2016; United Nations Environment Programme (UNEP), 'Buildings and Climate Change. Summary for Decision-Makers' (Paris, France: UNEP Sustainable Building and Climate Initiative, 2009).

⁹ Hans Carl von Carlowitz, *Sylvicultura oeconomica: oder Hauswirthliche Nachricht und Naturmäßige Anweisung zur Wilden Baum-Zucht*, ed. Joachim Hamberger, reprint of 1st ed. Leipzig: Braun, 1713 (München: oekom, 2013).

¹⁰ This understanding relates to a document from 1987 commonly referred to as the 'Brundtland Report', which followed the 1983 'World Commission on Environment and Development' (WCED) chaired by Gro Harlem Brundtland: 'Report of the World Commission on Environment and Development: Our Common Future - A/42/427 Annex - UN Documents: Gathering a Body of Global Agreements', n.d., accessed 17 June 2019. Cultural sustainability is sometimes included as a fourth realm, but often it is understood as encompassed by social sustainability. Holger König et al., *A Life Cycle Approach to Buildings: Principles, Calculations, Design Tools*, ed. Jakob Schoof, 1. ed, Detail Green Books (München: Ed. Detail, Inst. für Internat. Architektur-Dokumentation, 2010); Hans-Georg Bächtold, 'Nachhaltigkeit Herkunft und Definitionen eines komplexen Begriffs', *Schweizer Ingenieur und Architekt*, March 1998.

quality, process quality, and site quality.¹¹ The same areas are used for a collection of different assessment criteria used for urban districts. Core topics named by DGNB include people focus, circular economy, *Baukultur* (architectural culture) and design quality, sustainable development goals, EU-conformity and innovation.¹² These are rooted in a European context, and there are slight national variations to DGNB's criteria in several European countries. DGNB claims to be the first sustainability assessment system to integrate architectural culture and design quality into its criteria, and 'the first of its kind to make circular economy principles an assessable and measurable aspect of buildings'.¹³ Other new certification systems, such as WELL, formulate building standards for health and well-being.¹⁴

Putting aside for the time being whether and in what ways sustainability assessment systems have a positive effect on architecture, the growing acceptance for *architectural quality* as part of buildings' sustainability should be highlighted here. Qualitative aspects become even more important if future potentially carbon-neutral energy sources change the current basis for sustainability assessment. With regard to energy consumption in particular, the numbers for the Norwegian building sector are below the current global average, mainly because a large percentage of energy is sourced from hydropower. This suggests that changing energy sources could make it necessary to reconsider the sustainability argumentation in its entirety; it also underpins the need to base sustainability considerations on a broader set of aspects.

Including qualitative aspects in sustainability assessment could be one way to reintegrate the sustainability discussion into architectural discourse. As Norwegian architect Børre Skodvin lamented:

One tries to speak about love but ends up talking about the weather. (...) The debate about architectural quality is often replaced by a discussion of other aspects that are easier to evaluate. Now, sustainability is the topic when (...) speaking about architecture.¹⁵

¹¹ 'DGNB System. Overview of the Criteria', accessed 11 February 2020, <https://www.dgnb-system.de/en/system/version2018/criteria/index.php>.

¹² 'DGNB System Version 2018', accessed 15 September 2019, <http://www.dgnb-system.de/en/system/version2018/>.

¹³ Buildings may be awarded the 'diamond' distinction for architectural quality in addition to the highest achievable rank 'platinum'. Tanja Feil, 'Mit Diamanten gekrönt', *Deutsche Bauzeitung* 2017, no. 10 (October 2017); 'DGNB Diamant', accessed 27 April 2017, URL <http://www.dk-gbc.dk/dgnb/certificering/dgnb-diamant/>.

¹⁴ 'WELL Building Standard' | WELL Standard', accessed 13 February 2020, <https://standard.wellcertified.com/well>.

¹⁵ Børre Skodvin, 'Boligkvalitetens problem: Eie eller leie?', 2015, <http://www.arkitektnytt.no/boligkvalitetens-problem-eie-eller-leie>. 'Man forsøker å snakke om kjærligheten, men ender med å prate om været. Forsøket på å identifisere og diskutere arkitektonisk kvalitet i boligarkitekturen ender oftest med å gå rundt grøten. (...) I det hele tatt ser vi ofte at debatten om arkitektonisk kvalitet erstattes av en diskusjon om andre aspekter som det er enklere å vurdere. Nå er det bærekraft som er tema når våre egne fagtidsskrift og -organisasjoner snakker om arkitektur.' Translated and abridged by the author.

Current architectural discourse has been accused of focusing excessively on the technical aspects of these issues and thus missing out on qualitative aspects, or conversely, of addressing purely formal aspects.¹⁶ Anne Beim and Marie Frier Hvejsel observe that

in present day architectural discourse and especially in the building industry, there exist [sic] a leading focus on technological innovation, i.e. how to improve the technical duration of construction elements or the thermal performance of the building envelope.¹⁷

However, as they argue, an exclusively quantitative view is not sufficient to improve the built environment:

Raising the general quality of everyday architecture, ultimately has to do with that of positioning immeasurable aspects (...) within the highly quantifiable context of everyday industrialized construction practice.¹⁸

Already at the end of the 19th century, Adolf Loos made a point of improving the integration of qualitative aspects into architectural discourse and practice:

It is not just the quantity, but the quality of the work performed that determines the value of an object. We live in a time that gives precedence to the quantity of work performed. For quantity is easily controlled; it is immediately obvious to anyone and demands no skilled eye or special knowledge. Thus there are no errors. (...) Anyone can calculate it: And we want to make the value of the things with which we surround ourselves easy to understand. Or else there would be no point to them.¹⁹

Søren Nielsen emphasizes that, even with an increasing focus on sustainability, the architect's main concern is still architecture itself as a discipline that unites many aspects into a coherent whole.

Our primary field of work is not ecology. It is architecture that is primary, to create space and materiality. You can say that the word ecology doesn't cover it, and that we have to invent a new one, but the question is whether the word hasn't already been invented? Isn't it just architecture? That has always stood for integrating many challenges into a whole, into one common solution. So, if you bring in a new problem area such as ecology, then it still is architecture, just with some additional aspects to consider.²⁰

¹⁶ Anne Beim and Marie Frier Hvejsel, 'Everyday Tectonics? – Clarification of Concepts', in *Structures and Architecture: Beyond Their Limits: Proceedings of the Third International Conference on Structures and Architecture (ICSA2016), Guimarães, Portugal, 27-29 July 2016*, ed. Paulo J. S. Cruz (Boca Raton London New York Leiden: CRC Presse, 2016), 180; J. T. Lang and W. Moleski, *Functionalism Revisited: Architectural Theory and Practice and the Behavioral Sciences* (Surrey, England: Ashgate, 2010), 24–30.

¹⁷ Beim and Hvejsel, 'Everyday Tectonics? – Clarification of Concepts', 183.

¹⁸ Beim and Hvejsel, 183.

¹⁹ Adolf Loos, 'Building Materials', in *Spoken into the Void: Collected Essays 1897-1900*, Oppositions Books (Cambridge, Massachusetts: Published for the Graham Foundation for Advanced Studies in the Fine Arts, Chicago, Illinois, and the Institute for Architecture and Urban Studies, New York, New York: MIT Press, 1982), 63. First published August 28, 1898 in: Neue Freie Presse.

²⁰ Interview with architect Søren Nielsen from Tegnestuen Vandkunsten in: Anne Beim, Lena Larsen, and Natalie Mossin, *Økologi og arkitektonisk kvalitet* (København: Arkitektkoles Forlag, 2002), 85. "Det er da ikke det, der er vores primære arbejdsfelt, det økologiske. Det er jo arkitekturen, der er det primære, at skabe rum og stoffighed. Du kan så sige, at ordet økologi ikke

Several authors highlight that the ‘loveability’ of buildings encourages users to identify with and take better care of them, as well as making it more probable that users will adapt their needs to a building rather than changing or replacing it – in short, it contributes to a prolonged lifetime and appreciation, and thus to architectural sustainability.²¹ Dietmar Eberle points out the impact on a building’s value:

The cultural acceptance tied to beauty offers real estate more value than any technical innovation could. That which no longer pleases the public is torn down. By contrast, that which enjoys social and cultural standing remains. And the real meaning of a building ultimately lies in the contribution it makes to public life in the long run.²²

Only the things people like get a long life.²³

Prolonging the lifespan of a building and its components is one of the main strategies for conserving resources, together with a design that allows a building’s materials to be reused without being downgraded. *Circularity* has become a key term when considering *cradle-to-cradle* strategies. Inspired by circular economy and the continuous use of resources, buildings are to be designed in a way that allows for the later disassembly and reuse of building parts.

Stewart Brand’s model of a building’s ‘shearing layers’²⁴ is relevant here, as it describes and visualizes the average lifespan of building elements (Figure 1.1). It may help to localize and contextualize the target of the different sustainability approaches and it is especially relevant for circularity and disassembly concepts. The model suggests the importance of ‘getting the load-bearing structure right’ and of allowing for an easy upgrade or exchange of other parts that age or outdate more quickly. Although other authors or evaluation systems may suggest other layers as well or attribute differing

dækker, og at vi må finde på et nyt, men spørgsmålet er om ordet ikke allerede er opfundet? - er det ikke bare arkitektur? Det har altid stået for at integrere mange problemstillinger i en helhed, i en samlet løsning. Så hvis man inddrager et nyt problemfelt som økologi, så er det stadig arkitektur, hvor der bare er røget nogle flere input ind i, som man skal tage hensyn til." Translated by the author.

²¹ Alberto Pérez-Gómez, *Built upon Love: Architectural Longing after Ethics and Aesthetics* (Cambridge, Massachusetts: MIT Press, 2006), e.g. 5, 205; Baumschlager Eberle, Winfried Nerdinger, and Technische Universität München, eds., *Baumschlager-Eberle 2002 - 2007: Architektur, Menschen und Ressourcen = Baumschlager-Eberle 2002 - 2007, Architecture, People and Resources* (Wien: Springer, 2007); Peter Andreas Sattrup, ‘Arkitekter, arkitektur og ressourcer: Interview med Dietmar Eberle’, *Arkitekten* 11 (2008): 42–43; Søren Nielsen and Olga Larsen Popovic, ‘The Tectonic Potential of Design for Deconstruction (DfD)’, in *Proceedings of the Green Design Conference* (Rotterdam, Netherlands: In-house publishings, 2012).

²² Dietmar Eberle and Pia Simmendinger, eds., *Von der Stadt zum Haus - eine Entwurfslehre: From City to House - A Design Theory*, Repr. (Zürich: gta-Verl, 2010), 14–15.

²³ Sattrup, ‘Arkitekter, arkitektur og ressourcer: Interview med Dietmar Eberle’. ‘Kun de ting, folk kan lide, får et langt liv.’ Author’s translation from the Danish.

²⁴ Francis Duffy, ‘Measuring Building Performance’, *Facilities* 8, no. 5 (May 1990): 17–20; Stewart Brand, *How Buildings Learn: What Happens After They’re Built* (New York, New York: Penguin Books, 1995).

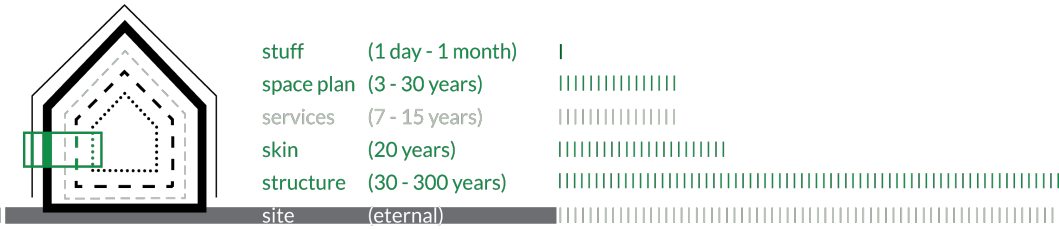


Figure 1.1 Building layers and their average durability according to the concept of shearing layers coined by Duffy and Brand. The colour marking indicates what can be made from wood.

numbers to these layers, the relative permanence and thus importance of the load-bearing structure is recurrent.²⁵

Besides reducing CO₂ emissions and conserving energy, another essential factor in a building's overall sustainability is its potential lifespan. The lifespan of building parts is not determined solely by structural integrity. While this is difficult to capture using sustainability rating systems, three factors can be seen as crucial for a building's durability: the soundness of a building's construction; its flexibility in adapting to changing programmatic needs and technical standards, and its public acceptance or 'loveability'. These assumptions are based on different notions of obsolescence.

Apart from 'absolute obsolescence' (which may be natural or planned), technically intact products can also suffer 'relative obsolescence' if the performance of newer products is superior, if the newer products save time, money, or other resources, or if they are more compatible with other systems or spare parts. But 'psychological obsolescence' may also lead to the abandonment of a product – when the product's appearance is no longer accepted, when changing trends make it unfavourable, when social perception of it changes, or when new legal requirements forbid their use.²⁶

With Brand's layer model in mind, the functional lifespan of building elements should thus be updated to reflect elements that add perceived and semantic life time.

One may conclude that architecture and its qualitative aspects are part of sustainability, and that sustainability is part of architectural quality.

²⁵ One example is Eberle and Simmendinger, *Von der Stadt zum Haus - eine Entwurfslehre* =, 16–17.

²⁶ Daniel Schallmo et al., 'Clarifying Obsolescence: Definition, Types, Examples and Decision Tool', in *Proceedings of the 5th ISPIM Innovation Symposium: Stimulating Innovation: Challenges for Management, Science & Technology* (Seoul, South Korea, 2012).

Timber and sustainability

The material aspect of buildings is growing increasingly important for sustainability considerations as their energy performance improves. Until recently, impact calculations only included electricity consumed during the building's use phase (operational energy), while the material manufacturing (embodied energy), transportation of materials (grey energy), the construction phase (induced energy) and the end-of life phase (demolition, re-use, recycling or disposal) were not accounted for.²⁷

Many countries have raised the energy performance requirements for buildings; in Norway for example, the passive house standard has been the norm for new buildings since 2015. Although simultaneously increasing area consumption often offsets these efforts, the reduced operational energy brings the impact of the buildings' embodied energy and thus the materials with which they are constructed to the forefront.²⁸

Numerous studies show that timber has the potential to outperform other materials when it comes to lowering CO₂ emissions and energy use during production.

Trees – ideally harvested at an optimal age of about 100 years from sustainably managed forests (granting biodiversity, a mixed age structure and individual harvesting without heavy machines) – sequester CO₂ during their growth. Instead of the climate gas being released again when the trees rot or are burnt in the forests, the CO₂ is 'stored' in wooden construction materials for the duration of a building's lifetime. 'Cascading' prolongs this 'freezing' function by reusing or recycling the wooden materials. At the same time, the wooden materials replace alternative, more harmful materials. In addition, they offer mass savings. Even when finally burnt for energy production, they reduce the use of fossil fuels.²⁹ (Figure 1.2 and Figure 1.3)

²⁷ Thibaut Abergel et al., 'International Energy Agency and the United Nations Environment Programme (2018): 2018 Global Status Report: Towards a Zero-Emission, Efficient and Resilient Buildings and Construction Sector' (The Global Alliance for Buildings and Construction (GlobalABC), 2018), 9.

²⁸ Abergel et al., 12, 43; Ambrose Dodoo, Leif Gustavsson, and Roger Sathre, 'Climate Impacts of Wood vs. Non-Wood Buildings' (R&D Fund for Public Real Estate, Growth and Community Development Division, The Swedish Association of Local Authorities and Regions, February 2016).

²⁹ See e.g. Dodoo, Gustavsson, and Sathre, 'Climate Impacts of Wood vs. Non-Wood Buildings'; Chadwick Dearing Oliver et al., 'Carbon, Fossil Fuel, and Biodiversity Mitigation With Wood and Forests', *Journal of Sustainable Forestry* 33, no. 3 (3 April 2014): 248–75; Geoffrey Guest et al., 'Consistent Quantification of Climate Impacts Due to Biogenic Carbon Storage across a Range of Bio-Product Systems', *Environmental Impact Assessment Review* 43 (2013): 21–30; Roger Sathre and Jennifer O'Connor, 'A Synthesis of Research on Wood Products & Greenhouse Gas Impacts. 2nd Edition', Technical Report (Vancouver, B.C.: FPInnovations, October 2010); Roger Sathre and Leif Gustavsson, 'Using Wood Products to Mitigate Climate Change: External Costs and Structural Change', *Applied Energy* 86, no. 2 (February 2009): 251–57; Brad Upton et al., 'The Greenhouse Gas and Energy Impacts of Using Wood Instead of Alternatives in Residential Construction in the United States', *Biomass and Bioenergy* 32, no. 1 (January 2008): 1–10; Leif Gustavsson, Kim Pingoud, and Roger Sathre, 'Carbon Dioxide Balance of Wood Substitution: Comparing Concrete- and Wood-Framed Buildings', *Mitigation and Adaptation Strategies for Global Change* 11, no. 3 (May 2006): 667–91.

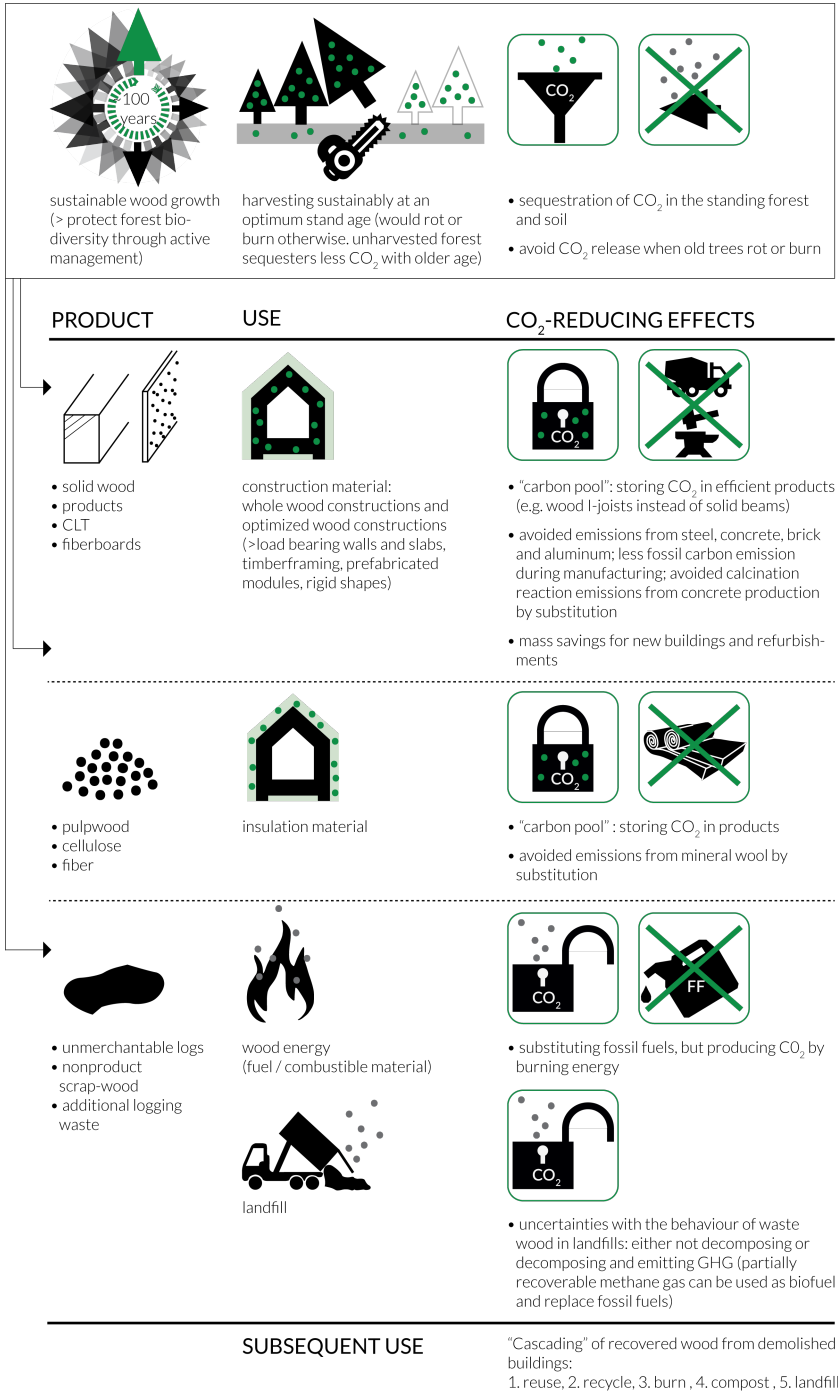


Figure 1.2 Potential reduction of carbon dioxide- and fossil fuel emissions through use of wood

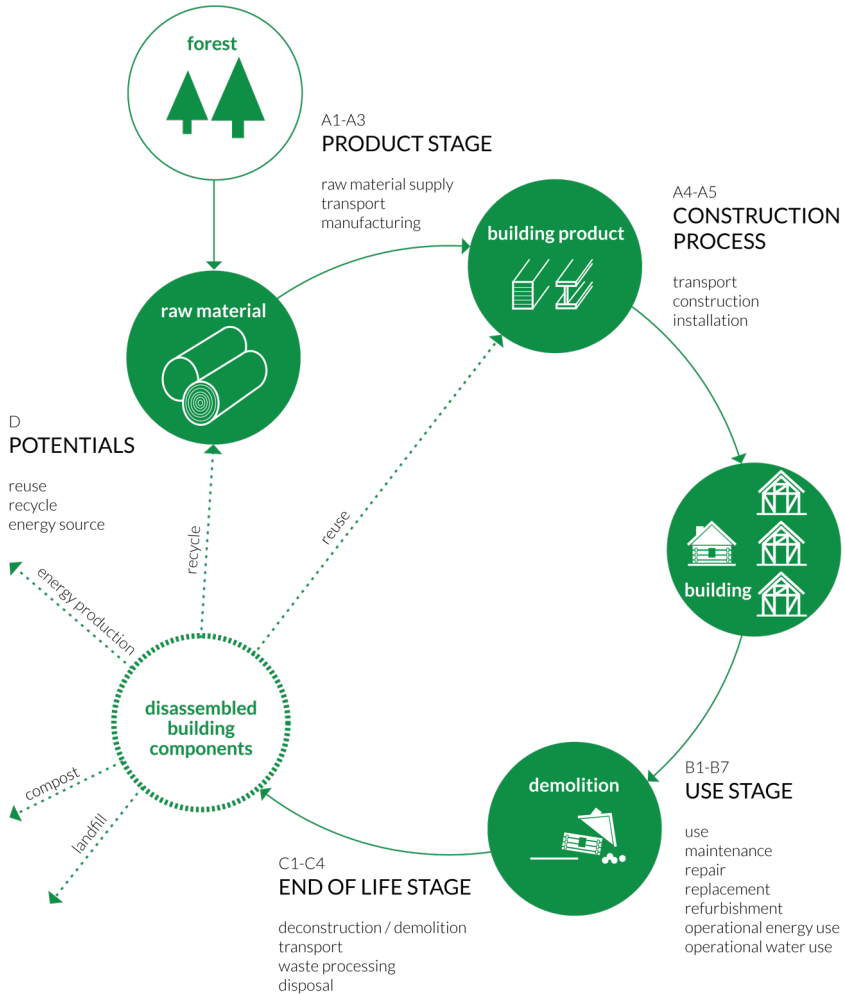


Figure 1.3 Life cycle stages of wood-based building products

Wooden building materials are furthermore ascribed various health benefits, such as a positive effect on the indoor climate.

Various degrees of prefabrication offer still other advantages that save time and costs as well as reduce area needs on building sites. They increase independence from weather and seasons, from site conditions, and from having skilled carpenters on site. Controlled off-site working environments allow for predictable working processes, greater precision and easier quality control. Wooden constructions entail on-site working environments

that are less noisy and humid and thus preferred by workers. In addition, buildings can often remain in use while being added onto or modified. With ‘just-in-time delivery’, installation times are drastically reduced in comparison to on-site construction. This is particularly compatible with urban sites where space and time are limited, and building activities usually happen while the neighbouring buildings are in use.

Along with the mentioned ecological, health, logistic and economic advantages, timber can offer social and cultural value³⁰ as additional complementing aspects of sustainability.

However, simply using wooden materials will not automatically ensure these easily jeopardized advantages. As the Austrian architect Walter Unterrainer warns:

It is far easier and more common to design and construct an unsustainable building in wood than a sustainable [one]!³¹

The material’s origin, its manufacturing, treatment and detailing must be taken into consideration. If the wood is sourced from unsustainable forestry, processed and manufactured in energy intensive ways or transported over long distances, the material’s environmental benefits diminish. Wood that is treated with harmful substances will negatively affect human health and render wood hazardous waste instead of allowing for its profitable combustion or decomposition. Improper handling of the material during a building’s execution phase, together with constructive details that do not take into account the material’s intrinsic properties, will increase the amount of maintenance required and be an obstacle to a building’s durability.³²

Wooden everyday architecture

Wooden high-rises, cultural buildings with their spectacular timber construction on display, and remote and evocative residences made of wood have caught broad attention around the globe. They feature timber as a constructive as well as visual material; these buildings communicate an environmental attitude, but also lend an individual identity to their surroundings.³³ Although everyday architecture such as multi-family housing may be acclaimed when being made of wood, its architectural design is not necessarily intriguing.

³⁰ Joseph Mayo, *Solid Wood: Case Studies in Mass Timber Architecture, Technology and Design* (London; New York: Routledge, 2015), ix.

³¹ Walter Unterrainer, ‘Wood – A Sustainable Building Material?’, in *6th Annual International Conference on Architecture and Civil Engineering (ACE 2018)*, vol. 2018 (6th Annual International Conference on Architecture and Civil Engineering (ACE 2018), Singapore: GSTF Journal of Engineering Technology, 2018), 450–59. Brackets added by the author.

³² Unterrainer.

³³ Mayo, *Solid Wood*, ix.

As a sector, residential buildings are responsible for the largest share of global greenhouse gas emissions.³⁴ However, while the architectural media's attention is mainly on representational public or cultural buildings or select private homes, economic pressure is increasing especially for buildings subject to 'an investment goal requiring measurable rates of return or requiring maximization of efficiency', such as housing.³⁵ Housing projects, especially multiple-dwelling units, are built in greater quantities than cultural and public buildings; they should therefore be subject to timber-related architectural research and innovation.³⁶

So far, with the exception of a building's services, wooden materials can be applied in any of Brand's building layers. In the case of cross-laminated timber (CLT) walls and ceilings in particular, the question arises as to whether or not the main structure should remain exposed, which in turn leads to further questions beyond pure functionality.

Especially in larger housing projects, private investors and developers have influence over quality standards and revenue, and often design decisions as well, for example concerning the surface materiality of walls and ceilings. In large housing projects, it can be challenging for the architect to define and defend architectural qualities.

Peter Cheret and Arnim Seidel observe that architectural awards are predominantly assigned to projects with 'honest' materiality; there is an almost moral obligation that implies that all constructive parts should be built in wood and left exposed wherever possible. They see this academic tenet as a limitation to the broad range of possible applications of wooden construction in urban contexts.³⁷ Furthermore, personal preferences for wooden or 'neutral' surfaces on façades or indoors vary greatly,³⁸ so that apart from technical requirements, questions of taste and preference complicate decisions concerning the visual presence of wooden construction materials.

³⁴ Abergel et al., 'International Energy Agency and the United Nations Environment Programme (2018): 2018 Global Status Report: Towards a Zero-Emission, Efficient and Resilient Buildings and Construction Sector'; Oswaldo Lucon et al., 'Buildings', in *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, ed. Ottmar Edenhofer et al. (Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, 2014).

³⁵ Housing as contrasted with 'owner/occupant-built houses' or cultural buildings that are 'financed for a higher (an economically ambiguous) mission', in: Timothy Love, 'Double-Loaded: Everyday Architecture and Windows for Improvement', *Harvard Design Magazine*, Fall/Winter 2004, 43.

³⁶ A study on the potential for an increased use of timber construction in the Oslo area found that this potential is greatest for residential buildings. Marius Nygaard et al., 'Increased Use of Timber in New Buildings in Oslo and Akershus: Potentials and GHG Emission Effects', *Frontiers in Built Environment* 5 (22 November 2019),

<https://www.frontiersin.org/article/10.3389/fbuil.2019.00131/full>.

³⁷ Peter Cheret and Arnim Seidel, 'Der neue Holzbau', in *Urbaner Holzbau: Chancen und Potenziale für die Stadt; Handbuch und Planungshilfe*, ed. Peter Cheret, Kurt Schwaner, and Arnim Seidel, Handbuch und Planungshilfe (Berlin: DOM Publishers, 2014), 14.

³⁸ Gerd Kuhn, 'Gemeinschaftliches Wohnen im Holzhaus', in *Urbaner Holzbau: Chancen und Potenziale für die Stadt; Handbuch und Planungshilfe*, ed. Peter Cheret, Kurt Schwaner, and Arnim Seidel, Handbuch und Planungshilfe (Berlin: DOM Publishers, 2014), 33–34.

1.2 Architecture's qualitative tacitness

Holistic understandings

A number of scholars call for holistic approaches in order to prevent the current focus on sustainability from rendering the concept a meaningless label. Architectural approaches with triple bottom line ambitions³⁹ rely on an integrative, pluralistic conception and interdisciplinarity when aiming at architectural quality. Culture and technology, tradition and change, form and materials, social perspectives and the production process are among the aspects to be joined into a synergistic whole, framing architectural quality as a consolidation of sometimes seemingly disparate concerns.⁴⁰

Quality, qualities, and qualitative aspects

Many academics seem to eschew the discussion of explicit aspects of architectural quality. Such academic discussion is complicated by the nature of architectural qualities: they are neither static nor of a permanent or universal size, and perception of them depends among other things on time, culture, taste, viewpoints and agendas.

Furthermore, architectural quality is rarely communicated explicitly in educational settings. Architectural qualities form part of the *tacit knowledge* that architecture students seemingly must learn from between the lines, through practice and the feedback offered on their designs by supervising experts, and based on individual sensitivity to intangible and inarticulable characteristics and correlations.⁴¹

Even for experts on juries for architectural awards and competitions, reaching consensus on what is 'good' or 'bad' – or 'sustainable' proves challenging.⁴²

³⁹ aiming for social, environmental and economic sustainability

⁴⁰ E.g. Marvin J. Malecha, 'Integrative Design Practices. Twenty-First Century Building for Sustainability', in *The Routledge Companion for Architecture Design and Practice: Established and Emerging Trends*, ed. Mitra Kanaani and David Alan 'Dak' Kopec, Routledge (New York: Routledge, Taylor & Francis Group, 2016), 211–21; Meredith Sattler, 'Situating Meanings of Sustainability Within the Architectural Discourse', in *The Routledge Companion for Architecture Design and Practice: Established and Emerging Trends*, ed. Mitra Kanaani and David Alan 'Dak' Kopec, Routledge (New York: Routledge, Taylor & Francis Group, 2016), 187–201; Walter Unterrainer, Claus Peder Pedersen, and Leif Leer Sørensen, eds., *Sustainability: An Imperative for Plurality and Context* (Aarhus: Arkitekt skolens Forlag, 2015); Peter Buchanan, 'The Big Rethink: Towards a Complete Architecture.', *Architectural Review*, Art, Design & Architecture Collection, 231, no. 1381 (March 2012): 67–81.

⁴¹ Michael Polanyi, *The Tacit Dimension* (Chicago ; London: Doubleday, New York; Routledge & Kegan Paul, London, 1967).

⁴² Sonja Oliveira and Martin Sexton, 'Conflict, Contradiction, and Concern: Judges' Evaluation of Sustainability in Architectural Awards', *Arg: Architectural Research Quarterly* 20, no. 04 (December 2016): 325–32.

Some academics seem to prefer discussing the more concrete *qualities* as properties of architecture than architectural quality. A clear distinction between the two terms, and the deliberate inclusion of both in discourse, seems expedient.

While the word *quality* in the singular form has the air of something absolute and irreproachable, many scholars understand it quite on the contrary as associations with an object rather than as the object's actual properties.⁴³ In accordance with a phenomenological perspective, quality is a subjective experience of value or excellence associated with an object. This value experience construed between subject and object might not only differ depending on time, social and cultural contexts more broadly, but also from individual to individual.⁴⁴

Qualities are commonly understood as synonymous with the characteristics, attributes, distinguishing features, or properties a thing can have. While one might initially feel reassured that these are based on 'neutral' facts that do not require interpretation, the philosopher John Locke, however, distinguished between intrinsic *primary* qualities and perceived and interpreted *secondary* qualities.⁴⁵ As an example, weight – as opposed to mass – is only an objective fact at first glance; as it depends on a context such as the distance from and mass of the Earth, it is a secondary quality according to Lockean epistemology.

Rather than going to the lengths necessary to apply this differentiation to architectural discourse, a simplified conclusion is utilised for the purpose of this thesis. It has been (rightly) argued that there exists no singular definition of architectural quality, or of what DGNB termed 'architectural culture and design quality'.⁴⁶ Many prefer instead to use 'desirable characteristics', 'appreciated properties', or at least 'architectural qualities'. *Qualities* may be understood as neutral (non-judgemental), *inherent* characteristics of an object, and quality is the experienced value *ascribed* to these characteristics, evaluated by individual taste or according to an agreed set of criteria.

Where the simplifying term *architectural quality* is utilised in this thesis, it is done with an awareness of its disputed and controversial connotations.

Architectural quality relates fundamentally differently to building design and academic research in focus and scope: While research seeks to isolate aspects for in-depth investigations that will deliver reliable and generalizable results, architectural projects are complex, and their thematic variety is broad. Their quality is measured according to the

⁴³ Trond Berg Eriksen, 'Kvalitet, arbeid og sirkulasjon', *Samtiden* 98, no. 2 (1989): 13–16.

⁴⁴ Eriksen; Birgit Cold, *Arkitektonisk kvalitet i norsk trehusbebyggelse*, ed. Sigmund Asmervik, Særtrykk fra: Bygge i Norge - synspunkter på utvikling, retning og tempo (Trondheim: Tapir Trykk, 1990), 1–3.

⁴⁵ John Locke, 'Book II, Chapter VIII: Other Considerations Concerning Simple Ideas', in *An Essay Concerning Human Understanding*, vol. 1, 2 vols (London: Cummings & Hillard and J. T. Buckingham, 1813), 123–33 (esp. Section 9, 10: Primary and Secondary Qualities); James Cargile, 'Qualities', in *The Oxford Companion to Philosophy*, ed. Ted Honderich, 2nd ed (Oxford; New York: Oxford University Press, 2005), 775.

⁴⁶ 'DGNB System Version 2018'.

successful consolidation of at times conflicting requirements. Due to the unique context of every design task – and contrary to scientific rules – these results must not be repeated or copied offhand.⁴⁷ Naturally, this also makes it difficult to be explicit about *qualities* or characteristics that produce architectural quality.

A focus on *qualitative aspects* of timber architecture, as used in this thesis, is concerned with the various, not always measurable characteristics of timber architecture and how they are valued by different stakeholders at different times.

Categories and topics

Relating aspects to higher, more universal categories is one way to facilitate the discussion of architectural quality whilst also structuring such discussion on a more general level. Some authors distinguish between parameters such as

- properties, coherence and value⁴⁸
- aesthetic, symbolic, and practical qualities,⁴⁹ or
- quality characterized through causation and time as pre-qualified (by given or accidental pre-existing circumstances), as qualified (by construction, assembly, finishing), and as re-qualified (by weathering and traces of use).⁵⁰

There is a recurring range of topics beyond a sensible use of financial and material resources and technical or ecological appropriateness in architecture competition briefs, architectural publications, and project discussions at architecture faculties. They can be arranged within categories such as the aforementioned and address functional, aesthetic, social, cultural, and time- and place dependent aspects. They include qualitative as well as quantitative parameters.⁵¹

- the building's relation to its physical surroundings; views out
- the building's relation to its time, and its timeless qualities
- the main idea and interpretation of the task, and its originality and readability

⁴⁷ Nigel Cross, 'Designerly Ways of Knowing: Design Discipline Versus Design Science', *Design Issues* 17, no. 3 (July 2001): 2.

⁴⁸ Anne Beim et al., *Arkitektonisk kvalitet og industrielle byggesystemer: råhuset i det aktuelle danske etageboligbyggeri* (Copenhagen: Kunstakademiets Arkitektkskole, 2007); Anne Beim, Jesper Nielsen, and Kasper Sánchez Vibæk, *Three Ways of Assembling a House* (CINARK, 2010).

⁴⁹ Dag Kittang, Randi Narvestad, and Anders Q. Nyrud, 'Tre i by – en kunnskapsoversikt' (Oslo, Norway: SINTEF Byggeforsk, 2011), 17.

⁵⁰ Stephen Kite, 'Can Quality Be Managed and Assured in Architecture? Issues of Qualification and Quantification', *Arq: Architectural Research Quarterly*, 11, no. 3/4 (2007): 195–97, referring to David Leatherbarrow's keynote contribution to a conference on 'Quality' at the Welsh School of Architecture in July 2007.

⁵¹ See e.g. Beim et al., *Arkitektonisk kvalitet og industrielle byggesystemer*; Kasper Vibæk Jensen et al., *Kvalitetsmål i den arkitektoniske designproces: med fokus på industrialiseret byggeri* (Copenhagen: CINARK: Eksp. Kunstakademiets Arkitektkskoles Bibliotek, 2006); Erik Nygaard, 'Arkitektonisk kvalitet - et forsøg på en kortfattet definition', *Nordisk Arkitekturforskning* 15, no. 1 (2002): 91–96; Beim, Larsen, and Mossin, *Økologi og arkitektonisk kvalitet*.

- functional organization; flexibility or generality, and adaptability
- interior spatial qualities such as proportions and spatial sequences; supported by light, surfaces, materials and colour; nuanced with a combination and negotiation of hard and soft, open and closed, heavy and light, massive and transparent parts
- balance between secluded areas for privacy and retreat, and areas for social encounter and community
- indoor climate and acoustics
- choice of construction system and material in correspondence with not only function, but also character of the building
- details that both transport the building's general idea or attitude, and that are robust, durable and easy to clean and maintain

This tentative range of topics would be weighted differently from a professional, architectural perspective than by laypeople or other stakeholders, and other topics would be included or omitted.

Assessing quality: experts, systems and users

The previous section addressed the perception of quality as something that must be experienced rather than something inherent. Traditionally, the connoisseur, owing to education and experience, has been an authority for individual judgement of this kind. Architectural critics interpret the characteristics of a building as qualities. Today however, organisations that seek quality assessment also purport objective evaluation according to standardized processes and systems.⁵²

Attempts to quantify architectural quality⁵³ may have been motivated by a desire to communicate, defend and also sell it more confidently. As an example, architectural quality has been linked to (business or social) 'value creation by architectural design' with quantifiable and measurable effects of architectural intervention, such as a rise in the price of adjacent properties following the renewal of public spaces,⁵⁴ or a decreased need for physical restraint and medication in newly built psychiatric hospitals.⁵⁵ Some authors

⁵² Kite, 'Can Quality Be Managed and Assured in Architecture? Issues of Qualification and Quantification'.

⁵³ E.g. linking financial benefits to natural design elements in 'The Economics of Biophilia', 12 June 2012, <http://clients.edmullen.com/terrapin/>.

⁵⁴ A discussion of these effects should however also take unwanted consequences such as resulting gentrification into account.

⁵⁵ Nanna-Rose Reinevald Broch, Peter Andreas Sattrup, and Karen Sejr, 'Arkitektur med merværdi. Eksempler på byggeri, byrum og landskaber der skaber social, økonomisk og miljømæssig værdi', ed. Karen Sejr (Danske Arkitektvirksomheder, April 2017); Active House Alliance, 'Value Creation by Architectural Design - Active House', <https://www.slideshare.net/activehousealliance/value-creation-by-architectural-design-active-house>; 'The Value of Public Space. How High Quality Parks and Public Spaces Create Economic, Social and Environmental Value' (London: CABE Commission for Architecture and the Built Environment, 2003); 'The Value of Good Design. How Buildings and Spaces Create Economic and Social Value.' (London: CABE Commission for Architecture and the

emphasize the difference between architectural quality and value, understanding quality as being more general, objective and universal in contrast to value, which has a greater degree of subjectivity and can change more abruptly.⁵⁶

More well-known ways of quantifying savings and benefits related to architectural design, such as the assessment of carbon emission reduction, energy conservation or life cycle cost reduction, are part of the rating systems mentioned earlier. Whether certification and quantification attempts will succeed in fully capturing architectural quality is questionable however.⁵⁷ Peter Zumthor emphasizes an emotional component, accessed through a direct experience of architecture as opposed to detached analysis:

Quality architecture to me is when a building manages to move me.⁵⁸

Furthermore, ‘good architecture’ appears to hold an element of surprise and innovation that tends to evade precise verbalization, let alone assessment or prescription. This enriching *je ne sais quoi*, as circumscribed by Mari Hvattum, exceeds expectations, and the attention and care that the architect dedicated to enhancing the experience of a space or a detail is sometimes only discovered upon closer inspection.⁵⁹

For some authors, originality and novelty need to be balanced with familiarity and stylistic recognizability.⁶⁰ Other critics have raised questions about prioritizing these aspects:

For many architects, not their clients, the quality of architectural originality easily outweighs the requirements of functional, structural or environmental performance.⁶¹

Some scholars describe conflicting opinions as regards the interpretive authority concerning architectural taste and values as defined by professionals, e.g. architects or designers, and the public – most often laypeople.

Building performance evaluations need to replace the metaphor of aesthetics with that of affective meanings conveyed to the public. Some people claim that differences between architects and the public are irrelevant and that heeding popular meanings gets mediocre

Built Environment, 2002); ‘The Value of Urban Design’ (London: CABE Commission for Architecture and the Built Environment, 2001).

⁵⁶ Vibæk Jensen et al., *Kvalitetsmål i den arkitektoniske designproces*; Pehr Mikael Sällström, ‘Processer för arkitektonisk kvalitet i byggandet. Rapport från nordisk konferens i samband med Arkitekturåret 2001. Kulturhuset, Stockholm 4-5 oktober.’ (Stockholm: FORMAS / Sveriges Arkitekter, August 2002), 9.

⁵⁷ Kite, ‘Can Quality Be Managed and Assured in Architecture? Issues of Qualification and Quantification’.

⁵⁸ Peter Zumthor, *Atmospheres: Architectural Environments: Surrounding Objects* (Basel: Birkhäuser, 2006).

⁵⁹ Mari Hvattum, *Hva er arkitektur* (Oslo: Universitetsforlaget, 2015), 129.

⁶⁰ Dag Kittang, ‘Trebyen Trondheim – Forvitring Og Fornying. Ein Studie Av Ein Byplandiskurs’ (Trondheim, NTNU Fakultet for arkitektur og billedkunst, 2006); Peter Smith, ‘Complexity, Order and Architectural Aesthetics’, ed. David Canter, *Ethnoscapes - Current Challenges in the Environmental Social Sciences* 1 (1988): 200–214.

⁶¹ Igea Troiani, ‘“Stirling’s Worth”: Architectural Quality and the Florey Building, Oxford’, *Arg: Architectural Research Quarterly* 11, no. 3/4 (2007): 296.

solutions, the average of an inexperienced public. They give higher priority to designer standards of taste, arguing that designers lead popular taste.⁶²

According to several studies however, the expert's view does not determine the direction of popular taste and value notions.

Studies consistently showed that the taste standards of designers did not lead popular taste. Popular values (not high-art values) led future standards of taste.⁶³

It appears that architecture professionals and lay people have different understandings, expectations and ambitions regarding the qualities of architecture. Architects seem to direct their design efforts in part towards recognition by their peers, and only in part towards satisfaction of their clients' and users' requirements.⁶⁴

Lang and Moleski describe an entire category of architectural aesthetics as purely understood by, discussed among, and directed at experts.

Dealing with conscious associational meanings and with design ideas expressed in built form is the subject of intellectual aesthetics. The intellectual aesthetic function of buildings deals with the stories that an architect wants to express in built form. Buildings function in this manner primarily for the intellectual interpretation by other architects and for the elite of the art world.⁶⁵

A building's score in 'intellectual aesthetics' will determine whether it is a mere building or if it is elevated to a work of art. The related theoretical and built references and expert discussions – 'architalk'⁶⁶ – are largely unknown or inaccessible to the general public.

However, clients not only represent the specific demands that need to be met with architectural design; users are also increasingly being acknowledged as an important factor in the assessment of quality, providing unique insights into both everyday experiences and their interpretation of symbolic aspects.

Quality is woven into a pattern of consumption and notions, into the comprehensive social and cultural circulation of signs and expressions. Quality can thus not be considered without knowledge of subjective, user-based experience.⁶⁷

⁶² Wolfgang F. E. Preiser and Jack L. Nasar, 'Assessing Building Performance: Its Evolution From Post-Occupancy Evaluation', *International Journal of Architectural Research: ArchNet-IJAR* 2, no. 1 (2008): 16.

⁶³ John Punter, 'Aesthetics in Planning', in *Values and Planning*, ed. Huw Thomas (Aldershot, England; Brookfield, Vermont, USA: Avebury; Ashgate Publishing Company, 1994), 38–67.

⁶⁴ J. T. Lang and W. Moleski, 'Experiential Aesthetics and Intellectual Aesthetics', in *Functionalism Revisited: Architectural Theory and Practice and the Behavioral Sciences* (Surrey, England: Ashgate, 2010), 255–87.

⁶⁵ Lang and Moleski, *Functionalism Revisited: Architectural Theory and Practice and the Behavioral Sciences*, 255,257.

⁶⁶ Lang and Moleski, 278; referring to Paul-Alan Johnson, *The Theory of Architecture: Concepts, Themes & Practices* (New York: Van Nostrand Reinhold, 1994).

⁶⁷ Kittang, Narvestad, and Nyrud, 'Tre i by – en kunnskapsoversikt', 16. Translation from Norwegian to English by the author.

This underlines the importance of granting greater attention to user perspectives. Rather than offering anonymous and abstract assumptions, users can provide personal, experience-based knowledge.

The public brings personal knowledge about their experience of places. In sum, the results highlight the value of integrating popular values into designs and building evaluation procedures. To gauge popular values, one must ask the public.⁶⁸

Wolfgang F. E. Preiser and Jack L. Nasar trace the emergence of post-occupancy evaluation (POE) and of environment-behavioural research in the late 1960s with a user-centred (or consumer-based) approach to building assessment at its core. Designers, planners and social scientists – sometimes in collaboration – aimed at improving building performance and design to be better able to meet occupants’ needs; to this end, buildings were evaluated systematically with multiple methods after they had been built and used for a period of time. While early POE focused largely on users’ satisfaction with functionality, efficiency, comfort and aesthetics, in recent years sustainability, technical performance or energy use have also been in the centre of attention.

Although POE can be useful for both improving occupant satisfaction and managing costs, its application is not universal for a number of reasons, e.g. that the costs for POE are not a standardized part of the architect’s or the developer’s fees, and the planning phases of conventional building projects do not include POE. Moreover, the range of skills and techniques required for the various kinds of POE is so broad that no single discipline covers them all; they are rarely represented in the staff of a medium-sized office, and external evaluations might be experienced as a threat to professional authority.⁶⁹ Even larger offices such as O.M.A. or Snøhetta do not apply POE by default, but instead use it in designated research projects or for special publications.⁷⁰

Beta Sirowy describes the inclusion of the user perspective as fragmented or incidental in most major architectural paradigms, either imposing solutions based on social ideals of users without consulting them directly, or turning instead to other realms such as formal or intellectual explorations or a positioning within market forces.⁷¹

⁶⁸ Preiser and Nasar, ‘Assessing Building Performance: Its Evolution From Post-Occupancy Evaluation’, 89.

⁶⁹ Preiser and Nasar, ‘Assessing Building Performance: Its Evolution From Post-Occupancy Evaluation’; National Research Council, ‘Overview: A Summary of Findings’, in *Learning from Our Buildings: A State-of-the-Practice Summary of Post-Occupancy Evaluation* (Washington DC: The National Academies Press, 2001); Jacqueline Vischer, ‘Post-Occupancy Evaluation: A Multifaceted Tool for Building Improvement’, in *Learning from Our Buildings: A State-of-the-Practice Summary of Post-Occupancy Evaluation* (Washington DC: The National Academies Press, 2001), 23–34, <https://www.nap.edu/catalog/10288/learning-from-our-buildings-a-state-of-the-practice-summary>.

⁷⁰ Rem Koolhaas, *Post-Occupancy*, Domus d’autore (Milano: Domus, 2006); Snøhetta, ‘Sustainability’, accessed 24 February 2020, <https://snohetta.com/process/sustainability>.

⁷¹ Beta Sirowy, ‘Among Paradigms: Major Ways of Framing User-Related Problems in Contemporary Architectural Discourse’, *FormAkademisk - Forskningstidskrift for Design Og Designdidaktikk* 5, no. 1 (10 August 2012).

Brand observes that an obsession with style and immediate – rather than long-term – results made architects neglect this perspective. He asks:

What made Architecture afraid of building users?⁷²

Francis Duffy observes the same distance between designer and client:

Clients stand outside the professional barricades looking in. How they interpret professional behaviour and professional institutions is less as a struggle against the forces of evil than a conspiracy against the public interest.⁷³

As visualized in a gap model by John Zeisel (Figure 1.4, left), there is often a lack of communication between designers and users (as opposed to paying clients).⁷⁴

This holds also true for larger residential buildings with many dwelling units, where the architect usually does not meet any actual inhabitants; this is different to e.g. a private residence. Often, the architect negotiates solutions with a developer (paying client), who then either sells or lets out flats.

Unless a collaborative design process is an explicit intention,⁷⁵ the architect bases design solutions on assumptions about a fictional inhabitant – these are often over-generalized⁷⁶ or reflect the architect's own preferences⁷⁷ – and on a mix of typologies that, according to the developer, responds to the demand on the housing market. The architect neither explains the design directly to the actual inhabitants, nor receives direct feedback on design choices based on lived experiences. Instead, architect and inhabitant communicate indirectly, through the physical manifestation of the architect's design intentions in a building, where they also have met other requirements such as building codes or a budget. The inhabitant leaves indirect commentaries on the design in the form of

⁷² Brand, *How Buildings Learn*, 211.

⁷³ Francis Duffy and Les Hutton, *Architectural Knowledge: The Idea of a Profession* (London; New York: E & FN Spon, 1998), viii.

⁷⁴ 'The user-needs gap' in John Zeisel, *Inquiry by Design: Tools for Environment-Behaviour Research*, ed. Irwin Altman and Daniel Stokols, reprint (original from 1984), vol. 5, Environment and Behavior (Cambridge: Cambridge University Press, 1993), 35; also represented in Bryan Lawson, *How Designers Think: The Design Process Demystified*, 4. ed (Amsterdam: Elsevier/Architectural Press, 2006), 86.

⁷⁵ This was the case in Vindmøllebakken by Helen & Hard and in several projects by Kaden + Lager that make up part of this study.

⁷⁶ 'The models of people implicit in architectural practice are over-generalized, the design implications of culturally specific activity patterns and aesthetic attitudes are poorly understood, and the full range of the purposes served by the built environment is not included in current models of "function" in architecture.' Lang and Moleski, *Functionalism Revisited: Architectural Theory and Practice and the Behavioral Sciences*, 27.

⁷⁷ 'Simplified solutions based on too narrow a definition of function willy-nilly eliminated such opportunities. It is, however, easier to design with a simple rather than a complex model of people in mind! (...) The model of the human still tends to be universalist, often based on the architect's image of, usually, himself (...)' Lang and Moleski, 12; Lang and Moleski refer to H. Allen Brooks, *Le Corbusier's Formative Years: Charles-Edouard Jeanneret at La Chaux-de-Fonds* (Chicago: University of Chicago Press, 1997).

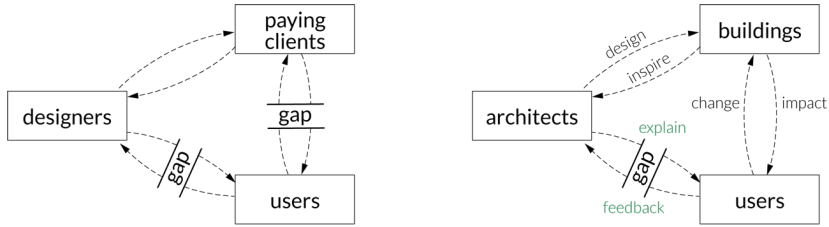


Figure 1.4 Gap model according to Zeisel (left), and adapted for this thesis (right)

physical changes to the building, such as modifications, additions, repairs, maintenance or traces of use (Figure 1.4 right).

Furthermore, as Jon Lang and Walter Moleski have pointed out, the inhabitant is also underrepresented in theory:

Theorists have shown little interest in the utility of buildings for the people who inhabit or visit them.⁷⁸

These ‘everyday perspectives’ matter however, and closer attention is merited to put ‘expert perspectives’ into context and subject them to a ‘reality check’. When the aim is a holistic understanding of sustainability, including the user perspective becomes more important still. Furthermore, architecture is acknowledged as a social concern:

If architecture, as a discipline, recognizes and embraces the diversity of values that exist in the larger population, a need exists to extend and reorganize the [theoretical] body of knowledge.⁷⁹

Increasing and improving the communication between architect and inhabitant may yield under-utilised benefits for both sides.

⁷⁸ Lang and Moleski, *Functionalism Revisited: Architectural Theory and Practice and the Behavioral Sciences*, 26.

⁷⁹ Lang and Moleski, 27.

1.3 Positioning and research questions

Chosen perspectives on timber architecture

The ‘sustainability paradigm’ justifies and enhances the relevance of and interest in wooden building materials. While acknowledging environmental concerns as critical general conditions, the studies are deliberately carried out without the ‘sustainability filter’ in place, but instead with a neutral openness to the selected perspectives.

Recent wooden building products and updated building codes in many countries offer new design options for representative or cultural buildings as well as for everyday architecture such as housing projects, the latter being responsible for the largest share of the building sector’s climate impact. Focusing particularly on urban residential buildings, this research aspires to broaden the designer’s, planner’s and decision maker’s perspective on the ideation, production and reception of architecture as influenced by wooden materials.

A holistic understanding of sustainable architecture underpins the importance of studying qualitative aspects of wooden materiality. These may be more difficult to assess and communicate, but they determine a building’s lifetime just as much as quantifiable aspects do. The durability of a building is not only affected by technical and constructive aspects, but also by the architecture’s experiential and semantic appreciation – its loveability. The term loveability implies that architecture can be, or is to be, loved. Its appraisal by the expert or connoisseur has been mentioned above. Academics and practitioners alike may be seen as professional experts, while users or inhabitants represent experts of everyday, lived experiences.

Vitruvius argued that neither the scholar nor the practicing architect had a full understanding of architecture without the perspective of the other.⁸⁰ These two perspectives are also represented in this thesis: – theory as a *generalizing* instance, and practice as a *contextualizing* element. Practice is represented by architects and their built work. Together with architectural writers, the practicing architects represent a ‘professional’ view on architecture. Both architects and academics are professional channels that – explicitly or not – produce, discuss, and evaluate architectural qualities and put them into perspective.

⁸⁰ Marcus Vitruvius Pollio, ‘The Education of the Architect’, in *The Ten Books on Architecture*, trans. Morris Hicky Morgan (New York: Dover Publications, 2012), 5: ‘It follows, therefore, that architects who have aimed at acquiring manual skill without scholarship have never been able to reach a position of authority to correspond to their pains, while those who relied only upon theories and scholarship were obviously hunting the shadow, not the substance. But those who have a thorough knowledge of both, like men armed at all points, have the sooner attained their object and carried authority with them.’

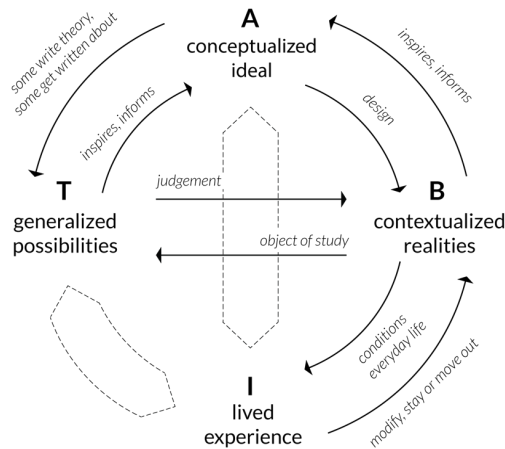


Figure 1.5 Research perspectives: Theory (T), Buildings (B), Architects (A) and Inhabitants (I)

The recipients toward whom these theoretical and concrete efforts should be directed – citizens, users, inhabitants (as opposed to competitors or critics) – are largely laypeople, presumably with varying perspectives.

Especially in larger housing projects, architects usually do not communicate their design ideas and intentions directly to the user, let alone base them on the users' preferences, needs and desires. With the exception of features that are highlighted in the project's marketing, the architecture has to speak for itself.

Through the building design, the architect is part of framing people's everyday life – this can range from everyday practicalities and adaption possibilities when needs change, to emotions, identification and a sense of belonging. Architects seldom seek the inhabitants' response to their housing project designs directly. Post occupation evaluations (POE) in which information is collected about how the building 'works' after the users have moved in, are rarely habitual practice for the average architectural office.

This research seeks to include both lay- and professional perspectives and to discuss conceptual possibilities along with built realities. Four research perspectives are chosen to explore the architectural qualities of wooden building materials:

- changing architectural paradigms – as represented in architectural history and theory,
- different design approaches – by leading timber architects,
- the encounter with the reality of diverse contexts – as manifested in buildings,
- and finally, everyday experiences with the studied range of buildings – by their inhabitants.

The research aims to uncover and integrate knowledge as generalized in architectural history and theory, as conceptualized by practicing architects, as manifested and contextualized in built examples and as experienced by inhabitants.

Two axes span the field of interest – with theory as architectural possibilities, opposed to buildings as architectural realities; and with the architect as producer and ideator of architecture versus the inhabitant as its receptor and experiencing instance. The arrows indicate possible mutual influences – or rather lacking links, as claimed earlier (Figure 1.5).

Of course, there are also other instances relating to and defining the context of timber architecture than those depicted in the presented model, such as e.g. political stakeholders, legislation, economy, marketing, production, consultancy, etc. For this thesis however, the four perspectives described are chosen as filters for the investigation of the materiality of wooden construction in residential everyday architecture.

Research questions

The following hypotheses are based on the considerations presented in the previous contextualizing sections.

In addition to measurable and calculable (quantitative) aspects, wooden building materials have qualitative characteristics. These can enhance everyday architecture and its long-term desirability. Qualitative characteristics would thereby facilitate holistic sustainability in architecture.

Integrating the user perspective in addition to professional architectural perspectives from theory and practice can contribute to improved architectural design and to a broader architectural debate.

The overarching research interest is in qualitative aspects of wooden construction materials and how they are experienced and valued by architects and inhabitants.

The perspectives sought are addressed with the following questions:

How have materiality and particularly concepts related to wooden materials been discussed in architectural history and theory?

How do contemporary architects view wooden materiality's contribution to their architectural ambitions?

How do inhabitants perceive and value the materiality of wooden constructions in the buildings they inhabit?

How do these perspectives converge or diverge?

1.4 Qualitative research approach

Multi-method

As stated above, this research aims to supplement quantitative aspects of timber architecture with qualitative knowledge. It is possible to investigate qualitative issues with quantitative methods, for example through statistical surveys regarding preferences of wood exposure, wood type or wood treatment. The focus here however is instead on how tacit attitudes, assumed implications and potential preferences are embedded within larger architectural paradigms; within the constructive, legal or financial requirements of a building; within the overall design philosophies of contemporary architects; and within the lived realities of people.

Qualitative research accommodates a broad variety of methods in order to incorporate multiple viewpoints into a ‘complex, holistic picture’⁸¹ of an issue and its manifold dimensions. Norman K. Denzin and Yvonna S. Lincoln write that

qualitative research is multimethod in focus (...). Qualitative researchers (...) [attempt] to make sense of or interpret phenomena in terms of the meanings people bring to them. Qualitative research involves (...) a variety of empirical materials – case study, personal experience, introspective, life story, interview, observational, historical, interactional, and visual texts (...). Accordingly, qualitative researchers deploy a wide range of interconnected methods, hoping always to get a better fix on the subject matter at hand.⁸²

The chosen perspectives for this research – theory, buildings, and people – all require different approaches to data collection and analysis. Several data sources and corresponding methods have become constitutive parts of the iterative research exploration presented in this thesis: desk research, such as literature studies and the analysis of architectural drawings and images; and empirical studies, which include interviews, site visits, and the probing and dissemination of ideas and findings in architectural education.

Some scholars describe qualitative researchers’ multi-method approach as *bricolage*, referring to the eclectic use or invention of investigative tools as needed in a specific context. Using a bricolage or mixed-method approach makes it possible to select and combine research methods from diverse academic fields and traditions and with different conventions to arrive at the most pertinent answers to the research questions.⁸³

⁸¹ John W. Creswell, *Qualitative Inquiry and Research Design: Choosing among Five Traditions*, Nachdr. (Thousand Oaks, California: Sage Publications, 2005), 15.

⁸² Norman K. Denzin and Yvonna S. Lincoln, eds., *Handbook of Qualitative Research* (Thousand Oaks London New Delhi: Sage Publications, 1994), 2.

⁸³ Joyce Yee and Craig Bremner, ‘Methodological Bricolage - What Does It Tell Us about Design?’ (Doctoral Design Education Conference, Hong Kong Polytechnic, 2011); Linda N. Groat and David Wang, *Architectural Research Methods*, 2nd ed. (Hoboken: Wiley, 2013); Denzin and Lincoln, *Handbook of Qualitative Research*, 2.

The researcher-as-*bricoleur*-theorist works between and within competing and overlapping perspectives and paradigms,⁸⁴

producing ‘complex, dense, reflexive, collage-like’ results.

Qualitative research thus

crosscuts disciplines, fields, and subject matter. (...) [It] crosscuts the humanities and the social and physical sciences.⁸⁵

As Creswell points out, a ‘general approach’ is more appropriate for qualitative, explorative research than a detailed plan, as

questions change during the process of research to reflect an increased understanding of the problem.⁸⁶

This is also reflected in the depiction of the research process as a *hermeneutic spiral*:⁸⁷ the researcher starts by studying an aspect of the subject matter. Every attempt to relink preliminary insights to the whole will produce new understanding, which will then be a modified starting point for revisiting that aspect. Such movement between aspect and overarching interest produces a ‘progressively deeper understanding of both’.⁸⁸ A research project can thus be divided into sequences – ‘different phases with respect to the reflective elements’.⁸⁹

This is similar to design processes within architectural practice and the specific ways in which architects are trained to address design problems. Among other things, architects ‘examine the problem at breadth before selecting a particular approach to the solution’. They ‘decompose the ill-defined problem into well-defined parts’ that, when resolved, are reassembled as an answer to the original problem.⁹⁰ Ömer Akin describes the architect’s iterative way of developing and evaluating partial solutions before modifying the problem so that better results become possible; this suggests that a flexible research strategy is best suited to accommodating continuously emerging insights.

Both the advantages of treating delimited portions of a complex problem at a time and the awareness of continuously growing insight have informed the chosen thesis format.

⁸⁴ Denzin and Lincoln, *Handbook of Qualitative Research*, 2–3.

⁸⁵ Denzin and Lincoln, 1,3.

⁸⁶ Creswell, *Qualitative Inquiry and Research Design*, 18–19.

⁸⁷ Gerard Radnitzky, *Contemporary Schools of Metascience* (Gothenburg: Scandinavian University Books, 1970), 23 Based in behavioral sciences, these ‘metasciences’ stand for epistemological questions, focusing on logical empiricism and hermeneutics.

⁸⁸ Mats Alvesson and Kaj Sköldböck, *Reflexive Methodology: New Vistas for Qualitative Research*, Repr (London: SAGE, 2004), 53. The authors differentiate between various interpretations of the ‘hermeneutic circle’, which will not be discussed further here.

⁸⁹ Alvesson and Sköldböck, 285–86.

⁹⁰ Ömer Akin, ‘Expertise of the Architect’, Research Showcase @ CMU (Pittsburgh, Pennsylvania, USA: Department of Architecture, Carnegie Mellon University, 1987).

Thesis format

Preliminary explorations of several areas of interest were presented and published as conference papers. Two of these helped clarify the research approach, and a third paper was useful as a first attempt to tackle the empirical data. Rather than constituting parts of the thesis, the papers were treated as exercises in the concise formulation and discussion of various aspects of the research. In a compilation thesis, the content would have been locked in these early stages of understanding. Furthermore, conference papers are often adapted to a conference's theme and modified to fit into particular sessions in ways that are not always aligned with the thesis's development. As the content and disposition presented here only became evident at a later stage, they were determined to be best accommodated in a monograph. This entails other challenges; the task of writing up and editing can become overwhelming as it is difficult to terminate updating the written with the understood.

Hermeneutic journey

The research at hand evolved in different phases and along several 'checkpoints' (the refocusing after assessing two conference papers, one of which described the pilot study; after feedback in a midterm review; and after receiving the reader report; see Figure 1.12 on page 39). Similar to work processes in architectural practice and as true for hermeneutic processes, the sequences informed one another, resulting in the reframing or reiteration of methods and activities and ultimately the restructuring of the presented results.

Some authors recommend setting out purposively⁹¹ and with clear goals⁹² in order to insure adequate preparation and problem setting⁹³ and thereby grant the relevance (or significance) of a research endeavour. Others however acknowledge the 'messy' rather than straight-forward and goal-oriented character of many qualitative research processes, where the research question that is ultimately presented only emerges towards the end.

As mentioned earlier, it appears to be typical of successful design processes that they are not overly rigid and pre-structured, but rather flexible processes, where problem-framing and the development of a solution evolve parallel to one another and openness is retained for emerging opportunities.⁹⁴ It has also been argued that this can be true for research processes. Nevertheless, convincingly conveying a research contribution often conceals

⁹¹ Nigel Cross, 'Design Research: A Disciplined Conversation', *Design Issues*, Summer 1999.

⁹² Julie Ellison and Eatman, 'Scholarship in Public: Knowledge Creation and Tenure Policy in the Engaged University' (Syracuse, New York: Imagining America, 2008).

⁹³ Ellison and Eatman; Daniel Fallman and Erik Stolterman, 'Establishing Criteria of Rigour and Relevance in Interaction Design Research', *Digital Creativity* 21, no. 4 (December 2010): 265–72.

⁹⁴ Nigel Cross, *Designerly Ways of Knowing* (Birkhäuser, 2007), 102,110-111,114-116.

the muddled path towards insights and structure in the final presentation or printed version of a doctoral thesis.⁹⁵

The most important elements of this research are listed briefly below and described more in detail in the following section, in the order in which they were undertaken and influenced one another. This ‘hermeneutic journey’ describes a cognitive process where growing insights continuously transform pre-existing understanding with the help of iterative method applications.

A first take on uncovering qualities of importance for wooden housing projects and how these are manifested in realized buildings relied on the study of literature and of built precedents, as well as on leading a master’s studio course at AHO. Studying literature and precedents provided interesting, although not necessarily timber-specific insights, and the course made it possible to explore the negotiation of architectural qualities with urban density from an overarching urban perspective, through architectural propositions, and down to material specifications and detailed constructive solutions for wooden materials.

An expanded knowledge background on which to base design decisions was still lacking, however. Therefore, in a second research phase, the architects from timber housing projects that had received broader attention or distinctions were interviewed about their motivations for working with timber, and on their viewpoints regarding how this is best done. This professional view was supplemented with accounts of how inhabitants of the projects felt about timber in general and how they experienced it in their homes.

The initial literature study on qualities in denser urban areas, for dwellings and concerning building materials, proved insufficient in relation to the large volume and thematic breadth of the interview material. A new literature search on materiality – and, when specifically available, with a view on wooden materials – became an undertaking on its own.

Both the interview material and the literature consulted were found to address three overarching thematic realms: timber’s concrete materiality; its perceived materiality; and its semantic materiality. Structuring the research results into according categories however turned out to be unsatisfactory for their overall communication. Conveying a line of argument was found to be better facilitated with the help of narratives instead. Consequently, concrete, perceived and semantic facets of materiality haven been woven into the three ‘timber tales’ presented here, each tale giving special weight to one of these facets.

⁹⁵ Charlotte Clark, Michael Brody, and Justin Dillon, ‘The Messy Process of Research: Dilemmas, Process, and Critique’, in *Towards a Convergence between Science and Environmental Education: The Selected Works of Justin Dillon*, ed. Justin Dillon, World Library of Educationists Series (New York: Routledge, 2017).

Pilot phase

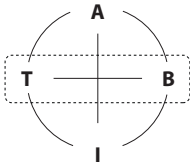


Figure 1.6 Pilot phase: Theory (T) and built precedents (B)

Architectural qualities for low-rise high-density timber housing

The qualitative aspects of timber architecture were addressed in a rather straightforward manner in a tentative conference paper during an initial research phase.⁹⁶ The paper focused on low-rise high-density housing projects with a timber construction and consisted of two main parts. A literature study served to identify desirable characteristics that enhance the architectural quality of such projects on an urban, building, and detail level. Findings were used as a focusing lens for a subsequent analysis of built precedents by renowned contemporary architects; a document study of architectural drawings, construction documents and photographs aimed to reveal how the theoretical requirements identified through the literature study could be translated into built reality.

Four precedents for multi-apartment timber housing were analysed in this pilot study: *Skadbergbakken* and *Kjølnes* by Helen & Hard, *Mühlweg* by Hermann Kaufmann Architekten, and *Hannibal Road Gardens* by Peter Barber Architects. Their analysis focused mainly on the projects' empirical settings and physical characteristics.

The consulted literature comprised Norwegian and international academic papers; research reports; specialized books by academics, planners and architects; declarations by architectural associations in Scandinavia; documents related to architectural awards; criteria forwarded by the Norwegian State Housing Bank (Husbanken); and publications by Scandinavian and European architects who are widely recognized for their work with wooden constructions.

Regardless of the difficulties related to defining architectural quality explicitly that are mentioned in the previous section, the literature study resulted in a collection of quite specific criteria – on an urban scale; with a housing focus; and on a material and detail level. Qualities that support a positive experience of urban density related to three

⁹⁶ Ute Groba, 'Design Strategies for Low-Rise High-Density Prefabricated Timber Housing', in *Sustainable Housing 2016 Proceedings of the International Conference on Sustainable Housing Planning, Management and Usability, Porto, Portugal, 16-18 November* (Sustainable Housing 2016 International Conference on Sustainable Housing Planning, Management and Usability, Barcelos, Portugal: Green Lines Institute for Sustainable Development, 2016), 211–26.

overarching topics: functions and connections; the built mass; and the social composition of a neighbourhood.⁹⁷

Desirable characteristics that foster identification with a place of home addressed the relationship between the individual and a community; aesthetic as well as practical issues (daily and long-term); the inhabitant's private economy; and the role of planted areas.⁹⁸

Aspects that are important for sustainable timber constructions in a broader sense concerned the topics longevity and maintenance; well-being; and environmental impact.⁹⁹

Contradictory requirements and consolidating design moves

Rather than providing the basis for simple and convincing guidelines for better architecture, the pilot study brought a number of contradictions to light. Some were between the criteria themselves, as well as with criteria for sustainable architecture and with aspects of prefabrication, which is an important aspect of timber construction. Four pairs of these contradictory aspects were selected as focus areas when studying example projects, or precedents, through drawings and pictures, namely: rationality versus variety; coherence versus individuality; community versus privacy; compactness versus spaciousness.

All of the chosen example projects had a load-bearing timber construction (with different degrees of prefabrication), were 2-4 storeys high, and had a residential function (one was

⁹⁷ Eberhard Tröger, *Density & Atmosphere: On Factors Relating to Building Density in the European City* (Basel: Birkhäuser, 2015); Jan Gehl, *Life Between Buildings: Using Public Space*, Sixth Edition (Washington, DC: Island Press, 2011); Birgit Cold, *Her er det godt å være: om estetikk i omgivelsene* (Trondheim: Tapir Akademisk Forlag, 2010); Julie Campoli and Alex S. MacLean, *Visualizing Density* (Cambridge, Massachusetts: Lincoln Institute of Land Policy, 2007); Jane Jacobs, *The Death and Life of Great American Cities*, Reissue edition (New York: Vintage, 1992).

⁹⁸ Eli Støa and et al., 'Bokvalitet i asylmottak - en veileder' (NTNU - Fakultet for arkitektur og billedkunst, 2016); Christian Schittich, ed., *Best of Wohnen: Best of Housing*, 1. ed, Edition Detail (München: Institut für Internationale Architektur-Dokumentation, 2012); a o Univ Prof DI Dr Helmut Schramm, *Low Rise - High Density Horizontale Verdichtungsformen im Wohnbau* (Vienna: Springer Vienna, 2008); Randi A. Narvestad, *Boligkvalitet i et samfunnsperspektiv: en casestudie av 8 nye norske boligprosjekter*, vol. 12–2008, Prosjektrapport (SINTEF byggforsk : online) (SINTEF byggforsk, 2008); Tatjana Schneider and Jeremy Till, *Flexible Housing* (Elsevier, 2007); Christian Schittich, Klaus-Dieter Weiß, and Eberhard Wurst, eds., *High-Density Housing: Concepts, Planning, Construction*, In Detail (München; Basel; Boston, Massachusetts: Edition Detail; Birkhäuser, 2004); Ola Nylander, *Architecture of the Home*, trans. John Krause and Deborah Fronko (Chichester: Wiley-Academy, 2002); Jon Guttu, 'Tidsskifter og syn på boligkvalitet', *Regionale Trender*, 2002; 'The Norwegian State Housing Bank's Role - Husbanken', accessed 4 August 2016, <http://www.husbanken.no/english/about-the-housing-bank/the-housing-banks-role/>.

⁹⁹ Mayo, *Solid Wood*; Peter Cheret, Kurt Schwaner, and Arnim Seidel, eds., *Urbane Holzbau: Chancen und Potenziale für die Stadt; Handbuch und Planungshilfe*, Handbuch und Planungshilfe (Berlin: DOM Publishers, 2014); Hermann Kaufmann and Otto Kapfinger, *Hermann Kaufmann: Wood Works: Ökorationale Baukunst = Architecture Durable* (Wien ; New York: Springer, 2009); Schneider and Till, *Flexible Housing*; Beim et al., *Arkitektonisk kvalitet og industrielle byggesystemer*.

student housing). They had all been recently built in Norway or Europe and received awards or other recognitions.

The building analysis aimed at extracting design moves that can consolidate the aforementioned conflicting requirements. A total of 17 design operations could be read out of the four example buildings; these bring about ‘rational variety’, ‘coherent individuality’, ‘privacy within a community’, and ‘spacious compactness’ (Figure 1.7 – Figure 1.9).

The design moves are predominantly geometrical operations concerning the constellation of several units, the volumetry of each single unit, the arrangement of enclosed spaces, and façade elements. They include design decisions that are made in the planning phase of a project, but also options for additions or modifications at later stages that do not necessarily require the involvement of an architect. Timber is particularly accommodating when it comes to relatively uncomplicated and cost-efficient implementation of these design moves.

Timber construction was found to influence qualities on an urban and on a housing level by facilitating various design operations, as well as by the possibility of being made experienceable directly. In denser urban areas, and where residential units are smaller due to economic pressure, the materials closest to us – those we touch, smell, look at closely, lean against, or on which we hear sounds reflected – might become increasingly important.

Refocus

Although the design operations described above have their origin in timber projects, they are valid for other building materials as well. This insight led to a reconsideration of the methods and research focus of this thesis. For the research to be more timber-specific, the focus was directed more explicitly toward the wooden materiality of constructive parts. A more direct meeting with the building’s materiality was thus sought not only through conversations with the buildings’ ideators, but also through site visits and meetings with the buildings’ inhabitants. The interviews eventually informed the selection of additional literature which added another material- and timber specific dimension to the data.

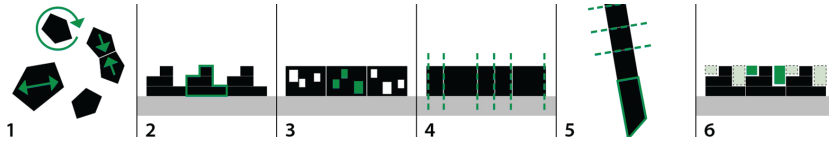


Figure 1.7 Design moves for rational variety (1-6)



Figure 1.8 Design moves for coherent individuality (7-9) and privacy within a community (10-11)

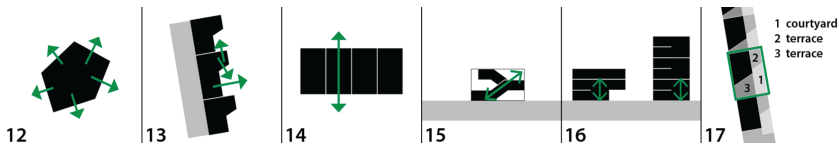


Figure 1.9 Design moves for spacious compactness (12-17)

Rational variety

- 1 Identical basic building geometries, repeated and rotated, mirrored or scaled
- 2 A sculpted volumetry of each repeated identical segment offers variety
- 3 Variation in the positioning of façade openings in otherwise identical parts
- 4 Random succession of repetitive units in a limited range of apartment sizes or access situations
- 5 End units adapted to the plot shape or forming a visual mark to end a row with repetitive units
- 6 Minimal basic structure that can be continued or modified by the owners

Coherent individuality

- 7 Repeated and rotated identical geometries with individual placement/orientation of roof terraces
- 8 Same façade material and surface treatment in all units, but with differences in cladding geometry
- 9 Identical façade material and treatment, with individual colour details, e.g. around windows/doors

Privacy within a community

- 10 Typical urban block flipped around: access from a shared courtyard area, private gardens and balconies on the backside or shielded
- 11 Transition in the degree of privacy of outdoor areas, e.g. by horizontal as well as vertical distance, in addition to separating elements, such as walls and railings

Spacious compactness

- 12 Window openings in a maximised number of directions per unit create visual spaciousness
 - 13 Window openings in a maximised number of directions per unit through angled cut-ins
 - 14 Windows and thereby views, light conditions and ventilation on two opposed sides
 - 15 Units crossing the entire building volume vertically and horizontally
 - 16 Spaces with double height or more conventional duplex typologies
 - 17 Multiple outdoor spaces on various levels such as terraces, balconies or roof gardens allow for the experience of spaciousness in spite of compact indoor volumes
- + Reduced individual units and increased shared facilities

Research phase

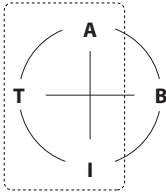


Figure 1.10 Research phase: Qualitative interviews with architects (A) and inhabitants (I), and another take on theory (T)

Case selection

Literature about case study methods distinguishes between quantitative and qualitative approaches. As opposed to quantitative set-ups, where a limited number of variables in numerous cases increases statistical significance, only a few strategically chosen cases are considered in qualitative investigations, and studied with many variables.¹⁰⁰ A smaller number of cases, for example three or four, with *maximum variation* can be appropriate¹⁰¹ and may lead to two types of results:¹⁰² on the one hand, detailed descriptions of the specific cases that can document distinctive features of every single case; and on the other hand, important patterns across the cases that gain significance because they originate from a heterogeneous background.

The literature suggests that there are different potential strategies for the selection of these few cases, or different ‘types of sampling’.¹⁰³ Several strategies have been applied for the cases on which this research draws. Including architects (and their works) who are known and widely recognized for their timber buildings ensures ‘information-rich cases that manifest the phenomenon *intensely* but not *extremely*’.¹⁰⁴ Two firms with two projects each were selected as a starting point; these are referred to as ‘core cases’ in this thesis. An *opportunistic* element has however also been embraced, ‘taking advantage of the

¹⁰⁰ As a background for comparative social science, these differences are discussed in Chapter 1 of: Charles C. Ragin, *The Comparative Method: Moving beyond Qualitative and Quantitative Strategies* (Oakland: University of California Press, 1987).

¹⁰¹ Bent Flyvbjerg, ‘Five Misunderstandings About Case-Study Research’, *Qualitative Inquiry* 12, no. 2 (April 2006): 219–45.

¹⁰² Helle Neergaard, *Udvelgelse af cases i kvalitative undersøgelser* (Frederiksberg: Samfundslitteratur, 2003).

¹⁰³ Matthew B. Miles, A. Michael Huberman, and Johnny Saldaña, *Qualitative Data Analysis: A Methods Sourcebook*, Edition 3 (Los Angeles London New Delhi Singapore Washington DC: Sage, 2014), 28.

¹⁰⁴ Miles, Huberman, and Saldaña, 28, author’s italics.

unexpected¹⁰⁵ by including ‘complementary cases’ when the opportunity arose to interview further architects and inhabitants. All cases meet a range of pre-determined *criteria*, e.g. the predominant construction material, a building height range, the location in a comparable climatic and cultural area, the construction period, and the building’s purpose. Other, differing characteristics were deliberately chosen; these concerned e.g. urban typology (building geometry and access principle), ownership model (rental or owner-occupied), construction system (massive timber, skeleton or hybrid constructions), and the visibility of the primary construction material. The resulting *maximum variation* ‘documents diverse variations and identifies important common patterns’¹⁰⁶ to ‘fully display multiple perspectives about the cases’.¹⁰⁷ Selection criteria, common and distinguishing features are shown in a table overview in the Appendix. The chosen cases (architectural offices and their housing projects) are presented in Section 1.5.

Qualitative interviews

Qualitative research can be used to address issues as they are perceived and given meaning by people.¹⁰⁸ Qualitative interviews as an established method for qualitative research¹⁰⁹ can produce rich and specific answers¹¹⁰ and contribute to ‘thick descriptions’ that contextualize phenomena, for example with the meanings people ascribe to them.¹¹¹ Naomi Stead discusses interviews with architects in the light of the theory of oral history.¹¹² She considers

first-person interviews to be a crucial source of ideas and information – the richly textured story beyond the often stultified and opaque architects’ statements or press release.¹¹³

In this research, semi-structured interviews were conducted quite early in the process; for this reason, questions were not specifically directed towards the three thematic categories according to which the material was ultimately structured. In fact, the interview guide for the structured part of the conversations was still oriented along the contradictory qualities identified in the pilot phase; the same is true for the ‘graphic surveys’ explained

¹⁰⁵ Miles, Huberman, and Saldaña, 28.

¹⁰⁶ Miles, Huberman, and Saldaña, 28.

¹⁰⁷ Creswell, *Qualitative Inquiry and Research Design*, 120.

¹⁰⁸ Joy Higgs and Nita Cherry, ‘Doing Qualitative Research on Practice’, in *Writing Qualitative Research on Practice*, Practice, Education, Work and Society (Rotterdam: Sense Publishers, 2009).

¹⁰⁹ E.g. Groat and Wang, *Architectural Research Methods*, on architectural research methods; John W. Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 3rd ed. (Los Angeles, London, New Delhi, Singapore: Sage Publications, 2009), on interviews as part of phenomenological research; or Steinar Kvale and Svend Brinkmann, *InterViews: Learning the Craft of Qualitative Research Interviewing*, Third edition (Los Angeles: Sage Publications, 2015), on qualitative research interviewing.

¹¹⁰ Steinar Kvale, *Det kvalitative forskningsintervju* (Oslo: Gyldendal akademisk, 2006).

¹¹¹ Clifford Geertz, ‘Thick Description: Towards an Interpretive Theory of Culture’, in *The Interpretation of Cultures*, ed. Clifford Geertz (Basic Books, 1973).

¹¹² Referring to Lynn Abrams, *Oral History Theory* (London; New York: Routledge, 2010).

¹¹³ Naomi Stead, ‘Architectural Affections: On Some Modes of Conversation in Architecture, Towards a Disciplinary Theorisation of Oral History’, *Fabrications* 24, no. 2 (3 July 2014): 156–77.

below. The interviews also left space for a more detailed exploration of issues that were of special interest to the interviewee.

The thematic categories were established afterwards, as a consequence of the interview material, and confirmed and supplied by an additional extended literature study. The open-ended questions formulated reflect the author's understanding at that stage of the research project, as well as an interest in the contribution of materiality to architectural quality, without having a material related theoretical framework in mind. While more directed questions would have elicited more specific statements, they might also have led to the omission of other aspects. This bottom-up procedure is also discussed in the concluding chapter.

In order to tease out timber's role for the interviewed architects, their take on architectural values and qualities were addressed before talking about timber. Likewise, the conversations with inhabitants started with questions regarding what good architecture implied for them and their reasons for moving to their place of residence at the time of the interview.

Short accounts of the most characteristic elements of each architect interview are included as 'interview vignettes' in Section 1.5, in addition to treating the interview material in greater detail in Chapters 2 - 4. The architects' practices are closely tied to the culture of their home region, their education, their other knowledge and interests, and it thus felt important to portray their position in a more coherent format as well. Stake remarks that

even a vignette is not too short to draw upon the biographer's craft. Sometimes (...) more for the illustration of an idea than for understanding the individual's life.¹¹⁴

Graphic surveys

When concluding the conversations, both architects and inhabitants were requested to fill out a 'graphic survey' in which they were asked to indicate preferences of different options for material treatment and placement. They could freely make a mark on a number of bars between two options. Layering the answers of participants aimed to uncover differences e.g. between different countries, project types, professional background, family status, etc. Although this was ultimately not actively used as part of the research results' discussion, the graphic surveys helped to clarify the impression of generally prevailing preferences; see Section 3.4 for an example.

¹¹⁴ Robert E. Stake, *The Art of Case Study Research* (Thousand Oaks, California: Sage Publications, 1995), 96–97.

Extended literature study and three thematic categories

Continuous mapping and reflecting on the interview data was carried out in order to link the statements to overarching themes. Topics addressed in both architect- and inhabitant interviews then informed an extended study of theoretical writing, including architectural theory dealing with materiality in general; in several cases, there is specific mention of wood. The theoretical works do not explain or structure the data in its entirety, but add a theoretical perspective to the addressed topics that in some cases exceeds what was discussed in the interviews.

The initial interview analysis led to the realization that they relate to tangible aspects of the material, to how these are experienced, and to meanings associated with them. The theoretical studies supported the crystallization of the three thematic categories of ‘concrete, perceived and semantic materiality’. These categories then formed an analytical framework for understanding the vast research material from the theoretical and empirical studies. This allowed for a discussion of the interview data, at the same time as the interview data allowed for commentary on the theory itself in the concluding chapter.

This bottom-up procedure for identifying thematic categories and related literature has truly brought about different results than setting out with the categories from the beginning would have. Several sub-topics, if defined top-down, probably would not have been included. Some topics were informed by the interview data (e.g. situatedness, affordance). Others were added through the literature study (e.g. concepts linked to different constructive layers). Many themes had germinated in both the interview material and the literature (e.g. material honesty, naturalness). This has resulted in a compilation of topics that are usually not combined in this way.

Instead of discussing architectural quality directly – which, as expressed earlier, would have been problematic – the question of quality has been broken down into aspects that relate to these overarching categories and that can be discussed by linking theory and practice-related architectural expertise. To test this choice, the author’s third conference paper focused on two architect interviews in the light of this theoretical background.¹¹⁵

Artefact descriptions

The buildings that form the backbone of this research (informing the choice of architect and inhabitant interviewees) were revisited during the inhabitant interviews, this time

¹¹⁵ An initial take on the interview data was tested in a conference paper, where two of the architectural firms were contrasted with literature; the inhabitants’ perspective was not included. Ute Groba, ‘The Presence of Timber – Oral History versus Architectural Theory’, in *Structures and Architecture - Bridging the Gap and Crossing Borders: Proceedings of the Fourth International Conference on Structures and Architecture (ICSA 2019), July 24-26, 2019, Lisbon, Portugal.*, ed. Paulo J. S Cruz (Milton: CRC Press LLC, Taylor & Francis, 2019), 141–48.

against the background of the initial theoretical studies and the on-going interviews with architects and inhabitants.

Photographs taken during the site visits and interview meetings were later selected according to topics that emerged in both the follow-up literature study and in the conversations, with the intention of adding unarticulated aspects to the discussion and illustrating some of the points made verbally. Photographs may

[provide] additional information about the topic being studied (...) [and] help to convey important case characteristics to outside observers.¹¹⁶

Rather than assigning the artefact descriptions an active part within analysis and reflection, they play an illustrative role, setting the scene.

Analysis phase and data presentation

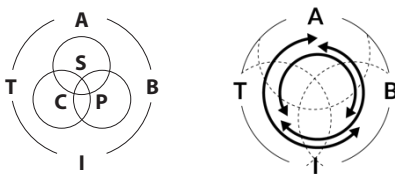


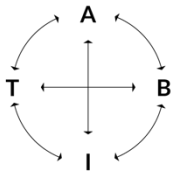
Figure 1.11 Analysis phase: Concrete (C), perceived (P) and semantic (S) materiality as thematic categories for data retrieved from theory (T), buildings (B), architects (A) and inhabitants (I), initially serving as an analytic instrument, and ultimately as a backdrop for three ‘timber tales’.

Instead of letting overarching frameworks like ‘sustainability’ or ‘tectonics’ take precedence over the analysis, findings and reflections in this thesis, the thematic categories that had emerged from the interviews and the subsequent literature study were initially adapted as a framework, with the intention of easing reflection across sources and better communicating the main interests of the study. This entailed an unexpectedly time-consuming restructuring of the text material – from being organized according to the different sources to being organized according to the thematic categories.

However, these were eventually found to be too ‘categorical’ to convey the data convincingly. In order to bind the many aspects together and to make a line of argument more evident, the format of ‘tales’ was ultimately chosen.

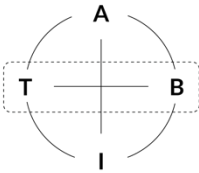
¹¹⁶ Photographs are suggested as part of ‘direct observations’ by Robert K. Yin, *Case Study Research: Design and Methods*, 2nd ed, Applied Social Research Methods Series, v. 5 (Thousand Oaks: Sage Publications, 1994), 87.

4 PERSPECTIVES



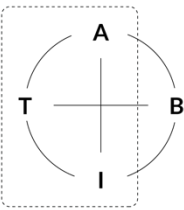
T Theory
 B Buildings
 A Architects
 I Inhabitants

PILOT PHASE



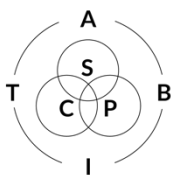
Literature study 1
 Study of built precedents
 > Paper 1
 > Paper 2
 Master's studio course 1

RESEARCH PHASE



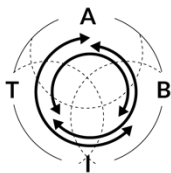
Architect interviews
 Inhabitant interviews
 Site visits
 > Midterm review
 Literature study 2

ANALYSIS PHASE



Focus on concrete, perceived and semantic aspects as an analytical instrument
 > Reader
 > Paper 3

FINAL PRESENTATION



Master's studio course 2
 Re-structuring into three 'timber tales'

Figure 1.12 'Hermeneutic Journey': Research process in sequences

Research quality criteria

This section builds on Creswell, Denscombe and Guba and Lincoln who suggest several ways to help ensure rigorous research with credible and valid results.¹¹⁷ Robust and reliable procedures require deep knowledge and understanding of the research issue, a truthful account of the gathered data, and a systematic, logical and consistent way of making sense of them.

Triangulation

Triangulation denotes the inclusion of multiple sources or the use of multiple methods in research as a way to ensure a better understanding.¹¹⁸ Combining different methods of data collection and analysis (e.g. from several perspectives or applying multiple tactics)¹¹⁹ should result in a research base that is firmer and more holistic as well as more objective. The aim is increased credibility, reliability and relevance. The use of multiple ‘mixed’ methods has been mentioned before as characteristic of qualitative research. Denzin and Lincoln argue that triangulation as the use of multiple methods per se is a way of verifying thorough comprehension of the research matter.

Triangulation is not a tool or a strategy of validation, but an alternative to validation. The combination of multiple methods, empirical materials, perspectives and observers in a single study is best understood, then, as a strategy that adds rigor, breadth, and depth to any investigation.¹²⁰

Denscombe points out that triangulation may serve different purposes – e.g. improving accuracy, or, as in the case of this research, offering a fuller picture.¹²¹

As described in greater detail above, this study includes a number of different sources, all of which require different and specific ways of gathering and analysing data. Multiple methods of extracting data have also been applied within single source groups. Architects and inhabitants both participated in semi-structured interviews and completed a ‘graphic survey’ (see Appendix). In the pilot phase, findings from theoretical texts were the basis for a study of buildings; in the next research phase case, interviews informed the topics explored more closely in literature. In other words, literature sometimes acted as a lens for further studies, and it was sometimes searched through the lens of a previous study. Buildings were initially investigated via drawings and images with a focus on spatial,

¹¹⁷ Creswell, *Research Design*; Martyn Denscombe, *The Good Research Guide: For Small-Scale Social Research Projects*, 4. ed, Open up Study Skills (Maidenhead: Open University Press, 2010); Yvonna S. Lincoln and Egon G. Guba, *Naturalistic Inquiry* (Beverly Hills, California: Sage Publications, 1985).

¹¹⁸ Denscombe, *The Good Research Guide*, 62,154,189, 346–51; Lincoln and Guba, *Naturalistic Inquiry*, 305.

¹¹⁹ David Wang, ‘Diagramming Design Research’, *Journal of Interior Design* 33, no. 1 (1 September 2007): 33–43.

¹²⁰ Denzin and Lincoln, *Handbook of Qualitative Research*, 2.

¹²¹ Denscombe, *The Good Research Guide*, 350–51.

geometric and volumetric composition, and subsequently through accounts of their becoming and of their experience, which also included their direct inspection from outside and within during visits to the interviewees' homes.

When advocating for triangulation as a way to exploit the results from different sources of evidence to a maximum, Robert Yin suggests the *convergence* of these multiple parts into a single fact, as opposed to the disclosure of findings and conclusions of different methods separately.¹²² The presentation of the research in the following chapters intends to strike a balance between both positions.

The findings' interest beyond an actual case should be ensured by their transferability and applicability in other contexts as well; to a certain degree, this means their generalizability.¹²³ Meanwhile, Flyvbjerg points out that in the case of qualitative research, unique cases can also have informative value:

Formal generalization is overvalued as a source of scientific development, whereas 'the force of example' is underestimated.¹²⁴

Instead of questionnaires with a large number of respondents, in-depth interviews with a smaller number of participants were chosen in order to meet the research focus described in the beginning of this section.

The detailed, 'thick description' of a phenomenon makes it easier to assess whether the conclusions drawn from its study are also valid for other physical, social or time-related contexts.¹²⁵

Giving a transparent description of how single research steps have built on one another adds to the confirmability and trustworthiness of the research,¹²⁶ which has also been an aim in this research. In addition, although unpublished, the interview transcriptions and working documents, reflexive notes, sketches and diagrams, preliminary thesis versions and feedback summaries have been retained and reconsulted throughout the entire research process.

¹²² Yin, *Case Study Research*, 91–94.

¹²³ Wang, 'Diagramming Design Research'; David Wang, 'Cognitive Design Thinking and Research in Design and Practice', in *The Routledge Companion for Architecture Design and Practice: Established and Emerging Trends*, ed. Mitra Kanaani and David Alan 'Dak' Kopec (New York: Routledge, Taylor & Francis Group, 2016), 45–59; Fallman and Stolterman, 'Establishing Criteria of Rigour and Relevance in Interaction Design Research'.

¹²⁴ Flyvbjerg, 'Five Misunderstandings About Case-Study Research'.

¹²⁵ Creswell, *Research Design*, 202.

¹²⁶ Called 'audit trail' in Lincoln and Guba, *Naturalistic Inquiry*, 319.

Prolonged engagement

Creswell suggests that a ‘prolonged engagement’ improves the trustworthiness of research whilst also facilitating the building of trust between researcher and participant.¹²⁷

Often, the engagement with the subject matter of a thesis starts years before the doctoral studies, for example within the context of architectural practice. Despite the multifaceted and practice-related background knowledge that this grants,¹²⁸ it also entails unfamiliarity with academic writing and scholarly research. Furthermore, one has to clarify possible preconceptions or biases; as pointed out by Creswell as well as by Lincoln and Guba, a reflection on how the researcher’s own background and role within the research might have influenced its outcomes and their interpretation adds to the validity and rigor of the research. This will be discussed in Chapter 5.

In this research, the author’s professional background as a practicing architect specialized in timber architecture offered extant insights into the daily design practice concerns from which the research interest originates. Addressing questions with importance to practitioners and aiming for results with applicability in design practice is a way to promote relevance and societal impact.¹²⁹

A further effect of the prolonged engagement both with the field of timber architecture and within the community of its architects facilitated establishing contact and a good rapport with the architect interviewees.

In all cases, the researcher’s former role as a practising architect working for a firm known for its timber buildings presumably helped to establish contacts and to convince the architects to participate in the research interview. It seemed to encourage trust in the researcher’s sincerity and professional competence. But could it also be a source of bias?

It is difficult, if not impossible, to fully eliminate preconceptions and bias, especially from qualitative research. As Denzin and Lincoln point out,

research [as] an interactive process [is] shaped by [the researcher’s] personal history, biography, gender, social class, race, and ethnicity, and those of the people in the setting.¹³⁰

Malterud describes effects this can have on research set-up and the collection and treatment of data:

¹²⁷ Creswell, *Qualitative Inquiry and Research Design*, 201; Creswell, *Research Design*, 202; also called ‘persistent observation’ in Lincoln and Guba, *Naturalistic Inquiry*, 304.

¹²⁸ Expert knowledge played a role for the research set-up. The selection of cases was based on professional expertise and an appropriate overview of the field of contemporary timber architecture and its designers.

¹²⁹ Fallman and Stolterman, ‘Establishing Criteria of Rigour and Relevance in Interaction Design Research’.

¹³⁰ Denzin and Lincoln, *Handbook of Qualitative Research*, 3.

A researcher's background and position will affect what they choose to investigate, the angle of investigation, the methods judged most adequate for this purpose, the findings considered most appropriate, and the framing and communication of conclusions.¹³¹

This does not need to be problematic, as Malterud differentiates:

Preconceptions are not the same as bias, unless the researcher fails to mention them.¹³²

This issue will be returned to in the final chapter.

Expert or active learner

Robert Stake points to different roles a researcher may assume.¹³³ While several of them were experienced as true – to different degrees and in different situations, the ambivalent roles as an expert and researcher were of special interest for the interviews. How this affected the relation with the interviewed architects has been described above.

During the interviews with inhabitants, the researcher role became slightly blurry, crossing over into that of a teacher or advocate. In some cases, after the official interview, conversations were directed towards the interviewees' homes and aspects about which they were curious to learn more. Despite the demand for efforts to retain a neutral position, Stake admits that every researcher also is an advocate of his or her own beliefs.¹³⁴ However, as Creswell points out, the aim must be to assume a

role as an active learner who can tell the story from the participants' view rather than as an "expert" who passes judgement on participants.¹³⁵

The author usually did not communicate her own views on the interviewees' homes or on their interview statements. This might have been eased by the thematic categories not yet being established at that point. It also made it easier to act as a 'learner' rather than an examiner of their personal situations, and to trust that they would share their true attitudes and opinions.

Stake addresses the question of 'how much to pose as expert, how much comprehension to reveal'.¹³⁶

The role as an expert was ambiguous in the inhabitant interviews and experienced almost as a flipping back and forth between being the professional authority and bearer of knowledge and being 'one of them'; and furthermore, between building rapport and feeling at risk. Visiting inhabitants in their homes means being invited into their personal, private refuge, and there can be awkward moments on both sides. Besides the

¹³¹ Kirsti Malterud, 'Qualitative Research: Standards, Challenges, and Guidelines', *The Lancet* 358, no. 9280 (August 2001): 483–84.

¹³² Malterud, 484.

¹³³ Stake, *The Art of Case Study Research*, 91–104.

¹³⁴ Stake, 93.

¹³⁵ Creswell, *Qualitative Inquiry and Research Design*, 18.

¹³⁶ Stake, *The Art of Case Study Research*, 103.

potential risk related to inviting a stranger into one's home, the interviewees had to trust in that no pictures were taken that they would not be comfortable with, and that their opinions would not be exposed in such a way that they jeopardised their anonymity. The interviewees might initially be unsure about how to talk to the interviewer: will the interview be like a test? What happens if they accidentally share confidential information? The author also sometimes felt uncomfortable at first entering a stranger's home as an unaccompanied female visitor to a new town. Meetings often happened after the interviewee's working hours, by which time it was dark outside in November. Although the literature on research interviews consulted during the interview preparation advised against conducting interviews alone in private homes, this is not easily avoided if the research is not part of a larger project. The author experienced it as easy to build rapport with the interviewees; this might have partly been a result of the described constellation where both parts felt vulnerable in the beginning.

Validation

A number of measures have supported legitimate and truthful use of the interview data in particular. Working closely with verbatim interview transcriptions has been important for being able to give a thorough account of the conversations with architects and inhabitants. Already during the interviews, their semi-structured set-up provided space for interviewees to expand on issues that were important to them, and time to clarify what they meant, which is a way of continually verifying the interpretation of the interview material.¹³⁷

The interviews were conducted in German, Norwegian or English, depending on the interviewee's mother tongue. They were translated by the author, which might have coloured the statements in a particular way, as translation always holds an element of interpretation as well.

The sections about the interviews in Chapters 2 - 4 contain detailed references to the transcriptions of the tape-recorded conversations. This adds to the validity and reliability of case studies.¹³⁸

Another verification strategy, often referred to as respondent validation, member check, or informant feedback, would have been to send the interviewees the transcriptions or the final text and allow the respondents to either confirm them or comment on possible misinterpretation or mistakes.¹³⁹ Although some see this as a crucial way of ensuring credibility, others see it as controversial.¹⁴⁰

¹³⁷ Kvale and Brinkmann, *InterViews*, 192.

¹³⁸ Yin, *Case Study Research*, 98–99.

¹³⁹ Denscombe, *The Good Research Guide*, 189; Creswell, *Research Design*, 201–2.

¹⁴⁰ E.g. Maureen Jane Angen, 'Evaluating Interpretive Inquiry: Reviewing the Validity Debate and Opening the Dialogue', *Qualitative Health Research* 10, no. 3 (May 2000): 378–95; Irit Mero-Jaffe, "Is That What I Said?" Interview Transcript Approval by Participants: An Aspect of Ethics in

In the context of this research, this was found to be challenging in two ways. In a paper that included data from two architect interviews, the architects were sent the interview transcriptions, and later also the finished excerpts that concerned them. This led to quite different reactions. One architect simply communicated that he trusted that the author's handling of the material was appropriate for the data being used for the thesis as well as the paper. The other architect reacted to the verbatim style of the transcription as he mistook it for what was going to be published. He was then reassured by the actual passages in the paper and 'very much agreed' with that text. Sharing the transcriptions as the research's 'raw data' to demonstrate trustworthiness to the interviewee resulted in worry rather than reassurance. Editing the verbatim transcriptions solely for the sake of the interviewees' approval would have been a significant undertaking with no productive advantages for the research itself.

Furthermore, although the interviewee was satisfied with the passages that concerned him, this might not be an ideal way of verifying interview content; involving the interviewees into a true account of the conversations may interfere with the author's discussion of the interviews within the research framework which sometimes also includes statements by other participants, and the interviewee's influence thus risks extending beyond what is appropriate or welcome. These questions do not only concern the verification of data; there is also an ethical dimension to them.

Ethical concerns

Inhabitants and architects were informed about the context and purpose of the study and gave written consent confirming that the interview material could be used for the purpose of this dissertation – anonymously in the case of the inhabitants, and in the case of the architects, with their names and office affiliation (see the interview invitations in the Appendix).

The interviewed architects were given the opportunity to read and approve the content of the sections in which their viewpoints appear with their names. They were sent all direct quotes and the interview vignettes, which seek to capture the quintessence of each conversation; they were invited to comment if they felt that they had been misinterpreted, or if they felt in retrospect that the information they provided was confidential. In addition, this was an added confirmation of the author's correct interpretation of what had been said, and it should thus be an indication that the interview material more broadly was handled appropriately.

Three architects agreed with the texts, one architect remarked that his formulations came across a bit sloppily but that he stood by his statements, one wished to clarify a few formulations, and two did not reply to the invitation for comments. None reacted to the

Qualitative Research', *International Journal of Qualitative Methods* 2011 10, no. 3 (September 2011): 231–47.

invitation to also read the chapter sections where their interviews were described in greater detail and discussed by the author.

The inhabitants were not contacted to review the material used. Given that they had provided informed consent and remained anonymous in the text, this was not seen as necessary.

Much effort has been dedicated to making the different statements traceable in the interview transcriptions. These transcriptions are not published with this thesis, but have been stored in an anonymized way so they may be revisited for future research. All interview data has been registered and treated according to the guidelines provided by the Norwegian Centre for Research Data (NSD).¹⁴¹

Checkpoints

The relevance of the thematic and methodological choices has been discussed and confirmed in various discussions with peers – in meetings with researchers from the author’s home university and beyond, through peer reviews before and conversations during conference paper presentations and symposia, and at a summer school event.¹⁴² These presentations helped to test the overall argumentative consistency across sources for parts of the thesis.

The entire dissertation – including its set-up, the chosen sources and methods, as well as the results and conclusions drawn – has also been examined by an external researcher in two instances: as part of oral feedback on an early written version during a formal ‘midterm review’, and as written feedback on a later ‘reader version’.¹⁴³ Both instances provided impulses for a reconsideration of aspects of the thesis.

¹⁴¹ NSD – Norsk senter for forskningsdata AS | NSD – Norwegian Centre for Research Data; <https://nsd.no>

¹⁴² This involvement of another person is called ‘peer debriefing’ in Creswell, *Research Design*, 202; and in Lincoln and Guba, *Naturalistic Inquiry*, 308.

¹⁴³ The independent examiner of a research study’s process and product is referred to as ‘external auditor’ in Creswell, *Research Design*, 202–3.

1.5 Studied cases

The following subsections comprise a brief introduction of the architectural offices included, followed by ‘vignette’ accounts of the interview meetings. The projects chosen for this study are presented with maps that illustrate their location, general project data, information about wooden building components, and pictures taken during site visits and interviews. These pictures from the autumn of 2017 are contrasted with pictures of the buildings published by the architects upon the buildings’ completion; in some cases, the pictures are separated by a gap of up to 20 years.

Office profiles

The architect interviews initially focused on two internationally renowned architectural firms regarded as being at the forefront of timber architecture in their respective countries. In order to offer a larger and more nuanced picture, these two ‘core cases’ were complemented with further interviews from three offices that, while also central in the development of new urban timber architecture, only use timber occasionally or in combination with other materials (‘complementary cases’).

The core cases are Hermann Kaufmann Architekten from Austria (founded in 1983; recently renamed as Hermann Kaufmann + Partner ZT GmbH), and Helen & Hard from Norway (founded in 1996). Complementary interviews were conducted with leading members of Dietrich I Untertrifaller Architekten from Austria (founded in 1994), Kaden + Lager from Germany (founded in 2014; formerly Kaden Klingbeil), and Haugen / Zohar from Norway (founded in 2007). The inhabitant interviews also include projects by Hubert Rieß from Graz (founded in 1985), Praschl Goodarzi Architekten from Vienna (founded in 2002), and Hagemüller Architekten from Vienna (founded in 2011; formerly Atelier Architekt Roland Hagemüller).

Altogether, seven architects were interviewed from five different offices in three countries in Central Europe and Scandinavia in the autumn and winter of 2017 (Figure 1.14).

Core cases

Hermann Kaufmann Architekten¹⁴⁴ and Helen & Hard¹⁴⁵ both advocate a broad, holistic understanding of sustainability. At the time of writing, the current version of Hermann Kaufmann Architekten’s website promotes ‘sustainable construction, in its broadest sense’ as ‘a lot more than just low-energy and passive house concepts’. It also includes

¹⁴⁴ ‘Architekten Hermann Kaufmann ZT GmbH | Architekturbüro’, accessed 4 November 2019, <https://www.hkarchitekten.at/en/>; ‘Office Profile | Architekten Hermann Kaufmann ZT GmbH’, accessed 26 November 2018, <https://www.hkarchitekten.at/en/office/company-profile/>.

¹⁴⁵ ‘About | Helen & Hard’, accessed 26 November 2018, <http://www.helenhard.no/about/>; ‘Thinking | Helen & Hard’, accessed 26 November 2018, <http://www.helenhard.no/thinking/>.

‘the constructional quality, the life cycle and most importantly, the ecology’, with the aim ‘to create durable and versatile structures.’ They emphasize the importance of the project’s context, i.e. both its physical surroundings and the local craftsmanship.

On Helen & Hard’s website, they cite their ‘aim to creatively engage with sustainability, not only in the design of spaces, but also in the conception and organization of the design process, including construction and fabrication.’ They want to ‘move away from a solely technical and anthropocentric view, allowing the project to unfold in relation to its physical, social, cultural and economic context’ and seek ‘architectural solutions that shall serve and inspire people to a sustainable life’.

Both firms explicitly favour timber as a construction material. In addition to sustainable construction, Hermann Kaufmann Architekten name ‘modern timber construction’ as one of their core specializations. Their landing page spotlights ‘architecture inspired by wood’ and cites advantages of timber for well-being and the environment, assuring potential clients of the office’s expertise (knowledge and experience) in producing sound timber constructions. Helen & Hard write that they have ‘specialized in using timber as construction material’ to create site specific ‘novel spatial designs’. Using ‘visible timber structures’ in particular, which can be simultaneously ‘spatial and material’ architectural elements, they aspire to create ‘synergistic design solutions’.

Complementary cases

The office of Dietrich | Untertrifaller promotes itself as ‘one of the iconic agencies of the renowned School of Vorarlberg’. Like Hermann Kaufmann Architekten, who are located in the same region, they emphasize the importance of a project’s ‘respective context’ – i.e., its location, environment and programme. They describe their architecture as ‘restrained in style [– not ‘flashy’ but ‘exciting’ –] with spatial sophistication and demonstrating a finely nuanced materiality’. They aspire to a ‘resource-saving and appropriate use of materials and structures, with a particular interest in and commitment to contemporary timber construction.’¹⁴⁶

Norwegian Haugen / Zohar designed one of Norway’s few multi-apartment housing projects in timber, for which they received an award. Their website does not specify a specialty in timber construction, but rather in architecture ‘by and for people’: this not only implies a focus on the relationship between space and body, but also comprises ‘social engagement and participation’. Besides environmental concerns, social sustainability is thus ascribed great importance in their work.¹⁴⁷

¹⁴⁶ ‘Profile’, Dietrich | Untertrifaller Architects, accessed 28 January 2019, <https://www.dietrich.untertrifaller.com/en/office/profile/>, brackets indicate quotes from the office’s webpage that have been inserted by the author.

¹⁴⁷ ‘HZA | STUDIO’, HZA, accessed 28 January 2019, <https://www.hza.no/studio>.

Kaden + Lager (at the time Kaden Klingbeil Architekten) drew attention with their Project e3, Europe's first inner-city seven storey timber housing project, completed in Berlin in 2008. The office's main focus is not on timber as the experienced material, but rather on the social constellations of their projects and how their buildings connect to and become part of the urban context. Their projects use timber as the primary construction material for its practical advantages and is most often combined with other materials.¹⁴⁸

These are the official versions with which the offices advocate their architectural services for sustainable timber buildings.¹⁴⁹

The 'interview vignettes' that follow begin to explore these phrases in more detail, as well as how they come alive in oral narratives about the architects' practice. The ways in which the conversations align with architectural theory related to material are studied in greater detail in Chapters 2-4, as is their relevance for the inhabitants' realities.

¹⁴⁸ 'Über Uns – Kaden+Lager', accessed 4 November 2019, <http://www.kadenundlager.de/buro/about/>.

¹⁴⁹ The websites cited here offer a living testimony of the offices' development and production. They are continuously updated and modified. The dates on which the pages were consulted are indicated in the footnotes.

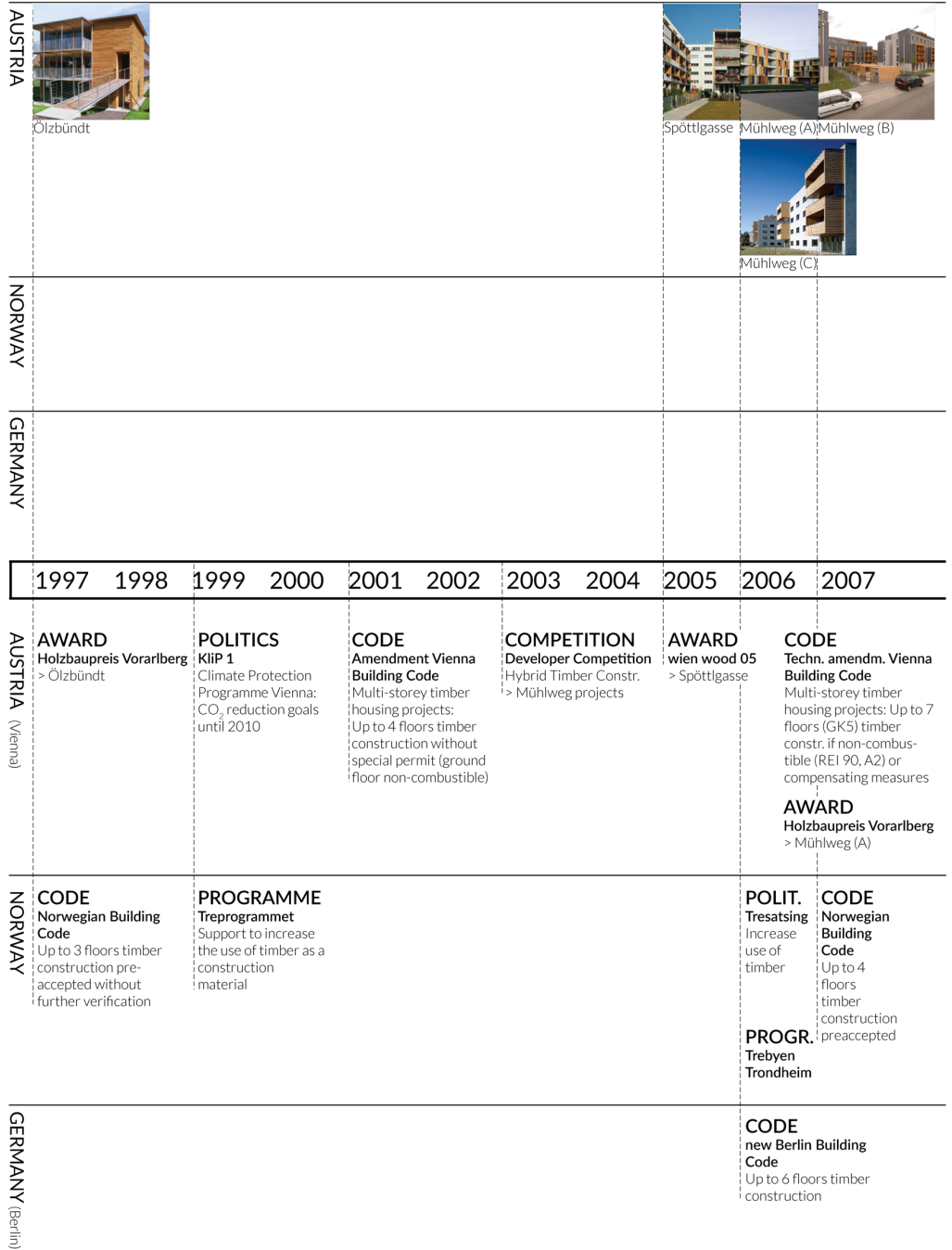



Figure 1.13 Completion dates of studied cases, building code updates and political incentives in Austria, Germany and Norway.

											
Lobaugasse		Wagramer Straße (B)									
											
		Breitenfurter Straße									
											
						Skadbergbk.	Ulsholtveien 31	Vindmøllebakken			
											
		wk65	sw40		c13					p1	
2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	

COMPETITION
Developer Competition
 Holzbau in der Stadt
 > Wagramer Straße
 > Breitenfurter Straße

POLITICS
Vienna City Council
 Aim for environmentally
 and socially sustainable
 buildings; timber as a
 contribution to climate
 protection

AWARD
wien wood 15
 > Breitenfurter Straße
 > Mühlweg (A) (h. mention)

CODE
Fire Protection
Regulation
 Up to 6 floors timber
 construction without
 additional requirement

PROGRAMME
Norwegian Wood /
Stavanger 2008
 Model projects,
 exhibition

PROGRAMME
Tre og By
 Model projects,
 courses

CODE
Dispensation from
Berlin Building Code
 First 7 floor timber
 building in Germany
 (Kaden Klingbeil)

sources:
 proholz.at; Zuschnitt 59 Wien
 Direktoratet for byggkvalitet; Presentation "Norges bygg- og brandregler"
 Nygaard et al., 2016, "Tracing a timber breakthrough"



Figure 1.14 'Core cases' and 'complementary cases': Projects and interviewees

Architect interview vignettes

Vernacular simplicity and a declaration of love

- Interview with Hermann Kaufmann, Hermann Kaufmann Architekten

The conversation begins with what Hermann Kaufmann Architekten call *baukulturelle Qualität* – an aspect they consider an important part of sustainability. While the office translates the term as ‘constructional quality’, a more direct translation could be ‘quality of building culture’, or simply ‘architectural quality’. Hermann Kaufmann soon turns to the topic of wood and his fascination with the material’s inherent beauty. Material aesthetics and constructive versatility appear to be at the core of Kaufmann’s drive to work with timber. The sustainability aspect has an auxiliary role; there are other aspects with greater influence on the office’s work.

According to Kaufmann, timber – like every building material – offers constructive conditions related to its properties that in turn influence wood-based architecture. The particular rules that timber sets for constructions can be learned from the tectonics of old buildings. In Kaufmann’s view, ‘good architecture’ respects these rules.

An earlier version of the office’s webpage highlighted the word ‘pragmatism’. Kaufmann now sees the use of the term as ‘slightly inflationary’ and limiting in the Vorarlberg architectural scene and feels that basing architecture on pragmatism alone does not guarantee good architecture. According to Kaufmann, their buildings appear very simple and clear because they are based on the culture of simple building from 200–300 years ago. For environmental reasons, these building principles – as opposed to traditional style – are considered an answer to the project’s context with ongoing relevance.

Another important factor is the quality of production and execution of the constructive parts and of the building as a whole. Kaufmann emphasises the vital importance of the outstanding expertise of Vorarlberg’s local carpenters and timber craftsmen – both for the production and execution of their buildings and for development and innovation; following Kaufmann, this is less about formal or stylistic innovation than progress in terms of scale and precision. According to Kaufmann, there are three important aspects to consider in order to sustain this: young people’s interest in timber-related professions must be kept alive (as does the social status of these professions; this can potentially be fostered by a dual vocational training as it is the case in Austria); the need to communicate on equal terms (acknowledging the crucial contribution of craftsmen and manufacturers); and a demand for their quality work.

*Local agency and strategic details**- Interview with Christoph Dünser, Hermann Kaufmann Architekten*

A chance meeting with Christoph Dünser at the Future Built Conference in Oslo in June 2017 had given me an opportunity to discuss timber architecture in general and the approaches of Hermann Kaufmann Architekten in particular. Some of his answers had been surprising and could be followed up on when Dünser returned to Oslo in November to speak at the National Timber Conference, hosted by AHO.

Based on my professional experience at Helen & Hard and on initial readings about timber as a building material, it seemed likely that Hermann Kaufmann Architekten would aim to maximise the exposure of the timber construction in their housing projects. According to Dünser however, this was not a priority; it would in fact compromise the integrity of robust transition details between building components (e.g. between walls and windows or walls and ceilings). When discussing an ongoing project in which the use of nailed massive timber elements was considered, it seemed natural that this was done to avoid toxic emissions or as preparation for later disassembly; Dünser instead informed me that the ulterior motive was to direct the call for tenders towards three local firms they knew were the only ones providing such a product.

When discussing possible additional benefits associated with exposed timber constructions – for indoor climate, health and well-being, and perhaps also psychological effects, Dünser mentions the oft-cited studies about a lower average heartrate and about quicker recovery in timber buildings. The office's motivation, however, is not based on these studies – it starts much earlier, and the backdrop is much more far-reaching. Housing projects are not an isolated topic, he argues, but part of a long value chain including locally-available resources, the tradition and quality of local crafts, and the social status held by that profession. While health and well-being in the built results are also important, there is also an aim to keep the knowledge and expertise of the local craftspeople alive by utilising it and maintaining the demand for it. Dünser also emphasizes the importance of observing how the regional forests are transforming with the changing climate, as well as learning to adapt to using available tree species, rather than relying on types that are traditionally used.

For the office, sustainability is as much a question of fostering the local economy as about using renewable resources: they not only select materials not exclusively for aesthetic or constructive reasons, but also view this as a way to support the local economy and to preserve local traditions and knowledge by active implementation.

Archaic relationalism and uplifting spaces

- Interview with Reinhard Kropf, Helen & Hard

Reinhard Kropf laughs and then grows pensive after the blunt question that opens the interview: What is good architecture to Helen & Hard? Kropf responds that good architecture serves the people who use it, as well as its surroundings. It should produce additional value, e.g. concerning health, well-being, emotions, everyday use, shared values, identification, feeling of belonging, or economic value. Good architecture, he says, gives something back to a system instead of simply taking from people or the building's surroundings – e.g. by draining energy, or producing waste that the system cannot reabsorb. Helen & Hard consider 'good architecture' as synonymous with 'sustainable architecture'; in this context, according to Kropf, timber as a renewable resource has the greatest potential.

Kropf names two important aspects of the office's interest in timber architecture: they are seeking ways to apply timber more widely in dwelling- and office projects whilst staying true to the material, and they strive to invent new ways of constructing and designing with timber by applying new digital technologies. When searching for constructive systems to design architectural spaces, Kropf says, Helen & Hard want to create high experience value ('enriching experiences'): an energizing and uplifting feeling of well-being. Kropf emphasizes the importance of architecture that not only has visual qualities, but also tactile and sensual qualities that activate all of the senses; again, he considers timber and its reference to nature relevant in this context. Whenever possible, Helen & Hard try to leave the constructive timber elements in their projects exposed, in order to make these experiences accessible.¹⁵⁰

Helen & Hard's relational philosophy concerns not only the project's context and related design decisions, but also the entire design process (e.g. collaboratively together with future inhabitants); the industrial products utilised (often modified and adapted to design intentions); and the timing of various feedback loops throughout conceptualization, planning and production phases.

¹⁵⁰ In an interview a decade earlier, Kropf also talked about material authenticity ('materialekthet') and exposed construction, inspired by Sverre Fehn and Christian Norberg-Schulz, although his focus had not yet shifted to timber architecture. Jan Olav Jensen and Børre Skodvin, eds., *10 arkitekter intervjuet* (Oslo: Unipax, 2007), 132.

Unreceptive users and a limited number of wooden hotcakes
 - Interview with Much Untertrifaller, Dietrich I Untertrifaller

Design quality is emphasised on Dietrich I Untertrifaller Architekten's homepage.¹⁵¹ According to Much Untertrifaller, design quality is what they 'put their heart and soul into' and what they want to distinguish their work from that of other offices, but it is difficult to communicate. The office treats it as a 'total package' that includes 'soft' factors such as materials and users that cannot be captured with calculations or achieved with recipes. As Untertrifaller sees it, good architecture is felt viscerally; in this respect, he finds that the average client is uncritical, thinking over the purchase of a car much more carefully than the purchase of a house. Values such as architectural qualities are rarely communicated – the average client is more interested in the price, location, condition and general quality of the object.¹⁵²

According to Untertrifaller, his office has no general preference for any particular materials, and he has no interest in comparing his office's timber use with that of other architects or offices. He appreciates the atmospheric qualities of timber, as well as the degree of precision that can be achieved with timber. As a material, it allows for quick construction, and is well suited for serial elements. Under the right circumstances (e.g. large spans, no acoustic requirements), it is economic and competitive and has great architectural potential.

In Untertrifaller's experience, users do not favour visible timber on walls or ceilings because it might not match their wooden furniture.

According to Untertrifaller, there has been an immense interest in a few wooden prototypes per region, but the market becomes saturated quickly. Often, there are no follow-up projects to these subsidised pilot projects.

¹⁵¹ At the time of the interview, the German version of the office's homepage mentioned 'Entwurfsqualität' (design quality).

¹⁵² The author understands this 'general quality' as referring to technical quality or quality of workmanship here.

Timeless meeting places and a trust in timber hygroscopicity

- Interview with Dan Zohar, Haugen / Zohar

For Haugen / Zohar Arkitekter, 'good architecture' has timeless qualities that hold true longer than current architectural paradigms. Dan Zohar talks about added value, e.g. concerning environmental or social sustainability, long-term aspects or re-use. The office puts a great deal of focus on the social aspects of a project, such as stable neighbourhoods and spaces for people to meet and talk to each other in an era when direct conversation is often replaced by electronic messages and social media.

Although Haugen / Zohar Arkitekter have not been working with timber for a very long time and are 'not married to timber', they are convinced by the material's qualities; Zohar praises its simplicity, versatility and robustness. He sees timber as especially capable of tolerating different user behaviours.

The office's project 'Ulsholtveien' features exposed timber walls and ceilings in the bathroom and kitchen. Besides an overall Osmo coating with white pigment, there is no extra protection or coating behind the kitchen counter. According to Zohar, the aesthetics of timber details are not the most important in this project; the main challenge was to make the project happen at all, he says – besides his role as a designer, the architect then first of all becomes a facilitator. When developing a detail, he considers the future user. In Ulsholtveien, he says, it is mostly non-Norwegian tenants. When leaving the timber surfaces exposed in the living room, this was done intentionally, imagining that the future inhabitant might use the living room in unexpected ways, and that the wood's hygroscopic characteristics would then help to balance air humidity.

Zohar sees the architectural profession as threatened by other professions and considers prefabricated, BIM processed timber construction a way to regain control. He is confident that they understand the material well enough to have control over its specific behaviour, which, according to Zohar, also helps to avoid constructive flaws. However, Zohar says that there are still open questions about massive timber construction. He wonders whether forests have the capacity to meet the current rapid increase in wood consumption around the globe and supply the building industry with wooden raw material, or if it will lead to a turning away from massive timber construction, towards construction systems that require lower quantities of timber.

*Unobtrusive honesty and subdued cosiness**- Interview with Markus Lager, Kaden + Lager*

Markus Lager lists a number of reasons why Kaden + Lager build with timber. Rather than aiming to display the material in the façades, they use wooden materials to store CO₂ and to make use of other advantages of timber construction. Lager highlights positive effects of prefabrication: production under controlled climatic conditions allows for precision comparable to that of industrial products, with low dimensional tolerance; in addition, the working conditions are better for the craftspeople. Prefabrication lessens the impact on surrounding neighbourhoods during the construction phase, which is also shorter due to quicker assembly. There is less noise pollution from tools, less dust, quicker drying times, etc. – such aspects are particularly relevant in the urban areas in which they build most of their projects. In addition, prefabrication requires less on-site coordination, as several trades have already been integrated in the factory. Lager further mentions aspects of well-being such as indoor climate and the acoustic qualities of visible timber surfaces; these are especially relevant for schools or dwellings. He also names the lower weight of timber construction, which puts less impact on the ground, with the downside of sometimes having to stabilize the building against wind loads. And finally, there is less mass that needs to be transported to the site. One result of the office's interest in and expertise with timber wooden materials is that it covers a market niche in Germany, as the demand for timber architecture has come to exceed the capacity of offices that have specialized in timber construction.

Kaden + Lager promote 'sober cosiness' and clear forms for urban building with timber. The timber surfaces in their projects are often only visible at second glance, e.g. in the ceilings. They have no great interest in communicating the timber content of their building by applying timber as a façade material; it would increase costs and conflict with their understanding of the urban context. Furthermore, they often feel that a client cannot be pushed any further after having agreed on a timber construction. According to Lager, fewer visible timber surfaces are a better solution in buildings destined for standard rental contracts, as tenants are allowed to paint their walls in any colour and must paint the apartment white again upon moving out; this would prove difficult with visible timber surfaces. Nevertheless, Lager prefers buildings with a readable structure and hopes that this will sensitize the inhabitants, and ultimately society, to architecture. Kaden + Lager have collaborated extensively with user groups in their projects. However, the office's interest in individualized construction in multi-apartment projects has shifted somewhat towards planning timber buildings for the urban rental market. They would like to make timber buildings accessible for everyone.

Timber for everyone and hybrid pragmatism

- Interview with Tom Kaden, Kaden + Lager

Tom Kaden says that he detests the sustainability terminology and its widespread use. He refers to the term's origins in forestry mentioned earlier in this chapter, referring to the principle of not removing a greater number of trees than what will grow back. While he finds this approach understandable, Kaden criticises what it has evolved into; overuse of the term has rendered it scarcely credible. He sees it as an essential advantage that wood is a renewable material, but otherwise, he says, it is a basic material no different than any other.

Kaden began working with timber almost by coincidence in the 1990s, he says, and now Kaden + Lager almost exclusively works with timber constructions. Most often, these are not pure massive timber constructions, but hybrids. According to Kaden, rather than being timber ideologists, Kaden + Lager see the choice of materials pragmatically. They often mix materials and use timber mostly for practical advantages related to construction, such as short construction periods due to prefabrication and the flexibility of timber constructions. The buildings they design are not intended to be spectacular, but rather reserved and understated. Whether to expose the timber construction or not has long since been rather a legal than an aesthetic issue, says Kaden; Kaden + Lager often conceal the wooden construction, especially the walls, but they sometimes use timber concrete composite slabs where the timber surface remains visible on the underside of the ceiling.

Kaden + Lager's work has always had a strong focus on participative building and collective processes to find designs that are not dictated by the architect. This brings about results that would never have been realized in collaboration with an investor. Kaden says that their first housing projects organized as *Baugruppen* were based on living moderately in a community. But he has observed a change in society: families are seeking a high degree of individuality at a low price when joining a *Baugruppe* to realize their dwelling dreams, and the community aspect is growing less important. Kaden says that the office is happy to be able to also build for some housing societies now, where the focus is on good dwellings for average families, and not only for investors who have their own profit in mind.

Projects

The range of buildings included in this research is described as ‘multi-apartment buildings’ in order to avoid the conceivably misleading term low-rise high-density.

Low-rise high-density is not clearly defined as either an urban typology or as a determined height. A range of building typologies can constitute low-rise high-density architecture: solitaires, linear structures, mat buildings, even spatial compositions or hybrids. The English terms ‘low-rise’ or ‘mid-rise’ do not offer strict definitions of building heights.

As one of the two main building categories in Norway, small houses are by definition up to two storeys high and provide direct ground floor access for all residential units.¹⁵³ This produces only moderate levels of density. Buildings with at least three floors or more than four residential units are referred to as large residential buildings in a Norwegian context.

The buildings included in this study are predominantly two to four or five storeys high, depending on the country and its building codes. There are however two exceptions with up to seven floors.

In order to allow for comparison, the projects were no more than 20 years old and located in similar geographical and climatic regions (moderate climate). Conversely, projects with differences in terms of urban typology, construction system, timber visibility, and occupancy were deliberately chosen in order to achieve maximum variation, as discussed above (see also table in the Appendix). The architectural standard of the buildings has received recognition by peers, through awards, and in publications.

On the following pages, the 4 core and 11 complementary case projects will be briefly presented with the aid of maps, data sheets, and pictures from around completion date and at the time of the interviews, and a more detailed description of some aspects of the core cases. Together, they illustrate the variety in volumetric composition and structural design of the selected projects.

¹⁵³ Lene Schmidt, Anne-Karine Halvorsen Thorén, and Norsk institutt for by- og regionforskning, *Bebyggelsestyper og bokvalitet i by: en studie av storgårdskvartalet* (Oslo: NIBR, 2001), referring to Byggforsk, A330.009.

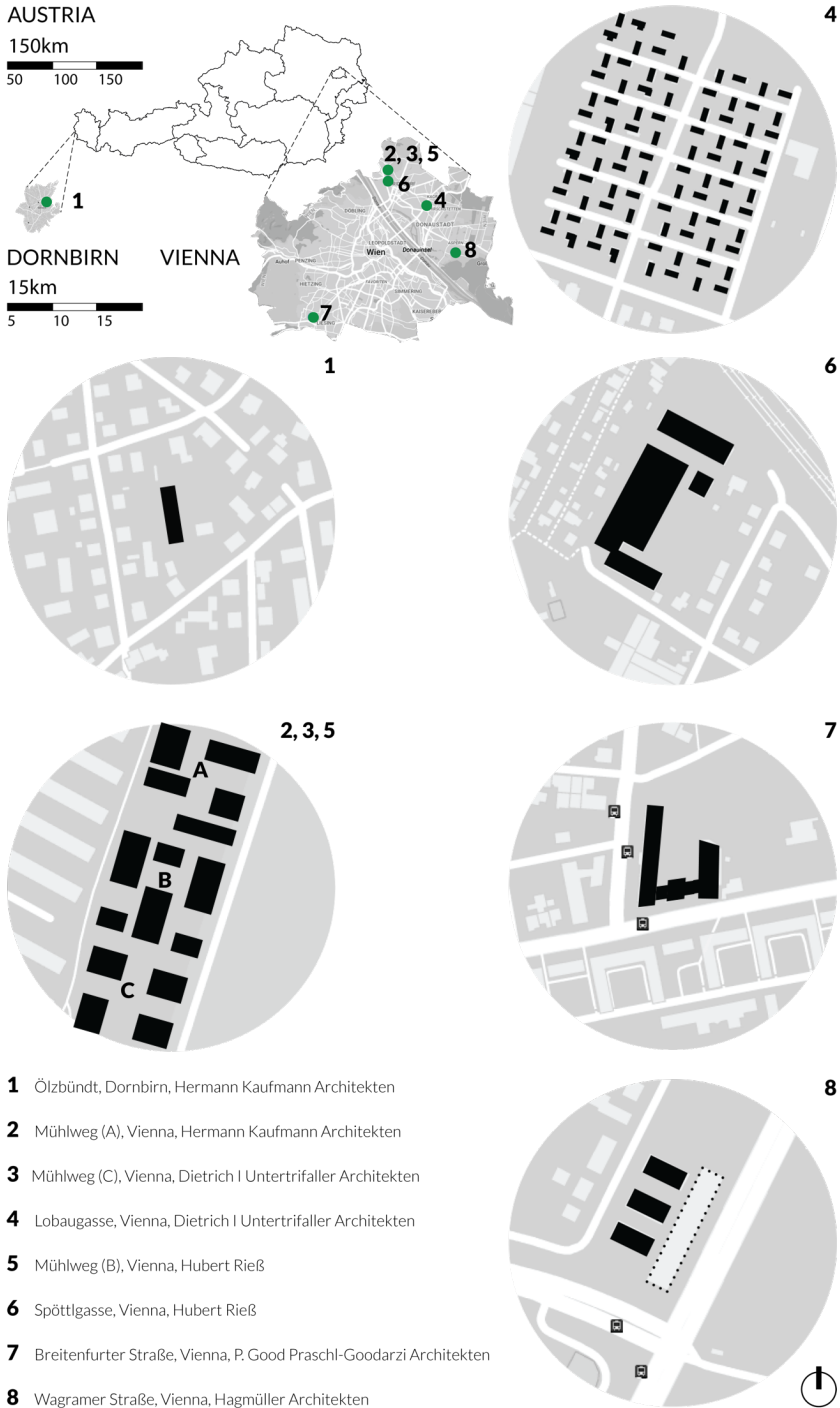
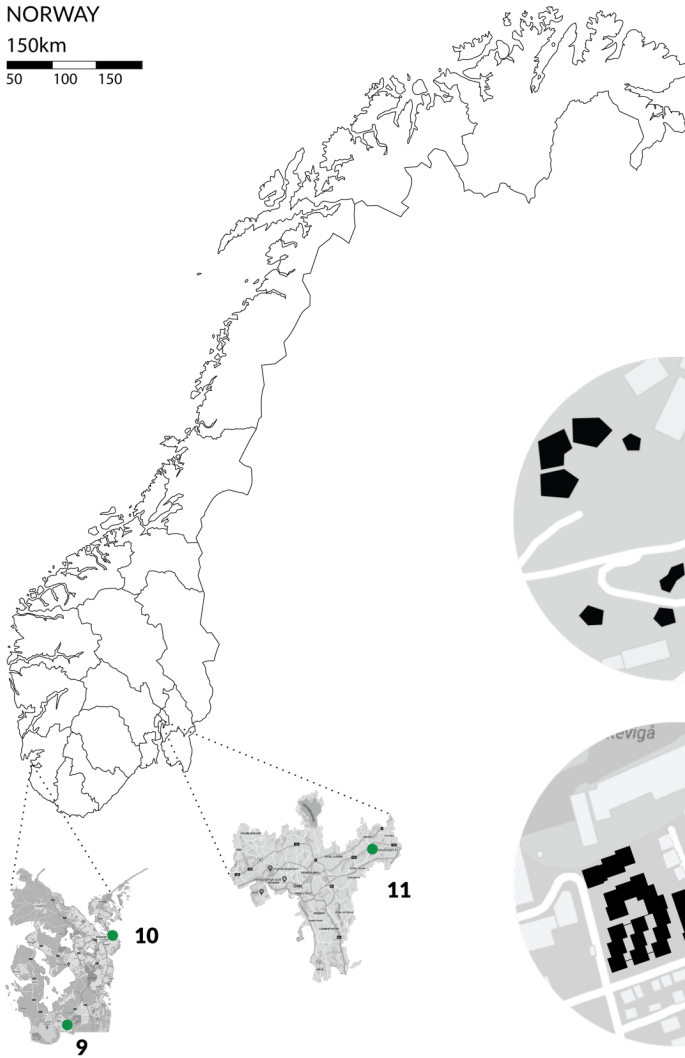
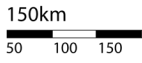
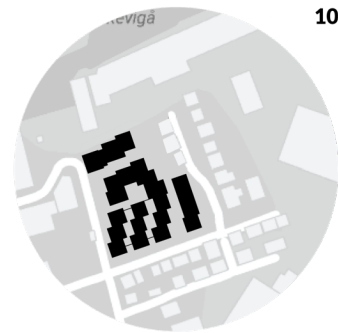


Figure 1.15 Austrian cases

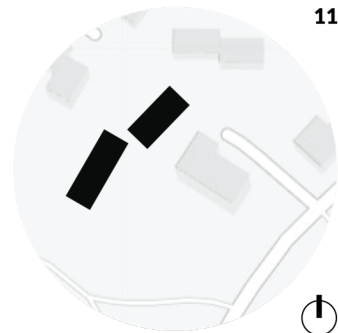
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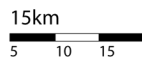


10



11

SOLA STAVANGER OSLO



9 Skadbergbakken, Sola, Helen & Hard

10 Vindmøllebakken, Stavanger, Helen & Hard

11 Ulsholtveien, Oslo, Haugen / Zohar

Figure 1.16 Norwegian cases

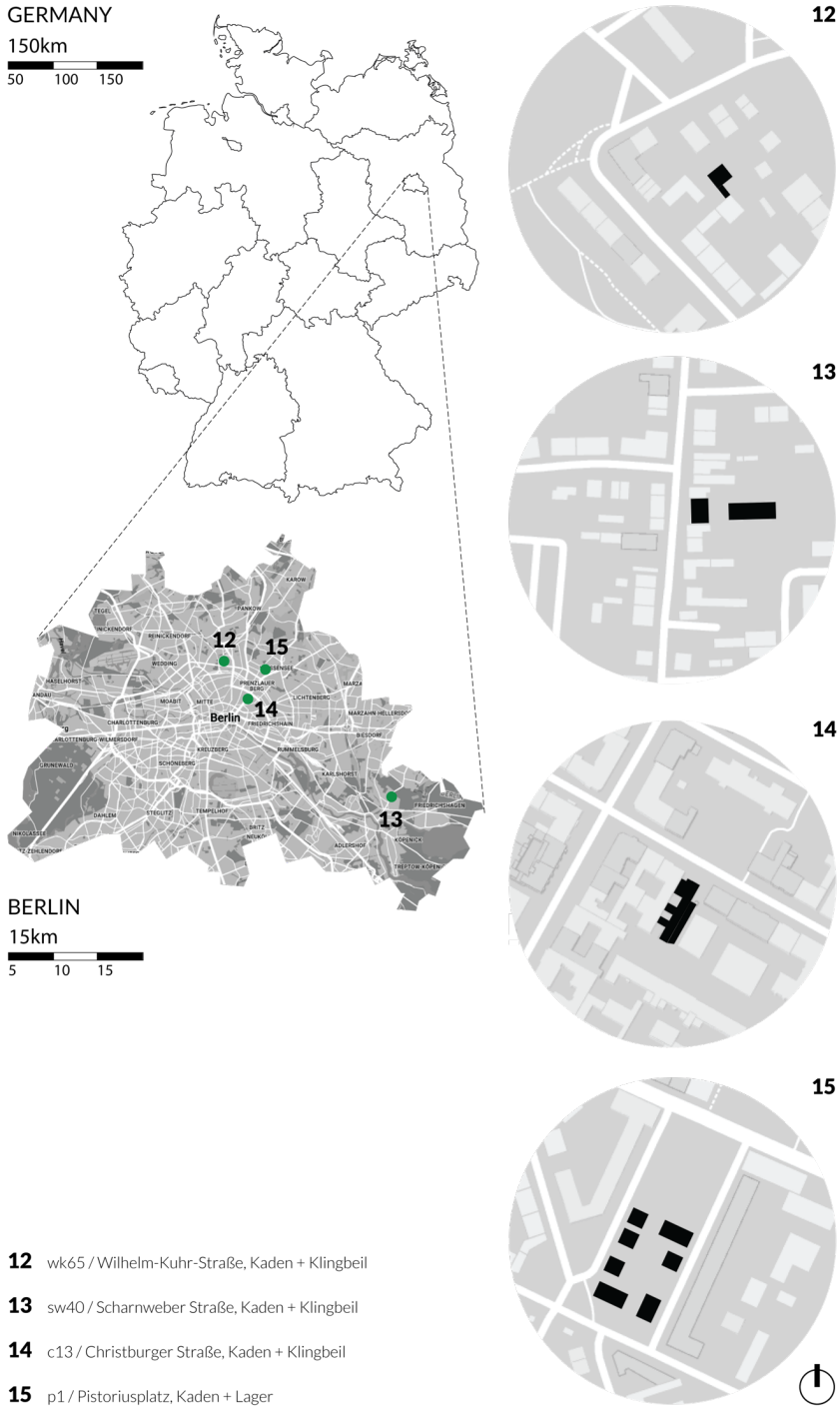


Figure 1.17 German cases

Austria, Ölbündt, Hermann Kaufmann Architekten

Project title	Ölbündt	
Architect	Hermann Kaufmann + Partner ZT GmbH	
Location	A - 6850 Dornbirn, Hamerlingstraße 12	
Completion	1997	
Awards	Holzbaupreis Vorarlberg 1997 (Preis) Vorarlberger Hypo-Bauherrenpreis 1998 Arge Alp Umweltpreis silber 2000 Haus der Zukunft – BM für Wirtschaftliche Angelegenheiten 2000	
Area	GFA (gross floor area):	2 300 m ²
	n.b.ar. (net building area):	1 900 m ²
	GBV (gross building volume):	5 475 m ³
Floors	3 + 1 basement	
Residential units	12 apartments, 1 single-family residential unit / commercial use	
Additional progr.	Commercial use	
Construction	Prefabricated 'table system' with load-bearing timber columns in a grid measuring 2.40 meters and hollow box elements joined to larger slab elements. Several vertical plywood panels for bracing. Prefabricated façade elements.	
Energy standard	Passive house certification	
Access	Balcony access	
Exposed timber	Clad with larch weather boarding; balconies with timber planking; glue-laminated indoor columns; partially wooden suspended ceiling. (Parquet floor; window frames)	
Client	Kaufmann Anton, Reuthe und Gerold Ölz, Dornbirn	
Project team	Construction budgeting: Bmst. Ing Norbert Kaufmann Structural engineering: merz kaufmann partner gmbH, Dornbirn Heating Ventilation and Sanitary Planning: GMI Ingenieure, Dornb. Electrical planning: Hecht Elektroplanung, Rankweil Building Physics/Acoustics: DI Dr. Lothar Kunz ZT GmbH, Hard Photo: Ignacio Martinez	
Online sources	https://www.hkarchitekten.at/en/projects/oelzbuendt/ https://www.nextroom.at/building.php?id=2735 https://passivehouse-database.org/index.php?lang=en#d_3124	



Figure 1.18 Ölbündt 1997, Architect: Hermann Kaufmann Architekten, Photo: Ignacio Martinez



Figure 1.19 Ölbündt 2017, Photo: Ute Groba

Austria, Mühlweg (A), Hermann Kaufmann Architekten

Project title	Wohnanlage Mühlweg (Bauteil A)	
Architect	Hermann Kaufmann + Partner ZT GmbH	
Location	A - 1210 Wien, Mühlweg 78 / Fritz-Kandl-Gasse 7-11	
Completion	Competition:	2003
	Start of construction:	June 2005
	Completion:	October 2006
Awards	wienwood 2015 (honourable mention); Holzbaupreis Vorarlberg 2007; Gebaut 2006 (honourable mention); best architects 08 (honourable mention)	
Area	GFA (gross floor area):	8 170.50 m ²
	n.b.ar. (net building area):	7 617.15 m ²
	GBV (gross building volume):	23 755.14 m ³
Floors	4 + 1 basement	
Residential units	70 apartments and duplex apartments	
Additional progr.	Stroller parking, bicycle parking, common room, playground	
Construction	Upper floors: prefabricated cross-laminated timber panel construction; load-bearing double walls between apartments, and inner walls; sound insulated slab elements function as continuous beams. Longitudinal façades: prefabricated, highly sound insulated lightweight timber frame elements. Corridors: independent steel construction. Ground floor: reinforced concrete	
Energy standard	Energy efficient	
Access	Access balconies, some wings double-loaded	
Exposed timber	Clad with vertical untreated larch wood boards (thus avoiding the more fire resistant but more expensive hardwood by separating the vertical boards with a protruding horizontal metal-covered façade element; avoiding uneven colour changes due to weathering by using other materials for the loggia walls) Ceilings, also in bathrooms. (Parquet floors; window frames)	
Client	BWS	
Project team	Cooperation: Johannes Kaufmann Architektur; Consultants: merz kaufman partner GmbH; Pesek Planungsbüro; s.d. & engineering; Holzforschung Austria; Institut für Brandschutz-technik und Sicherheitsforschung; PlanSinn; Erich Wiesner (colour)	
Online sources	https://www.hkarchitekten.at/projekt/muehlweg/	



Figure 1.20 Mühlweg (A) 2006, Architect: Hermann Kaufmann Architekten, Photo: Bruno Klomfar



Figure 1.21 Mühlweg (A) 2017, Photo: Ute Groba

Norway, Skadbergbakken, Helen & Hard

Project title	Skadbergbakken
Architect	Helen & Hard AS
Location	NO – Sola, Sandangersvingen
Completion	2015
Awards	
Area	Site: 77 000 m ² Unit sizes: 56 - over 200 m ²
Floors	3 – 7 + basement
Residential units	393 units planned in 29 buildings (apartment blocks, multi-family houses, semi-detached or single-family houses)
Additional programme	Kindergarten and playground, small trade (e.g. hairdresser, kiosk etc.)
Construction	CLT load bearing walls, roofs, slabs. (Except for multi-family houses: built by a different contractor with concrete construction)
Energy standard	Passive house
Access	Directly from ground floor, or through internal staircases
Exposed timber	Semi-detached / single-family: Inner walls, ceilings, columns. Parquet floor. Block apartments: Top floor ceiling, columns. Parquet floor. Façades: Kebony
Client	Real Estate Ottessen & Dreyer Block Watne AS & Skadberg Eiendomsutvikling AS
Project team	Collaboration with PPAG Structural engineering? Massive timber project coordination - KLH? Building physics - Rambøll?
Online sources	http://www.helenhard.no/thinking/skadbergbakken http://www.forumholzbau.com/pdf_10/nl48_mmk_Skadbergbakken_Projektseitenblatt.pdf https://docplayer.me/60023080-Skadbergbakken-formgivingsveileder-tilhorende-reguleringsplan-skadbergbakken-foto-ensign.html



Figure 1.22 Skadbergbakken 2015, Architect: Helen & Hard, Photo: Emile Ashley



Figure 1.23 Skadbergbakken 2017, Photo: Ute Groba

Norway, Vindmøllebakken, Helen & Hard

Project title	Vindmøllebakken
Architect	Helen & Hard AS
Location	NO – 4014 Stavanger, Pedersgata 130 (Storhaug)
Completion	Part 1: Dec 2018 Part 2: Sep 2019
Awards	
Area	Heated GBV (gross building volume): ca. 5 000 m ²
Floors	3 – 5
Residential units	40 owner-occupied apartments as part of a co-living project (apartments with 1 - 4 rooms from 38 - 95 m ² ; + 12.6 m ² of more than 500 m ² shared area). In a future construction stage: 4 urban villas (row houses) and 11 owner-occupied apartments.
Additional programme	Shared area of the co-living project with various functions (e.g. additional shared kitchen and multipurpose room, greenhouse, roof terrace, car pool, amphi stairs), guest apartment.
Construction	Timber construction system by Holzbau Saurer
Energy standard	Passive house (NS3700/3701), energy label A (dark green)
Access	Direct or from shared indoor staircase
Exposed timber	Walls and ceilings (except bathroom); floors (parquet)
Client	Kruse Smith Eiendom AS, Helen & Hard AS, Indigo Vekst AS
Project team	Project leader: Kruse Smith AS Timber engineering: Creation Holz; Hermann Blumer Structural engineering: Treteknisk Institutt, rådgivingstjenesten Fire protection survey: Sblumer ZT GmbH; Norconsult AS Sustainability consultants: GAIA Lista AS Timber system supplier: Holzbau Saurer Main contractor: Kruse Smith Entreprenør AS
Online sources	http://www.helenhard.no/projects/vindmllebakken https://www.arkitektur.no/vindmøllebakken http://www.gainingbysharing.no/prosjekter/vindmøllebakken/ http://vindmøllebakken.no



Figure 1.24 Vindmøllebakken 2016, Architect: Helen & Hard, Rendering: Helen & Hard



Figure 1.25 Vindmøllebakken 2019, Photo: Harald Sævereid

Austria, Mühlweg (C), Dietrich I Untertrifaller

Project title	Passivhäuser am Mühlweg / Passive Houses, Vienna (AT)	
Architect	Dietrich I Untertrifaller Architekten ZT GmbH	
Location	A - 1210 Wien, Mühlweg 74 / Fritz-Kandl-Gasse 1-3	
Completion	Competition	2004
	Construction	2005-2006
Awards	2007 Energy Globe Vienna	
Area	6 750 m ²	
Floors	4 + 1 basement, + 1 attic floor	
Residential units	70 apartments	
Additional programme	Children's Village group home in one of the ground floors	
Construction	Mixed-timber construction: Walls, floors and ceilings made of solid timber panels Staircase: reinforced concrete Prefabricated façade including windows, insulation and base plaster. Plaster finish done on site	
Energy standard	Passive house	
Access	Internal staircase (reinforced concrete), elevator	
Exposed timber	Cladding cantilevering loggia and stepped 5th storey; parquet floor	
Client	Bauträger Austria Immobilien	
Project team	Structural engineering: JR Consult, Graz HVACR: Ökoplan, Vienna Building physics: IBO, Vienna Timber construction: KLH Massivholz, Katsch Landscape: Bacher, Vienna Photos: Bruno Klomfar	
Online sources	https://www.dietrich.untertrifaller.com/projekte/passivhaeuser-am-muehlweg-wien/?filter=17&parent=8 https://www.baunetzwissen.de/daemmstoffe/objekte/wohnen/wohnanlage-muehlweg-in-wien-70140 https://www.nextroom.at/building.php?id=29276	



Figure 1.26 Mühlweg (C) 2006, Architect: Dietrich I Untertrefaller, Photo: Bruno Klomfar



Figure 1.27 Mühlweg (C) 2017, Photo: Ute Groba

Austria, Lobaugasse, Dietrich I Untertrifaller

Project title	Garden Estate Lobaugasse, Vienna (AT)
Architect	Dietrich I Untertrifaller Architekten ZT GmbH
Location	A - 1220 Wien, Plattensteingasse 43
Completion	Competition: 2006 Construction: 2008-2009
Awards	
Area	7 610 m ² 83 m ² per house
Floors	2 (originally planned with optional basements)
Residential units	91 allotment houses
Additional programme	Playground Originally planned with a building for communal use
Construction	Prefabricated timber-frame construction
Energy standard	Low energy / Niedrigenergie
Access	Front door at ground level
Exposed timber	Ceilings, floors (original equipment: laminate), internal stairs. Façades: larch boards, in some houses in combination with plastered walls on ground level
Client	ÖSW – Österreichisches Siedlungswerk
Project team	Structural engineering, HAVCR: Vasko+Partner, Vienna Landscape: Land in Sicht, Vienna Photos: Bruno Klomfar
Online sources	https://www.dietrich.untertrifaller.com/en/projects/gartensiedlung-lobaugasse-wien/?filter=381&parent=369 https://www.oesw.at/presse/archiv/news/detail/News/uebergabe-der-kleingartenhaeuser-in-der-lobaugasse.html https://www.bauforum.at/architektur-bauforum/wohnen-en-miniature-17153



Figure 1.28 Lobaugasse 2009, Architect: Dietrich I Untertrifaller, Photo: Bruno Klomfar



Figure 1.29 Lobaugasse 2017, Photo: Ute Groba

Austria, Mühlweg (B), Hubert Rieß

Project title	Mühlweg	
Architect	Hubert Rieß	
Location	A – 1210 Wien, Mühlweg 76 / Fritz-Kandl-Gasse 5	
Completion	Competition:	2004
	Completion:	2006
Awards		
Area	n.b.ar. (net building area):	13 438 m ²
	building area residential:	8 599 m ²
Floors	4 + 1 attic floor	
Residential units	3 buildings with 27 or 28 units each 3 'urban villas' with 6 units each	
Additional programme	-	
Construction	Hybrid timber construction: Ground floor, staircase and wet rooms: concrete Ring-shaped residential part: massive timber	
Energy standard		
Access	Internal staircase	
Exposed timber	Loggias	
Client	ARWAG	
Project team	Structural engineering: RWT Plus Building physics: Vasko + Partner Ingenieure	
Online sources	https://www.nextroom.at/building.php?id=29985	



Figure 1.30 Mühlweg (B) 2006, Architect: Hubert Rieß, Photo: Gomilschak



Figure 1.31 Mühlweg (B) 2017, Photo: Ute Groba

Austria, Spöttlgasse, Hubert Rieß

Project title	Spöttlgasse
Architect	Hubert Rieß
Location	A – 1210 Wien, Spöttlgasse 7
Completion	2005
Awards	wienwood 2005 (one of 7 awardees)
<hr/> <hr/>	
Area	
Floors	4 – 5
Residential units	154 (112 in massive timber construction, 42 in concrete part)
Additional programme	4 playground areas for different age groups, sauna, 2 laundry rooms, common room, 7 bicycle- and pram parking areas
<hr/> <hr/>	
Construction	Upper floors: cross-laminated timber (native spruce) Building facing the street and all ground floors: concrete
Energy standard	
Access	Access balconies
Exposed timber	Loggias
<hr/> <hr/>	
Client	Sozialbau AG
Project team	Photos: Pez Hejduk
<hr/> <hr/>	
Online sources	https://www.nextroom.at/building.php?id=28438 https://www.sozialbau.at/presse/referenzprojekte/tueroeffner-fuer-massivholz-bauweise/ http://www.proholz.at/zuschnitt/71/im-gespraech-mit-dem-holzbaupionier/



Figure 1.32 Spöttlgasse 2005, Architect: Hubert Rieß, Photo: Anna Blau



Figure 1.33 Spöttlgasse 2017, Photo: Ute Groba

Austria, Breitenfurter Straße, p.good Praschl-Goodarzi Architekten

Project title	Breitenfurter Straße
Architect	P.GOOD Praschl-Goodarzi Architekten ZT-GmbH
Location	A – 1230 Wien, Breitenfurter Straße 450-454
Completion	2013
Awards	wienwood 2015 (one of 6 awardees)
Area	5 123 m ²
Floors	3
Residential units	55 (7 with universal access)
Additional programme	Retiree club, child care, medical practice
Construction	Massive timber Staircases and elevator shafts: concrete
Energy standard	nZEB (Niedrigstenergiehaus), heat-recovery ventilation
Access	Internal staircase, access balconies
Exposed timber	Ceilings, recessed parts of façade
Client	GEWOG Gemeinnützige Wohn- und Siedlungsgesellschaft GmbH
Project team	Structural engineering: RWT Plus Timber: MHB Holz und Bau GmbH Massive timber supplier: Binderholz GmbH Landscape: DI Jacob Fina
Online sources	https://www.pgood.at/detail-en/holzbau-breitenfurterstrasse.html https://www.proholz.at/holzbauten/architektur/wohnbau-breitenfurter-strasse-in-wien https://www.proholz.at/bauen-mit-holz/haeuser/wohnbau-breitenfurter-strasse-450-454-wien/a http://www.proholz.at/zuschnitt/54/wohnbau-breitenfurter-strasse-in-wien/ https://www.proholz.at/bauholz/2018-2-wien/modul1/viergeschossiger-holzwohnbau-breitenfurter-strasse-450-454 https://www.proholz.at/zuschnitt/59/oekobilanzierung-und-zertifizierung



Figure 1.34 Breitenfurter Straße 2013, Architect: Praschl-Goodarzi Architekten, Photo: Bruno Klomfar



Figure 1.35 Breitenfurter Straße 2017, Photo: Ute Groba

Austria, Wagramer Straße (Bauteil B), Hagmüller

Project title	Wagramer Straße
Architect	Hagmüller Architekten ZT GmbH
Location	A – 1220 Wien, Wagramer Straße 151
Completion	Competition 2009, Planning 2009-2011, Construction 2012-2013, Completion 2013
Awards	wienwood 2015 (honourable mention)
Area	Site: 6 254 m ² Gross 18 313 m ²
Floors	3 in part B (7 floors in part A)
Residential units	31 in part B (71 units in part A)
Additional programme	800 m ² (laundry room, play room, pram room, bike workshop and party room)
Construction	Massive timber construction: Load-bearing inner walls and floor slabs: cross-laminated timber; façade: timber staircases: reinforced concrete
Energy standard	
Access	Front door at ground level, or via internal staircase and access balconies
Exposed timber	Façade parts
Client	Familie, Gemeinnützige Wohn- und Siedlungsgenossenschaft
Project team	General contractor: Voitl & Co Structural engineering: RWT Plus Timber: Franz Aichinger Hoch-, Tief- und Holzbau Massive timber supplier: Binderholz Photos: Bruno Klomfar
Online sources	http://www.hagmueller.com/portfolio/hbw-holzbau-in-der-stadt-bauteil-b/?i=14&c=0 https://www.proholz.at/holzbauten/architektur/wohnhaus-wagramer-strasse https://www.nextroom.at/building.php?id=36011 https://www.binderholz.com/bauloesungen/wohnbau-wagramer-strasse-wien-oesterreich/ (Part A by schluderarchitektur: http://www.architecture.at/index.php?article_id=39&clang=0)



Figure 1.36 Wagramer Straße 2013, Architect: Hagemüller Architekten, Photo: Bruno Klomfar



Figure 1.37 Wagramer Straße 2017, Photo: Ute Groba

Norway, Ulsholtveien, Haugen / Zohar Arkitekter

Project title	Housing for Youth
Architect	HZA Haugen / Zohar Architects
Location	NO – 1053 Oslo Furuset, Ulsholtveien 31
Completion	2017 (Competition: 2013)
Awards	Arkitekturprisen 2017 (Norwegian Architecture Prize 2017) Årets trebyggeri 2017 (Wooden Project of the Year 2017) Oslo bys arkitekturpris 2018 (Oslo Architecture Prize 2018) (finalist + honourable mention)
Area	GFA (gross floor area): Furuhuset (existing building) 1 124 m ² Storage rooms and bike workshop 154 m ² New building 1 922 m ² Sum: 3 200 m ² (NB: many different numbers published)
Floors	3
Residential units	36 (9 within refurbished existing building, 27 in new building)
Additional programme	Multifunctional room with kitchen, laundry room, crafting room and bike workshop in an existing building, garden, stairs
Construction	Prefabricated massive timber modules in walls, slabs, roofs
Energy standard	Passive house (new building)
Access	From terrain (ground floor) and via bridges (upper floor)
Exposed timber	Load-bearing CLT elements visible indoors, treated with vapour permeable, nature-based wood oil. Façades: spruce, pre-greyed with iron sulphate
Client	Stiftelsen Betanien Oslo
Project team	Competition: Odd Steinsvik, Dronninga Landskap; Massive timber: Woodcon; Pilot project promoted by: 'FutureBuilt', 'Tre og by'; Project management: CM Prosjekt AS; Structural engineering: Rambøll; Timber engineering and fire protection survey: WSP Eng.; Electrical engineering: Foyn Consult; HVAD and sanitary planning: Dagfinn H. Jørgensen; Soundproofing/Building acoustics: Brekke & Strand; Building physics: Sweco; Landscape: Dronninga Landskap
Online sources	https://www.hza.no/u31 https://www.futurebuilt.no/English/Pilot-projects#/English/Pilot-projects/Ulsholtveien-31-Oslo http://www.bygg.no/article/1319030 https://www.arkitektur.no/ulsholtsveien-31



Figure 1.38 Ulsholtveien 2017, Architect: Haugen / Zohar, Photo: Are Carlsen



Figure 1.39 Ulsholtveien 2018, Photo: Ute Groba

Germany, wk65, Kaden Klingbeil Architekten

Project title	wk65
Architect	Kaden + Lager (formerly Kaden Klingbeil Architekten)
Location	D - 13187 Berlin-Pankow, Wilhelm-Kuhr-Strasse 65b
Completion	2011-2012
Awards	
Area	663 m ²
Floors	5, no basement
Residential units	5
Additional programme	One freehold apartment used as an atelier
Construction	Hybrid timber construction Load-bearing walls and roofs: timber frame construction with non-combustible surfaces Façade: mineral thermal insulation composite system Floors: filigree concrete slabs Ground floor: walls in reinforced concrete
Energy standard	
Access	External staircase (exposed concrete), elevator
Exposed timber	Parquet floors
Client	Bauherrengemeinschaft 'Wilhelm-Kuhr-Strasse 65b'
Project team	Structural engineering: Pirmin Jung Deutschland GmbH / IFB Thal+Huber Technical building services: Planungsbüro Roth Fire protection survey: Dehne Kruse Brandschutzingenieure
Online sources	http://www.kadenundlager.de/projects/wk65/



Figure 1.40 wk65 2012, Architect: Kaden Klingbeil Architekten, Photo: Bernd Borchardt



Figure 1.41 wk65 2017, Photo: Ute Groba

Germany, sw40, Kaden Klingbeil Architekten

Project title	sw40
Architects	Kaden + Lager (formerly Kaden Klingbeil Architekten)
Location	D - 12587 Berlin-Friedrichshagen, Scharnweberstraße 40
Completion	2011
Awards	
Area	1 720 m ²
Floors	4.5 / 3.5 floors front buildings + 0.5 parking garage 3.5 floors rear building
Residential units	16
Additional programme	-
Construction	Hybrid timber construction Load-bearing walls and roofs: timber frame construction with non-combustible surfaces Façade: mineral thermal insulation composite system Floors: filigree concrete slabs
Energy standard	
Access	External staircase (exposed concrete), elevator
Exposed timber	Parquet floors
Client	sw40 BauGbR
Project team	Structural engineering: - Fire protection survey: Dehne Kruse Brandschutzingenieure
Online sources	http://www.kadenundlager.de/projects/sw40/



Figure 1.42 sw40 2011, Architect: Kaden Klingbeil Architekten, Photo: Bernd Borchardt



Figure 1.43 sw40 2017, Photo: Ute Groba

Germany, c13, Kaden Klingbeil Architekten

Project title	C13
Architects	Kaden + Lager (formerly Kaden Klingbeil Architekten)
Location	D - 10405 Berlin-Prenzlauer Berg, Christburger Straße 13
Completion	2013-2014
Awards	
Area	2 350 m ²
Floors	7 floors front building 5 floors rear building + 1 basement
Residential units	8
Additional programme	Various meeting spaces, bistro, canteen for neighbouring school, day-care centre, family centre, medical practices, offices, group home for the elderly
Construction	Hybrid timber construction
Energy standard	
Access	External staircase (concrete), elevator
Exposed timber	Ceilings (permanent formwork), some floors (parquet)
Client	Stiftung Bildung.Werte.Leben.
Project team	Structural engineering: Pirmin Jung Ingenieure AG, Switzerland Fire protection survey: Dehne Kruse Brandschutzingenieure
Online sources	http://www.kadenundlager.de/projects/c13/



Figure 1.44 c13 2014, Architect: Kaden Klingbeil Architekten, Photo: Bernd Borchardt



Figure 1.45 c13 2017, Photo: Ute Groba

Germany, p1, Kaden Klingbeil Architekten / Kaden + Lager

Project title	p1
Architects	Kaden + Lager (formerly Kaden Klingbeil Architekten)
Location	D - 13086 Berlin-Weißensee, Pistoriusplatz 1
Completion	2016-2018
Awards	
Area	5 500 m ²
Floors	4 – 5 floors + 1 floor basement in some areas
Residential units	47
Additional programme	-
Construction	Hybrid timber construction
Energy standard	
Access	External staircase (concrete), elevator
Exposed timber	Ceiling
Client	Pistoriusplatz GbR, Holz GbR
Project team	Structural engineering: Pirmin Jung Deutschland GmbH Fire protection survey: Dehne Kruse Brandschutzingenieure HVACR: Specht Kalleja + Partner Gebäudetechnik GmbH Landscape: kre ta Garten- und Landschaftsbau GmbH Visualization: www.thethird.de Photos: Bernd Borchardt
Online sources	http://www.kadenundlager.de/projects/p1/



Figure 1.46 p1 2016, Architect: Kaden + Lager, Illustration: Kaden + Lager



Figure 1.47 p1 2017, Photo: Bernd Borchardt

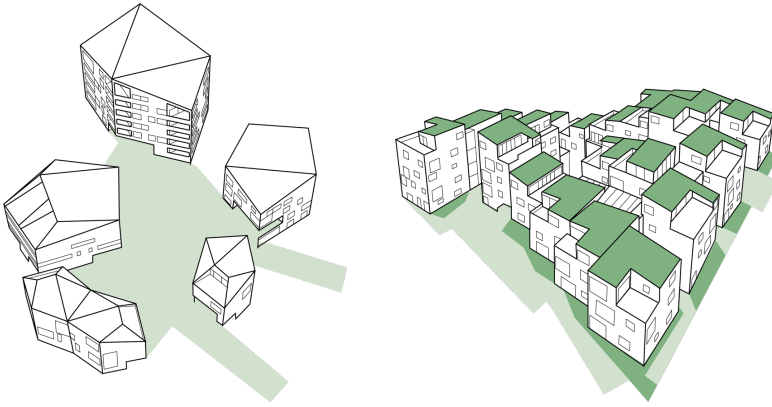
Core case description

Figure 1.48 Core cases Skadbergbakken (schematic illustration of one 'tun') and Vindmøllebakken, Helen&Hard

The polygonal shape of the buildings at Skadbergbakken is a result of both wanting them to participate in a variety of spatial constellations (forming 'tuns'¹⁵⁴ in the middle of a building group, semi-private areas between them, and private gardens with insinuated spatial framing behind them), whilst taking advantage of the views between and over buildings in various directions. This makes an increased number of façade directions plausible, and the buildings become experienceable from all sides – all of which suggests an understanding of the building as an object. The monolithic conceptualization is supported visually by the avoidance of any building parts that might look added on, such as roofs in another material than that of the façades, carports, balconies or canopies. Everything is integrated into the main building volume, and the façade material and roof cladding are the same (Figure 1.48 left).

An increased level of density has been achieved in Vindmøllebakken; the houses are joined tightly together and form frontal façades and an inner courtyard whilst maintaining an overall monolithic expression. The entire building group resembles a carpet-like conglomerate where single units are articulated through recessed street lines, and top floors and roof terraces that 'peek out'. Although made from wood, the complex may evoke pictures of North-African rammed earth or masoned ksars (Figure 1.48 right). In both Skadbergbakken and Vindmøllebakken, the load-bearing function is located within the façade layer.

¹⁵⁴ Norwegian for yard areas between farm buildings.

While Vindmøllebakken reserves the centre of the plot to more private areas for the housing community and turns its public face outwards, Skadbergbakken invites the public into the middle of each tun and shields private gardens at the outside.

Ölzbündt dedicates one longitudinal façade to shared communication and the other one to private balconies and gardens. Mühlweg (A)'s three volumes – two L-shaped and one rectangular – are grouped around a shared outdoor area. Overlapping partly, they create a spatial differentiation. Private balconies are placed along longitudinal façades with respect to sunlight. Wrapped around partly open shared access balconies, some apartments face the shared area and others turn towards a street or neighbouring plots. All apartments have openings towards at least two sides, one of which may be the shared access system.



Figure 1.49 Core cases Ölzbündt and Mühlweg (A), Hermann Kaufmann Architekten

Mühlweg and Ölzbündt (Figure 1.49) have very different construction systems, namely punctual grid-based versus cross-wall construction, the latter being to situate somewhere between massive and skeleton construction. In both cases, the façade has no load-bearing function beyond carrying itself, and the external access balconies support a layered expression. While Ölzbündt's private balconies are also added on the exterior, they are integrated into the building's main volume in Mühlweg. Here however, the coloured movable blinds communicate a shielding rather than a structural role of the outer walls.

1.6 Thesis outline

The introductory chapter establishes the backdrop for the research interests in this thesis. It discloses the research process that evolved together with the research questions and describes the chosen methods. An overview of the studied cases sets the scene for the following chapters.

The thesis maintains that concrete, perceived and semantic aspects of timber materiality may add a multitude of qualitative facets to timber's quantitative benefits. Three 'tales' as a structuring and communicative device depart from either concrete, perceived or semantic materiality as a frame of reference and branch out into the respective other realms as well (Figure 1.50).

Chapter 2 departs from the concrete properties of wooden materials and ideas about their appropriate use according to these properties – with regard to constructive form, its cladding, coating and lining. Discussions also include how these were perceived and semantically rated. The concrete properties of timber may be seen as true and factual; as a scientifically evident knowledge base that does not need to be negotiated all the time. How this truth is interpreted, experienced and valued, and views of its design implications vary however, both over time and among individuals.

Chapter 3 departs from the perception of architecture and its materiality through all senses and how this influences the experience of comfort and beauty, together with the perception of possible action based on sensory stimuli. The experience and appreciation of timber's (concrete) characteristics such as its thermal conductivity, wood grain, shade and lightness vary greatly, both among architects and among inhabitants, and depend on knowledge, personal background and context, which points towards a semantic facet. The sensory-perceptual aspects of timber are thus seen as personal and individual experiences.

Chapter 4 departs from different general understandings of material value and associated with timber and explores their situatedness in a physical, temporal and cultural context. Concrete aspects of timber tended to be dominant in the architects' semantic interpretation of wooden materiality, while inhabitants based their semantic understanding more on perceived aspects. The interpretation of materiality firstly as an interaction with its context as a socio-cultural background, and secondly as resulting from the negotiation of value notions between architect and inhabitant as equal participants in the design process are seen as intersubjective.

The concluding chapter takes a step back in order to 'see the wood for the trees'. It restates and discusses central findings and includes a reflection on the researcher's role and choices, on the research's strengths and shortcomings, on research impact and future prospects.

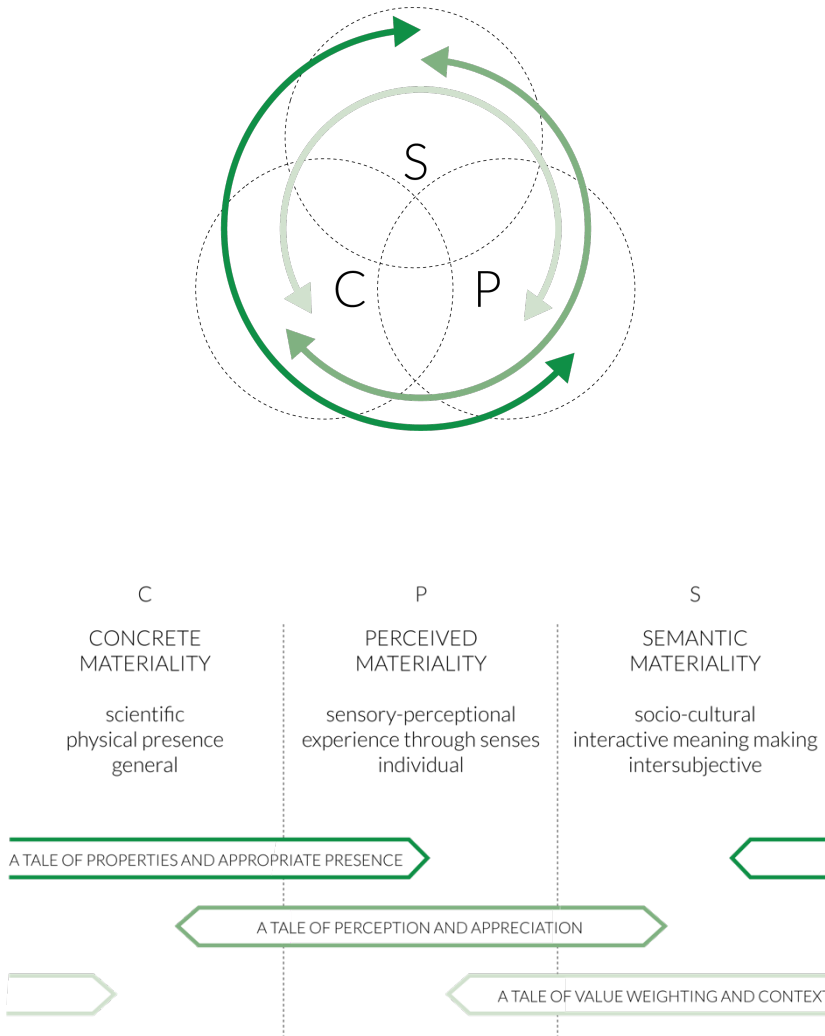


Figure 1.50 Three ‘timber tales’ across concrete, perceived and semantic materiality



Skadbergbakken

2

A Tale of Properties and Appropriate Presence

2.1 Literature

Natural forms and intrinsic properties

A number of properties are characteristic for wood: it performs differently along and across the direction of its fibres; no piece is internally homogeneous nor alike another in cellular structure, knot position or surface; it changes dimension according to ambient air humidity, and colour when exposed to sun, wind and rain. These are some of the heterogeneous properties that make wood more difficult to control and for many architects thus a less desirable material than ‘fixed ones’ such as concrete or steel.¹⁵⁵

Tools, calculation methods and new products have been developed in order to control or eliminate these variations. As a result, contemporary timber construction operates with a lower dimensional tolerance than concrete or steel.

The desired form a material is subjected to has traditionally been ascribed supremacy over its properties; conceptual idea(l) ranked over its (necessarily imperfect) material representation.¹⁵⁶ An influence of material on form and surface of building elements has been a perseverative demand and will be the subject of this chapter; only few design approaches however fully acknowledge or harness the form-generating potential of the material wood itself and let changing moisture content or grown form co-define resulting form. This idea, currently receiving growing interest, is not a new one.

The tools used in the Neolithic Age limited the workability of wooden stems, so they were integrated into the constructions according to their naturally grown form to the furthest extent possible. Entire tree parts were incorporated into houses or boat constructions according to where these shapes were needed. Forks in trees and branch junctures were used for joining details. This was not only convenient in times with limited tools, minimizing the need for cuts or joints, but it also exploited the grown fibre direction optimally. A tree that had been bent by the wind had grown reinforcing fibres exactly where they were needed to preserve its form.

¹⁵⁵ Le Corbusier advocated for the use of artificial materials that were easier to control and use efficiently: ‘(...) heterogeneous and doubtful (...) natural materials, which are infinitely variable in composition, must be replaced by fixed ones.’ To his mind, ‘steel girders and (...) reinforced concrete, are pure manifestations of calculation, using the material of which they are composed in its entirety and absolutely exactly; whereas in the old-world timber beam there may be lurking some treacherous knot, and the very way in which it is squared up means a heavy loss in material.’ Le Corbusier, *Towards a New Architecture*, trans. Frederick Etchells, Reprint of the translation of the 13th French edition from 1931 (New York: Dover Publications, 1986), 232.

¹⁵⁶ Described as hylomorphism in Katie Lloyd Thomas, ed., *Material Matters: Architecture and Material Practice* (New York, NY: Routledge, 2006); distinguished as ontological and representational use of material in Marcin Wójcik, ‘Hylomorphism - The Classical Framework for the Form-Matter Relationship in Architecture’, in *Reframing Wood Construction: Innovation in Architecture through Activating Material Properties with the Use of Digital Technologies* (The Oslo School of Architecture and Design, 2020), 105–37.

Until medieval times, the naturally curved shape of wood was preserved and displayed, e.g. in large, oaken open-timber roof structures, or in the walls of half-timbered houses. Before techniques were developed to manipulate and bend wood with heat, naturally curved knee timber was also in high demand for boatbuilding, and this sought-after resource was sometimes more expensive than straight parts.¹⁵⁷ The fibre direction is not only important for the load-bearing capacity of wood, but also for its processing – especially by hand – as cutting wood against the grain is far more difficult; the grain influences the direction of the axe and expertise is required to cut with precision.¹⁵⁸

Newer timber products make use of the swelling and shrinking of wood as a bonding mechanism for the glue-, nail- and screw-free joining of parts into larger panels, e.g. DLT (dowel-laminated timber) or Holz100. The natural characteristics of individual pieces of wood and the associations with their past as living trees and as part of a forest have attracted renewed interest in contemporary architectural- and art projects. Recent examples are smaller projects like the temporary pavilion ‘Ratatosk’¹⁵⁹ or the exhibition piece ‘Tree of Dining’ by the Norwegian architectural firm Helen & Hard.¹⁶⁰ Both featured only partly machined tree parts that had been 3D-scanned and CNC-processed.

While this is a rather literal interpretation of the perennial demand to use ‘wood as wood’, it is a recurrent topic for architects and theoreticians. Different interpretations of the catchphrase and ideas about ‘material as such or being itself’ can be traced from the 18th century to contemporary architectural practice and thought.¹⁶¹

‘Wood as wood’ in preindustrial times

‘Stoffwechseltheorie’: *Theory of material change*

In the oldest preserved source of architectural theory, Vitruvius writes about temple buildings that first existed as wooden constructions. Their forms and ornaments remained the same when newer temples were built in stone.¹⁶²

¹⁵⁷ Christoph Schindler, *Ein architektonisches Periodisierungsmodell anhand fertigungstechnischer Kriterien, dargestellt am Beispiel des Holzbaus* (Zürich: ETH, 2009), 103.

¹⁵⁸ Wood has greater load-bearing capacity parallel to its fibres. The fewer fibres that have been cut, the stronger it is. See e.g.: Schindler, 108.

¹⁵⁹ Constructed for the Victoria and Albert Museum in London, 2010.

¹⁶⁰ This was part of the exhibition ‘Turning the Tables’ at testbed1 in Battersea and at the London gallery Great Western Studios in 2011.

¹⁶¹ Ute Poerschke, ‘On Concrete Materiality in Architecture’, *Architectural Research Quarterly* 17, no. 02 (June 2013): 149–56.

¹⁶² ‘Drawing from these elements and from the art of carpentry and applying them to the construction of sacred dwellings in stone and marble, craftsmen imitated these arrangements in their sculptures and agreed that these inventions ought to be adopted.’ Chapter 2 in Vitruvius, ‘Book 4. Corinthian, Doric, and Tuscan Temples’, in *Ten Books on Architecture*, ed. Ingrid D. Rowland and Thomas Noble Howe, 1. paperback edition (Cambridge: Cambridge University Press, 2001), 56;

Semper later termed this practice of ‘petrification’ that has been known since antiquity ‘Stoffwechseltheorie’,¹⁶³ and the term is now widely utilised. The translation into English as ‘metabolism’¹⁶⁴ is somewhat misleading; while it refers to chemical transformations as part of bodily processes that indeed inspired Semper,¹⁶⁵ it fails to capture the wordplay of the original German. Furthermore, as Ákos Moravánszky points out, the term metabolism is also used in architectural history for building design in the information society under the umbrella of structuralism, and can thus lead to confusion. A more literal translation would be ‘change of material’; this has also been used in literature.¹⁶⁶

Mumford argues that wood and the transfer of knowledge derived from experiences with wood to other materials created the foundation for the development of modern technology on the whole:

Wood, then, was the most various, the most shapeable, the most serviceable of all the materials that man has employed in his technology: even stone was best as an accessory. Wood gave man his preparatory training in the technics of both stone and metal: small wonder that he was faithful to it when he began to translate his wooden temples into stone. And the cunning of the woodman is at the base of the most important post-neolithic achievements in the development of the machine. Take away wood, and one takes away literally the props of modern technics.¹⁶⁷

Beginning in the mid-18th century however, the transfer of a canon of forms derived from one material to another material was increasingly criticised, perhaps most pointedly by scholar Carlo Lodoli as ‘truly the solemnest abuse one could ever have imagined’.¹⁶⁸

Illustrated in an engraving in Berardo Galiani, *L'architettura di M. Vitruvio Pollione* (Naples: Simoniana, 1758), plate 4 figure 3.

¹⁶³ Gottfried Semper, *Der Stil in den technischen und tektonischen Künsten, oder Praktische Aesthetik. Ein Handbuch für Techniker, Künstler und Kunstfreunde*, vol. 1 (Frankfurt am Main: Verlag für Kunst & Wissenschaft, 1860), 233.

¹⁶⁴ E.g. as used in Andrea Deplazes, ed., *Constructing Architecture: Materials Processes Structures. A Handbook*, 2nd, corrected reprint of the 2nd, extended edition 2008 ed. (Boston: Birkhäuser Publishers for Architecture, 2010), 77, 306, 309.

¹⁶⁵ Physiologist Jacob Moleschott was a friend of Semper and wrote about metabolism in animals and plants, as mentioned in Lars Spuybroek, *Sympathy of Things: Ruskin and the Ecology of Design* ([Rotterdam]: New York, New York: V2 Publishing; NAi Publishing; available in North, South and Central America through D.A.P./Distributed Art Publishers Inc, 2011), 93.

¹⁶⁶ Moravánszky refers to the English terms ‘theory of material change’ and ‘theory of material metamorphosis’ in Ákos Moravánszky, *Stoffwechsel: Materialverwandlung in der Architektur* (Basel: Birkhäuser, 2018), 203–4; Semper himself frequently used the German term ‘Stoffwechsel’ together with ‘Metamorphose’ in Gottfried Semper, *Der Stil in den technischen und tektonischen Künsten, oder Praktische Aesthetik. Ein Handbuch für Techniker, Künstler und Kunstfreunde*, 2 vols (Frankfurt am Main: Verlag für Kunst & Wissenschaft, 1860); Moro uses the term ‘mimesis’ in José Luis Moro, *Baukonstruktion: vom Prinzip zum Detail* (Berlin: Springer, 2009), 134.

¹⁶⁷ Lewis Mumford, *Technics and Civilization*, Reprint (Chicago: The University of Chicago Press, 2010), 79. First published in 1934.

¹⁶⁸ As quoted in 1756 by his student Francesco Algarotti, *Saggio sopra l'architettura*, Republication of 1st edition from 1756 (Venice: Graziosi a S. Apollinare, 1784); as translated in Poerschke, ‘On Concrete Materiality in Architecture’, 149.

‘Wood as wood’ – material as itself, and its form

Lodoli dedicated himself to the appropriate form and use of building materials to ensure the desired performance of a constructive element. Rather than blindly subscribing to the formal canon of classical architecture, he saw such forms and uses as unique to a material and believed thus that a material should be implemented according to its inherent properties, such as its flexibility or rigidity.¹⁶⁹ Lodoli is quoted by his student Francesco Algarotti:

For which reason does stone not represent stone, wood [not] wood, each material itself and not another? (...) as it pertains to its characteristic qualities, to the flexibility or rigidity of its components, to the degrees of resistant force, in one word to its own essence, or nature of the employed material. As the nature of wood is formally different from the nature of stone, also the forms which you give wood in the construction of a building have to be different from those of stone. Nothing is more absurd (...) than when a material is made not to signify itself, but is supposed to signify another.¹⁷⁰

Lodoli’s point of using a material in its appropriate form for a given function is illustrated by the example of cracking Venetian thresholds made of stone.¹⁷¹ The bending moments could have been compensated with another material or another design, avoiding ‘the cracking, tearing, and collapsing of buildings; almost a manifest punishment for the tort which has been continually committed against the truth.’¹⁷²

Following Lodoli, material can only generate harmony and solidity if applied in accordance with its properties and its intended function.

Almost a hundred years later, although stressing that the essence of architecture is defined by more than just ‘improved construction (...) or mere materiality’,¹⁷³ Gottfried Semper again called for the use of ‘wood as wood’:

¹⁶⁹ Alberto Pérez-Gómez, *Architecture and the Crisis of Modern Science*, 7th print (Cambridge, Massachusetts: MIT Press, 1994), 253–54.

¹⁷⁰ Francesco Algarotti, *Saggio sopra l’architettura*, Republication of 1st edition from 1756 (Venice: Graziosi a S. Apollinare, 1784), 14–15; as translated in Poerschke, ‘On Concrete Materiality in Architecture’, 149; see also Ákos Moravánszky, *Stoffwechsel: Materialverwandlung in der Architektur* (Basel: Birkhäuser, 2018), 133.

¹⁷¹ The example was given by another disciple of Lodoli, Andrea Memmo, in *Elementi dell’architettura lodoliana* (Nella stamperia Pagliarini, 1786).

¹⁷² Algarotti, *Saggio sopra l’architettura*; as translated in Poerschke, ‘On Concrete Materiality in Architecture’, 149.

¹⁷³ Gottfried Semper, *Style in the Technical and Tectonic Arts; or, Practical Aesthetics*, trans. Harry Francis Mallgrave and Michael Robinson, Texts & Documents (Los Angeles: Getty Publications, 2004), 106, see also 75–78; and Gottfried Semper, *The Four Elements of Architecture and Other Writings*, trans. Harry Francis Mallgrave and Wolfgang Herrmann, repr. 1989 (Cambridge, Massachusetts: MIT Press, 1851), 102.

Let the material speak for itself; let it step forth undisguised in the shape and proportions found most suitable by experience and science. Brick should appear as brick, wood as wood, iron as iron, each according to its own statical laws.¹⁷⁴

Semper's coeval Eugène-Emmanuel Viollet-le-Duc insisted on coherence not only between form and materiality, but also function. He furthermore pointed out that the way in which materials are combined must be taken into consideration - a concern with continuing relevance beyond aesthetic harmony; differences in expansion behaviour and dimensional tolerance of materials and products still have to be respected for a sound and durable construction today.¹⁷⁵

Material canons

When Goethe referred to forms derived from woodcarving and transferred to stone,¹⁷⁶ he implies the concept of a canon, or hierarchy of materials. He objected to gothic embellishments, as transferring forms from wood – a hierarchically lesser material – would violate stone as a higher-ranking matter. The perforated and fragile shapes would contradict the solidity of stone.¹⁷⁷

A bequeathed canon of values ascribed to materials, or the conventionalized use of materials for certain functions, is described in written records from antiquity as well as in

¹⁷⁴ Semper, *The Four Elements of Architecture and Other Writings*, 48. According to Krufft, this statement on materials has often been misunderstood and used to wrongly reduce Semper to a positivist and functionalist. Hanno-Walter Krufft, *A History of Architectural Theory: From Vitruvius to the Present* (London; New York: Zwemmer; Princeton Architectural Press, 1994), 311; see also Ákos Moravánszky, *Metamorphism: Material Change in Architecture* (Basel: Birkhäuser, 2018), 52–53: Semper's ideas about material have often been dismissed as materialism. Yet Semper also criticized 'materialists' for linking their ideas excessively to the natural sciences and mathematics and for seeing architectonic form as solely conditioned by matter and construction. He emphasizes that matter should serve the idea and be just one of several factors that condition the manifestation of an idea: 'Although form - the idea made visible - should not be in conflict with the material out of which it is made, it is not absolutely necessary for the material as such to be a factor in the artistic appearance.' Semper, *Style*, 77.

¹⁷⁵ 'The materials employed reveal their function through the form you give them: the stone must clearly look like stone, iron like iron, wood like wood. And while assuming forms appropriate to their nature, the materials must be in harmony with each other.' Eugène Emmanuel Viollet-Le-Duc, *Entretiens sur l'architecture* (Gollion: Infolio, 2010), 472, first published 1863; English version: Eugène-Emmanuel Viollet-Le-Duc, *Discourses on Architecture*, trans. Benjamin Bucknall, 1st ed., 2 vols (Boston: Ticknor and Company, 1875).

¹⁷⁶ 'Architecture is not an art of imitation, but rather an autonomous art; yet at the highest level it cannot do without imitation. It carries over the qualities and appearance of one material into another: every order of columns, for example, imitates building in wood.' Johann Wolfgang von Goethe, 'Palladio Architecture (1795) [Not Published by Goethe]', in *Goethe on Art*, ed. and trans. John Gage (London: Scolar Press, 1980), 197.

¹⁷⁷ Johann Wolfgang von Goethe, 'Material der bildenden Kunst', *Teutscher Merkur*, 1788; as referred to by Monika Wagner, "Materialgerechtigkeit". Debatten um Werkstoffe in der Architektur des 19. und frühen 20. Jahrhunderts', in *Historische Architekturoberflächen: Kalk - Putz - Farbe; Historical architectural surfaces: lime - plaster - colour*, ed. Jürgen Pursche, ICOMOS Hefte des Deutschen Nationalkomitees (Internationale Fachtagung des Deutschen Nationalkomitees von ICOMOS und des Bayerischen Landesamtes für Denkmalpflege, München: Lipp, 2003), 135–38.

the Bible, and found in art and architectural practice in Europe and beyond. Such a material canon is not a rigid concept.¹⁷⁸

Semper suggested an organization of building materials in the mid-19th century that is still referred to today in the discourse on new building materials and operations.¹⁷⁹ In an early version from 1850, Semper's categories of raw materials resembled the ancient Greek elements fire, air, water and earth (as states of aggregation), as he ranked them from softer to harder materials.¹⁸⁰ 'Die vier Elemente der Baukunst' from 1851 ranks materials from light to heavy.¹⁸¹ In 'Der Stil in den technischen und tektonischen Künsten' (1860-63) however,¹⁸² Semper turned to grouping materials according to their respective associated processing¹⁸³ and fabrication¹⁸⁴ techniques, categorising them into 'technological classes': textiles, ceramics, tectonics and stereotomy.¹⁸⁵ Tectonics relates to the craft of carpentry with linear structural members, and stereotomy refers to the craft of stone cutting, where solid materials are cut into three-dimensional shapes. Semper also mentions overlaps within his four categories, e.g. when wooden panelling can refer to the textile category as a form-giving aspect and to tectonics as related to the matter.¹⁸⁶

A contemporary categorisation and ranking of building materials and construction elements could be organized based on different criteria, for example those described by Deplazes. He names the material's longevity,¹⁸⁷ the size of its sub-units,¹⁸⁸ its use according to timing in the building process,¹⁸⁹ its load-bearing function or space-defining capacity,¹⁹⁰ and sensory qualities.¹⁹¹ It could also include aesthetic, perceptual and semantic characteristics – in the case of wood for example, these relate to perceptions of how warm or cold, how natural or industrialized, how homogeneous or lively, how cosy

¹⁷⁸ Wagner, 'Materialgerechtigkeit', 135.

¹⁷⁹ E.g. by Deplazes and Cache, as illustrated later in this text.

¹⁸⁰ Spuybroek, *Sympathy of Things*.

¹⁸¹ Semper, *The Four Elements of Architecture and Other Writings*; Kenneth Frampton and John Cava, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture* (Cambridge, Massachusetts: MIT Press, 1995).

¹⁸² Semper, *Der Stil in den technischen und tektonischen Künsten, oder Praktische Aesthetik. Ein Handbuch für Techniker, Künstler und Kunstfreunde*.

¹⁸³ Spuybroek, *Sympathy of Things*.

¹⁸⁴ Poerschke, 'On Concrete Materiality in Architecture', 151.

¹⁸⁵ These techniques relate to four basic materials which Semper does not metallurgy see as part of. Krufft, *A History of Architectural Theory*, 314. The five parts of his book however also include metallurgy; see also Poerschke, 'On Concrete Materiality in Architecture', 151.

¹⁸⁶ See also Gottfried Semper, 'Erstes Hauptstück. Einleitung.', in *Der Stil in den technischen und tektonischen Künsten, oder Praktische Aesthetik. Ein Handbuch für Techniker, Künstler und Kunstfreunde*, vol. 1 *Textile Kunst*, 2 vols (Frankfurt am Main: Verlag für Kunst und Wissenschaft, 1860), 7–12; retrieved from Dietmar Rübel, Monika Wagner, and Vera Wolff, eds., *Materialästhetik: Quellentexte zu Kunst, Design und Architektur* (Berlin: Reimer, 2005), 99–104 (102).

¹⁸⁷ Deplazes, *Constructing Architecture: Materials Processes Structures. A Handbook*, 21.

¹⁸⁸ Deplazes, 12.

¹⁸⁹ Deplazes, 272.

¹⁹⁰ Deplazes, 16.

¹⁹¹ Deplazes, 20.

or obtrusive it is. These last aspects, to a greater degree based on subjective perception and appreciation than the former ones, are more likely to inform a personal material canon than a generally agreed on norm.

The value of a material can be judged according to broadly-ranging criteria; for example, hierarchies in line with economic value do not always correspond to the materials' symbolic value.¹⁹² The significance of some criteria diminishes over time, and new aspects become important. Different notions of value are addressed in greater detail in Chapter 4; the focus here is more on a categorization of building materials according to their structural and functional appropriateness as a background for the critique of imitation described below.

Historically, the general call for a study of the material in question and its appropriate forms seems directed primarily towards other materials than wood, towards materials that were ranked higher. As the original material, timber did not receive the same amount of attention or critique as new and still unfamiliar materials.

By the end of the 19th century however, different architects argue also against transferring forms in the opposite direction; i.e. to a lower-ranking material, as described further in the section about surrogates and falsification below.

More recent statements on the matter recognize the potential for material and construction innovation. One example are experiments with thin wooden vaults in the mid-20th century,¹⁹³ 'at times disturbing in their thinness'.¹⁹⁴ Ford suggests that these vault constructions, preceded by thin concrete and masonry shells, could be seen as an imitation of constructive form back into timber, without however discussing any hierarchical status of materials and forms.¹⁹⁵

As Monika Wagner points out, one speaks of 'imitation' and 'surrogates' only in the case of transfer 'downwards' in a material hierarchy. Hence, although it is criticized in both cases, the transfer of forms and functions from one material to another have been

¹⁹² Rübél, Wagner, and Wolff, *Materialästhetik*, 35.

¹⁹³ In the end of the 1950s, Paul Rudolph searched for new ways to construct vaults with plywood for his Hook Guest House; featured in John D. Entenza, ed., *Arts & Architecture*, June 1959. '[It was] The first use, as far as I know, of bent plywood to span architectural space. The engineering involved was accomplished by trial and error, utilizing a few small boys jumping on various thicknesses of bent plywood in my backyard.' Sibyl Moholy-Nagy and Paul Rudolph, *The Architecture of Paul Rudolph*, First edition (New York: Praeger, 1970), 36.

¹⁹⁴ George Nakashima's experiments with thin-shell wooden vaults were from around the same time. He used conoids and hyperbolic paraboloid forms with wooden materials. Edward R Ford, *Five Houses, Ten Details*, 1. ed, Writing Matters (New York, New York: Princeton Architectural Press, 2009), 71; see also George Nakashima, *The Soul of a Tree: A Woodworker's Reflections*, 1st ed (Tokyo; New York: Kodansha International, 1981), 35, 173, 177.

¹⁹⁵ Edward R Ford, "Brick as Brick, Wood as Wood, Stone as Stone". The Nature of Material in Modern Architecture' (Norske Arkitektakademi, Oslo, September 2000).

opposed with different arguments at different points in time and directed at functional problems as well as the design habits and conventions of the time.¹⁹⁶

Disruptive industrialization and the call for honest materiality

'Materialgerechtigkeit': Truth, or justice to materials

In the mid-19th century, John Ruskin and English-speaking members of the Arts and Crafts Movement turned their attention to the 'truth of materials'.¹⁹⁷ The German 'Materialgerechtigkeit' – literally: material justice – is generally associated with modernism and has appeared in texts dating from the very beginning of the 20th century.¹⁹⁸ As described in the previous sections however, the debate that surrounds truth to materials and their inherent characteristics is older. It was especially lively during the entire period of industrialization in the 19th century and thus starting far earlier than the period of modernism with which it often is associated.¹⁹⁹

Industrialization brought new ways of processing traditional materials, first with the help of steam-powered machines and then with electricity. Furthermore, it was now possible to produce completely new materials, such as cast iron, vulcanized rubber or cellulose. One can easily imagine how discussions around honesty, authenticity and taste were boiling up, as well as about traditional craftsmanship and new mechanical production techniques.²⁰⁰ The – sometimes polemically used – terms 'justice' and 'truth' against material's 'imitation' or 'surrogates',²⁰¹ 'falsification', or even 'violation'²⁰² suggest a moral obligation or commitment to materials. Controversial subjects exceeded mere technical or aesthetic issues by far, falling in line with a fundamental critique of industrialized

¹⁹⁶ Wagner, 'Materialgerechtigkeit', 135.

¹⁹⁷ John Ruskin, *The Seven Lamps of Architecture*, Reprint (1849) (New York: Dover Publications, 1989); see also Rübel, Wagner, and Wolff, *Materialästhetik*, 104.

¹⁹⁸ According to Poerschke in 'On Concrete Materiality in Architecture', the concept of the 'suitability of materials' was first used by Loos in 1900: Adolf Loos, 'My Appearance on Stage with Melba' in *Spoken into the Void*. The German version 'Mein Auftreten mit der Melba' indeed features the word 'materialgerecht', even though its meaning is not discussed there. In 'Materialgerechtigkeit', Wagner traces the term *Materialgerechtigkeit* in the German architectural magazine 'Deutsche Bauhütte' from 1902; in Rübel, Wagner, and Wolff, *Materialästhetik*, 112–13, the terms 'Materialgerechtigkeit' or 'materialgemäß' are referred to in texts from 1897 (Karl Friedrich Wilhelm Henrici: *Moderne Architektur*), 1902 (Franz Geiger [alias Franz Xaver Kreuter]: *Putzbau*) and 1905 (Wilhelm Michel: *Materialgemäß*).

¹⁹⁹ Wagner, 'Materialgerechtigkeit'.

²⁰⁰ Wagner.

²⁰¹ Loos, 'Building Materials', 64–65; originally published in Adolf Loos, 'Die Baumaterialien', *Neue Freie Presse*, 28 August 1898.

²⁰² Loos, 'Building Materials', 65; originally published in Loos, 'Die Baumaterialien'; Wilhelm Michel, 'Materialgemäß', *Deutsche Kunst und Dekoration* 16 (September 1905): 628–31; Konrad Lange, 'Geschmacksverirrungen im Kunstgewerbe', *Dekorative Kunst*, 1909; latter two sources found in Rübel, Wagner, and Wolff, *Materialästhetik*, 115, 180.

societies.²⁰³ As Rübel et al. point out, ‘Materialgerechtigkeit’ was used in a broad variety of arguments, such as the valorisation of craftsmanship in an era of increasing mechanization and a call for ‘honest’ machine work, ideas of ‘good design’ and the purist absence of ornaments, but also nationalistically motivated material preferences.²⁰⁴

Everyday products for industrial society were to be of timeless ‘good design’,²⁰⁵ shaped appropriately for their intended use, and ‘materialgerecht’.²⁰⁶ ‘Good design’ was to be taught and learned, and formed part of educatory measurements – as for example promoted by the German Work Federation (Deutscher Werkbund).²⁰⁷

Cast iron and later vulcanized rubber were accused of being false and imitations. The traditional and conventional material hierarchies were disordered as an increasing number of objects could be made from just one malleable material; this rendered obsolete any demand for forms that do justice to material.²⁰⁸ Cast iron was lighter and required much less material for load-bearing functions than stone and could span wider than timber of the same dimensions.

It was not merely the increased load-bearing capacity of new industrial or synthetic materials, but first and foremost their easy formability that allowed architects to realize new forms and volumes.²⁰⁹ This formability also sparked fierce debates about how materials should be used in buildings. If steel for example simply repeated the massive

²⁰³ Rübel, Wagner, and Wolff, *Materialästhetik*, 9.

²⁰⁴ The term ‘Materialgerechtigkeit’ has also been used in an ideologized way for ideas of native materials in a nationalistic context. This is referred to as ‘national semantisation of materials’ in Rübel, Wagner, and Wolff, 195–96; Exposed timber structures, inspired by medieval construction and other historicist or folkloric details, were associated with ‘German-ness’ and favoured by National Socialist city planners and architects. This was not only the case in National Socialist Germany and allied countries such as Italy and Japan, but also e.g. in prerevolutionary Russia. National connotations of materials still exist and are referred to today, for example in world expo pavilions, described in e.g. Sharon Macdonald, ‘Words in Stone?: Agency and Identity in a Nazi Landscape’, *Journal of Material Culture* 11, no. 1–2 (July 2006): 105–26.

²⁰⁵ Rübel et al. use the term ‘gute Form’, which only later became an established term. “Die gute Form”, translated as ‘good design’, was coined by Max Bill in an eponymous controversial exhibition shown for the first time in Basel in 1949, see Lars Müller, Jakob Bill, and Museum für Gestaltung Zürich, eds., *Max Bill’s View of Things: Die Gute Form: An Exhibition 1949* (Zürich: Lars Müller, 2015).

²⁰⁶ ‘Die äußere Form und jeder einzelne Bestandteil eines Gegenstandes sollen mit dem zu erfüllenden Zweck und den zur Verwendung gelangenden Materialien übereinstimmen.’ in Max Bill, ‘Die gute Form’, *Das Werk: Architektur und Kunst = L’oeuvre: architecture et art*, Bund Schweizer Architekten, 44, no. 4: Wohlfahrtsbauten-Formgebung (1957): 140.

²⁰⁷ Museums displayed examples of bad taste and inadequate use of materials in ‘cabinets of horror’ or ‘departments of kitsch’. This new museum type also emerged in North America, motivated by ambitions for the aesthetic education of the Arts and Crafts movement. Mistakes originating in the transfer of ornaments from one material to another were addressed, but also the appropriate use of a material to achieve a desired effect. Woodcraft for example had to respect the direction of the wood grain and avoid coloured or strongly grained wood for ornamental carving – otherwise, expensive and qualified work would be wasted. Several examples in Rübel, Wagner, and Wolff, *Materialästhetik*, 95–99, 175–83.

²⁰⁸ Wagner, ‘Materialgerechtigkeit’.

²⁰⁹ Rübel, Wagner, and Wolff, *Materialästhetik*, 59.

forms of timber and stone buildings, it was considered an imitation in bad style. Insufficient knowledge about new materials or lack of imagination of their formal potential was for example discernible in the detail work on early iron bridges²¹⁰ or early concrete constructions, where the ‘timber logic’ still prevailed.²¹¹

But forms that pushed a material’s structural capacity to its limits were also seen as problematic. Lightweight steel constructions not only broke the boundaries of conventional building design, but also challenged the way people saw structures and the use of materials. Cornelius Gurlitt writes that the minimal cross sections of iron were perceived as fragile and considered less trustworthy than thicker wooden or stone alternatives, in spite of engineering calculations and empiric experience.²¹² Semper states that metal constructions, sometimes as thin as wires, withdraw their surfaces from the human gaze – even more so when the construction is perfected and uses as little material as statically required. To Semper’s mind, this makes them unsuitable for load-bearing building components where they would be perceived as unsettling. Iron and later steel were not considered appropriate for all functions – it was seen as too cold, too uncomfortable or too prosaic for anything but utilitarian buildings.²¹³ The material had to overcome the habitual notion of material suitability. Cast iron was associated with stark industrial structures or cold and draughty waiting halls, which seemed inappropriate for any domestic or ceremonial functions. Significant uses of cast iron of the time defined its semantic qualities.²¹⁴

Gurlitt predicted changing attitudes towards new materials and their appropriate use due to increasing material knowledge and habituation. Instead of using new materials (in this case iron) in accordance with to how people felt about them, Gurlitt asked people to adjust their feelings to the new materials.²¹⁵ This ascribes increased importance to the role of the viewer and user.²¹⁶ However, he leaves no doubt that the architect should be

²¹⁰ E.g. Coalbrookdale-Bridge, Great Britain, 1775

²¹¹ In concrete structures, this ‘timber logic’ was furthermore important for their formwork and for achievable geometries in concrete. Deplazes also mentions the resulting indirect, yet permanent presence of wooden formwork through the imprint of its surface on concrete building parts. Andrea Deplazes, ed., ‘On the Metaphysics of Exposed Concrete’, in *Constructing Architecture: Materials Processes Structures. A Handbook*, 2nd, corrected reprint of the 2nd, extended edition 2008 ed. (Boston: Birkhäuser Publishers for Architecture, 2010), 56–59.

²¹² Cornelius Gurlitt, ‘Ästhetik des Eisenbaues’, in *Die Deutsche Kunst Des Neunzehnten Jahrhunderts: Ihre Ziele Und Thaten* (Berlin: Georg Bondi, 1899), 463–69; retrieved from Rübel, Wagner, and Wolff, *Materialästhetik*, 67–70.

²¹³ Gottfried Semper, ‘Eisenkonstruktionen’, in *Wissenschaft, Industrie und Kunst und Andere Schriften über Architektur, Kunsthandwerk und Kunstunterricht*, ed. Hans Maria von Winkler, Neue Bauhausbücher (Mainz; Berlin, 1966), 22–24; retrieved from Rübel, Wagner, and Wolff, *Materialästhetik*, 61–63.

²¹⁴ Wagner, ‘Materialgerechtigkeit’.

²¹⁵ ‘Es handelt sich also nicht um die Frage: Wie bilden wir das Eisen, damit es unserem Empfinden entspreche! Sondern um die viel wichtigere: Wie bilden wir unser Empfinden, daß es dem Eisen entspreche?’ Gurlitt, ‘Ästhetik des Eisenbaues’; retrieved from Rübel, Wagner, and Wolff, *Materialästhetik*, 69.

²¹⁶ Rübel, Wagner, and Wolff, *Materialästhetik*, 67.

considered the authority in questions of taste and good design. The users' role is passive, and they must accept the design and if necessary 'learn to like it' by adapting their emotions to it instead of the architect altering the design to align with the users' preferences and needs. A broader interest in ascribing the user a more active role in the design process and its results emerged first decades later, in the 1960s.

As with steel, new techniques to use, form and strengthen timber have changed the relationship between material and form. Today, trusses made from hardwood can be used to achieve similar cross sections and spans as steel trusses, which many spectators still find puzzling and out of place because of the wooden beams' unfamiliar slimness.²¹⁷

Initially, the described notion of material honesty mainly addressed the structural form of materials, and then developed to also take the material surface into account. Ute Poerschke links these two conceptions to Günter Bandmann's twofold understanding of material justice: he frames the notion of material justice as *rationalist suitability of materials*²¹⁸ 'as the justification of a material form in relationship to a purpose' on one hand, and as *sensualist suitability of materials*²¹⁹ with an emphasis 'on the senses of sight and touch' on the other.²²⁰ (Sensory aspects will be addressed in greater detail in Chapter 3).

Even today, the term *Materialgerechtigkeit* is used to express the view that via its inherent properties, a material imposes rules on construction and formal design, or on an entire building's structural conception.²²¹ Even though the honest display of a construction's materiality by way of exposed surfaces has been complicated by increasing technical requirements, *Materialgerechtigkeit* often still serves as an indicator for discussion and assessment of a building's technical and formal quality.²²²

Differences between materials most typically concern their density and maximum load-bearing capacity (tension), deformation behaviour (with and without loads), brittleness and ductility, isotropic or anisotropic properties, manufacturing process and common forms (e.g. amorphous, slab-, stove- or building block-shaped), and durability. Some might consider *Materialgerechtigkeit* a matter of ideology beyond purely technical considerations, one that needs to be addressed individually to recognise a relation between material and building design. Nevertheless, disregarding the described principles will most probably cause serious technical problems, increased planning and detailing

²¹⁷ An example is the project 'SWG Schraubenwerk Gaisbach' in Waldenburg by Hermann Kaufmann Architekten.

²¹⁸ 'Rationalistische Materialgerechtigkeit' in German.

²¹⁹ 'Sensualistische Materialgerechtigkeit' in German.

²²⁰ Günter Bandmann, 'Der Wandel der Materialbewertung in der Kunsttheorie des 19. Jahrhunderts', in *Beiträge zur Theorie der Künste im 19. Jahrhundert*, ed. Helmut Koopmann and J. Adolf Schmoll genannt Eisenwerth, vol. 1 (Frankfurt am Main: Klostermann, 1971), 149; Poerschke relates Bandmann's distinction of materiality in architecture as opposed to materiality in painting and sculpture to 'material as such' in architecture in Ute Poerschke, *Funktionen und Formen: Architekturtheorie der Moderne*, 1. Auflage (Bielefeld: transcript, 2014).

²²¹ Moro, *Baukonstruktion*, 133–34.

²²² Moro, *Baukonstruktion*; see also Moravánszky, *Stoffwechsel*, 166ff on mimesis and imitation.

efforts, higher costs, and – for the keen-eyed viewer at least – less satisfactory design results, if it is not sheerly impossible to realize a conceptual design.²²³

Many timber architects and engineers therefore repeatedly emphasize the importance of ‘thinking timber’ from the beginning, i.e. of already having the material and its specific characteristics in mind during the initial design phases and of developing solutions together with specialized consultants and engineers.

Surrogates and falsification

The tenet of truth and authenticity may as well be defined by its opposite. It has been common to replace expensive and rare materials with alternatives that were cheaper, stronger or easier to handle.²²⁴ Even within a single material group such as wood, imitation and ‘falsification’ were (and are) common,²²⁵ for example when rare and expensive wood species are used as veneer – thin cover layers mounted on cheaper wood. Pliny the Elder (23-79 AD) remarked on the

requirement of luxury which displays itself in covering one tree with another, and bestowing upon the more common woods a bark of higher price. In order to make a single tree sell many times over, laminæ of veneer have been devised.²²⁶

Archaeological evidence from Egypt and the Roman Empire dates veneered furniture back to the 15th century BC.²²⁷ Veneering craftsmanship flourished especially during the Renaissance, Baroque and Rococo periods.

As industrialisation progressed and new materials emerged, this practice increasingly drew critique, for example when stucco or stone was used instead of marble, plastering instead of stone and cast cement instead of stucco work, when patterned wallpaper replaced (textile) tapestry, wood was imitated by pressed pasteboard, softwood painted as hardwood, and tin casting or painted iron took the place of bronze or copper, or cast cement replaced stucco work.²²⁸ As mentioned before, as the ‘ape among utility

²²³ Moro, *Baukonstruktion*.

²²⁴ Rübel, Wagner, and Wolff, *Materialästhetik*, 143.

²²⁵ Franziska Leeb, ‘Holz mit Holz fälschen. Vom Furnier und seinen Verwandten’, *Zuschnitt 32: Echt falsch*, December 2008, <http://www.proholz.at/zuschnitt/32/holz-mit-holz-faelschen/>.

²²⁶ Eugene Vernon Knight and Meinrad Wulpi, *Veneers and Plywood: Their Craftsmanship and Artistry, Modern Production Methods and Present-Day Utility*, 1st ed. (New York: The Ronald Press Company, 1927).

²²⁷ See also Brand, *How Buildings Learn*, 220.

²²⁸ §XL-XLVI in John Ruskin, *The Stones of Venice*, vol. 3 (New York: John Wiley & Sons, 1881), 61–66; retrieved from Rübel, Wagner, and Wolff, *Materialästhetik*, 145–48; Moravánszky, *Stoffwechsel*, 138ff.; Loos, ‘Building Materials’; Adolf Loos, ‘The Principle of Cladding’, in *Spoken into the Void: Collected Essays, 1897-1900*, Oppositions Books (Cambridge, Massachusetts: Published for the Graham Foundation for Advanced Studies in the Fine Arts, Chicago, Illinois, and the Institute for Architecture and Urban Studies, New York, New York, by MIT Press, 1982), 66; Hermann Muthesius, ‘Die Bedeutung des Kunstgewerbes. Eröffnungsrede zu den Vorlesungen über modernes Kunstgewerbe an der Handelshochschule in Berlin’, *Dekorative Kunst*, 1907.

materials',²²⁹ rubber in particular prompted discussions. Loos promoted the authenticity of materials and rejected imitations, such as the graining of wood in order to make it look like wood of a higher quality.²³⁰

Contemporary massive wooden elements, usually consisting of cross-laminated spruce or pine wood layers, are available with top layers made of larch, white fir, Swiss stone pine, or even hardwood species. Moreover, today, just about every wood species can be imitated with cheaper wooden material, and various kinds of ornaments can be created with the help of digital technology.

As described by Franziska Leeb, so-called fineline veneers can be produced from light wood species (e.g. poplar) that are liberated from their knots and irregularities, bleached, tinted, digitally arranged, and pressed to blocks according to the imitation or pattern desired. Though made from real wood, veneers with checked patterns or flower décor might not look like real wood. Trends in the domestic realm change about every second year – the cycle is more rapid than for offices – most often from dark to light wood and back. According to a product developer featured in Leeb's article, real wood veneer and synthetic laminate (where the wood pattern only is printed) are often used within the same product lines and with the same optics in order to distinguish between offices for the upper echelon and the back office; he says that it is possible to produce far more than what he considers ethically justifiable, and he condemns laminate that combines the wood pattern of one tree species with the colour of another.²³¹

While it would be fair to suspect that this 'moral responsibility' to wooden materials is not universal, it is an important matter of concern for Bernhard Tschofen. Following the critique of a material's 'violation' and inadequate use, he disapproves of wood imitations for sacrificing the material's 'intrinsic nature [and] innocence'. He describes the

paradox of intentional charm and avoided effect²³²

of wooden objects, furniture and building components that motivated '[craft], industry and housewives (...) to find suitable alternatives that resemble wood' – first wood glazing that mimicked more precious types of wood, and later synthetic resin coating and self-adhesive films for a wooden appearance that was easy to clean and not as flammable.²³³

²²⁹ Semper, *Der Stil*.

²³⁰ Frampton and Cava, *Studies in Tectonic Culture*, 18.

²³¹ Leeb, 'Holz mit Holz fälschen. Vom Furnier und seinen Verwandten'.

²³² Bernhard Tschofen, 'Über Totenbretter und andere Listen gegen die Vergänglichkeit', *Zuschnitt 4: Holzaltern*, December 2001; extracts of the essay are also published in Bernhard Tschofen, 'Weathering– Tricks against Transcience', in *Hermann Kaufmann: Wood Works: Ökorationale Baukunst = Architecture Durable*, ed. Otto Kapfinger (Wien; New York: Springer, 2009), 217.

²³³ Tschofen, 'Über Totenbretter und andere Listen gegen die Vergänglichkeit'.

But the effects of wear and climate on well-crafted wooden components are sometimes also designed and imitated intentionally. ‘Roughness is prized because it bears witness to creative energy.’²³⁴

If rough forms precede and follow those that have been finished, can picturesque roughness (...) be designed? (...) Can this quality, can this emblem of natural development and deterioration, of unauthored power, be the object of creative making, or is it, when designed, the result of mere simulation, a representation of a representation?²³⁵

Brand also points out an aesthetic dimension of traditional materials as they age:

Traditional materials are considered aesthetic partly because of their rich texture but even more because they are thought to age attractively. They have a time dimension. Artisans even learn how to ripen them artificially.²³⁶

Now that timber has become a building material that allows for extreme accuracy and efficient building processes, façade materials that communicate the wooden construction material and that furthermore do not require maintenance have gained popularity. But many prefer controlled treatment to ‘honest’, natural processes. In order to avoid uneven greying on different façade parts, wooden façade panels that look untreated are in reality often pre-greied or treated with iron vitriol which accelerates the greying process. What appears honest is the simulation of a natural process and avoids the imprint that orientation towards the sun, protruding building parts, exposure to rain or prevailing wind direction leave on the façade over time.

A new interest in materials’ true self

At the end of the 19th century, when new machines and new materials expanded the range of possible forms, a number of Modernists replaced any formal canon²³⁷ by function as a definer of form. The slogan *form follows function* commonly attributed to Louis Henry Sullivan does not include materiality. Frank Lloyd Wright however suggested that the new machines and the correlated standardization of building materials both allowed for and required new, material specific ways to design. He contrasted his approach with that of his mentor Sullivan, who

had designed for the old materials all alike; brick, stone, wood, iron cast or plaster – all were grit for his rich imagination with his sentient ornamentation.²³⁸

In a similar vein, Adolf Loos emphasized the importance of form being suitable and even unique to each material and its processing. In his words,

²³⁴ David Leatherbarrow, ‘Roughness’, in *Architecture Oriented Otherwise*, 1st edition (New York: Princeton Architectural Press, 2008), 101.

²³⁵ Leatherbarrow, 103.

²³⁶ Brand, *How Buildings Learn*, 119.

²³⁷ e.g. with regard to proportion, symmetry, harmony or geometric forms

²³⁸ Frank Lloyd Wright, ‘The Nature of Materials’, in *An Autobiography*, Eighth printing September 1962 (New York: Duell, Sloan and Pearce, 1943), 148–49.

every material possesses its own language of forms, and none may lay claim for itself to the forms of another material. For forms have been constituted out of the applicability and the methods of production of materials. They have come into being with and through materials. No material permits an encroachment into its own circle of forms.²³⁹

Architect and theoretician Hermann Muthesius, a contemporary of Wright and Loos, pointed out that even different types of materials within a single group, e.g. two different materials in the group *metal*, might require different treatment.

Every material demands to be treated in its own particular way. Stone requires different dimensions and different forms from [sic] wood, wood is different from metal, and among the metals themselves, wrought iron is different from silver.²⁴⁰

This is also true for different wood species. The greatest differences are between conifers and deciduous trees, but also between different species within needle or broadleaf trees. They differ for example in density, workability, form stability, impregnability, yellowing or rot resistance. Even different parts of the stem have properties that make them better suited for specific uses, such as pillars exposed to compressive force, or beams requiring also tensile strength; this also depends on how the stem is cut. When designing details and joints, it is important to possess knowledge about differences in the deformation of massive (not cross-laminated) wooden elements that may result from changing humidity or carry load, depending on the fibre direction. When it comes to façades, apart from considering the growth rings when mounting horizontal façade panels so that they warp the right way to lead off water, water absorption is also impacted if vertical panels are mounted ‘head first’ instead of with the same fibre direction the tree had when growing. The reason for this is that nutrients and water are drawn upwards in the living stem by capillary action, and when mounted upside down, cut capillaries get more exposed to rain and take up and transport water more easily.

The nature of wood

The recurrent message throughout history – that architectural form must relate to the materials used – is quite clear. But the exact design implications of material-specific form are less evident. Various modernist architects studied form according to the characteristics of a material, with an interest in the material's nature beyond its technical and constructive aspects. Architect and writer Edward R Ford describes Alvar Aalto as ‘the leading “regionalist” and “organic” architect’ after 1945, along with Frank Lloyd Wright, and discusses the relationship between material and form in the work of both.²⁴¹

²³⁹ Loos, ‘The Principle of Cladding’, 66; Originally published in Adolf Loos, ‘Das Prinzip der Bekleidung’, *Neue Freie Presse*, 4 September 1898.

²⁴⁰ Muthesius, ‘Die Bedeutung des Kunstgewerbes. Eröffnungsrede zu den Vorlesungen über modernes Kunstgewerbe an der Handelshochschule in Berlin’; as translated in Krufft, *A History of Architectural Theory*, 368.

²⁴¹ Edward R Ford, *The Details of Modern Architecture. 1928 to 1988*, vol. 2 (Cambridge, Massachusetts: MIT Press, 1996), 137.

Wright aspired to truly understand materials as themselves and to derive form from their inherent nature:

So I began to study the nature of materials learning to *see* them. I now learned to see brick as brick, to see wood as wood, and to see concrete or glass or metal. See each for itself and all as themselves. (...) Each material demanded different handling and had possibilities of use peculiar to its own nature. Appropriate design for one material would not be appropriate at all for another material.²⁴²

Wright's explorations of material-related form focused primarily on geometric patterns and on forms inspired by nature.²⁴³ Ford expresses disappointment about Wright's articles about 'the meaning of materials',²⁴⁴ and criticises that the abstracted plant forms Wright used as geometric motif for decorative patterns did not inherently relate to a material's nature:

[The motif as secondary means of material expression] is one of the oldest and most common in twentieth-century architecture (...), but also one of the most problematic, since it is not about material at all but about geometric pattern imposed on a material.²⁴⁵

Other aspects of Wright's buildings relate more to an engineering viewpoint, 'based on the structural capacities and limitations of material'.²⁴⁶

When Aalto experimented with wood in 1929, he used a special laminating technique that allowed him to produce curved shapes; these curved shapes increasingly became part of his furniture and interior design.²⁴⁷ At first, these wood experiments were mere abstract explorations that did not relate to any built references, and in his Viipuri Library,²⁴⁸ the undulating wooden ceiling conceals the actual construction which is made of concrete. In the 1930s however, Aalto became interested in vernacular wooden architecture from Karelia, where he discovered forms derived from the natural properties of wood.²⁴⁹ Aalto was fascinated by the 'naked' wooden materiality, 'without the effect of immateriality given by colouring'.²⁵⁰ Aalto's work became formally inspired by vernacular examples to an increasing degree. According to Ford,

²⁴² Wright, 'The Nature of Materials'.

²⁴³ An example are his student assignments at Taliesin, as described and exemplified with reproductions of the apprentices' works in Vernon Swaback, *Art and Philosophy of Frank Lloyd Wright*, n.d., <https://franklloydwright.org/lesson-frank-lloyd-wright-patterns-nature/>.

²⁴⁴ Frank Lloyd Wright, *In the Cause of Architecture: Essays by Frank Lloyd Wright for Architectural Record, 1908-1952*, ed. Frederick Albert Gutheim, 1st ed. (New York: McGraw Hill / Architectural Record, 1975), 171–211.

²⁴⁵ Ford, *Five Houses, Ten Details*.

²⁴⁶ Ford, 70.

²⁴⁷ E.g. the plywood and moulded birch wood in his 'Model No. 41' lounge chair, or his '31' armchair composed of laminated birch plywood and bentwood (both from 1931-32). The free-form curved shape of his famous 'Savoy' glass vase (1936) also required wood as a mould.

²⁴⁸ Construction period from 1927-1935. Viipuri (Viborg in Swedish or Vyborg in Russian) is part of Karelia and belonged to Finland during that time.

²⁴⁹ Ford, *The Details of Modern Architecture. 1928 to 1988*, 2:125.

²⁵⁰ Aalto's essay 'The Architecture of Karelia' from 1941 was republished in Alvar Aalto and Göran Schildt, 'Karelian Architecture', in *Alvar Aalto in His Own Words* (Helsinki: Otava, 1997).

He saw these [wood forms] as being in the nature of the material, based not on abstract form derived from structural qualities but on vernacular form based on constructional tradition.²⁵¹

This adds importance to the situatedness within a geographic and cultural context of specific architectural solutions, which is discussed further in Chapter 4.

At first glance, this might sound like a radically different approach to form as a result of materiality, rooted in vernacular tradition instead of in the material's physical properties. However, building tradition would probably not have arisen from constructions that were not appropriate for the material. During the evolution of these vernacular forms, versions that did not prove sound, robust and long-lasting would likely have been abandoned, and improved constructions would have taken their place – unless there were other advantages to ephemeral constructions, for example with cultural significance.

Ford raises the question of whether it is at all

possible to construct an architecture in which the form is inseparable from the material,²⁵²

whether there is

[a contemporary architecture] based not on preconceived form, but derived from the inner life of its material.²⁵³

While he does not offer a clear answer to that question, he at any rate expresses doubt about Wright's success in counteracting formalism by finding forms that are unique and integral to each material's nature. He sees much of Wright's work as imposing abstract forms on materials instead of deriving forms from the materials' structural qualities.²⁵⁴

Ford points out that although the statements of architects sound similar despite the centuries of technological and stylistic evolution that separate them, their studies have all resulted in quite different architectural languages. He suggests that rather than offering universal truths, the studies reveal the preferences or preconceptions of their authors. Design philosophies are hence less influenced by universal rules dictated by the materials than by the architects' personal interests, imagination and ability.

Challenging the notion that new materials sparking new formal interpretations were central for the modern tradition, Ford thus suggests a different valuation of the transformational interplay between new materials and formal language than the valuation that prevailed in both Viollet-le-Duc's and Wright's times.²⁵⁵ While the theory of material change as framed by Semper had focused on the transfer of architectural forms

²⁵¹ Ford, *The Details of Modern Architecture. 1928 to 1988*, 2:127.

²⁵² Ford, *Five Houses, Ten Details*, 15.

²⁵³ Ford, 69.

²⁵⁴ Ford, "Brick as Brick, Wood as Wood, Stone as Stone". *The Nature of Material in Modern Architecture*.

²⁵⁵ Ford, 8.

from one material to another, Ford postulates an interplay of formal ideas and material properties.

Honest brutalism

Brutalism as an architectural style is often associated with large, bulky, monolithic constructions in exposed poured concrete. The term brutalism is not, as one might assume, primarily related to a bold and blunt formal expression,²⁵⁶ but refers to the state of the material; the French *brut* means raw, untreated, unrendered.²⁵⁷ Le Corbusier was one of the advocates of exhibiting a building's structure and using materials in their natural state, 'as found',²⁵⁸ to evoke an emotional connection between user and architecture that exceeds the mere satisfaction of functional requirements.

L'architecture, c'est avec des matières brutes établir des rapports émouvants.²⁵⁹
(Architecture is the establishing of moving relationships using raw materials.)

Alison and Peter Smithson were leading figures of a new post-war generation of architects interested in unclad primary structures of good quality.

It is our intention (...) to have the structure exposed entirely, without interior finishes wherever practicable. The contractor should aim at a high standard of basic construction, as in a small warehouse.²⁶⁰

As made clear by Reyner Banham, buildings related to 'The New Brutalism' were to be 'made of what [they appear] to be made of' and honest in the sense of displaying both the basic structure, materiality and the pipes needed for installations, without any additional covering, coating or lining. The buildings' materiality should be stripped back and reduced to what is really necessary. Materials that are visible on the outside should represent the building's primary materials. Raw materials ('as found') should be joined to structures that clearly exhibit the relationship of their parts. This would contribute to an easily graspable and thus memorable visual entity, with the building's form 'entirely proper to [its] functions and materials'. According to Banham, 'honesty in structure and material' is 'one of the basic moral imperatives of the Modern Movement'.²⁶¹

²⁵⁶ Reyner Banham mentions a certain carelessness as regards conventions as a characteristic of brutalism: 'its brutality, its je-m'en-foutisme, its bloody-mindedness' in Reyner Banham, 'The New Brutalism', *Architectural Review*, December 1955, 354–61.

²⁵⁷ The French 'béton brut' means 'raw concrete' in English.

²⁵⁸ Banham, 'The New Brutalism'.

²⁵⁹ Le Corbusier, *Vers une Architecture*, 2nd revised and extended edition., Collection de 'L'Esprit Nouveau' (Paris: Les Éditions G. Crès et Cie, 1923), IX. English translation by the author.

²⁶⁰ Alison and Peter Smithson, 'House in Soho, London', *Architectural Design*, December 1953, 340–42.

²⁶¹ Banham, 'The New Brutalism'. Brutalism's other concerns with 'memorability as an image' and the 'formal legibility of plan' mentioned in Banham's essay are not considered here; Banham relativized this essay later, while insisting on the continuing importance of how a building's parts and materials relate to each other for an ethical design tenet. Reyner Banham, *Brutalismus in der Architektur: Ethik oder Ästhetik?*, ed. Jürgen Joedicke, Dokumente der Modernen Architektur:

This ideal became increasingly difficult to achieve with stricter insulation requirements, however. In addition, although antique constructions appeared to consist only of the main structure, they too often had protective outer layers (see also the section about formal expression). The Smithsons acknowledged that even towards the interior, leaving the structure exposed without a finishing layer is not always a possibility.²⁶²

Reducing materials to what was essential may in part be related to post-war scarcity. Apart from the timber construction systems for DIY homes by Walter Segal, wood did not play a prominent role in brutalism. Brick – and later and to a much greater degree concrete – were industrial products that allowed for faster construction processes and on a larger scale, and they were also more compliant in terms of fire security than the timber products of the time. In addition, timber was not largely available in the UK, where the Smithsons and Reyner Banham had coined the term brutalism. Associated with modern, progressive ways of building, steel and concrete became more fashionable than timber. For the same reasons, these materials were later ousted by steel and glass in façades, which allowed for faster building processes with fewer complications.

Contemporary timber revival and new architectural potentials

The large-scale industrial production of glue laminated timber products from the 1960s and, even more so, cross-laminated walls and slabs in the early 1990s in Austria and Germany brought about fundamental changes for wood's technical and conceptual utilization.

Deplazes emphasises the universal applicability of contemporary timber products, exemplifying their artificial qualities of with the non-directionality of CLT elements whose theoretically endless dimensions are only limited by production facilities and transportation vehicles. In addition, with the help of glue, many semi-finished wood-based products are 'almost totally susceptible to any attempt to shape them'.²⁶³ Moving away from the traditional linear structural members to the new planar solid elements opened up for a new tectonic understanding of timber construction. It allowed for a greater abstraction of architectural elements, in a similar way as with homogeneous concrete walls and slabs.²⁶⁴

Beiträge zur Interpretation und Dokumentation der Baukunst 5 (Stuttgart: Karl Krämer Verlag, 1966).

²⁶² They advocate omitting 'interior finishes wherever practicable' in Smithson, 'House in Soho, London'.

²⁶³ Andrea Deplazes, 'Indifferent, synthetisch, abstrakt - Kunststoff: Präfabrikationstechnologie im Holzbau: aktuelle Situation und Prognose. Wood: Indifferent, Synthetic, Abstract - Man-Made: Current Prefabrication Technology in Timber Building, and a Prognosis.', trans. Michael Robinson, *Werk, Bauen + Wohnen* 88, no. 1/2 (2001): 10–17, 78–81; Andrea Deplazes, 'Holz: indifferent, synthetisch, abstrakt - Kunststoff', *ARCH+ Zeitschrift für Architektur und Städtebau*, no. 193 (September 2009): 27–29.

²⁶⁴ Irma Nosedá, 'Editorial: Kunststoff Holz. Bois, Matière Artificielle. Wood, an Artificial Matter.', *Werk, Bauen + Wohnen* 88, no. 1/2 (2001); Deplazes, 'Indifferent, synthetisch, abstrakt - Kunststoff:

As Deplazes states, cross-laminated timber slabs and walls denote a shift in the tectonic understanding of timber as a construction material, as they belong to slab tectonics rather than to linear elements. Deplazes points out the somewhat contradictory interpretation of solid wood construction as either according to building technology or to architectural expression, as these do not unequivocally correspond to Semper's categories.²⁶⁵ However, this transition from linear, filigree to planar, solid elements makes an enormous difference for contemporary practicing architects, regardless of whether they are interested in or familiar with Semper's theories.

Traditional timber construction is rather complex and requires special knowledge and experience²⁶⁶ about for example constructive timber protection²⁶⁷ and necessary constructive, sealing and air layers, along with knowledge of production processes, mounting and controlling.²⁶⁸ Knowledge about timber's directionality and hygroscopic properties is required to avoid damage caused by water and the material's changing dimensions. New products and technologies made timber construction accessible for a wider group of practitioners; CLT is often embraced by architects who lack specialized training or experience with timber construction and have no established collaborations with sawmills or timbermen. Deplazes claims that the architect no longer needs to understand the functional interrelation and interplay of these specialized components, but simply orders the desired aesthetic quality of visible surfaces from the contractor.²⁶⁹

CLT planes are more easily managed and can be coordinated well with design habits familiar from the use of concrete. Dimensions for walls for both concrete and timber are similar, as is the tectonic design understanding, designing with planes rather than with smaller linear elements.

While the planar tectonic expression familiar from concrete may also have helped its public reception,²⁷⁰ CLT offers an expanded repertoire of space defining expressions beyond this. New digital tools for structural modelling and automated production of high-precision timber components facilitate architectural exploration of complex shapes

Präfabrikationstechnologie im Holzbau: aktuelle Situation und Prognose. Wood: Indifferent, Synthetic, Abstract - Man-Made: Current Prefabrication Technology in Timber Building, and a Prognosis.'

²⁶⁵ Deplazes, *Constructing Architecture: Materials Processes Structures. A Handbook*, 77–78.

²⁶⁶ As stated by e.g. Ludwig Steiger, *Basics Holzbau*, Überarbeitete und ergänzte Neuausgabe, Basics Konstruktion (Basel: Birkhäuser, 2013), 8.

²⁶⁷ See e.g. Unterrainer, 'Wood – A Sustainable Building Material?'

²⁶⁸ Lectures by and conversations with Hermann Kaufmann and Christoph Dünser, 2017.

²⁶⁹ Deplazes, 'Indifferent, synthetisch, abstrakt - Kunststoff: Präfabrikationstechnologie im Holzbau: aktuelle Situation und Prognose. Wood: Indifferent, Synthetic, Abstract - Man-Made: Current Prefabrication Technology in Timber Building, and a Prognosis.', 12.

²⁷⁰ Banham used a similar argument with regards to the acceptance of the aesthetics of steel construction. Reyner Banham, *Theory and Design in the First Machine Age*, 1st MIT Press paperback ed (Cambridge, Massachusetts: MIT Press, 1980), 30.

and joints. They also make new experiments with timber's inherent properties possible, seeing these as a design potential rather than as a drawback.²⁷¹

Some contemporary architects insist that the wooden materials they use are not related to a romantic, nostalgic or moral design philosophy, but that they instead take advantage of new timber products that now have acquired artificial qualities.

Wood has generally been perceived as entirely natural, a firmly established and pleasing alternative to artificial materials, but now it has suddenly mutated into something artificial.²⁷²

A sculptural quality, previously achieved with the cardboard-like assembly of concrete walls and slabs, is now also possible with massive timber panels. The material neutrality of massive but thin-walled, painted construction elements emphasizes this new abstract quality –

above all when they are neutralized inside and out by coloured paint – and will take up a position similar to homogeneous concrete in massive building, which can occupy all the tectonic elements of a building structurally without ever [having to] express itself as a material. (...) [The] sheet tectonics of current timber building will be read exclusively structurally, and not materially, as is the case with traditional timber building.²⁷³

Likewise, Frampton sees gypsum, dry-wall construction and veneers as contributing to a 'dematerialization of building' in skeleton frame construction.²⁷⁴

As Irma Noseda describes, instead of fearing that changes in appearance would put timber's own identity and traditional values as a building material at risk, a range of architects, building engineers and consultants accept the man-made artificiality that new products and construction systems have acquired and embrace the 'potential spatial and formal achievements of new-style timber building'; they are more concerned with architectural themes than with timber building principles or ideologies.²⁷⁵

But even if new technologies change the relation between material and form, most timber components still share basic thermal, hygroscopic, acoustic and a number of other sensory characteristics. Important aspects of material justice remain relevant to all these timber properties.

²⁷¹ See e.g. Marcin Wójcik, 'Reframing Wood Construction. Innovation in Architecture through Activating Material Properties with the Use of Digital Technologies' (The Oslo School of Architecture and Design, 2020).

²⁷² Noseda, 'Editorial: Kunststoff Holz. Bois, Matière Artificielle. Wood, an Artificial Matter.'

²⁷³ Deplazes, 'Indifferent, synthetisch, abstrakt - Kunststoff: Präfabrikationstechnologie im Holzbau: aktuelle Situation und Prognose. Wood: Indifferent, Synthetic, Abstract - Man-Made: Current Prefabrication Technology in Timber Building, and a Prognosis.', 81 Translation modified by the author to better reflect the significance of the German version.

²⁷⁴ Frampton writes that the presence of these materials is greater in skeleton frame constructions than in load-bearing walls. In addition, building services cover the largest part of the budget of a building. Frampton and Cava, *Studies in Tectonic Culture*, 381.

²⁷⁵ Noseda, 'Editorial: Kunststoff Holz. Bois, Matière Artificielle. Wood, an Artificial Matter.'

Architectural expression and the presence of timber

Formal expression: Monolithic or layered

Ford observes monolithic construction to be an overriding conception of good architecture among many architects.²⁷⁶ The aesthetics of an abstract object-like expression is characteristic for prominent examples of modernist architecture that are less concerned with blending into and continuing the existing urban tissue or with showcasing the constructive parts they consist of. The buildings' sculptural volumetry may be experienced from all sides and in all three dimensions (some even from underneath, when raised on piloti), instead of taking for granted that the spectator's gaze will fall from the street perspective and only on the main façade. The shift from a frontal to an all-round experience of buildings in post-war modernism conditioned their conception as large objects that were seemingly one single piece.²⁷⁷

Made up of small, identical elements or plastered all over, their surfaces appeared to be seamless, homogeneous, as if cast in one pour.²⁷⁸ This *monolithic* expression was to be achieved through the unity of material form and surface – this could not be done with large prefabricated elements; the visual prominence of their seams is difficult to conceal.²⁷⁹

Precedents were sought in the past: in ancient times, the stone walls of a cathedral provided everything at once – load-bearing structure and a space-enclosing element that both defined the geometric forms (vaults, arches etc.) and the material on inward and outward surfaces. The wall consisted of only one material layer, and the stone looked the same on the façade as from within the cathedral, without any coating.

One principal characteristic of this monolithic style is that it appears massive, solid and heavy, but perhaps more importantly, it exposes the structure and displays the actual materiality. However, Ford points out that even then, constructions were not always what they appeared to be:

The idea that walls in ancient or medieval architecture were monolithic was largely an illusion. Marbles have always been veneered, interiors have always been plastered, and even in a simple stone wall the quality stone was always placed on the faces.²⁸⁰

²⁷⁶ Ford, *The Details of Modern Architecture. 1928 to 1988*, 2:427.

²⁷⁷ Ralf Liptau, 'Allansichtigkeit, Massstäblichkeit: Der Bau als "Objekt"', in *Architekturen bilden: Das Modell in Entwurfsprozessen der Nachkriegsmoderne*, 1. Auflage, Architekturen, Band 49 (Bielefeld: transcript, 2019), 30–40.

²⁷⁸ The German expression 'aus einem Guß', literally 'in one pour', refers here to the monolithic structure appearing to have been cast in one single piece. This appearance often does not reflect the actual make-up. Villa Savoye for example is seemingly made "in one pour", while the non-structural outer walls and the solarium's curved screens hide masonry under a unifying layer of plaster.

²⁷⁹ Liptau, 'Allansichtigkeit, Massstäblichkeit: Der Bau als "Objekt".'

²⁸⁰ Edward R Ford, *The Details of Modern Architecture*, vol. 1 (Cambridge, Massachusetts: MIT Press, 1990), 352.

In addition, increasing insulation requirements and industrialization leading to a specialisation and isolation of different building trades make it even more difficult to achieve a unity between structural and surface materiality; Ford has observed a turning away from monolithic compositions where structural components were ‘tightly integrated (...) so that masonry, ironwork, and carpentry had to be erected almost simultaneously’. Ford describes a trend towards *layered* structures instead. With more specialized components – typical for layered walls – and subsequently more specialized and independent subcontractors, communication and interaction between the different trades on the construction site was minimised.²⁸¹

Technical advancements in the 1930s and ‘40s allowed for new iterations of monolithic expression that used cavity walls and veneering, but also for constructive changes that offered different interpretations of constructive elements: Frame constructions separated load-bearing and space-enclosing functions, so that structure and skin could be treated and expressed differently. This position had also been represented by Wagner and Loos ‘who saw modern building as layered in nature’.²⁸²

Especially in larger buildings, the distinction between the load-bearing frame and the curtain wall deprived outer walls of their load-bearing function; this had design consequences both for the structural elements and the façade. The primary structure could have a more prominent and articulated presence within the building and dominate the architectural expression. In contrast, structures that support secondary elements, such as glazed curtain walls, were often downplayed or concealed in order to maximize the effect of transparency. The architecture’s ‘bones’ thus become logically separated from its ‘skin’.

The energy crisis and rising energy costs in the 1970s prompted increased technical requirements, so that dematerialized, ‘invisible’ glass walls were no longer sufficient. In addition to holding a building upright and providing protection from wind, rain and intruders, walls were required to manage the flows of air and moisture and buffer thermal differences between inside and outside. The environmental membrane had to become a ‘multilayered multifunctional wall’. According to Ford, this is one of the reasons for a loss of interest in expressing the structure of a building, ‘for it is difficult to express a structure you cannot expose.’²⁸³

It became increasingly difficult to merge inner and outer materiality while meeting the contemporary demands for energy efficiency and building performance. Louis Kahn succeeded in his effort to follow the structural logic of brick and to ‘fuse (...) inner and outer material’ in his Indian Institute of Management in Ahmedabad (1963) because the construction did not require insulation or layered walls.²⁸⁴ Peter Zumthor’s thermal bath in Vals (completed in 1996) allowed for an association with a quarry as the place where

²⁸¹ Ford, 1:352–53.

²⁸² Ford, 1:352–53.

²⁸³ Ford, *Five Houses, Ten Details*, 114.

²⁸⁴ Poerschke, ‘On Concrete Materiality in Architecture’.

rock is transformed into building material, but it required a more complex build-up than what it suggests in order to resist moisture and avoid heat loss. Building projects without any insulation or acoustic requirements – e.g. exhibition pavilions or temporary installations – allow for an easier display of the primary structure as both a definer of space and a surface material.²⁸⁵

Ford describes two approaches to monolithic architecture without deeming either of them obviously superior: first, through material excess, with ‘massive, monolithic walls’, or second, ‘through the appearance of mass by artificially thick yet hollow walls or by (stone) veneers striving to retain the appearance of a traditional (stone) configuration.’²⁸⁶ There are parallels to this in timber construction, one contemporary main alternative being massive cross-laminated walls and slabs with inherent vapour tightness and thermal insulation capacity. Another option are frame or skeleton constructions with plywood or other lining.

Percentage of timber: Monomateriality or material efficiency

Besides creating a monolithic impression, the ideal of construction that consists of only one material has also been favoured by ‘material purists’. It is however difficult to reconcile with another tenet: the economy of material.

Some architects and engineers prioritize monomateriality and strive to use as few different materials as possible. In the case of timber, a number of architects advocate using timber to the greatest extent possible, and keeping the number of other materials to a minimum. This is not visible in the case of insulation materials, but it leads to new forms e.g. when joints are designed so that they can be made entirely of wood (e.g. Shigeru Ban’s Tamedia building), or when a glue-free product’s build-up is modified to maximise spans (e.g. Pulpit Rock Mountain Lodge by Helen & Hard). This design approach usually leads to larger dimensions and greater material quantities. Deplazes also suggests more material-efficient compound structures that will be described later in this section.

Other architects approach the question of formal design and materiality from a purely engineering perspective, where the foremost goal is the maximal exploitation of a material’s structural potential whilst using the smallest possible amount of material to cover maximum spans or space.

According to art historian Konrad Lange, who was an early advocate for ‘material justice’, a material is only applied properly according to its properties if these are maxed out. If one material allows for finer detailing or sharper edges than another, this should be displayed – for example in the sharp undercuts of a wood-carved leaf ornament. This

²⁸⁵ Poerschke.

²⁸⁶ Ford, *The Details of Modern Architecture. 1928 to 1988*, 2:427.

communicates the object's materiality, which Lange considers an important artistic and aesthetic principle.²⁸⁷

In the case of wood architecture, there are also contemporary proponents of the tenet of 'material efficiency', of rational and structurally optimized designs that use the minimum material quantity and combine timber with other materials where their performance is superior to that of wood.

'Less (timber) is more', says Ingo Bucher-Beholz, who advocates constructive asceticism and a disciplined architecture. According to Bucher-Beholz, massive timber buildings are a questionable contemporary development, fuelled by the timber lobby and its simple argumentation: If small amounts of timber are good because they store CO₂, large amounts of timber must be even better. In contrast, Bucher-Beholz points out economic, ecological and social disadvantages of using a resource in a way that exceeds the absolute constructive minimum; for him, this also justifies a combination of materials into hybrid skeleton constructions. He rather pointedly relates the recent popularity of massive timber buildings to steel construction and questions related to aesthetic preferences:

Here, massive steel construction would not convince anyone as an innovation within steel construction. Already for concrete construction, this is different: At present, massive concrete constructions with 50-60cm thick monolithic outer walls and light concrete slabs with limited insulation capacity are seen as a contemporary version of "building simply". Timber construction seems to develop similarly. Not the constructive minimization of wooden raw material is the measure of all things for beautiful architectural design, but the bold and eye-catching use of materials.²⁸⁸

It must be added though and has been mentioned before that, in contrast to steel or concrete, massive timber walls have an insulating and sealing effect that allows for reducing the number of layers and material types and eases the construction process.

Bucher-Beholz points out that skeleton constructions also allow for much greater spatial flexibility – for example regarding zoning- or plan solution changes – than massive timber constructions or timber frame constructions do.

Deplazes relativizes this. The shift in the tectonic understanding of wooden construction materials from stave-based elements to plates and slabs²⁸⁹ also affects the role of the constructive grid. Whilst Deplazes acknowledges the 'flexibility of the interior spaces' as apparently inherent of filigree systems²⁹⁰ (e.g. skeleton constructions), he also argues that plan solutions were adapted to the constructive grid in stave-based timber frame

²⁸⁷ Konrad Lange, 'Die Kraftillusion', in *Das Wesen der Kunst: Grundzüge einer illusionistischen Kunstlehre*, 2nd ed. (Berlin: G. Grote, 1907), 362–63.

²⁸⁸ Ingo Bucher-Beholz, 'Weniger (Holz) Ist Mehr / Less Wood Is More – Ascetic Structures and Architectural Discipline' (17. Internationales Holzbau-Forum 11, Garmisch Patenkirchen, 2011) Translation by the author.

²⁸⁹ Deplazes, *Constructing Architecture: Materials Processes Structures. A Handbook*, 78.

²⁹⁰ Deplazes, 284.

constructions; now however, new timber products such as plate shaped slabs and walls can be placed according to a plan solution.²⁹¹

The decision between monomaterial and minimized wooden constructions has other consequences than the impact on material consumption and spatial flexibility. Ford warns that when ‘high-tech’ architects focus exclusively on optimizing a material’s structural capacity, a result might be structures that exceed a specific project’s actual requirements or that neglect the building’s context. The economy of means might condone an excess in other respects; the economic use of materials might not be economic at all with regard to labour, complexity, material quality, or costs. Although this approach might produce expressive images, strengthened by one overriding design guideline,²⁹² it might not correspond to society’s or the inhabitants’ actual needs.

Recent timber product development aims to combine the use of primarily wooden materials with constructive efficiency. In traditional walls, very few different materials performed the functions of load-bearing, protection against rain or cold, and visual surface; in modern layered walls, due to an increasing importance of building physics, each function is provided by a separate component.²⁹³ Deplazes describes timber frame building systems that are composed of a number of monofunctional and complementary layers, all of which may consist of wooden materials. Each element fulfils a specific role in creating a stable construction that responds to the requirements according to building physics. Squared timber posts and beams form the linear structural elements that carry the load. Panels on both sides of the frame stabilize the construction and work as enclosing surfaces of the wall sandwich. The enclosed insulation material can also consist of wooden fibres; these are a bi-product of semi-finished manufacturing processes, where a stem is first cut into high-quality larger products, the remaining parts are used for products of secondary size or quality, and the final bits are reassembled into chipboards or fibre sheets (see also Figure 1.2 in Chapter 1.1). Outer cladding and eventual inner sheathing leave cavities that ensure ventilation on the outside and space for electrical and water installation on the inside. The complexity of both planning process and warranty claims calls for a re-simplification, as e.g. in new single-leaf solid wall products that combine load-bearing and insulating functions.

In one of his own projects, Deplazes has reversed the traditional structural roles of wooden plates and vertical linear elements: Thin cross-laminated plates carry the load, function as a vapour barrier and provide a surface towards the room, while vertical ribs serve as bracing elements and provide a frame for the mounting of insulation products. A plate closes off the sandwich element and is covered with a cladding layer. These compact sandwich elements are a step back towards fewer layers with a multi-functional role and

²⁹¹ Deplazes, 94–95.

²⁹² According to Ford, the modernist fascination with airplanes, bridges or other engineered constructions might be primarily connected to the design guiding strength of a ‘unity of purpose’, rather than a direct translation or reinvention of forms. Ford, *The Details of Modern Architecture. 1928 to 1988*, 2:422.

²⁹³ Ford, *The Details of Modern Architecture. Vol. 1*, 1:352.



Figure 2.1 Perforated façade combined with window placement in gaps between constructive parts in C13, Berlin, 2014, Kaden+Lager. Photos: Bernd Borchart

thus a re-simplification.²⁹⁴ The use of wooden components is optimized according to their function and use of the entire tree stem (solid where load-bearing and consisting of fibres or cellulose where insulating).

A focus on the maximum utilisation of wood products also prompts a new view on the much-praised design and production possibilities for CLT offered by digital technologies and CAD programming. It is possible to produce a large number of CLT plates with individual designs (mass customisation mentioned earlier) or CNC-cut-to-measure, and openings may be positioned relatively freely within a plate. The resulting cut-offs however are usually not used any further and burnt for energy production, thus skipping a number of steps in the favourable cascading use of wood products described in the introduction. Placing windows in the gaps between plates reduces the waste of material, with consequences for the building's façade design and expression.

Tangible and abstract presence

A number of authors have claimed that – besides sometimes being difficult to achieve – a material does not need to be exposed in order to be perceivable; it can either be sensed or understood through symbolic representation.

The total exposure of modern structure was a fiction. The partially exposed structure was far more common, and the clad structure, symbolically expressing its construction, was equally common. (...) The question then was how to display the structure without

²⁹⁴ Deplazes, 'Indifferent, synthetisch, abstrakt - Kunststoff: Präfabrikationstechnologie im Holzbau: aktuelle Situation und Prognose. Wood: Indifferent, Synthetic, Abstract - Man-Made: Current Prefabrication Technology in Timber Building, and a Prognosis. '; also in Deplazes, 'Holz: indifferent, synthetisch, abstrakt - Kunststoff'.

revealing it or, if partially revealed, how to determine what would be hidden. One of the secret histories of modernism is the degree to which it employed representative construction, elements that were not structural in themselves but which both clad the structure and represented it.²⁹⁵

Ford describes three options with different degrees of presence of the load-bearing structure and its materiality: entirely or partly exposed structures, or clad constructions with a symbolic representation of the structure. While architects like Mies van der Rohe used cladding for structural elements with either representative or ornamental function, Le Corbusier argued that an exposed or represented structure was unnecessary if its presence could be 'expressed by suggestion instead'.²⁹⁶

One commonplace among Architects (the younger ones): *the construction must be shown.* (...) But.... To show the construction is all very well for an Arts and Crafts student who is anxious to prove his ability. (...) Architecture has another meaning and other ends to pursue than showing construction.²⁹⁷

This gives rise to new challenges, as Ford points out:

Yet the idea of feeling the structure can be problematic (...). The difference between the exposed and the expressed and between the frame and the skin requires a clear distinction as to what is structure and what is not.²⁹⁸

This distinction is not always easily discernible. Ford describes the airplane structures that inspired Le Corbusier as having developed from skeleton-skin-structures to shell structures in which the differentiation of exposed and expressed structure is more difficult. This ambiguity might impede the aspired structural expression and clarity.²⁹⁹

Whilst Ford maintains that structural expression is still among the ideals of the majority of contemporary rationalist architects,³⁰⁰ he is sceptical about the idea that the construction of a building is best communicated by exposing it. According to him and as cited above, architecture must always conceal some elements, whilst others are displayed openly. The aim to either emphasize or downplay the number and role of different constructive elements is also addressed in the section about monolithic and layered expression.

Other authors specify ways in which a construction may communicate its presence without being displayed with its actual surfaces; e.g. through an overall structuring grid's rhythm which informs the plan layout's composition or the positioning of façade openings. This rhythm may also inform the composition and proportions of façade elements that indicate the construction they shield (e.g. when a covering board has the

²⁹⁵ Ford, *Five Houses, Ten Details*, 114–15.

²⁹⁶ Ford, 116.

²⁹⁷ Le Corbusier, *Towards a New Architecture*, 110.

²⁹⁸ Ford, *Five Houses, Ten Details*, 116.

²⁹⁹ Ford, 116–17.

³⁰⁰ Published in 1996, this statements presumably refers to the architecture of the 1980s and early '90s. Ford, *The Details of Modern Architecture. 1928 to 1988*, 2:422.

same dimensions as a column behind it).³⁰¹ As such a rhythm is based on typical spans for a specific material, this gives some indication of the material.

This may additionally be enhanced through ‘structural ornaments’ in the façade design, tectonic motifs that depict selected aspects of the construction, for example by reproducing a joining principle in the corners (e.g. the interlacing of façade boards as a reference to log construction).³⁰²

Others have a different view on the cladding’s aesthetic role when covering gaps between different constructive components that may result from imprecise mounting or from a settling of the construction. In more recent cases, joints of prefabricated modules are hidden in order to avoid formal associations with stacked containers or prefabricated slab construction in large-scale social housing projects of the 1960s.

Contrasting design philosophies have also earlier demanded that the outward-facing surfaces of a building communicate the building’s main construction – or, in contrast, that they are covered with anything else but the main material so that structure and cladding, bone and skin, will not be confused. The significance of cladding goes beyond its functional role and becomes part of an architect’s design ideology.

In the beginning of the 20th century, Hendrik Petrus Berlage and Adolf Loos defended their strong standpoints regarding the role of structure and cladding.

Berlage rejects the decorative dressing of structural elements and insists that constructive elements such as pillars should blend into flat surfaces and asserts that the only acceptable form of decoration is a change of materiality or the visible transition between structural building components. ‘The various constructional difficulties’ should be exploited as ‘decorative motifs’, ‘making a virtue out of the seam.’³⁰³

In the notes of the English edition of Loos’ book *Ins Leere gesprochen*, the editor cites a German architectural encyclopaedia, where cladding’s importance for ‘Materialgerechtigkeit’ – discussed earlier in this thesis – is highlighted:

Bekleidung signifies the external covering of the building materials by other materials, either for technical reasons – for example, weatherproofing – or aesthetic ones ... The problem of so-called correctness of materials [*Materialgerechtigkeit*] is closely related to the question of *Bekleidung*.³⁰⁴

³⁰¹ Christoph Baumberger, ‘Konstruktive Schönheit: Zur ästhetischen Erfahrung und Wertschätzung von Architektur’, in *Holz: Stoff oder Form: Transformation einer Konstruktionslogik*, ed. Mario Rinke and Joseph Schwartz (Sulgen: Niggli, 2014), 193.

³⁰² Baumberger, 193.

³⁰³ The argument is part of one of Berlage’s lectures from 1904. Hendrik Petrus Berlage, *Gedanken über Stil in der Baukunst (1905)* (Kessinger Legacy Reprints, 2010); Hendrik Petrus Berlage, *Hendrik Petrus Berlage: Thoughts on Style, 1886-1909*, trans. Iain Boyd Whyte and Wim de Wit, Texts & Documents (Santa Monica, California: Getty Center for the History of Art and the Humanities, 1996), 139.

³⁰⁴ Adolf Loos, *Spoken into the Void: Collected Essays, 1897-1900*, Oppositions Books (Cambridge, Massachusetts: Published for the Graham Foundation for Advanced Studies in the Fine Arts,

With his ‘Principle of Cladding’, Loos aims to prevent façade materials from imitating other materials; cladding has an important protective function, but it should not be used as a surrogate for other materials. Frampton sees Loos’ way of masking architectural structure, using e.g. thin marble coverings, as ‘[embracing] an atectonic strategy’.³⁰⁵

The law goes like this: we must work in such a way that a confusion of the material clad with its cladding is impossible.³⁰⁶

The cladding material can keep its natural colour if the area to be covered happens to be of the same colour. Thus, I can (...) cover wood with another wood (veneer, marquetry, and so on) without having to colour the covering wood (...). But the principle of cladding forbids the cladding material to imitate the colouration of the underlying material. Thus iron can be tarred, painted with oil colours, or galvanized, but it can never be camouflaged with a bronze colour or any other metallic colour.³⁰⁷

When Loos wants to ensure that the structural material cannot be confused with the surface material, this does not only concern its cladding, but also its coating:

That means, for example, that wood may be painted any colour except one – the colour of wood.³⁰⁸

This demarcates the beginning of a second conceptual understanding of material in architecture: on the one hand, material and its inherent structure and form, that is, as structural form, and on the other hand, material as surface. (See also Bandmann’s notion of material justice mentioned earlier.)

Other modernist architects emphasized that even if walls require an additional outward layer for protection from the elements, this layer should communicate the building’s main materiality, as described by Poerschke:

The effort to fuse inner and outer materiality is characteristic of many modern architects (...) Louis Kahn’s brick buildings in India and Bangladesh in particular do not give one the feeling of cladding but rather of the oneness of structural and surface materiality.³⁰⁹

The complications of such formal intentions have been discussed in greater detail in the section about monolithic and layered expressions above. While an apparent oneness of load-bearing and surface material often rather is illusion than genuine build-up, a

Chicago, Illinois, and the Institute for Architecture and Urban Studies, New York, New York, by MIT Press, 1982), 139, sic. The original version in the lexicon describes the aesthetic reasons behind building materials for cladding in greater detail: (...) because the materials used as cladding are to remain visible on the exterior, but building the entire construction element from them would be too expensive or statically inadequate. *Wasmuths Lexikon Der Baukunst*, vol. 1 (Berlin: Ernst Wasmuth Verlag A.G., 1929), 449, translation by the author.

³⁰⁵ Frampton and Cava, *Studies in Tectonic Culture*, 18.

³⁰⁶ Loos, ‘The Principle of Cladding’, 67.

³⁰⁷ Loos, ‘The Principle of Cladding’, 68.

³⁰⁸ Loos, ‘The Principle of Cladding’, 67.

³⁰⁹ Poerschke, ‘On Concrete Materiality in Architecture’.

conceptual differentiation of wall components facilitates their independent replacement and accommodates their different properties more easily.

Stewart Brand's approach to material and its cladding or coating is rather pragmatic and addresses maintenance and weather protection as crucially important for a building's lifespan. He points out a certain security function of materials that do not trap moisture behind them – the trapped moisture can cause structural damage that goes undetected – and that are easy to exchange only where necessary.

The question is: do you want a material that looks bad before it acts bad, like shingle or clapboard, or one that acts bad long before it looks bad, like vinyl siding? A whole philosophy of maintenance falls one way or the other with the answer. What you want in materials is a quality of forgivingness. Shingles and clapboards expand and contract comfortably with temperature extremes, they let water vapour through, they show you when they're getting worn, and they're easy to replace piecemeal.³¹⁰

Contemporary architects who embrace the broad design possibilities offered by modern industrial timber production do not seem to struggle with questions of design ethics or dogmas that demand the representation or masking of structure.³¹¹

Current building in wood hides behind other non-timber materials, which have the advantage of providing large, impervious surfaces with few joints, made of remarkably thin, light materials.³¹²

Cladding may assume a representational role by referring to the construction's materiality, but cladding may also be chosen independently of what it covers.

'Futtermal': Construction and its lining

While exterior cladding provides protection for the construction, additional layers on the wall's interior could be seen as protecting the intimacy of private life.

As with the outside façade, the material choice for interior finishes will define whether the wall surface *represents* the construction inside, or if it instead provides an apparently *neutralized*, dematerialized background for the inhabitant's decorations and belongings.

This plain indoor surface layer might also mutate into something three-dimensional that provides functions for everyday life; this calls to mind Walter Benjamin's concept of the dwelling as a protective shell – 'Gehäuse' – whose walls envelope as an étui, a 'Futtermal' of domestic life. Benjamin sees the urge to withdraw from urban life in the modern metropolis – from overstimulation and impersonal fluctuation – as feeding into a desire for individualized interiors that not only provide a sense of safety and seclusion, but that

³¹⁰ Brand, *How Buildings Learn*, 118.

³¹¹ Nosedá, 'Editorial: Kunststoff Holz. Bois, Matière Artificielle. Wood, an Artificial Matter.'

³¹² Deplazes, 'Indifferent, synthetisch, abstrakt - Kunststoff: Präfabrikationstechnologie im Holzbau: aktuelle Situation und Prognose. Wood: Indifferent, Synthetic, Abstract - Man-Made: Current Prefabrication Technology in Timber Building, and a Prognosis.'

also express the inhabitant's personality.³¹³ He refers to the middle-class as 'étui-men' looking for comfort³¹⁴ and describes a fine-tuned adaption of interiors to user needs and - values:

The original form of all dwelling is existence not in the house but in the shell. The shell bears the impression of its occupant. In the most extreme instance, the dwelling becomes a shell. The nineteenth century (...) conceived the residence as a receptacle for the person, and it encased him with all his appurtenances so deeply in the dwelling's interior that one might be reminded of the inside of a compass case, where the instrument with all its accessories lies embedded in deep, usually violet folds of velvet.³¹⁵

Wrapping around inhabitants and belongings and acquiring a three-dimensional quality, these layers not only defend, but also display the imprints and traces of human life.

Gabriele Kaiser suggests the metaphor of a lining, étui or sheath for wooden contemporary interior design as well, although today's often reductive aesthetics of living spaces are a contrast to the ornate interiors of the 19th century. Contemporary preferences for monomateriality in particular, with floors, walls and ceilings made of one and the same material, fit the analogy to textiles.³¹⁶ Kaiser names craftsmanship, precision and perfection as preconditions for letting all space-enclosing surfaces visually melt together and appear as one. In one of her examples, the wooden material was dried according to the average air humidity of the building's surroundings prior to installation to avoid cracks from the wood's humidity-related swelling and shrinking.

This 'lining' can also retract from the construction and create cavities, or even become furniture; this functional ambiguity can enrich a home with enigmatic qualities. Christopher Alexander is an advocate of secret places within 'thick walls' in a home for their inspiring and stimulating potential.³¹⁷ He refers to Bachelard's *The Poetics of Space*³¹⁸ when describing the symbolic and psychological value of niches and recessed shelves beyond their function.

As a contrast to a monolithic impression, an interior wall cladding might also visually 'peel off' the layer beneath, for example to create seating, as the plywood benches in the waiting rooms of Erik Gunnar Asplund's Chapel of Hope and Chapel of Death at the

³¹³ Brian Elliott, *Benjamin for Architects*, Thinkers for Architects 6 (London; New York: Routledge, 2011), 66–67.

³¹⁴ Walter Benjamin, *The Arcades Project*, ed. Rolf Tiedemann, trans. Howard Eiland and Kevin McLaughlin, 1st paperback ed (Cambridge, Massachusetts: Harvard University Press, 2002), 9, 20, 865.

³¹⁵ Benjamin, 220.

³¹⁶ Gabriele Kaiser, 'Sinnhafte Oberflächen: Assoziationen zum Innenausbau', *Zuschnitt 35: Innenfutter*, September 2009. This view brings also Semper's system of building materials back to mind; as Semper sees it, the origin of all building elements and their shapes is not in wooden, but in textile materials. Spuybroek, *Sympathy of Things*, 90–91.

³¹⁷ Christopher Alexander, Sara Ishikawa, and Murray Silverstein, *A Pattern Language: Towns, Buildings, Construction* (New York: Oxford University Press, 1977), 929–31.

³¹⁸ Gaston Bachelard, M Jolas, and Etienne Gilson, 'Drawers, Chests and Wardrobes', in *The Poetics of Space=La Poétique de l'espace* (Boston: Beacon Press, 1994), 74–89.



Figure 2.2 a) Stair continuing as a bench at Vindmøllebakken, increasing gestural expressiveness – limiting or optimizing furnishing options? Photo: Sindre Ellingsen.
b) Tailor-made furniture added by the residents at Mühlweg (B).

Woodland Cemetery,³¹⁹ or to improve the acoustic performance of ceilings, like in a range of Aalto's buildings, e.g. in the lecture hall of his Viipuri library referred to before, or in Maison Carré.³²⁰

In a residential context, space is limited, and there is a fine balance for built-in furniture between conveying a formal idea and optimizing the usage of space; fixed fittings might also limit a room's functional flexibility (Figure 2.2).

Tectonic gestures and telling materiality

Beim and Hvejsel suggest the concept of gestures as a way of inviting different interpretations and uses of a building's elements. They describe the 'correlation of structure, materials and details',

³¹⁹ A detail drawing of the plywood bench's integration with the plywood-faced wall is included in Dan Cruickshank et al., *Erik Gunnar Asplund*. (London: Architects' Journal, 1988), 34. A bench design in the foyer of Eslöv Civic Hall shows that Hans Asplund was clearly inspired by his father's design. It evokes the same impression of the wall cladding sliding away from its vertical support to provide a place to sit. In addition, the façade undulates into the room to create recessed spaces for display, telephone booths or storage. Hans Asplund was a Swedish exponent of New Brutalism.

³²⁰ Ford doubts that acoustics were the main reason for the undulating wooden ceiling concealing the concrete structure, as the room's proportions are not ideal for acoustics – although many early modernist historians support Aalto's explanation. Ford, *The Details of Modern Architecture. 1928 to 1988*, 2:125; in contrast, Giedion saw artistic inspiration and technical requirements as merged in the 'irrational curves' of Aalto's design. Sigfried Giedion, *Space, Time and Architecture: The Growth of a New Tradition*, 5. ed., rev. enlarged, 5. print, The Charles Eliot Norton Lectures 1938/1939 (Cambridge, Massachusetts: Harvard University Press, 1974), 632–33.

understood as a spatial unification of aesthetics and technique where structure and materials carry and amplify the spatial experience.³²¹

They advocate a playful and ‘inventive use of humble means’ at no extra costs in order to bring forth ‘a subtle sensuous quality’ and ‘the vital, imaginative, and joyful possibilities of architecture’. Rather than ‘mere rational frameworks’ or ‘indifferent construction elements’, they see the potential to produce ‘enriching spaces’ by a ‘spatial utilization of the construction elements and careful detailing.’³²² In a conference paper on ‘everyday tectonics’, they suggest to

conceive structural elements, i.e. walls, facades, windows etc. as spatial gestures (...) [also in] ‘everyday architecture’.³²³

Beyond rather unambiguous gestures that suggest a defined use (e.g. sitting or storage), materiality has the potential to also more subtly indicate a wall’s or ceiling’s spatial and functional affordances. Jonathan Hale suggests that an ‘intuitive, bodily ‘feel’ for the constraints and possibilities of tectonic elements’ may invite but not predetermine their use and modification.

Rather than rigidly imposing programmatic functions in a top-down deterministic manner, spaces could instead offer more loosely structured fields for creative appropriation by the building user. Features designed for one purpose can then be turned to other uses.³²⁴

As Hale sees it, ‘these affordances vary according to the bodily abilities of the individual to exploit them.’ Arguably, also the individual’s cognitive abilities are engaged when recognizing a wall’s or a ceiling’s affordances, and the individual’s knowledge background will influence potential insights and inspiration. The possibilities of action or appropriation are only accessible to those who perceive these affordances.

³²¹ Beim and Hvejsel, ‘Everyday Tectonics? – Clarification of Concepts’, 47.

³²² Beim and Hvejsel, 47,184,185.

³²³ Beim and Hvejsel, 47.

³²⁴ Jonathan Hale, ‘The Tectonic Sensibility’, *Bodyoftheory* (blog), 19 December 2016, <https://bodyoftheory.com/2016/12/19/the-tectonic-sensibility/>.

2.2 Architects

Moral duty or irritating idealism

There seems to be an underlying notion of ethical obligation to show what a building is made of – and the question appears more acute and topical for wooden building materials than for others. When discussing reasons to expose or cover the wooden constructive parts in the interviews, some architects reacted almost gruffly and pointed out that they would not subscribe to any timber dogma.

We are absolutely convinced [of building with timber], but I repeat, no ideology please.³²⁵

Others were interested in letting users experience what the building is made of – either to showcase the material that they valued so highly and with which they mainly design,³²⁶ or to raise awareness and hopefully increase appreciation of good craftsmanship.³²⁷

Kaufmann appreciates that uncovered surfaces can mediate a building's construction system or the materials' origin. He likes exposed timber structures because they make the building's structure readable, and he suggests that this may sensitize individuals and society to architecture. In addition, he thinks that this could stimulate appreciation of good craftsmanship; if everything is instead concealed, workmanship loses significance. His arguments for exposing the timber surfaces relate to the material's aesthetics, but also to didactic ambitions and a notion of value that relates to how a material is worked.³²⁸

While some clearly intended to leave the construction exposed wherever possible,³²⁹ this was not a general dogma for most of the interviewees. Fire protection and sound requirements for each specific case aside, the choice of whether surfaces are left visible or not always depends on the project's location and its users.

Lager spoke about non-structural thin wooden wall covers, which he considered dishonest and objectionable; he found lining constructive elements with wooden materials as a kind of wallpaper intolerable.

This is an issue that in my opinion deserves to be questioned – at universities and in apprenticeship and in [public] perception: how to deal with linings and surfaces and such. I see some architect colleagues putting a great deal of effort into covering their constructions or maybe even flaws or just the joints, which in my opinion completely overshoots the mark. This dedicates much more attention to the lining than to the actual architecture. To

³²⁵ Tom Kaden, Transcription AD2, 25 November 2017, 7.

³²⁶ Hermann Kaufmann, Transcription AA1, 8 October 2017.

³²⁷ Markus Lager, Transcription AD1, 15 September 2017.

³²⁸ Kaufmann, Transcription AA1.

³²⁹ Reinhard Kropf, Transcription AN1, 4 December 2017.



Figure 2.3 Permanent wooden formwork in the ceiling of c13, Kaden+Lager, 2014.
Photo: Bernd Borchart

my mind, in the design process you should rather consider where and how to use material[s]. Wood is often downgraded to a kind of wallpaper, which I really dislike.³³⁰

Instead, Kaden + Lager sometimes use timber-concrete composite slabs with wooden undersides or leaves the wooden permanent formwork of concrete floor slabs uncovered. Although they have no static function, they remain visible as evidence of the production process in a number of the office's residential projects.³³¹ According to Untertrifaller, this solution is used more frequently in office buildings than in housing projects.³³²

Properties and their interpretation

Regardless of whether timber ranked highest in their personal material canon or not, all of the architects interviewed highlighted the importance of using timber according to its particular qualities, or of 'staying true' to the material. However, their understanding of what this entails varies; there were significant differences in how easy or difficult they judged this to be, and how robust or vulnerable they considered timber as a material. This concerned constructive complexity in general and the material's hygroscopic capacity in particular.

While building codes allow for a broad application of wooden construction materials, the architects also discussed typical concerns that are commonly seen as risks with specific relevance for timber. Strikingly, the more experienced a firm was with timber construction, the more they emphasized its complexity and susceptibility to execution

³³⁰ Lager, Transcription AD1, 16.

³³¹ Lager, Transcription AD1.

³³² Much Untertrifaller, Transcription AA2, 9 October 2017.

flaws; in contrast, firms with less timber experience asserted that massive timber constructions in particular were easy to plan with and even helped to avoid mistakes. The architects interviewed also showed rather diverging estimations of the robustness of exposed timber surfaces.

Robustness and risks

Water is an issue that needs to be addressed in the construction phase of any building project, and timber in particular requires protection; however, Kaufmann said that they rarely encounter problems thanks to prefabrication – which allows for quick building processes – and because of their cooperation with ‘good firms’. While he had never experienced a case of indoor damage, he was more concerned about leaking pipes that might go undiscovered and cause extensive damage. He values exposed wooden ceilings for their important control function and pointed out that ceilings without membranes or cladding make potential water damages visible before they can cause substantial harm, e.g. when mould or rot develop but go undetected. While the wooden buildings are protected carefully from rain during the construction phase, Kaufmann sees potential damage by sprinkler systems as a negligible risk. He stated that it is unusual to use sprinkler systems in Austrian residential buildings³³³ due to their currently prohibitive cost, but that he would use them more if they became less expensive. Although one of the sprinkler systems that Hermann Kaufmann Architekten used in two office buildings was dismantled when fire prevention authorities deemed the building safe enough without it, he believes that using them more frequently in dwelling projects would make sense; he cited greater security without great damage to timber buildings or visible timber surfaces when such a system turns on.³³⁴

Untertrifaller spoke about indoor water damage caused by inhabitants. He reports that building owners are afraid of water damage in subsidized housing in particular; in subsidized housing, tenants are allocated flats and it is possible that they lack the necessary appreciation for timber constructions and handle it wrong, for example by letting the bathtub overflow. To avoid such damage, they sometimes build the wet rooms around a staircase core in concrete, and only habitable rooms in wood.³³⁵ Lager thinks it would be wise to install monitors to control water damages.³³⁶

According to Untertrifaller, damage often occurs during the construction phase and is covered up before being detected. The damage is related to the quality of workmanship, which is consistently good in Vorarlberg, but not necessarily in Vienna or other regions. Firms lacking sufficient know-how often fail to monitor their workers enough during the installation phase. He has experienced this with a project in France that stood uncovered

³³³ While it is unusual to use sprinkler systems in Austria, this is mandatory in Norway for buildings with more than two floors, as these require an elevator.

³³⁴ Kaufmann, Transcription AA1, 17,18.

³³⁵ Untertrifaller, Transcription AA2, 3.

³³⁶ Lager, Transcription AD1.

in rainy weather for 12 weeks; another example is the total loss in a single-family house due to a minor flaw which caused water to enter over many years so that a floor slab and a window have been rotting. The house was built 15 years ago when one did not have the replacement of parts in mind. Today, one tries to make also load-bearing parts exchangeable, he says. Untertrifaller stated that an advantage with very old farmhouses was that nothing was covered up, so damage was easy to detect. Today, membranes and similar conceal such things.³³⁷

Other architects prefer in particular that main constructions on the ground floor are concrete to provide greater robustness against water damage. Infills between concrete pillars may be in wooden materials.³³⁸ The transition between concrete and timber is not always unproblematic. Kaden reported experiencing unprecedented problems in one project with a developer who was not trustworthy. In addition, there were problems with the contract constellation. The construction was not executed correctly, which led to extensive water damage. Water entered the construction, and moisture was also distributed throughout the construction via condensation. Furthermore, there was no reinforcement fabric in the transition between concrete and timber construction. Tension and settlement damage were visible on the interior and exterior of the building. The water damage was hidden and remained undetected for over six years. Rehabilitation measures are complicated.³³⁹

Zohar was quite confident about the material's hygroscopic qualities and purposefully exposes it in rooms with high humidity, having concluded that the wood would help balance air humidity (Figure 2.4 and Figure 2.8). He suspects that the unsubstantiated fear of damage is in part because it has become less common to leave wooden surfaces exposed in certain rooms.³⁴⁰

In Ulsholtveien, the concrete foundation had to be split to ensure the required acoustic insulation. This would potentially allow some humidity to rise and enter the insulation between the double wall construction, which therefore had to be ventilated (Figure 2.4). The hygroscopic properties of wood are thus seen as both beneficial and contributing to robustness, as well as challenging and requiring careful detail decisions.³⁴¹

The bathrooms at Mühlweg (A) by Hermann Kaufmann Architekten also feature exposed wooden slabs (see also Figure 2.8).

³³⁷ Untertrifaller, Transcription AA2, 4–5.

³³⁸ Lager, Transcription AD1.

³³⁹ Kaden, Transcription AD2.

³⁴⁰ Dan Zohar, Transcription AN2, 15 December 2017.

³⁴¹ Zohar.



Figure 2.4 a) Double CLT wall separating two units, Ulsholtveien, 2017, Haugen/Zohar. Photo: hza.no. b) Cooktop against exposed, oiled CLT wall at Ulsholtveien.

Other architects are more worried about the damageability of wooden surfaces. Massive timber products with industry surfaces are rougher, but also more robust regarding damages under transportation. Elements with a high-quality finish are more expensive and require careful handling during transportation and in the construction phase. Workers must be made aware of which surfaces will remain visible after installation and that thus must be handled with care.³⁴² The elements require more careful use, and in hired flats in particular, users might not be aware of or interested in adapting to this. The surfaces are more difficult or even impossible to repair (e.g. by grinding them down or painting them) without changing their original properties.³⁴³ As Kaufmann says,

if someone makes a stain [on the wall], the next tenant will have that stain. And I won't be able to sand it. I cannot plane it. The wall is damaged.³⁴⁴

For most of the architects who mentioned concerns with rental properties, the best solution seemed to be to cover wooden walls with a gypsum layer in order to keep them repairable, but also to provide a more neutral surface that tenants could either modify to suit their taste, or not feel that it was necessary to modify.

Zohar however considered exposed wooden construction particularly suitable for anonymous or changing inhabitants with unknown habits:

You don't know who the user is going to be very often. You have a very robust material that can take different users without being destroyed or demolished.³⁴⁵

³⁴² Lager, Transcription AD1.

³⁴³ Kaufmann, Transcription AA1, 20–21; Lager, Transcription AD1.

³⁴⁴ Kaufmann, Transcription AA1, 21–22.

³⁴⁵ Zohar, Transcription AN2, 3.

To Kaufmann, another reason for leaving wooden ceilings rather than walls exposed is that this solution, with sound insulation on top of floor slabs, facilitates the acoustic separation of flats.³⁴⁶ In the experience of Untertrifaller, although the installed constructions meet the calculational sound insulation requirements with e.g. exposed CLT elements, they often fail when measured. Building contractors want to avoid such situations and simply cover the walls right away; this is more critical for ceilings than for walls. His Dietrich Untertrifaller Architekten build mostly hybrid constructions, with concrete ceilings and drywall.³⁴⁷

Multi-layered complexity or amazing simplicity

The interviewed architects with the most experience with timber constructions talked about how they strive to simplify them. They cited the many layers of timber construction as a challenge, especially when it comes to complex geometries and transitions between construction parts that need to be handled on site.

Dünser expanded on the complexity of timber constructions due to the many required layers,³⁴⁸ but also to geometries and transitions between construction parts. He pointed out that practical experience is required to imagine the construction sequences realistically, in order to design details accordingly. Furthermore, external circumstances such as weather and temperature must be taken into consideration. Simplifying the construction can contribute to fewer flaws during construction and make quality control of the building site easier. In addition, the constructions might be better equipped to withstand unwitting and unintentional damages by users (e.g. to the vapour barrier).

The complexity begins when you try to glue a vapour barrier to a column. And you better not try out this idea on the construction site. You better know beforehand how these things work. All these layers have to be installed in a certain way. (...) It requires a certain robustness of these detail solutions that you are only able to pass on with experience. It is very, very difficult if you have never done that yourself. (...) It has to be doable, but you must also be able to control it.³⁴⁹

In Dünser's experience, if the geometries are overly complex, it becomes difficult to recognise possible mistakes after having checked many windows; as they are hidden in the finished construction, these mistakes might remain undetected and cause damage over time.

According to Dünser, if there are too many trades involved, it will also be difficult to allocate responsibilities and accountability in case of construction defects. This is a reason

³⁴⁶ Kaufmann, Transcription AA1.

³⁴⁷ Untertrifaller, Transcription AA2, 3.

³⁴⁸ Such as visual surface, insulation, vapour and wind barrier, air space, substructure and cladding etc.).

³⁴⁹ Christoph Dünser, Transcription AA3, 16 November 2017, 13.

why they often get very few tender submissions for larger projects; carpenters are reluctant to work with general contractors.

The expertise required and the vulnerability of complex solutions to errors are some reasons why several architects are interested in a modular timber construction system.

Dünser explains:

You always draw two-dimensionally. Membranes are hard to draw two-dimensionally. (...) There are many things to consider that cannot simply be noted down on a sheet of paper. That is why we have often tried to provide a system that has solved all these knots. So that everyone, no matter if he has had 20 years of timber construction experience, can use it as a template for the carpenter.³⁵⁰

Kropf talked about local workers' lack of experience with the logics of timber construction; this is still relevant for buildings with complex building geometries. One of their projects (Skadbergbakken) confronted problems during the planning and execution phase that were related in part to a complex geometry that created challenging transitions, especially around the roof. According to Kropf, while the project was indeed complex as a whole – also in terms of its typologies, topography and energy standard – the main challenge concerned the project leader, who was not experienced in such projects; the construction process was not well-coordinated.³⁵¹

This lack of organization and leadership had also negative consequences for the execution, quality management and schedule of the building, which ultimately gave the entire project a bad reputation. The project had been promoted as a timber pilot project of unprecedented size. Although the issues were not directly related to the choice of timber, the organizational problems spilled over to the wooden construction itself.

One lesson learned from the project was the crucial importance of project management, for construction site management or for the call for tenders for a successful project – although the office did not have any formal responsibility for these things. One should ensure that those involved are knowledgeable and positive about timber construction. If the building process lacks professional organization, timber elements might e.g. get delivered at an inopportune time and end up left in the dirt, as nobody has considered the logistics of when they will be mounted. Whilst things can obviously also go wrong with other materials than timber, the risk is higher with timber, as fewer firms are experienced with multi-story timber buildings.³⁵² Project planning is discussed further in Chapter 4.2.

Massive timber construction with elements such as CLT is considered a significant simplification of the multi-layered complexity of traditional timber frame construction, as it comprises so many fewer layers.³⁵³

³⁵⁰ Dünser, 13–14.

³⁵¹ Kropf, Transcription AN1, 8.

³⁵² Kropf, Transcription AN1.

³⁵³ Kaden, Transcription AD2.

Zohar spoke about how ‘amazingly simple’ massive timber construction in particular is.

We found out that the most difficult in life is to make it simple, and working with massive timber especially is very simple. If you have the right tools, you control them, and all the technical details are amazingly simple. When we present it, sometimes people say, oh that’s it? You know. I think this is very attractive because when you manage to keep it simple, at least you know that you reduced the amount of mistakes.³⁵⁴

Complexity was however added in Ulsholtveien, a multi-apartment housing project in which dwelling units overlap in the section. This ‘spaghetti geometry’ created acoustic challenges, which were reduced by the careful positioning of the different units’ functions.

It also has to be considered that massive timber construction often implies increased wall thicknesses, meaning not only a higher material consumption, but also less light indoors.³⁵⁵ The question of simplification is therefore also related to the discussion about the amount of timber used in different constructive systems, which suggests a combined assessment of these different aspects.

Challenging norms and products

In a number of cases, the interviewed architects accepted product limitations and legal restrictions and maintained that these coincided with their architectural intentions.

Ölzbündt and Mühlweg (A) feature access balconies that are covered to different degrees. Both had to be built with incombustible materials. According to Kaufmann, they are open for architectural reasons and not because of fire regulations.³⁵⁶ Others see their external open staircases (such as in c13, wk65, sw40, p1) as having an important mediating function between public city and private home, in addition to fostering communication and community between neighbours. Furthermore, a contact with nature and the experience of weather, views and natural light is often not possible in internal staircases, as Lager points out.³⁵⁷

The ground floor of Mühlweg (A) was built in concrete in accordance with the local building regulations at the time. Asked whether lifting the timber construction off of the potentially wet ground was an additional motivation, Kaufmann replied that the reason was rather that ground floors often have a different programme than housing, with different ceiling heights, acoustic- and fire protection requirements.³⁵⁸ Kaden+Lager also strive to include other functions than housing in the ground floors of their urban projects. In addition to accepting concrete for a building’s base or its entire ground floor

³⁵⁴ Zohar, Transcription AN2, 3–4.

³⁵⁵ See also Deplazes’ suggestion of a ‘stretch pullover over slab tectonics’ to combine advantages from both systems. Deplazes, *Constructing Architecture: Materials Processes Structures. A Handbook*, 80–81.

³⁵⁶ Kaufmann, Transcription AA1, 17–18.

³⁵⁷ Lager, Transcription AD1, 13,14.

³⁵⁸ Kaufmann, Transcription AA1, 17–18.



Figure 2.5 Fire safety façade detail, interrupting air flow behind the façade and at the same time becoming a design element in line with shutter guiding rails at Mühlweg (A).

as a reasonable choice with regard to water damage, Lager sees the medieval socle as a reference.

In other cases, the architects push boundaries in a variety of ways and challenge the legalized or commercialized interpretation of material properties: they develop their own detail solution and perform their own fire tests to get approval; they measure sound to understand the real sound conditions in a complex geometry; they build in unprecedented heights in a European urban context; they improve span and precision together with local craftsmen; or they modify existing products to achieve a desired spatial and formal expression.

Hermann Kaufmann Architekten conducted their own fire tests for one of their projects to prove that contrary to the building code, which required a certain timber quality in the façade, it was more important to detail the façade correctly to prevent a fire from spreading (in this case, to interrupt air circulation by means of a steel sheet; Figure 2.5).³⁵⁹

Different solutions with exposed timber surfaces are tested and measured for their sound insulation in the flats of Ulsholtveien, which are otherwise the same. The test results have not been published, but are intended to give the team a competitive advantage after this first experience with massive timber.³⁶⁰

To Kaufmann's mind, the particular rules that timber imposes on constructions can be learned from the tectonics of vernacular timber buildings. In his firm, development takes

³⁵⁹ Dünser, Transcription AA3.

³⁶⁰ Zohar, Transcription AN2, 10.



Figure 2.6 a) Digital tools have been used for scanning, modelling, 3D-printing, cutting and milling: *Ratatosk*, 2010, exhibition pavilion for the V&A Museum in London. Photo: Helen & Hard. b) Hollow-box elements, originally conceived as beams, have been modified so they can be stacked and filled with insulation where necessary. *I-park*, 2012, Helen & Hard. Photo: Emile Ashley

place in collaboration with craftsmen based on their abilities and experience, and advances concern scale, dimension and precision rather than formal expression.³⁶¹

Helen & Hard want to apply digital technologies to invent new ways of designing and constructing with timber, using digital technologies to study not only structural systems, but also the naturally grown forms of trunks, branches and roots (Figure 2.6). They often intervene in the production process of established timber products or apply technology in unconventional and unprecedented ways to obtain a desired spatial or atmospheric quality (Figure 2.6).³⁶² This is a way of staying true to the material in its grown and only partly refined form. So far, its application has been predominantly limited to art installations or furniture; its use in multi-apartment projects is yet to be explored.

Formal expression and material use

One of the most noticeable differences in the designs of the firms interviewed is that some predominantly feature simple, rectangular geometries, and others expressive, angular constellations in their timber projects. Whilst formal expression was not addressed directly in the interview questions, a number of the architects expressed contrasting geometric preferences in the discussions of why and how they build with timber.³⁶³ Different arguments are used to defend the stylistic approaches, even when the geometries in question are similar. They were conditioned by the material's properties

³⁶¹ Kaufmann, Transcription AA1.

³⁶² Kropf, Transcription AN1.

³⁶³ Kaufmann, Transcription AA1; Lager, Transcription AD1; Kaden, Transcription AD2.

(related to machining and obtainable forms), by more abstract formal inspiration prompted by wood, by the site's characteristics (site geometry, as well as built context as a formal reference), but also by the architects' general attitude.

It is often argued that rectangular geometries are more rational and self-evident for timber constructions; some architects maintain that rectangular geometries correspond better with the logics of production and construction.³⁶⁴

The design language of the projects by Hermann Kaufmann Architekten reflects that they remain conceptually close to the material itself, focusing on its properties and manufacturing possibilities rather than relating to more abstract concepts. They stay true to the material, as in industrial timber products. As they see it, this also facilitates keeping the degree of complexity and the building's costs under control.

Kaufmann is committed to a modern design language that takes advantage of new, industrial timber products and developments concerning building technology and construction processes (e.g. prefabrication and digitalisation). His office's designs evolve parallel to developments in the material sector, e.g. concerning building technology and regarding the building process (prefabrication). When exploring new architectural possibilities and formal ways of working with the material, they do not alter the industrial wooden products in order to achieve certain desired spatial expressions but instead design their spaces in accordance with the products' original properties. The architect advocates for applying timber in a 'disciplined' way to avoid increasing complexity and costs. He characterizes his designs as rather linear.³⁶⁵

Another reason for choosing rectangular forms is for their simple and unobtrusive design language,³⁶⁶ or preferring simpler geometries instead of expressive and extraordinary spaces. Rather than aesthetic preferences, this seems related to a discreet attitude and an aim to create architecture that provides a calm and supportive framework for daily life.³⁶⁷

Speaking about 'spatial experience', Kaufmann whose design philosophy is based on clarity and simplicity remarked:

If you mean by spatial experience that these are sort of crazy spacy rooms, dissolving and geometric systems and so on, then we are more on the [other] side.³⁶⁸

Lager characterizes the stylistic ambition for their timber architecture as 'sober cosiness' and clear forms.

We don't want to artificially make it colder than it is, not at all, but we want to give it a clear form (...) and not overdo it.³⁶⁹

³⁶⁴ Kaufmann, Transcription AA1.

³⁶⁵ Kaufmann.

³⁶⁶ Kaufmann; Lager, Transcription AD1.

³⁶⁷ Kaufmann, Transcription AA1.

³⁶⁸ Kaufmann, 26.

³⁶⁹ Lager, Transcription AD1, 16.



Figure 2.7 Beam meeting irregular angles at a) Ulsholtveien and b) Skadbergbakken.

Kaden + Lager do not design ‘spectacular’ buildings, but prefer instead a rather reserved design language, as Kaden states:

We are no ‘spectacle architects’, and I don’t mean that in a judgmental way. It is a conviction.³⁷⁰

While some architects do not make a sharp distinction like this and maintain that a design does not need to be flashy to be exciting,³⁷¹ others realize their ambitions to provide unique and unconventional spatial experiences both in- and outdoors with multi-angular geometries in plan and section.³⁷²

Irregular urban patterns and non-orthogonal construction site geometries are also used as justification for angular shapes; rectangular buildings do not exploit these optimally. Untertrifaller points out that this is a challenge for constructive systems that often are based on rectangular basic units.³⁷³

Monomateriality or material efficiency

Timber is clearly the first choice of material for some architects, and they strive to use it to the greatest extent possible. The criteria they rank highest when favouring timber are

³⁷⁰ Kaden, Transcription AD2, 7.

³⁷¹ ‘Profile’.

³⁷² Kropf, Transcription AN1.

³⁷³ Untertrifaller, Transcription AA2.

sustainability,³⁷⁴ aesthetics,³⁷⁵ and the possibility to build many different elements from just one material.³⁷⁶

For others, timber is a preferred material, but only for buildings parts where it performs better than other materials (e.g. concerning prefabrication),³⁷⁷ and therefore most often in combination with other materials (e.g. in hybrid wood-concrete constructions).

Still others value certain qualities of timber, but do not have a general preference for it over others. Zohar emphasized that they are ‘not married to timber’ – however, after their first project with timber, the firm felt that far from being constrained to argue in favour of timber, they would have to justify why they were not working with timber.

We didn’t work so much with timber to begin with, and it wasn’t any kind of main objective to work with timber, but timber became, after the first project we did with timber – we saw the qualities that you have in one material doing many things (...) and you can save a lot of materials.³⁷⁸

Untertrifaller stated that while it is entirely possible to build a stairwell or even an elevator shaft in timber, most of the buildings in their latitude include concrete. For him, the objective is not to construct everything in timber, but to find a reasonable balance. However, he appreciates it when structural and material expression can be merged in monomaterial building elements, for example in halls with large spans, or in projects with low sound requirements; the primary structure can then define the architectural expression.³⁷⁹ Then,

[one can] virtually make architecture with the primary structure.³⁸⁰

As he observed, design preferences differ between architectural firms as well as from country to country. In his experience, Scandinavians preferred rougher and less engineered designs than Austrians; he saw clear differences in the approaches to timber architecture by Norwegian architects and those by firms from Vorarlberg – both in terms of style and public perception and in how projects are realized. For him, the material expression in Norway is far rougher than in Vorarlberg, resembling what was built in Vorarlberg in the 19th century;³⁸¹ that is, it has little in common with engineered timber construction. He stated that some offices’ ambition to use as much timber as possible is not something that many architects from Vorarlberg share.

³⁷⁴ Kropf, Transcription AN1.

³⁷⁵ Kaufmann, Transcription AA1.

³⁷⁶ Kaufmann.

³⁷⁷ Lager, Transcription AD1; Kaden, Transcription AD2.

³⁷⁸ Zohar, Transcription AN2, 3–4.

³⁷⁹ Untertrifaller, Transcription AA2, 4,8.

³⁸⁰ Untertrifaller, 8.

³⁸¹ He was referring to student works from Bergen.

Architecturally, we have been raised with modern timber architecture involving stainless steel joints, and its resulting elegance of course. This appearance is important to us (...). You can never achieve this with timber joints.³⁸²

Untertrifaller specifies that his firm considers it important to reduce dimensions and to obtain slim profiles – which are difficult to achieve with timber in a range of building components like pillars, joints or beams. Whilst unwilling to claim superiority over others, he contrasted the prevalent aesthetic preferences in Vorarlberg with projects by Shigeru Ban in collaboration with Hermann Blumer:

There are joints that I would never in my life design this way, for architectural reasons.³⁸³

He also mentioned the Pulpit Lodge Mountain Lodge by Helen & Hard in which a doweled, glue-free massive timber system was used (Holz100). Although the producer has used this Austrian product to build many houses in Austria, he does not know of any architect colleague who uses it.³⁸⁴

National or regional differences in an overall preference of stylistic expression and related material usage suggest an anchoring of design concepts in a geographic and cultural context. This situatedness will be discussed further in Chapter 4.

Massive or lightweight

There are diverse consequences associated with the choice of either stave-based, lightweight construction systems or of planar, massive construction systems, for example concerning the amount of timber that goes into a building, the flexibility or spatial generality of the plan solution, the degrees and ways of prefabrication, and the construction's complexity.

Most firms did not have a particular preference for massive timber construction or lightweight wood construction; each have advantages and disadvantages that must be re-evaluated for each project, according to intended use, prescribed building height, or the desired degree of flexibility. They do however express that certain particulars are easier to achieve using one or the other.

The primary advantages of massive wooden construction mentioned in the interviews concerned greater simplicity in planning with them. Zohar also stated however that there still remain open questions about massive timber construction. Their questions include whether forests can supply the building industry with the wooden raw material necessary to satisfy the increasing demand, or whether using less material than required in massive timber construction should be an aim.³⁸⁵

³⁸² Untertrifaller, Transcription AA2, 9.

³⁸³ Untertrifaller, 9.

³⁸⁴ Untertrifaller, 10.

³⁸⁵ Zohar, Transcription AN2, 15.

Speaking about the advantages of skeleton timber construction, Lager described it as a simple and efficient system for buildings with several floors in building Class 4; there is no lateral pressure, and the type of infill is flexible.³⁸⁶

The conversation with Kaufmann went into more detail about two different construction systems in their projects. The office had developed a timber construction system – a skeleton construction primarily based on slabs and pillars, with some bracing walls – prior to adapting it to a site in the case of Ölzbündt. Whilst it has to be flexible enough to be adaptable to different typologies and building sites, it has a great deal in common with a closed system: determined building elements with a determined modularity and spans allows for a (limited) range of options. According to Kaufmann, avoiding ceiling joists in order to obtain flush ceilings is a great challenge in timber construction. The described system achieved this by applying 2.40m wide elements on a 2.40m grid. The same project in concrete would not have allowed the same extent of prefabrication.³⁸⁷

In Mühlweg (A), a housing developer competition explicitly requested timber constructions in an urban context that were able to meet subsidized housing standards and low energy standards. The office developed an urban typology, knowing that it could be realized in timber, but without conceiving it as a building system. In contrast to Ölzbündt, this was ‘a regular massive timber construction, with no system behind [it].’ Its appearance would have been similar if conceived in concrete.³⁸⁸

Kaufmann says that he is partial to careful material use, where this means less costs and effort.³⁸⁹

Systematization and standardization

Timber is especially suitable for prefabrication, and the many possibilities range from one-of-a-kind elements produced off-site to systems that are conceptualized for serial production.³⁹⁰ In both prefabricated and conventional timber construction, building components are much less standardized than those for concrete and steel construction. Almost all of the architects interviewed expressed an interest in the systematization of timber construction, or at least in systematized details, to facilitate planning and execution. Modular construction systems would also make it easier to re-use entire elements. There are however only a few examples where timber construction systems developed by architects have been applied in follow-up projects, or even by other architects. The systematization of timber details or entire construction sets is seen as easing planning, but building law is seen as complicating it.

³⁸⁶ Lager, Transcription AD1.

³⁸⁷ Kaufmann, Transcription AA1.

³⁸⁸ Kaufmann, 8–9.

³⁸⁹ Kaufmann, 23.

³⁹⁰ Kaufmann, Transcription AA1; Dünser, Transcription AA3.

The architects had different aims with this systematization: the simplification of the multi-layered composition of currently prevalent timber construction; to make the planning easier and help avoid mistakes with standardized building and joining principles for timber; easier approval of material or product combinations specifically for timber; to find aesthetically satisfactory ways for serial production; to maintain local identity despite serial production; and to increase collaboration on the systematization, as opposed to every office devising its own system and protecting results and experiences for competitive advantage.

More systematized, generally valid timber construction details would make building with timber easier, says Lager.³⁹¹ In contrast to other buildings systems however, there is no building parts catalogue for timber construction, as it is more complex than other systems, states Dünser.³⁹² Lager explains that as the possible product combinations are plentiful, there are few pre-accepted details, and not all products are certified for use with all other available products; e.g. a window might not be certified for use in a timber construction and require special permit – this does not necessarily mean that that particular use is impossible, but that the approval process is lengthy and sometimes pushes an office to its limits.³⁹³

There is a huge stumbling block for anyone who wants to build with timber, namely the lack of so-called system details – which means that you have a variety of possible solutions and product combinations. The approval by way of the DIN and the like, anything regarding certification, which is still in its infancy. (...) The process of applying for a building permit as such is as difficult for timber buildings as for other projects. (...) But we've had several cases where windows and doors were not approved for being mounted in wooden constructive parts, and then you have to get it approved on a case-by-case basis. This is no knock-out for such a project, but it gets you to the limits of feasibility time and again.³⁹⁴

According to Lager, there is still pioneer work to be done. Products from different manufacturers compete with each other. There are far more standardized products in the concrete industry, and the concrete lobby is far larger. To his mind, the issue is more standardized system details and joints, transitions between materials and possibly spans rather than standard dimensions. While Kaden + Lager are sometimes included in system studies, they had not seen any real outcomes – there tends to be more talk than action.

Dünser points out that the Austrian association 'proHolz' has made first steps towards such a catalogue with an open source database of approved constructions.^{395,396} Kaufmann heads a research project at TU München that focusses on the systematization

³⁹¹ Lager, Transcription AD1.

³⁹² Dünser, Transcription AA3.

³⁹³ Lager, Transcription AD1.

³⁹⁴ Lager, 8.

³⁹⁵ Dünser, Transcription AA3.

³⁹⁶ Holzforschung Austria, 'About Dataholz.Eu', dataholz.eu, accessed 5 February 2021, <https://www.dataholz.eu/en/about-dataholzeu.htm>.

of residential projects, on planning processes, and on the simplification and adaptability of timber construction.³⁹⁷ They have worked with adapting the Austrian database to a German context.³⁹⁸

Kaufmann had previously tried to apply a system developed by his firm in subsequent projects but encountered challenges related to contracting law; a call for bids cannot prescribe a specific construction system if there is only one firm able to offer it.

At that time, we didn't take into focus how our market works. The housing market functions with local craftsmen, with architects who have been cooperating with housing developers for a long time. There is little flexibility in these structures. We thought that we would develop a product that we could conquer the European market with, (...) so architects could say: (...) with this building system I am really flexible in my architectural design. But that is not how housing works. Quite the opposite: With the follow-up project (...), we had to abandon the system, because the housing developer said that we must avoid that only one firm can tender. And the system was tailored to one firm. (...) The system has been patented as well. That is not possible because then you only have one bidder. (...) [The firm] did not follow up the system anymore – they saw that it was too complicated, and it died. But in my opinion, the idea would still be up to date.³⁹⁹

According to Kaufmann, the marketing system would have to change. He sees a relevance in this for affordable housing, which is based on a certain standardisation, on serial construction, and on not re-inventing everything every time.⁴⁰⁰

Dünser feels that repetition is important for developers in order to earn money from applying new constructions. The fact that the probability of building the same project together with the same developer multiple times is very low sparks new interest in systems for timber construction.⁴⁰¹

Kaufmann had experienced social housing developers as often positive towards prefabrication, because problems on the construction site are avoided, and satisfactory timber surface qualities are produced.⁴⁰² One of Hermann Kaufmann Architekten's timber housing projects had been assembled in Vorarlberg and transported to Vienna by train.⁴⁰³

Providing a building system that should also be followed in future modifications may also ensure the conservation of design intentions. It is not always possible to enforce this however, as Untertrifaller experienced with Lobaugasse:

I have not been there for ages. They have carried out quite daring changes there, the inhabitants. (...) We had developed a whole modular construction system, with different

³⁹⁷ Kaufmann, Transcription AA1.

³⁹⁸ 'Einfach mit Holz bauen', Detail.de, accessed 5 February 2021, <https://www.detail.de/artikel/einfach-mit-holz-bauen-34904/>.

³⁹⁹ Kaufmann, Transcription AA1, 10.

⁴⁰⁰ Kaufmann, Transcription AA1.

⁴⁰¹ Dünser, Transcription AA3.

⁴⁰² Kaufmann, Transcription AA1, 29.

⁴⁰³ Dünser, Transcription AA3, 11.

façades and garden sheds and roofed sitting areas and so on. And then everything got discarded. And now they have added the wildest things.⁴⁰⁴

Lager emphasized that their firm is interested in industrialized timber products that can uphold architectural ambitions. Other architects identified such ambitions as geometries that can adapt to different site conditions, variety in spite of rationality, and hiding the seams between elements.

Kaufmann remarked that a skeleton system developed by his firm is especially suitable for the adaption to different uses in existing buildings. The system must however be adjustable to different plot geometries and apartment typologies.⁴⁰⁵ Also Untertrifaller pointed out that an inherent challenge – for all building materials – is to invent systems that can adapt to irregular building sites. He maintained that there is a shortage of systems that can ‘think outside the box’ and can be bent or have different angles [than 90 degrees].⁴⁰⁶

Systems like ‘Cree by Rhomberg’ developed together with Kaufmann are like salami; they work at endless lengths, but can only be cut. As soon as you want to turn around a corner, they start to limb.⁴⁰⁷

Other forms than orthogonal ones are of special interest in urban contexts, which are not always rectangular or linear. If great effort must be invested in adapting systems every time, this will never be profitable. In addition to the urban context, a variety of angles can enhance the spatial experience.

Skadbergbakken, one of Helen & Hard's residential projects features an innovative polygonal typology with a density that is unusual for current timber projects. There were a range of challenges with the urban layout that only became apparent later in the process. The many surfaces of this urban typology contribute to its special characteristics, but also increase costs, and the many transitions and joints create a greater complexity than with simple blocks of flats. Every flat is a separate fire compartment. The buildings and common areas are sprinkled indoors. Windows are offset in the façades. The requirements for many building components were high, as the timber walls were not plastered, but left exposed.⁴⁰⁸

Kropf expressed that finding new approaches for housing systems with a balance between rationality and flexibility is an important challenge:

This is what always is complicated with housing projects, and why you often have these boring typologies: you already know what adds up, and just do your lamellas that then

⁴⁰⁴ Untertrifaller, Transcription AA2, 16.

⁴⁰⁵ Kaufmann, Transcription AA1.

⁴⁰⁶ Untertrifaller, Transcription AA2.

⁴⁰⁷ Untertrifaller, 13.

⁴⁰⁸ Kropf, Transcription AN1.

work somehow. (...) What is exciting with [our project] is the flexible system of houses which is very unusual for housing projects.⁴⁰⁹

Kaufmann sees the success of serial construction as dependent on possibilities for variation in façades and volumetric typologies within reasonable practicability and costs. Prefabrication always limits the façade design options.⁴¹⁰

In the interview, he agreed that producing visual variety with serial constructions is an important challenge to address if serial construction is to succeed, and asserted that variety – e.g. in façade design and urban typologies – and pragmatic low-cost serial production do not have to be at odds. He commented on the façade details for one of his projects in which vertical corner elements are prefabricated with mitred joints, and horizontal joints are covered with a board on site. He remarked that the higher the degree of prefabrication, the fewer design options there are, also in terms of materials. A metal façade for example cannot be mounted in the factory; in contrast to a wooden construction, it must be mounted on site. Joints cannot be avoided in prefabrication. Nonetheless, he sees prefabrication as a huge advantage on today's construction sites.⁴¹¹

Lager remarks that as yet, there is no serial individualization by means of digital machining for multi-story building. As in the automobile industry, prefabricators often have various options from which the client can choose. Kaden + Lager also develop individual solutions with clients within a system in which they can choose from different options, but there is greater variety and individuality if they are planned by an architect together with the clients.

Kaden expressed interest in industrialized timber building that is not associated with post-war prefabricated concrete slab high-rises. According to him, one of the dangers of industrialization is that buildings will look the same everywhere, regardless of whether they are in a rural or an urban setting, in Central Europe or Scandinavia; this is something he wishes to avoid.⁴¹²

Flexibility, adaptability and generality

According Dünser, Hermann Kaufmann Architekten put effort into making their projects flexible thanks to large spans, even if the brief does not require it.⁴¹³ Kaufmann maintained that a skeleton system, where one 'can do anything, besides changing the room height', is more flexible than massive cross-wall constructions. 'Gründerzeit' (Wilhelminian style) buildings offer great flexibility regarding changing usage due to the immense room heights, but realizing this with a housing developer is unrealistic at

⁴⁰⁹ Kropf, 17.

⁴¹⁰ Kaufmann, Transcription AA1.

⁴¹¹ Kaufmann.

⁴¹² Kaden, Transcription AD2.

⁴¹³ Dünser, Transcription AA3.

present; at the same total building height and with 2.40 or 2.50m room height, it is possible to build an extra floor.⁴¹⁴

Besides seeking to simplify the many constructive layers, Kaufmann also believes that plan solutions and spatial programme have become overly specific and provide too little flexibility for changing uses and technical upgrades. He remarked on one of his research interests:

Probably also with tailor-made plan solutions, we have become way too complicated. Every building is somewhat customized. Too little openness, too little adaptability because of cost pressure. (...) And then technic[al installation]s are added that are customized as well and that prevent flexibility from the outset. Maybe one has to return to much more robust and simple concepts where the building serves much more than this one function the building has been designed for in the year 2000 or so, and then doesn't work anymore after 10 years. (...) How can we re-simplify constructions, away from all the madness practiced regarding mechanization. (...) These are the big questions we ask, that probably many ask themselves currently. We are probably not the only ones.⁴¹⁵

Less customized constructions and more open plan solutions lead to greater adaptability.

Lager reports that they aim to locate ducts and cables in inner drywalls and avoid the façades in order to achieve greater flexibility. He also advocates leaving installations visible rather than concealing them within the walls; the aim is to increase sensibility for modest consumption. He sees a reduced amount of stainless-steel tubes as a robust and flexible solution.⁴¹⁶

Disassembly and re-use

Disassembly has been discussed from various viewpoints, focusing on the re-use of building materials, as well as on the repair or replacement of damaged parts. Due to the multi-layered complexity of timber construction components, the re-use of these parts might in reality be less practicable than intended.

The disposal of these elements thus returns in focus – and, as Kaufmann pointed out, the lifetime of buildings, and hence also their adaptability to changing needs.⁴¹⁷ Different construction systems allow for greater flexibility than others (e.g. skeleton constructions versus massive timber constructions). Details might be determined with regards to disassembly and re-use (e.g. glued versus screwed or nailed massive timber elements), or disassembly for the replaceability of damaged or outdated building parts in order to increase a building's lifetime.

⁴¹⁴ Kaufmann, Transcription AA1.

⁴¹⁵ Kaufmann, 21–22.

⁴¹⁶ Lager, Transcription AD1.

⁴¹⁷ Kaufmann, Transcription AA1.

Kaufmann said that constructing with elements automatically implies that they can be dismantled again; to his mind however, the multi-layered design of timber walls presently makes this rather a question of disposal.⁴¹⁸ Untertrifaller spoke about a project they had once done for a public client (the municipality), who required a dry construction that could be disassembled again according to the cradle-to-cradle principle for a subsidized housing project. They embraced this unusual task and designed with a dry construction. This is however a rare case. According to Untertrifaller, although it has been attracting attention for some time, disassembly is still not really considered in practice at present.⁴¹⁹ As Kaufmann has experienced, clients have little interest in long-term issues, such as concepts for reusing or repurposing constructive parts. He thus considers it more important to focus on building structures that allow for changing use of spaces and buildings.⁴²⁰

He contrasts multi-layered constructions – which use less material and are less expensive – with 40 or 50 cm thick massive timber walls, which would be easier to reuse or incinerate, but that are unrealistic and too costly. He says that they have yet to find a final solution to this dilemma, and they aim to use materials that can be reused or disposed of well.⁴²¹

Dietrich Untertrifaller had been using screws in place of nails for about 20 years at the time of the interview. When disassembling, they did not saw the elements, but instead screwed apart components.⁴²²

Dünser and his students tested the feasibility of taking screwed elements apart again; ultimately, the amount of work needed to disassemble the timber elements made him doubt the plausibility of disassembly for re-use. Although it was not the main design focus, they used aluminium nails in one project; the nails in the timber elements would not damage tools if the elements were sawed for later reuse or combustion.⁴²³

⁴¹⁸ Kaufmann.

⁴¹⁹ Lager, Transcription AD1.

⁴²⁰ Kaufmann, Transcription AA1.

⁴²¹ Kaufmann, 15.

⁴²² Untertrifaller, Transcription AA2.

⁴²³ Dünser, Transcription AA3.

2.3 Inhabitants

Even though today, building codes and technical guidelines are meant to ensure the structural safety and required performance of timber constructions, the interviewed inhabitants experienced and interpreted concrete properties of wood in rather different ways – either as solid and safe, or as vulnerable and prone to execution flaws. This is described more in detail below, while the inhabitants' diverging aesthetic appreciation of wood will be addressed in Chapter 3.

From honesty to reliability

Different dimensions of soundness

In the everyday, inhabitants are concerned with whether a wall or a slab is sufficiently sound to withstand heavy furniture or decoration objects, whether the construction will provide safety in the event of a fire, and whether the construction's acoustic insulation is enough to keep good neighbourly relations.

Soundness in the longer run is also an important concern. For those renting flats, it is important to know if and how changes made to the construction (e.g. paint or drilling holes) can be reversed or reset when they move out. For buyers, it is important to know whether their investment will prove to be sound, or if the building's soundness has diminished due to constructive decline (e.g. from water damage, insect attack or rot), aesthetic deterioration (e.g. from sunlight and weather exposure), functional and spatial outdatedness (e.g. when more space is needed for a growing family, or when community has been deemed more important than a larger privately owned property), or in case of psychological obsolescence (e.g. if the current focus on sustainability and the general liking of natural materials fades).⁴²⁴ It is important to them that the building not only looks good initially or in photographs, but that this quality has long-term duration.

Solid and safe or vulnerable and unsettling

Users' perceptions of the stability and durability of timber as a building material and thus of timber buildings were remarkably different. While some saw timber buildings as less stable and durable than buildings made from other materials, others emphasized that they perceived the timber building in which they lived as especially sturdy.

⁴²⁴ See the section about sustainable architecture in the introductory chapter for a differentiated notion of obsolescence.

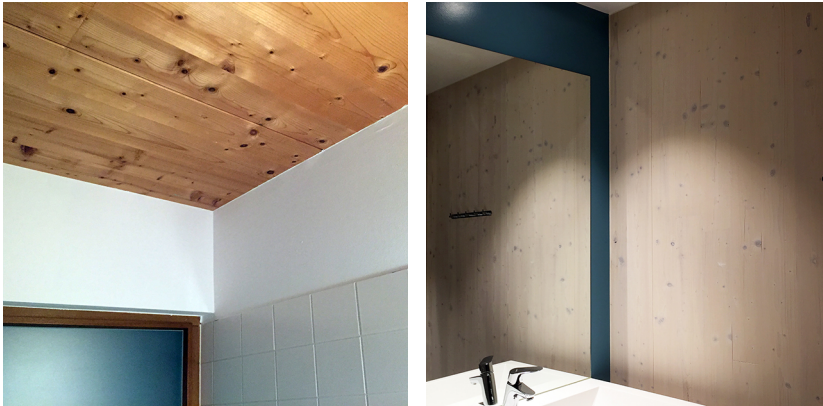


Figure 2.8 Exposed timber in the bathrooms at Mühlweg (A) (left) and Ulsholtveien (right).

Some of the inhabitants from Skadbergbakken have the sense that they live in a very solid building⁴²⁵ or reported needing to get used to timber at first, but ultimately liking the sturdy feel of it:

[Timber] feels solid, it looks pretty good.⁴²⁶

Some insisted that materials have to be applied in the right way though, and this might vary from country to country; this implies that material justice might have a component of climatic and cultural context dependency, of situatedness (see also Chapter 4). One interviewee pointed out that especially in Norway, labour costs and the extreme weather have to be considered. Otherwise, to him

basically, any material used properly is great in architecture. (...) I think [timber is] a brilliant material, very versatile, if used properly.⁴²⁷

An interviewee from Mühlweg (A) remarked that while there were no problems with the wooden part of the building, not even with the exposed ceilings in the bathroom, the concrete garage was not rainproof.⁴²⁸

One inhabitant from sw40 felt reassured by what the architect had told her:

That you shouldn't think that it will somehow fall apart after 30 years.⁴²⁹

Other interviewees however could not be certain whether the changes they observe in wooden surfaces or the sounds they hear mean a decrease in the soundness of the

⁴²⁵ Skadbergbakken - Inhabitant 4, Transcription IN3, 27 November 2017.

⁴²⁶ Skadbergbakken - Inhabitant 1, Transcription IN1, 9 November 2017, 2.

⁴²⁷ Skadbergbakken - Inhabitant 1, 1–2.

⁴²⁸ Mühlweg (A) - Inhabitant 1, Transcription IA3, 10 October 2017.

⁴²⁹ sw40 - Inhabitant 1+2, Transcription ID3a+b, 25 November 2017, 8 (3b).



Figure 2.9 a) Gaps between CLT slab elements at Mühlweg (A), and b) cracks in the CLT walls at Skadbergbakken.

building elements. The visual changes might be related to the material's drying process and a reaction to changing room temperatures and air humidity, which can cause fissures or cracks; they could also be due to sunlight exposure, which can cause changes to the wooden colour (see Chapter 3 for associations with a living material due to these changes).

One interviewee from Mühlweg (A) remarked that the size of the gaps between the exposed ceiling slabs vary with changing temperature.⁴³⁰ Another inhabitant from the same building also pointed out small cracks in the ceiling surfaces.⁴³¹ An inhabitant from Skadbergbakken has filled in the emerging gaps in his massive wooden walls. They were probably a result of carelessness on the construction site, where the material was presumably unprotected from rain.⁴³² At sw40, a couple reported that they see colour changes in the wooden floor (and furniture and books) where there is high exposure to sunlight.⁴³³

Some interviewees had experienced minor damage within their buildings due to the building's movement and reactions to changing humidity levels. A couple living at Skadbergbakken reported that they feel the building moving when the wind is strong, and they had also noticed that mouldings came loose – fixing them with silicone proved difficult and they were ultimately removed. There were also cracks in the bathroom, but

⁴³⁰ Mühlweg (A) - Inhabitant 1, Transcription IA3.

⁴³¹ Mühlweg (A) - Inhabitant 2, Transcription IA5, 12 October 2017.

⁴³² Skadbergbakken - Inhabitant 1, Transcription IN1.

⁴³³ sw40 - Inhabitant 1+2, Transcription ID3a+b.

these were attributed to the building settling.⁴³⁴ In a dwelling at Ölzbündt, some parquet blocks loosen when the air is dry in winter.⁴³⁵

One of the interviewed couples considered timber constructions particularly fire safe; another from Skadbergbakken felt more vulnerable to fire risks in their multi-story building, despite the sprinkler systems on site and the fire department having confirmed that there was easy access to the flats in an emergency.⁴³⁶ Others from Skadbergbakken were unsure and had discussions about whether they were correct in believing that the timber construction in their house was fire safe.⁴³⁷

Some inhabitants were afraid of or had heard of insects entering or eating away at the construction (see also 'worrying vitality' in Chapter 3).

Hidden damage: flawed execution and former occupants

A number of inhabitants were afraid or even experienced that the wooden construction might have been damaged, either due to improper workmanship and lack of experience with the material,⁴³⁸ or because of improper use by neighbours or previous occupants,⁴³⁹ and that the damage might go undetected. This concerned owners more than tenants, as they themselves would have to pay for repairs of hidden damage through no fault by their own.⁴⁴⁰

One interviewee from Lobaugasse did not believe that her house was very durable compared to the sometimes centuries-old wooden buildings in rural areas.

But this has nothing to do with the timber construction as such, but with my concern that it was built sloppily.⁴⁴¹

An inhabitant from Skadbergbakken had similar concerns and pointed out that a construction's soundness also depends on the careful and appropriate handling of the material during the construction process. He disapproved of how the material was handled on the building site and stated that building processes should be coordinated better; he felt that buyers need to have the necessary knowledge to control the process, as workers are too specialized nowadays.⁴⁴²

Unprofessional project management was not only criticized with regard to the very buildings but also concerning the adjacencies, impacting the establishment of the

⁴³⁴ Skadbergbakken - Inhabitant 2+3, Transcription IN2a+b, 27 November 2017.

⁴³⁵ Ölzbündt - Inhabitant 2, Transcription IA2, 9 October 2017.

⁴³⁶ Skadbergbakken - Inhabitant 2+3, Transcription IN2a+b.

⁴³⁷ Skadbergbakken - Inhabitant 4, Transcription IN3.

⁴³⁸ Skadbergbakken - Inhabitant 1, Transcription IN1; Skadbergbakken - Inhabitant 5, 'Email IN4', 14 November 2017; Mühlweg (A) - Inhabitant 2, Transcription IA5, 2; Lobaugasse - Inhabitant 1, Transcription IA4, 11 October 2017; sw40 - Inhabitant 3, Transcription ID4, 25 November 2017.

⁴³⁹ Mühlweg (A) - Inhabitant 2, Transcription IA5; Lobaugasse - Inhabitant 1, Transcription IA4.

⁴⁴⁰ Mühlweg (A) - Inhabitant 2, Transcription IA5.

⁴⁴¹ Lobaugasse - Inhabitant 1, Transcription IA4, 25.

⁴⁴² Skadbergbakken - Inhabitant 1, Transcription IN1.

intended community among neighbours and the planned collective energy supply. One interviewee from Skadbergbakken said that they had been waiting for the outdoor areas to be finished for several years now, as well as for the neighbouring houses to be built. As a consequence, the promised district heating had not yet been realized and would possibly never arrive.⁴⁴³

Another inhabitant from Skadbergbakken has experienced the faulty execution of his own building:

The buildings have been raised by unprofessional craftsmen causing extremely many flaws, deficiencies and sloppiness.⁴⁴⁴

As mentioned in the architect interviews as well, damage while the building is being constructed may occur because of inadequate workmanship, but also because of the difficulty of detecting these flaws. According to an inhabitant from Mühlweg who also works professionally with buildings:

Maybe the architect even has a clue. But the problem is also – I have had building sites where the execution was a disaster. Even the project management took pictures where the faults were evident, but nobody noticed it. And they closed it and when we later opened the walls and circuit points, there was mould and the damp barrier was done wrong.⁴⁴⁵

Another interviewee from wk65 remarked that

because everything is covered anyway, there is more the feeling of living in an experiment where I think: 'I hope this thing is still standing in 30 years the way we imagine it.' With a brick house, I'd be confident... (*laughs*). It's unusual with such big buildings with timber frame constructions. Normally they are smaller. That's the architectonically special thing about this house.⁴⁴⁶

She was afraid that the sealings might not be sound and that humidity could get trapped within the construction and quickly cause damage. The construction being covered increased this insecurity, possibly hiding both sloppy work and potential future damage and being dishonest about the construction's actual state. Advancing timber architecture to new and unfamiliar heights and sizes adds to doubts about its proper execution.

One interviewee from Mühlweg (A) was less confident about wooden houses with which he had no experience. He was sceptical about them lasting as long as brick or concrete buildings; for this reason, he said, he would have to think carefully about buying the flat in which he lived when the opportunity arose. He was however also optimistic that the necessary knowledge and experience would be acquired as timber constructions become increasingly widespread.

⁴⁴³ Skadbergbakken - Inhabitant 4, Transcription IN3.

⁴⁴⁴ Skadbergbakken - Inhabitant 5, 'Email IN4', 14 November 2017.

⁴⁴⁵ Mühlweg (A) - Inhabitant 2, Transcription IA5, 12–13.

⁴⁴⁶ wk65 - Inhabitant 1+2, Transcription ID1a+b, 24 November 2017, 16.

I don't want to badmouth it. I'm just saying, we don't have that much experience and there's a certain responsibility (...) Well there are some great examples. And maybe there will be a little more experience then.⁴⁴⁷

As an inhabitant of sw40 saw it, the issues of quality with which they were struggling, such as planning and execution faults, were not specific to timber constructions; they could be related to the executing firm trying to cut down expenses. The problems were not detected by the construction management. There is a settlement crease in the plaster façade at the transition between the concrete base and timber construction, and there is also moisture within the façade where water enters and condensation occurs.⁴⁴⁸

Other damage has been caused by former inhabitants; in the house in Lobaugasse for example, bathroom tiles began cracking after water damage, and the floor needed to be opened and had to dry for several months.

Scepticism about timber construction thus does not necessarily concern the material itself, but a lack of security and trust that the construction will be executed properly or that damages from previous inhabitants have remained undetected and will continue to damage the concealed construction. Being covered with gypsum, the visual impression of a wall or ceiling might not give a truthful account of their actual condition.

Maintenance and cleaning

Inhabitants who perceived wood as a robust material found that stains and marks in wooden surfaces could be easily fixed. The inhabitants who live with exposed timber surfaces say that untreated wood does not require any maintenance for a very long time (less than gypsum walls and ceilings),⁴⁴⁹ and that local repairs can be done rather easily on oiled surfaces; the entire surface does not have to be retreated. Almost all interviewees expressed an interest in maintenance-free surfaces.

While an inhabitant of sw40 feared that a wooden building with exposed timber surfaces would require a lot of care,⁴⁵⁰ others had found that oiled wooden surfaces tolerated minor mending operations. A couple from Spöttlgasse referred to a house in which they had lived previously:

You can easily re-treat it. If there is something, you go over it with sandpaper and oil it again and strangely it will blend in with the rest after a short while. So, there are no stains so you'd say: well this has been grinded and it's lighter now. No, it blends in. (...) [Oiled wood] is the most comfortable floor for me.⁴⁵¹

Another inhabitant of sw40 had a similar experience:

⁴⁴⁷ Mühlweg (A) - Inhabitant 2, Transcription IA5, 12–13.

⁴⁴⁸ sw40 - Inhabitant 3, Transcription ID4.

⁴⁴⁹ Ölzbündt - Inhabitant 2, Transcription IA2.

⁴⁵⁰ sw40 - Inhabitant 4+5, Transcription ID5a+b, 25 November 2017.

⁴⁵¹ Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b, 12 October 2017, 20.

And I can influence it as well. Of course, when there's a scratch, I'm annoyed. But if I want to, I take a little bit of oil and fiddle with it and do something about it. It is something organic. You can do something with it.⁴⁵²

Some also mentioned that they appreciated being able to judge how clean the wooden floors were more easily than e.g. with carpets; this could be seen as an aspect of 'material honesty'. While one interviewee perceived wooden surfaces as more prone to damage than other materials, he said about the wooden floor in the family's apartment:

The beauty outweighs [having to be a bit cautious]. But for me it is also something like clean and healthy. (...) With a carpet, I think what's all in there of dirt. Then it's undefined. Here, I see the dust. If I feel like it, I remove [the dust] and I know it's clean again.⁴⁵³

His partner talked about the perceived 'clarity'⁴⁵⁴ of wooden surfaces and their easy maintenance: dirt does not hide in them as e.g. in textiles, and many stains can be rubbed away as the wood fibres readjust after a while. She perceived wood itself as clean and healthy, having the sense that it is not harbouring anything hygienically questionable, as a carpet might.⁴⁵⁵

Painted surfaces require regular repainting, and there also seem to be more problems with green algae⁴⁵⁶ outdoors. They impair surfaces with little sunlight exposure aesthetically; on wooden decks, green algae can also be a problem that impedes safe use as the surface becomes very slippery.⁴⁵⁷ The inhabitants had different views on what was more important: impregnated and naturally greying wooden façades that do not require maintenance, or their appropriateness in an urban context.

Sound transmission

Sound transmission is among the constructive challenges that are most important and most difficult to solve properly with wooden constructions. The sound-related discussions referred mostly to how sound is experienced by the inhabitants, and what influences these experiences. Both sound transmission and indoor acoustics also have an impact on well-being. Therefore are sound-related issues mainly presented in Chapter 3, apart from a few remarks that comment on constructive specificities.

⁴⁵² sw40 - Inhabitant 1+2, Transcription ID3a+b, 7.

⁴⁵³ sw40 - Inhabitant 1+2, 7.

⁴⁵⁴ The interviewee used the German term 'Klarheit', which the author has understood as 'unambiguous nature'.

⁴⁵⁵ sw40 - Inhabitant 1+2, Transcription ID3a+b, 7.

⁴⁵⁶ The Norwegian word 'grønske' denotes green grass stains on fabric, but also various kinds of slimy green algae on stones or in small bodies of water.

⁴⁵⁷ Skadbergbakken - Inhabitant 4, Transcription IN3, 15.

Most of the inhabitants interviewed were not disturbed by the sound of their neighbours, and they experienced their apartments as well-insulated enough to enjoy a sense of not being alone in the building.⁴⁵⁸

An inhabitant of wk65 reported that while she could hear her neighbours much more than the architect had suggested, the acoustic insulation was much better than in her previous wooden single-family house.⁴⁵⁹

When the construction was modified, e.g. by mounting loudspeakers directly on it, the sound insulation became worse. A couple from Mühlweg (B) said that their neighbours had opened the sheetrock layer in their flat to install loudspeakers. When their son was still living there, they heard when he played music.⁴⁶⁰

He cut something out of the wall and inserted loudspeakers. Before, when the son was still at home, he sometimes really turned up the volume and then it vibrated. Then the glasses in the cupboard really clanked because he inserted it in a way that it probably touches the wood.⁴⁶¹

From form and performance to affordance

An important aspect of concrete materiality as addressed during the interviews relates to what timber as a construction- and surface material allows inhabitants to do (that other materials might not), and the maintenance that the material requires. Both depend on the user's knowledge and on the material's treatment (covering or coating).

Mounting a swing

Many interviewees spoke about things they want to mount on and in their walls and ceilings, e.g. pictures or heavy curtains. A surprising number of inhabitants mentioned interest in mounting a swing or hanging chair from the ceiling. While a solid timber beam suggests that this is possible, a gypsum ceiling gives no indication of whether it could be sufficiently stable, or if it is concealing a concrete slab and will require a hammer drill.

According to the inhabitants' experiences, timber's role is ambivalent; some emphasized how mounting something on a timber wall was much easier than mounting something on concrete (too hard) or plaster (too soft). Some searched for the timber construction when drilling to ensure that the area would have sufficient load-bearing capacity. Others were unsure of how much timber ceilings and walls could support, or if the visible

⁴⁵⁸ Ölbündt - Inhabitant 1, Transcription IA1, 9 October 2017; Ölbündt - Inhabitant 2, Transcription IA2; Mühlweg (A) - Inhabitant 1, Transcription IA3; Mühlweg (A) - Inhabitant 2, Transcription IA5; Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b; sw40 - Inhabitant 3, Transcription ID4.

⁴⁵⁹ wk65 - Inhabitant 3, Transcription ID2, 24 November 2017.

⁴⁶⁰ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b, 12 October 2017.

⁴⁶¹ Mühlweg (B) - Inhabitant 1+2, 6.

wooden materials were the load-bearing construction itself or just a decorative surface. Some interviewees however reported being afraid of drilling into the wooden materials for fear of damaging them – while others in contrast, as mentioned before, found wooden materials especially suited for mounting things.

An interviewee from Ölbündt reported that it was difficult to hang pictures on the gypsum wallboards. Her partner wanted to hang a swing from the ceiling and had made a construction at the door lintel, where they suspected the load-bearing wall elements to be.⁴⁶²

An inhabitant from Mühlweg (A) said that it had been difficult to put up pictures or curtain rods in her previous home, which was constructed of concrete, compared to the wooden walls and ceiling in her current apartment.⁴⁶³

Another inhabitant from the same project recounted that he wanted to mount a hanging chair from the ceiling. While he had been confident doing this from the concrete slabs in his previous flat, he was unsure whether the wooden ceilings in his current apartment would allow this; he was unsure whether the wooden surface was cladding or the actual slab. He was not certain that drilling a hole into the slab to mount the hanging chair was acceptable as the holes could not be filled in and painted over as with plastered ceilings upon moving out. On the other hand, he said, mounting lamps also leaves holes. He laughed:

I purposely bought a hammer drill for the previous flat a year ago or so, and I thought: wow, now you can get any dowel into that stone wall, and it goes in in the blink of an eye. And – well, now I have timber.⁴⁶⁴

An inhabitant living at Skadbergbakken found wooden walls very practical because it was easy to hang things up without fear of causing any damage besides the hole itself.⁴⁶⁵ In contrast, an interviewee from Wagramer Straße reported having received a plan on which all of the wooden walls are marked; they were told that they were not allowed to drill into them because the wood still might shift. The walls are covered with sheetrock and thus not distinguishable from other walls from the outside.⁴⁶⁶

An inhabitant of sw40 spoke about a swing; in her post-war childhood, she had

a beautiful swing and a gymnastics bar between two rooms. They just screwed the hooks into the ceiling beam.⁴⁶⁷

The concept of affordance (introduced in Chapter 3) can be related to the potential functions offered to the inhabitant by the material with no need for explanation (e.g. hanging things on the wall or from the ceiling, DIY options, minor changes to the room

⁴⁶² Ölbündt - Inhabitant 1, Transcription IA1.

⁴⁶³ Mühlweg (A) - Inhabitant 1, Transcription IA3.

⁴⁶⁴ Mühlweg (A) - Inhabitant 2, Transcription IA5, 22.

⁴⁶⁵ Skadbergbakken - Inhabitant 4, Transcription IN3.

⁴⁶⁶ Wagramer Straße (B) - Inhabitant 1, Transcription IA7, 10 October 2017.

⁴⁶⁷ sw40 - Inhabitant 4+5, Transcription ID5a+b, 22.

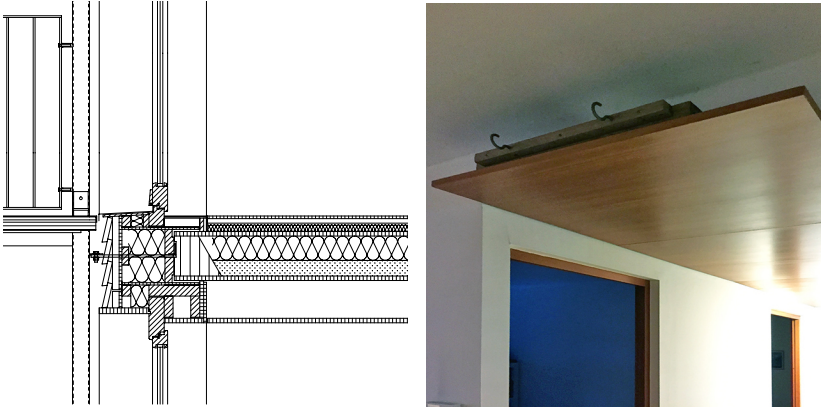


Figure 2.10 a) Wooden hollow-box slabs lined with gypsum boards at Ölzbündt. Drawing: Hermann Kaufmann Architekten. b) The inhabitants recognized the load-bearing capacity of a door lintel and the decorative role of wooden ceiling lining when searching for a reliable place to mount a swing.

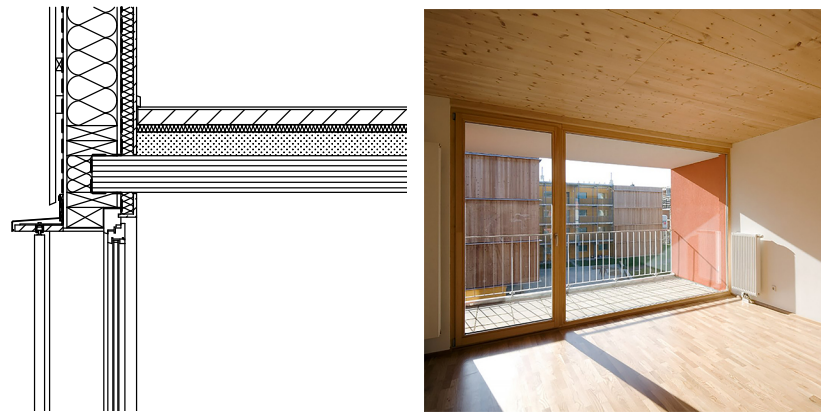


Figure 2.11 a) Exposed CLT slabs at Mühlweg (A). Drawing: Hermann Kaufmann Architekten b) The inhabitant was unsure whether the ceiling would tolerate mounting a hanging chair. Photo: Bruno Klomfar

layout). This was important for the interviewed inhabitants, though it had not been mentioned by the architects. It will be suggested later that the building could communicate affordances through design choices concerning materiality and by way of joining constructive parts.

Knowledge about wooden constructions and surfaces allows the user to read and understand different possibilities, such as installing shelves on a wall or a hanging a swing



Figure 2.12 a) Tailor-made seizing of gaps and spaces around a stair at Mühlweg (B), and b) around a radiator at Lobaugasse.

from the ceiling, or even removing a wall. It also helps them do some work in their dwelling themselves, without an architect or other professionals.

The covering or surface treatment of wooden surfaces (e.g. untreated, oiled, glazed, painted, impregnated or charred) influences the readability of the construction and thus the knowledge that users can have about the construction without having been involved in the planning or construction, as well as about what the surfaces allow them to do.

Seizing spaces

A number of inhabitants was interested in a tailor-made appropriation of left-over spaces and in optimizing a room's furnishing;⁴⁶⁸ they took advantage of the workability of wooden materials and were less worried about mixing wood species than the architects, as described more in detail in Chapter 3.

Some interviewees talked about alternative uses of load-bearing elements besides mounting things in the wooden construction. One inhabitant recalled her childhood room, which featured exposed beams that she could use as shelves. She found them beautiful.⁴⁶⁹

⁴⁶⁸ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b; Lobaugasse - Inhabitant 1, Transcription IA4.

⁴⁶⁹ Wagramer Straße (B) - Inhabitant 1, Transcription IA7.



Figure 2.13 Constructive grid of the column-based load-bearing system at Ölbündt – increasing flexibility regarding the placement of walls, limiting furnishing options.

Flexibility

Different building systems were not addressed directly during the interviews, but some aspects were commented on indirectly, such as the ways in which the construction elements allowed them to furnish their apartments. An interviewee at Ölbündt stated that the wooden pillar in her apartment has taken some getting used to, but that this was rather because of its position in the middle of the room than the fact that it is made of wood (Figure 2.13).⁴⁷⁰

⁴⁷⁰ Ölbündt - Inhabitant 1, Transcription IA1.

2.4 Chapter summary and preliminary conclusions

Material properties and formal presence

Important themes in material discourse address the relationship between form and matter – between formal concepts and material properties. Views about if and how distinct material characteristics should influence construction principles, design language and the materiality’s visual presence have evolved and changed over time. Concepts have been affected by technological development, but also by changing requirements regarding the performance of building parts. The perception of new solutions (e.g. as unsettling in unfamiliar dimensions or as draughty and flimsy in the case of steel) influenced their semantic evaluation (e.g. as unapt for certain classes of buildings). This continues to be true for new applications of timber in unprecedented slimness (e.g. of veneer laminated hardwood trusses) or in new contexts (e.g. untreated wooden façades in urban settings).

Notions of ‘material honesty’ as one of such concepts have been extended through the interviews in this study. The tenet of applying materials according to their properties and to not make them appear as if they were other materials or had a different structural role originally targeted a construction’s stability and longevity. The importance of using materials appropriately remained as insulation requirements increased and new materials and production possibilities emerged, while making this visible became more complicated and less evident as a general design principle.

Rather than a constructive necessity, the dogma of material honesty evolved into more individual conceptual and ideological approaches that co-determine where and how to display or represent constructive layers and their materiality. Architects’ convictions and self-imposed design rules thus turn to serve decision-making when navigating the many design options and develop a semantic connotation. Ambitions were in part also educational and pedagogical – teaching good taste and avoiding illusions about the building’s composition. Architects developed quite different positions towards these paradigms, but even when subscribing to similar values, these manifest in different architectural expressions; it has been stated that rather than universal truths about a material, these tenets reveal the architects’ personal approaches and interests.

Moral duty or irritating idealism

The same holds true in the case of the interviewed architects. Building codes and technical guidelines have replaced the role of overarching paradigms in ensuring a building’s solidity. While the interviewed architects follow building laws and agree that timber should be applied according to its properties, they interpret this appropriateness in rather different ways, for example concerning the material’s hygroscopic capacity; regarding formal language with either orthogonal or polygonal structures; and with either engineered precision or with bolder, monomaterial expressiveness. Some also challenge existing norms and products, for example by performing their own fire tests to obtain

approval for a façade design, or by developing an existing product further so that it can be applied according to a desired spatial expression.

Even when in agreement about the presence of a material, the formal language of their works may still differ; and where formal principles are similar, the material's presence may be handled differently. None of the included projects deals with decisions about interior wood exposure and façade material and treatment in the same way. Some of the interviewed architects expressed some irritation at what they seem to perceive as a subliminal general expectation of wooden construction to be exposed. All showed very individual motivations, preferences and approaches for their use of timber. Attitudes about why, how and to what extent to use timber could even vary within the same office, while still culminating in a single collaborative project. The architects prioritized either aesthetic reasons, sustainability concerns, practical advantages, social interests or some combination of these. There were also different outlooks on timber construction's complexity and vulnerability, or in contrast, its simplicity and robustness.

Some architects objected to using thin wooden layers to cover mineral constructions as if they were wallpaper, but did not see fault with covering a wooden construction with gypsum plates. An exception would be permanent wooden formwork that remains visibly in place at the ceiling after a concrete slab has been cast in place on top. Other architects are irked by the term's moral undertones and felt the need to defend their choice when covering wooden surfaces with gypsum boards, when using hybrid constructions, and perhaps even when painting wooden surfaces. Generally, the interviewed architects were less bothered by the moral implications of strict design paradigms, but some were very interested in letting the user know what a building was made of, both in order to allow them to experience the material's beauty and other sensory stimuli, and as part of a mission to educate and increase appreciation of good craftsmanship and design.

The architects' practical concerns (e.g. acoustic separation of dwelling units or the detectability of water damage) hardly included considerations of the inhabitants' everyday concerns or customization interests. Nonetheless, choices about where and how to leave the wooden construction exposed could enable inhabitants to realize individual choices more easily and independently.

From honesty to reliability

Inhabitants were less concerned with dogmatic material honesty than with the reliability of their building, to which they entrust their lives and health, as well as their financial investment. Without needing to understand technical details, inhabitants want to be able to rely on the construction a) for their economic investment, hoping that the building preserves its value over time, b) as a load-bearing structure for additional installations such as swings, shelves, curtains, c) in spite of cracks, sounds and changing characteristics (which some inhabitants find unsettling as it implies faulty structural integrity and does not visually convey robustness and durability), d) regarding its impact on health and well-being which may be affected by surface treatments and e) as an environmentally friendly solution based on the common assumption that wood can be recycled or

composted – without awareness that some surface treatments and impregnations make it difficult to re-use or even burn timber and render wood hazardous waste.

The interviewed inhabitants had different interpretations of the concrete aspects of the visual presence of wood. Some felt that the building in which they lived was very solid, while others were unsettled by visual alterations of the wooden surfaces. The reliability of a construction is difficult for a non-professional to read from the construction itself; it is more convincingly and reassuringly communicated by an expert, for example, the architect.

From form and performance to affordance

Furthermore, rather than conceptual approaches towards the timber construction's form (what it *is*) or the details of the material's performance (what it *does*), the inhabitants were concerned with the material's affordances (what it *allows* them to do). This sparks interest in the consideration of a building's 'telling materiality' (what the material *inspires* one to do).

Inhabitants are concerned with ways to modify and customize their dwellings and how they can use, adapt and reverse changes to them in everyday life. They wondered, for example, whether building parts were strong enough for additional loads, or whether they were drillable with household tools. This is an aspect worth integrating in future design decisions: can honest materiality communicate possible ways to use, adapt or remove building parts? Are these modifications reversible? Can architectural gestures retain an openness for interpretation whilst at the same time conveying their affordances? An updated notion of material honesty should include a reliable communication of options to use and adapt a building (e.g. the position of ducts and load-bearing components, and whether a surface is a wallpaper-thin, decorative layer or a massive element).

Telling timber

For the inhabitants, possibilities for the use, modification or replacement of materials were important. A conscious choice of the material's exposure and treatment may disclose these possibilities, and – importantly, invite rather than impose a breadth of different uses and appropriations of one's home.

However, architecture does not always speak for itself. Conveying an understanding of the ideas motivating the design beyond mere practical issues helps inhabitants to better understand and appreciate material, spatial or detail design choices and their affordances. This understanding might require additional forms of communication beyond the material's presence.



Spöttlgasse

3

A Tale of Perception and Appreciation

3.1 Literature

Sensory impoverishment

From the mid-20th century on, voices emerged that denounced the absence of an essential dimension from architectural discourse and practice, sparking increasing interest in architectural impulses beyond pure functional considerations.

The German philosopher Ernst Bloch dramatically criticised functionalist architecture resulting from an ‘ice-cold world of robots, created by the consumer society’ as ‘boring, apparently daring but in reality trivial, claiming to be full of hatred for the cliché in every ornament yet (...) trapped in stereotypes’.⁴⁷¹ To his mind, modern architecture has become ‘deliberately soulless’, failing to ‘[seize] the imagination’.⁴⁷²

In Germany, functionalist ideas remained important throughout the extensive reconstruction of the post-war years. But in the United States, a range of post-modern architects strove to reintroduce ‘the value of symbolism and allusion’⁴⁷³ with an eclectic and sometimes ironic use of stylistic quotes from the past. Many references to historical places or buildings removed from any physical or intellectual context were hard to understand and decode without background knowledge.

Other architects however sought an architectural approach that involved the human senses rather than the intellectual mind. Attention was increasingly given to an ‘anthropological conception of architecture’⁴⁷⁴ – to the human perception and bodily experience of a site, of space, of building materials etc., and to their effect on well-being and in turn on meanings and values. In 1977, Charles Moore states that

the feeling of buildings and our sense of dwelling within them are more fundamental to our architectural experience than the information they give us.⁴⁷⁵

Erik Wegerhoff describes an ‘escape from postmodernism’s concept of architecture as sign, symbol, and “language”’ as only occurring in the 1990s. He calls this ‘Neue

⁴⁷¹ Ernst Bloch, *Das Prinzip Hoffnung*, vol. 2 (Frankfurt am Main: Suhrkamp, 1959), 860; as translated in Krufft, *A History of Architectural Theory*, 440.

⁴⁷² Ernst Bloch, *The Principle of Hope*, trans. Neville Plaice, Stephen Plaice, and Paul Knight, vol. 2 (Cambridge, Massachusetts: The MIT Press, 1995), 734–35.

⁴⁷³ Robert Venturi, Denise Scott Brown, and Steven Izenour, *Learning from Las Vegas: The Forgotten Symbolism of Architectural Form*, rev. ed. (Cambridge, Massachusetts: MIT Press, 1977), 53.

⁴⁷⁴ Krufft, *A History of Architectural Theory*, 441.

⁴⁷⁵ Kent C. Bloomer and Charles Willard Moore, *Body, Memory, and Architecture*, A Yale Paperbound (New Haven and London: Yale University Press, 1977), 36.

Sinnlichkeit' (New Sensuousness) – a sensory counterpart to the rational 'Neue Sachlichkeit' (New Objectivity) of the 1920s and '30s.⁴⁷⁶

New Sensuousness stands for the sensory, emotional and intuitive perception and experience of a building rather than the intellectual comprehension or even critique of it. It focuses on atmosphere and on architecture's appeal to all human senses, on non-rationalized impressions, sensations and sentiments, since

atmospheres by their nature are felt rather than intellectually defined, being perceptible but never quite graspable.⁴⁷⁷

Wegerhoff formulates this 'shift from an intellectual to a sensuous design ideal' quite uncompromisingly:

Architecture does not need to be understood; architecture is felt. (...) Architecture is held to be in the realm of the senses, not the intellect.⁴⁷⁸

He reasons that the movement – which is not to be confused with postcriticality – is even 'concerned with preventing a cognitive approach to architecture. (...) *Neue Sinnlichkeit* triggers reflexes, not reflection.'⁴⁷⁹

Wegerhoff ascribes building materials an important role in this, with the potential to replace theory altogether:

Materiality indicates architecture's gravitas; it takes the place of intellectual ballast, of theory.⁴⁸⁰

In a lecture manuscript from 1990, Scott Gartner points out that the bodily experience of architecture is absent 'from almost all contemporary theories of meaning in architecture', while there is an inordinate focus on 'signification and reference' to render meaning and experience to something solely conceptual that has to be understood, not felt. Apart from providing the brain with visual impulses that need to be decoded, the body is rather associated with needs and constraints. He diagnoses a 'philosophical alienation of the body from the mind', where 'the body and its experience do not participate in the constitution and realization of architectural meaning'.⁴⁸¹

As an alternative, Mallgrave sees 'a now largely understated layer of meaning' as apprehended by one's senses. In his foreword to Frampton's seminal exploration of the 'Poetics of Construction', he states that a

⁴⁷⁶ Erik Wegerhoff, 'Neue Sinnlichkeit: Postcritical Issues Regarding an Architecture of Sensuousness', *Future Anterior: Journal of Historic Preservation, History, Theory, and Criticism* 13, no. 2 (Winter 2016): 119–37.

⁴⁷⁷ Wegerhoff, 2.

⁴⁷⁸ Wegerhoff, 6.

⁴⁷⁹ Wegerhoff, 15.

⁴⁸⁰ Wegerhoff, 5.

⁴⁸¹ Frampton and Cava, *Studies in Tectonic Culture*, 10–11.

potent empathetic expressiveness of what Frampton now calls ontological form (...) presumed both our physiological and emotional engagement with the world and therefore was corporeal and emotive rather than conceptual or intellectual.⁴⁸²

To Mallgrave, this intuitive approach forms part of a set of architectural evaluation criteria that is very different from what he observes as contemporary tendencies in the architectural profession.

Materiality plays an important role for the implementation of these ideas in architecture. Mallgrave sees a fine line between ‘cruder efforts at artistic’ or even ‘vulgar materialism’ and the ‘tactile and tectonic dimension’ of architecture, its ‘tangible materiality’.⁴⁸³ He relates an ‘empathetic sensitivity to form and its material expression’ to *Formgefühl*, translated literally as feeling for form. This notion of empathy, as referred to in a German context in the 19th century,⁴⁸⁴ presumes that emotional engagement informs the bond established between object and viewer.

Even if Frampton puts the label of tectonics on this thinking and writing, he also addresses many topics that are part of phenomenology. M. Reza Shirazi argues that ‘though Frampton never employs phenomenology in a classical way, his architectural thought is permeated by themes and concerns essentially phenomenological.’⁴⁸⁵

Phenomenology

Arising in opposition to functionalist modernity and through a distancing from overly intellectual postmodernism, the phenomenological movement is one of the main philosophical movements occupied with a whole-body experience and understanding of the world. As the philosophical study of perception, phenomenology has been building on the work of Edmund Husserl and Martin Heidegger since the 1940s / 1950s. It was however not until the 1960s that it began to have a wider impact on architecture, as important works by Heidegger (‘Being and Time’) and Maurice Merleau-Ponty (‘Phenomenology of Perception’) were only translated into English in 1962.

The latter work addressed

the typically taken-for-granted miracle of everyday experience that results from the ongoing interactions of brain, body and world,⁴⁸⁶

which indicates a

⁴⁸² Harry Francis Mallgrave, ‘Foreword’, in *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture* (Cambridge, Massachusetts: MIT Press, 1995), x.

⁴⁸³ Mallgrave, ‘Foreword’.

⁴⁸⁴ E.g. by Friedrich Theodor Vischer and his son Robert Vischer, and later by Heinrich Wölfflin.

⁴⁸⁵ M. Reza Shirazi, ‘Critical Regionalism, Raum, and Tactility: Kenneth Frampton’s Contribution to Phenomenological Discourse in Architecture’, *Environmental & Architectural Phenomenology* 24, no. 3 (Fall 2013).

⁴⁸⁶ Jonathan Hale, *Merleau-Ponty for Architects* (London; New York: Routledge, Taylor & Francis Group, 2017), 2.

[concern] with the relations between intellectual ideas and material things.⁴⁸⁷

In contrast to Wegerhoff's interpretation of architectural concepts at the end of the 20th century, this description of Merleau-Ponty's thinking by Jonathan Hale suggests the involvement of the reflective mind as well.

Although Hale sees phenomenology as a form of discourse rather than a design method for architecture,⁴⁸⁸ a number of built projects are repeatedly referred to in relation to phenomenology. The design intentions on which these projects are based may not have followed an explicit 'phenomenological design guideline', but they exhibit features with illustrative value for phenomenological discourse. One of the most prominent projects are Peter Zumthor's thermal baths in the Swiss village Vals, which opened in December of 1996. Juhani Pallasmaa highlights the value of 'conceptual strength [combined] with sensual subtlety' that he finds in Zumthor's work.⁴⁸⁹ Wegerhoff also focuses on the thermal baths as 'the first material contribution' to an architectural discourse on sensuousness, a 'built manifesto'.⁴⁹⁰ Frampton however highlights Alvar Aalto's Säynätsalo Town Hall, built almost half a century earlier in 1952, as a testimony of 'phenomenological awareness'.⁴⁹¹

Frampton describes the experience of Aalto's Säynätsalo Town Hall through 'a sequence of contrasting tactile experiences' and 'various nonretinal sensations', such as 'the tactility of the brick treads', 'the smell of polished wood', 'the floor flexing under one's weight' or the polished surface of the floor causing a 'destabilization of the body'. Together with changing light conditions and either visual massiveness or a lighter tectonic expression, these sensations communicate experiences that are difficult to relate to isolated architectural features, and even to verbalize – such as 'the feeling of enclosure' or a 'sense of arrival'.⁴⁹²

Perception

Intake, interpretation and action

The experience of architecture and its intangible qualities through all human senses is here examined under the umbrella term perception.

In psychology, perception refers to the knowledge-based processing of sensory information that provides a representation of information or of an environment, and

⁴⁸⁷ Hale, 3.

⁴⁸⁸ Hale, 5.

⁴⁸⁹ Juhani Pallasmaa, 'Hapticity and Time: Notes on Fragile Architecture', *The Architectural Review* 207, no. 1239 (May 2000): 78–84.

⁴⁹⁰ Wegerhoff, 'Neue Sinnlichkeit: Postcritical Issues Regarding an Architecture of Sensuousness'.

⁴⁹¹ Frampton and Cava, *Studies in Tectonic Culture*, 11–12.

⁴⁹² Frampton and Cava, 12.

how it is understood.⁴⁹³ This process is differentiated into several stages and distincts between *sensation*, directed at the intake of sensory stimuli; *perception*, addressing an interpretation of sensations; and thirdly, possible *action* based on the gained information.

From the vantage point of our own consciousness, sensation and perception appear to be one seamless event. Information comes in from the outside world, gets registered and interpreted and triggers some kind of action (...). However, psychologists have known for some time now that sensation and perception are two separate activities.⁴⁹⁴

In psychology, a sense is described as

a system that translates information from outside the nervous system into neural activity. Messages from the senses are called *sensations*.⁴⁹⁵

Sensation may be defined as

the *simple awareness due to the stimulation of a sense organ*. It is the basic registration of light, sound, pressure, odour or taste as parts of our body interact with the physical world.⁴⁹⁶

A number of authors cited in the previous section called for sensory, bodily experience that excludes cognitive processing. While sensation as an input channel into the brain indeed precedes any mental effort, the brain is involved in identifying, organizing and interpreting sensory information in order to make sense of it.⁴⁹⁷

Much of this interpretation takes place automatically, but sometimes conscious effort is required to translate sensations into meaningful experience.⁴⁹⁸

Beyond a solely passive reception of signals through the nervous system, perception is thus a

process through which people actively use knowledge and understanding of the world to interpret sensations as meaningful experiences.⁴⁹⁹

⁴⁹³ Douglas A Bernstein, *Essentials of Psychology* (Belmont, California: Wadsworth Publishing, 2011), 132,132.

⁴⁹⁴ Daniel Schacter, Daniel Gilbert, and Daniel Wegner, *Psychology*, European Edition (Palgrave Macmillan, 2012), 123.

⁴⁹⁵ Bernstein, *Essentials of Psychology*, 123.

⁴⁹⁶ Schacter, Gilbert, and Wegner, *Psychology*, 123.

⁴⁹⁷ 'After a sensation registers in your central nervous system, perception, the organization, identification and interpretation of a sensation in order to form a mental representation, takes place at the level of your brain.' Schacter, Gilbert, and Wegner, 123.

⁴⁹⁸ Bernstein, *Essentials of Psychology*, 132.

⁴⁹⁹ Bernstein, 123.

Perception may be influenced by the recipient's previous experiences and cultural background⁵⁰⁰ and memories and emotions,⁵⁰¹ as well as by attention⁵⁰² or expectation,⁵⁰³ all of which form a framework for the meaning ascribed to a sensation.

Visual bias

Although increasing attention is drawn towards the experience of architecture and not only its technical performance, this often exclusively involves its visual impression. In their article on building performance and post-occupancy evaluation, Wolfgang Preiser and Jack Nasar describe a building's appearance as part of its overall performance. They claim that

research has consistently shown that vision dominates human experience, and that appearances, aesthetics or the invisible mental image places convey takes first priority in human's experiences of places. (...) Research also indicates that designs that look good work better.⁵⁰⁴

Zumthor however states that

the most important things are often those one doesn't see.⁵⁰⁵

Pallasmaa criticises the dominance of the visual sense as 'visual bias' and diagnoses a resulting 'pathology of today's architecture'.⁵⁰⁶

Seeking to create photogenic sceneries when conceiving architecture and reducing architectural design to what is perceivable in an image reduces its experiential dimensions. Apart from uniform illumination and eliminated micro-climatic differences, Pallasmaa objects to the flatness of surfaces and materials, which all lead to standardized and predictable environments that cause 'a serious sensory impoverishment'.⁵⁰⁷

He reasons that

the inhumanity of contemporary architecture and cities can be understood as the consequence of the neglect of the body and the senses, and an imbalance in our sensory system. (...) Modernist design at large has housed the intellect and the eye, but it has left

⁵⁰⁰ Bernstein, 126.

⁵⁰¹ Schacter, Gilbert, and Wegner, *Psychology*, 124.

⁵⁰² Bernstein, *Essentials of Psychology*, 128.

⁵⁰³ See e.g. placebo effect, in Bernstein, 33.

⁵⁰⁴ Preiser and Nasar, 'Assessing Building Performance: Its Evolution From Post-Occupancy Evaluation', 91; with reference to Jack L. Nasar, 'Urban Design Aesthetics: The Evaluative Qualities of Building Exteriors', *Environment and Behavior* 26, no. 3 (1 May 1994): 377–401.

⁵⁰⁵ Heide Wessely, "Ich baue aus der Erfahrung der Welt..." - ein Gespräch mit Peter Zumthor', *Detail - Zeitschrift für Architektur + Baudetail* 41, no. 1 (2001): 25.

⁵⁰⁶ Pallasmaa, 'Hapticity and Time: Notes on Fragile Architecture'; Juhani Pallasmaa, *The Eyes of the Skin: Architecture and the Senses*, 3. ed (Chichester: Wiley, 2012), 43 He condemns 20th-century architecture's focus on visual impression as 'an evident bias in the architecture of our century'.

⁵⁰⁷ Pallasmaa, 'Hapticity and Time: Notes on Fragile Architecture', 78.

the body and the other senses, as well as our memories, imagination and dreams, homeless.⁵⁰⁸

Pallasmaa sees something existential in the direct experience of a spatial situation and criticizes architecture for having become ‘an art form of instant visual image (...) for the purpose of immediate persuasion.’⁵⁰⁹

Already about 20 years before the launch of social networking services for the immediate sharing of photos and videos such as Instagram and Pinterest,⁵¹⁰ Frampton had also warned that ‘buildings tend to be increasingly designed for their photogenic effect rather than their experiential potential.’⁵¹¹

A decade earlier still, Frampton had criticised pictures’ reduction of architecture to two-dimensionality, distant from real life, so that ‘our tactile environment tends to lose its concrete responsiveness.’⁵¹²

Whilst ‘opposing (...) the split between body and mind, the semiotic, communicational manipulation that television represents in dividing body from mind’⁵¹³ in 1989, Frampton warned 20 years later of the ‘abuse’⁵¹⁴ of computers for the ‘generation of exotic form’⁵¹⁵ ‘as an end in itself,’⁵¹⁶ ‘solely (...) for the purpose of aesthetic display’,⁵¹⁷ ‘as a seductive substitute for all other modes of representation’.⁵¹⁸

Similarly, Alberto Pérez-Gómez criticizes that rational frameworks and computerized form-generating processes dominate the creation of architecture, generating brief allurements instead of profound love.

Made possible by powerful computers and ingenious software, the new algorithmic magic creates novelty without love, resulting in short-lived seduction, typically without concern for embodied cultural experience, character, and appropriateness.⁵¹⁹

⁵⁰⁸ Pallasmaa, *The Eyes of the Skin*, 21–22.

⁵⁰⁹ Pallasmaa, ‘Hapticity and Time: Notes on Fragile Architecture’, 78.

⁵¹⁰ Pinterest was launched in March 2010, and Instagram in October 2010.

⁵¹¹ Kenneth Frampton, ‘Reflections on the Autonomy of Architecture: A Critique of Contemporary Production’, in *Out of Site: A Social Criticism of Architecture*, ed. Diane Yvonne Ghirardo (Seattle: Bay Press, 1991), 26.

⁵¹² Kenneth Frampton, ‘Place, Production and Architecture: Towards a Critical Theory of Building’, *Architectural Design* 52, no. 7/8 Modern Architecture and the Critical Present (1982): 45.

⁵¹³ Kenneth Frampton, ‘Some Reflections on Postmodernism and Architecture’, in *Postmodernism: ICA Documents*, ed. Lisa Appignanesi (London: Free Association Books, 1989), 86.

⁵¹⁴ Kenneth Frampton, ‘Technoscience and Environmental Culture: A Provisional Critique’, *Journal of Architectural Education* 54, no. 3 (1 February 2001): 124.

⁵¹⁵ Frampton, 124.

⁵¹⁶ Kenneth Frampton, ‘Introduction: On the Predicament of Architecture at the Turn of the Century’, in *Labour, Work and Architecture: Collected Essays on Architecture and Design* (London; New York: Phaidon Press, 2002), 10.

⁵¹⁷ Frampton, 10.

⁵¹⁸ Frampton, ‘Technoscience and Environmental Culture: A Provisional Critique’, 124.

⁵¹⁹ Pérez-Gómez, *Built upon Love*, 28.

Frampton voices concern that disregarding other senses than vision leads to what Heidegger called a ‘loss of nearness’.⁵²⁰ According to Heidegger, neither pictures nor film can overcome the ‘uniform distancelessness’, as ‘nearness does not consist in shortness of distance’ in time or space.⁵²¹ As Shirazi reasons, the focus is on emotional or attentional nearness, which however cannot be achieved by

the current abolition of physical distances, through technology (...) [which] doesn’t always bring us closer to things, since nearness is much more an existential mood than a physical proximity.⁵²²

Timber may be considered a material that invites to experience nearness. Rather than offering white abstraction and perfection, it welcomes individuality, ageing, and change over time. Wooden surfaces will bear the traces of time if they are not continually maintained and touched up. Immaculate white surfaces communicate that they should be looked at – not touched or tarnished. The wooden wall invites nearness, leaning, touch, and use; it invites things to be mounted. Its smoothness or roughness suggest how it has been used as well as how to use it – e.g. whether one should lean against a wooden wall with a delicate wool jumper or walk barefoot on a wood floor.

However, it also requires the designer’s empathetic engagement and sensitivity to the user perspective to reduce the ‘distance from life’, as Pallasmaa points out, refraining from the stylistic or conceptual consideration that is so closely associated with the architecture profession. Designing in a way that accommodates future inhabitants’ needs, desires and everyday challenges requires the architect to commit to an empathetic imagination of their everyday lives and experiences.

Contemporary architecture has often been accused of emotional coldness, restrictive aesthetics and a distance from life. This criticism suggests that we architects have adopted formalist attitudes, instead of tuning our buildings with realities of life and the human mind. In all honesty, don’t we usually design our houses on the basis of functional and aesthetic criteria, rather than imagining them as resonant settings and backgrounds for situations of lived life?⁵²³

The question of whether the demanded focus on human realities and lived life is solely based on the architect’s imagination or whether it is derived from actual encounters with users remains open.

⁵²⁰ Kenneth Frampton, ‘Towards a Critical Regionalism: Six Points for an Architecture of Resistance’, in *Labour, Work and Architecture: Collected Essays on Architecture and Design* (London; New York: Phaidon Press, 2002), 89.

⁵²¹ Martin Heidegger, *Poetry, Language, Thought*, 20. print (New York: Perennial Classics, 2001), 163–64.

⁵²² Shirazi, ‘Critical Regionalism, Raum, and Tactility: Kenneth Frampton’s Contribution to Phenomenological Discourse in Architecture’, 11–12.

⁵²³ Juhani Pallasmaa, ‘Empathic and Embodied Imagination: Intuiting Experience and Life in Architecture’, in *Architecture and Empathy: A Tapio Wirkkala-Rut Bryk Design Reader*, ed. Philip Tidwell (Espoo: Tapio Wirkkala—Rut Bryk Foundation, 2015), 5.

Multi-sensory experience

Architect and expert on evidence-based health care design Roger Ulrich addresses the lack of research data on other senses than vision in spite of perception involving all of the senses.

Environmental perception is obviously multimodal and is not restricted to vision. Although vision is by far our most important sense, many sounds and smells in natural settings surely also influence our feelings. Unfortunately, empirical studies of affective and aesthetic response to auditory and olfactory components of natural environments are virtually nonexistent.⁵²⁴

While some authors argue for the primacy of sight or of touch, architectural perception is generally thought of as a whole-body experience, involving all senses. The generally referred-to five human senses – vision, hearing, smell, taste and touch – can be differentiated further:

Touch, for example, encompasses distinct body senses, including sensitivity to pain and temperature, joint position and balance, and even the state of the gut.⁵²⁵

These multi-sensory experiences not only include immediate stimulations, but also refer to indirect sensations, such as imagined or remembered events. Such

experience as an ongoing interplay between perception and action⁵²⁶

also often happens unconsciously.

Pallasmaa suggests including all senses in architectural conception and repeatedly promotes a 'simultaneity of experience and sensory interaction'.⁵²⁷

Every touching experience of architecture is multi-sensory.⁵²⁸

Every significant experience of architecture is multi-sensory: qualities of matter, space and scale are measured by the eye, ear, nose, skin, tongue, skeleton and muscle.⁵²⁹

Citing Merleau-Ponty, Pallasmaa emphasizes the holistic character of perception, involving the entirety of being human:

My perception is not a sum of visual, tactile, and audible givens: I perceive in a total way with my whole being: (...) the thing (...) speaks to all my senses at once.⁵³⁰

⁵²⁴ Roger S. Ulrich, 'Aesthetic and Affective Response to Natural Environment', in *Behavior and the Natural Environment*, ed. Irwin Altman and Joachim F. Wohlwill, reprint of 1st edition 1983, Human Behavior and Environment, volume 6 (New York and London: Plenum Press, 2014), 86.

⁵²⁵ Schacter, Gilbert, and Wegner, *Psychology*, 124.

⁵²⁶ Hale, *Merleau-Ponty for Architects*, 1.

⁵²⁷ Pallasmaa, 'Hapticity and Time: Notes on Fragile Architecture'.

⁵²⁸ J. Pallasmaa, 'An Architecture of the Seven Senses', in *Questions of Perception: Phenomenology of Architecture*, July 1994, 1994, 27–37.

⁵²⁹ Pallasmaa, 'Hapticity and Time: Notes on Fragile Architecture'.

⁵³⁰ Maurice Merleau-Ponty, ed., 'The Film and the New Psychology', in *Sense and Non-Sense* (Evanston, Illinois: Northwestern University Press, 1964), 48.

Steen Eiler Rasmussen also sees all senses as involved in the experience of architecture. Hearing, an important, albeit oft-neglected sense, completes a range of different sensory impressions that help us understand and navigate the world.

We receive a total impression of the thing we are looking at and give no thought to the various senses that have contributed to that impression.⁵³¹

We see the light [architecture] reflects and thereby gain an impression of form and material. In the same way we hear the sounds it reflects and they, too, give us an impression of form and material. Differently shaped rooms and different materials reverberate differently. We are seldom aware of how much we can hear.⁵³²

Despite the simultaneity of sensory impressions that shape experience as described above, Pallasmaa ascribes touch primacy amongst the senses. As opposed to an ‘architecture of the eye’ associated with speed, control and distant impact,

haptic architecture promotes slowness and intimacy (...). [It] engages and unites. Tactile sensibility replaces distancing visual imagery by enhanced materiality, nearness and intimacy.⁵³³

Pallasmaa sees a direct link between sensations through the hands and operations executed with the hands, and the imaginative and rational capacity of the human brain.

There is a rather wide agreement in science that our amazing hands are not products of our spectacular brains, but we have our amazing brains due to our spectacular hands. The body and the hands participate in everything we do, perception, remembering, thinking and imagining, not to speak of physically making something.⁵³⁴

The hands’ involvement in both concrete activity and abstract ideas is also reflected in the German word ‘Handlung’, which can both refer to action and the plot of a story. The hands create a link between concrete, perceived and abstract materiality.

Pallasmaa refers to Gaston Bachelard and his ‘distinction between “formal imagination” and “material imagination”’.⁵³⁵ As it activates unconscious images and emotions, matter-related imagination is ascribed a more profound experience than form-related images.

⁵³¹ Steen Eiler Rasmussen, *Experiencing Architecture*, 1st English publication (London: Chapman & Hall, 1959), 232.

⁵³² Rasmussen, 232.

⁵³³ Pallasmaa, ‘Hapticity and Time: Notes on Fragile Architecture’.

⁵³⁴ Juhani Pallasmaa, ‘Dimensions of Design’, originally published in ‘Indian Architect & Builder’, Oct 2015. Also published on archdaily.com as ‘Juhani Pallasmaa on Writing, Teaching and Becoming a Phenomenologist’, October 2015.

⁵³⁵ Gaston Bachelard, ‘Introduction. Imagination and Matter’, in *Water and Dreams: An Essay on the Imagination of Matter*, trans. Edith R Farrell, Third Printing 1999, The Bachelard Translation Series (Dallas: Dallas Institute of Humanities and Culture, 1982), 1–18.

Warmth

As raised in the beginning of this section, touch comprises various different sensations, among them sensitivity to temperature. Wood is frequently referred to as a ‘warm material’; this is due in part to the fact that wood has a lower thermal conductivity than e.g. steel, glass or concrete, and does not lead away the body’s heat in the same way as the other materials mentioned. It is perceived as warmer when touched in a cold environment. For the same reason, it will feel much cooler than e.g. metal in a sauna. It does not heat up in the same way as the air temperature increases, and it does not transmit that heat to the human body.

Several authors maintain that a sensation of temperature or other surface characteristics not only tells us something about our environment, but also about ourselves. Tadao Ando⁵³⁶ sees the world as articulated through the human body, and the world as simultaneously articulating the body. This means that when perceiving a surface as cold and hard, the body is at the same time acknowledged as warm and soft.

The world that appears to man’s senses and the state of man’s body become in this way interdependent. The world articulated by the body is a vivid, lived-in space.⁵³⁷

Another possible explanation for the perception of wood as a warm material is that red, orange and brown hues are generally perceived as warmer than e.g. blue, black or white.⁵³⁸ The perception of colour and its meaning differ with cultural context, but associations of warmth or coldness are often related to natural phenomena such as fire or the sun and the colours associated with them.⁵³⁹

⁵³⁶ Without explicitly relating to phenomenology, Tadao Ando reflects on similar themes in his writing. M. Reza Shirazi, ‘An Investigation on Tadao Ando’s Phenomenological Reflections’, *Armanshahr Architecture & Urban Development* 5, no. 8 (2012): 21–31.

⁵³⁷ Tadao Ando, ‘Shintai and Space’, in *Architecture and the Body*, edited by students of the Graduate School of Architecture, Planning and Preservation, Columbia University, New York (New York: Rizzoli, 1988), unpaginated.

⁵³⁸ See e.g. Hayter’s ‘painter’s compass’ for warm and cold colours in Charles Hayter, *An Introduction to Perspective, Drawing, and Painting: In a Series of Pleasing and Familiar Dialogues between the Author’s Children; Illustrated by Appropriate Plates and Diagrams, and a Sufficiency of Practical Geometry, and a Compendium of Genuine Instruction, Comprising a Progressive and Complete Body of Information Carefully Adapted for the Instruction of Females, and Suited Equally to the Simplicity of Youth and to Mental Maturity* (London: Black, Kingsbury, Parbury, and Allen, 1820), 16th letter plate XIX Fig. 4 opposite to page 209, 218; or Anna Wierzbicka, ‘The Meaning of Color Terms: Semantics, Culture, and Cognition’, *Cognitive Linguistics* 1, no. 1 (January 1990): 99–150 on experiences of natural phenomena contributing to a semantic notion of colour.

⁵³⁹ According to John Gage, *Color and Meaning: Art, Science, and Symbolism* (Berkeley and Los Angeles: University of California Press, 2000), 22–23, the notion of warm or cold colours is rather commonly accepted among anthropologists but could be complicated further. How the metaphorical link of a temperature to a colour and the association of other qualities with colours might affect the human mind is discussed further by Gage, but this is not explored further in this thesis. Many claim that colour psychology as a research field has not been yet researched thoroughly and extensively enough. T.W. Whitfield and T.J. Whiltshire, ‘Color Psychology: A Critical

Apart from colour, the acoustic characteristics of materials – whether they reflect or absorb sounds – affect our psychological evaluation of a room as cold or warm.

When we say of a room that it is cold and formal, we seldom mean that the temperature in it is low. The reaction probably arises from a natural antipathy to forms and materials found in the room – in other words, something we *feel*. Or it may be that the colours are cold, in which case it is something we *see*. Or, finally, it may be that the acoustics are hard so that sound – especially high tones – reverberate in it; something we *hear*. If the same room were given warm colours or furnished with rugs and draperies to soften the acoustics, we would probably find it warm and cosy even though the temperature was the same as before.⁵⁴⁰

Beyond the described sensations, warmth has also become a culturally informed association with wood, as Jean Baudrillard claims; wood has become a symbol for warmth. In 1968, he cites a ‘sentimental nostalgia’ for ‘warm’ and ‘human’ natural materials as a reason for the desire of wood in his time. He writes about both natural and artificial materials as bearers of cultural images, symbolising certain characteristics rather than possessing them. He rejects reminiscent moralising of natural and artificial materials and their colours. According to Baudrillard, there are no real or fake materials, no natural or artificial substances beyond an inherited cultural ideology that will fade over time and give way to abstraction on a higher level. He argues that wood is no longer a primordial natural material, dense and warming, but has become a cultural symbol of this warmth: It has ceased to be a wooden substance, but is now a wooden element with atmosphere-creating value.⁵⁴¹

Affordance

In contrast to Pallasmaa, who advocates insistently against the ‘hegemony of vision’ and instead maintains that touch is ‘the mother of senses’,⁵⁴² in the 1980s Gibson stated:

The sense of touch is supposed to be more trustworthy than the sense of sight (...). But it is surely wrong. (...) One perceptual system does not validate another. Seeing and touching are two ways of getting much the same information about the world.⁵⁴³

Gibson focuses on visual perception as ‘a whole perceptual system, not a channel of sense’, specifying:

Review.’, *Genetic, Social, and General Psychology Monographs* 116, no. 4 (November 1990): 385–411 note ‘different degrees of experimental rigor exercised’ and a great diversity in literature.

⁵⁴⁰ Rasmussen, *Experiencing Architecture*, 232–33.

⁵⁴¹ Jean Baudrillard, ‘Stimmungswert Material. Naturholz und Kulturholz’, in *Das System der Dinge. Über unser Verhältnis zu den alltäglichen Gegenständen* (1968), ed. Jean Baudrillard (Frankfurt am Main: Campus, 1991), 50–52; also in: Rübél, Wagner, and Wolff, *Materialästhetik*, 29–31.

⁵⁴² Pallasmaa, ‘Hapticity and Time: Notes on Fragile Architecture’.

⁵⁴³ James J. Gibson, *The Ecological Approach to Visual Perception* (Hillsdale, New Jersey: Erlbaum, 1986), 257–58.

One sees the environment not with the eyes but with the eyes-in-the-head-on-the-body-resting-on-the-ground.⁵⁴⁴

According to Gibson, natural vision (as opposed to laboratory set-ups with a fixation point) is related to turning the head and '[looking] around,⁵⁴⁵ [walking] up to something interesting and moving around it so as to see it from all sides, and [going] from one vista to another.'⁵⁴⁶

In contrast to phenomenologists, Gibson focuses not so much on what sensations the perceptual system provides, but rather on 'information pickup'.⁵⁴⁷ This becomes part of his theory of affordance: when looking at objects or surfaces, what humans immediately perceive are not their particular physical qualities, but their affordance, meaning the opportunities for action that they offer. This does not involve a conscious or cognitive process ('indirect realism') but implies a direct awareness of objects provided by the senses ('direct realism'). Gibson termed this approach 'ecological', understanding the environment not as 'described by physics', but as what is perceived.⁵⁴⁸ Thus, with many phenomenologists, he understands perception as embodied and situated, not reflective.

Setting aside an understanding of the universe based on classical physics as consisting of bodies in space, Gibson suggests describing the terrestrial environment 'in terms of a *medium*, *substances*, and the *surfaces* that separate them.'⁵⁴⁹ He claims that human knowledge in these terms is tacit, but 'has long been known implicitly by practical men'.⁵⁵⁰ Air or water would be a medium, and earth a substance. Gibson thus says: 'We do not live in "space"'. He continues:

The medium permits unimpeded locomotion from place to place, and it also permits the seeing, smelling, and hearing of the substances at all places. Locomotion and behaviour are continually controlled by the activities of seeing, smelling, and hearing, together with touching.⁵⁵¹

The physical and chemical composition of substances differ, and they can be distinguished in many ways, differing in their hardness, viscosity, density, cohesiveness, elasticity, or plasticity.⁵⁵² Gibson emphasizes the importance of vision:

The substances of the environment need to be distinguished. A powerful way of doing so is by seeing their surfaces.⁵⁵³

⁵⁴⁴ Gibson, 205.

⁵⁴⁵ Termed 'ambient vision' in Gibson, 1.

⁵⁴⁶ Termed 'ambulatory vision' in Gibson, 1.

⁵⁴⁷ Gibson, 262–63.

⁵⁴⁸ Gibson, 15.

⁵⁴⁹ Gibson, 16.

⁵⁵⁰ Gibson, 22.

⁵⁵¹ Gibson, 32.

⁵⁵² Gibson, 20,22.

⁵⁵³ Gibson, 32.

A surface is the interface between a substance and the medium.⁵⁵⁴

To perceive is to be aware of the surfaces of the environment and of oneself in it.⁵⁵⁵

According to Gibson, the earth-air interface is the most important surface for humans and animals.⁵⁵⁶ For animals, substances' biochemical, physiological and behavioural effects are the most important. He distinguishes between planes (as a *geometrical* term) as colourless 'transparent ghosts', and surfaces (as an *ecological* term)⁵⁵⁷ as coloured, opaque and substantial.⁵⁵⁸ Surfaces can be altered by mechanical (implying movement) or chemical events (e.g. the surface colour of wood changing to black when burnt).⁵⁵⁹

Solid substances and their characteristic surfaces could afford for example nutrition, support, or various kinds of manufacture. Here, the hand comes into play:

Things were fabricated by hand. To identify the substance in such cases is to perceive what can be done with it, what it is good for, its utility; and the hands are involved.⁵⁶⁰

Assigning substances and surfaces affordances in a given situation changes the commonly agreed upon notions of value and meaning.

The perceiving of an affordance is not a process of perceiving a value-free physical object to which meaning is somehow added in a way that no one has been able to agree upon; it is a process of perceiving a value-rich ecological object. Any substance, any surface, any layout has some affordance for benefit or injury to someone. Physics may be value-free, but ecology is not.⁵⁶¹

Value is not something abstract added to an object, but already contained within an object, as latent possibilities of being put to use. Value changes thus from one situation to another and from one observer to another, as the value of what can be done with the object depends on what action a situation requires and according to one's ability to recognize the affordances and to act upon them; 'self-awareness accompanies perceptual awareness.'⁵⁶² Value and meaning as part of an object's affordances are situated.

There also exist 'kinds of visual awareness other than perceptual'. Gibson considers 'so-called higher mental processes' such as '*remembering, thinking, conceiving, inferring, judging, expecting*, and, above all, *knowing*', but also '*imagining, dreaming, rationalizing*

⁵⁵⁴ Gibson, 99: 'Substances, however complex, can be classed as solid, viscous, viscoelastic, liquid and particulate. A gas is not a substance although it is, of course, matter. When a substance goes into the gaseous state, it becomes merely a component of the medium, and its surface ceases to exist. It has not been dematerialized, but it has been desubstantialized. It no longer reflects light, and it is therefore not specified in any ambient array at any point of observation. It has not merely gone out of sight; it has gone out of existence.'

⁵⁵⁵ Gibson, 255.

⁵⁵⁶ Gibson, 16.

⁵⁵⁷ This refers to Gibson's phrasing 'ecological approach to visual perception'.

⁵⁵⁸ Gibson, *The Ecological Approach to Visual Perception*, 33.

⁵⁵⁹ Gibson, 98.

⁵⁶⁰ Gibson, 131.

⁵⁶¹ Gibson, 140.

⁵⁶² Gibson, 263.

and *wishful thinking*' as neither purely intellectual, nor mere reactions of the body. Gibson suggests that the perceptual system can be triggered without an actual stimulation of the senses – but instead by remembering or imagining known sensations.⁵⁶³

Information becomes further detached from stimulation. The adjustment loops for looking around, looking at, scanning, and focusing are then inoperative. The visual system visualizes. But this is still an activity of the system, not an appearance in the theatre of consciousness.⁵⁶⁴

This relativizes a time-based delimitation of perception, as the boundaries 'between the present and the past, between perceiving and remembering' get blurred:

A special sense impression clearly ceases when the sensory excitation ends, but a perception does not. It does not become a memory after a certain length of time. A perception, in fact, does not *have* an end. Perceiving goes on.⁵⁶⁵

This continuity may '[close] the supposed gap between perception and knowledge':

The extracting and abstracting of invariants are what happens in both perceiving and knowing. (...) Our reasons for supposing that seeing something is quite unlike knowing something come from the old doctrine that seeing is having temporary sensations one after another at the passing moment of present time, whereas knowing is having permanent concepts stored in memory. It should now be clear that perceptual seeing is an awareness of persisting structure. Knowing is an *extension* of perceiving.⁵⁶⁶

Besides immediate perception or with the help of instruments that enhance or extend the human perceptual system, Gibson suggests further means of mediated information pickup that also allow for sharing information. Language and pictures are 'aids to perceiving'; 'extended or aided modes of apprehension'. Not to be confounded with knowledge itself, they '[make] aware of the world', 'facilitate knowing' and 'extend the limits of comprehension' by making 'second hand' information accessible.⁵⁶⁷

Perceiving is the simplest and best kind of knowing. But there are other kinds (...). Knowing by means of language makes knowing explicit instead of tacit. (...) Knowing by means of pictures also extends perceiving and consolidates the gains of perceiving. (...) Imagination, as well as knowledge and perception, can be aroused by another person who uses language or makes pictures. These tentative proposals are offered as a substitute for the outworn theory of past experience, memory, and mental images.⁵⁶⁸

⁵⁶³ Gibson, 255.

⁵⁶⁴ Gibson, 255–56.

⁵⁶⁵ Gibson, 253.

⁵⁶⁶ Gibson, 258.

⁵⁶⁷ Gibson, 258. Compare also to Tim Ingold, 'Culture, Perception and Cognition', in *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill* (London; New York: Routledge, 2000), 157–71: '[Whereas] sensations are private and individual, representations are public and social. Since sensations consist in the reaction of the organism to particular external stimuli, there is no way in which a sensation can be made to pass directly from one individual consciousness to another. If people are to share their experiences they must talk about them (...).'

⁵⁶⁸ Gibson, *The Ecological Approach to Visual Perception*, 263.

Perception needs to reach the observer's conscious awareness in order to become knowledge that can be put into words. When mediating knowing by description, tacit knowledge becomes explicit.⁵⁶⁹

Effects of wood on comfort, health and mind

Well-being is a perennial buzzword when qualitative aspects of timber architecture are being discussed. A common understanding of well-being is a state in which one is at ease and basic human needs such as shelter, security and comfort are satisfied. Being surrounded by aesthetically pleasant impressions also contributes to well-being. Well-being concerns both physical and mental health and is at the ill-defined core of what is commonly said to be beneficial about the use of wooden materials, where quantitative aspects merge with qualitative effects. Typically, measurable, health-related topics are addressed first, e.g. thermal comfort or a balanced indoor climate. Less explicit aspects – for example atmosphere, aesthetic experience or beauty – are more difficult to communicate or assess.

If wood is not covered or treated with sealants or harmful products, its hygroscopic capacity balances indoor air humidity,⁵⁷⁰ it has low toxic emittance,⁵⁷¹ and it is said to balance indoor air contamination.⁵⁷² Although some wood products would not comply with the limit values determined in VOC⁵⁷³ evaluation schemes that do not account for the natural evaporation of untreated wood,⁵⁷⁴ additional studies have not detected any harm to human health or well-being. Furthermore, most people in these studies appreciated the scent of natural wood.⁵⁷⁵

⁵⁶⁹ Gibson, 260.

⁵⁷⁰ Kristian Bysheim, Anders Nyrud, and Kristen Strobel, 'Building Materials and Wellbeing in Indoor Environments. Project Wood2New Competitive Wood-Based Indoor Materials and Systems for Wood Construction' (Oslo: Alto University, BRE, Holzforschung Austria, LiU, Treteknisk, February 2016); Kristine Nore et al., 'Moisture Buffering, Energy Potential, and Volatile Organic Compound Emissions of Wood Exposed to Indoor Environments', *Science and Technology for the Built Environment* 23, no. 3 (3 April 2017): 512–21.

⁵⁷¹ Rainer Marutzky, 'Europäische und nationale Regulierungen für VOC aus Bauprodukten – Auswirkungen auf den Holzbau', in *Documentation du 2ème Forum International Bois Construction* (2. Forum Holzbau Beaune 12, Beaune, France: Forum Holzbau, Biel, Schweiz, 2012), 4.

⁵⁷² Karin Krichmayr, 'Hölzerne Lunge - von atemaktiv bis schmalbrüstig', *Zuschnitt*, September 2010; proHolz Austria, 'Holz ein fußwarmer Bodstoff', proHolz Austria, accessed 20 January 2020, <http://www.proholz.at/fussboden/vorteile/>.

⁵⁷³ VOC: volatile organic compounds

⁵⁷⁴ Olaf Wilke et al., 'Emission Behaviour of Wood and Materials Produced from Wood - Summary' (Dessau-Roßlau, Germany: Federal Environment Agency (Germany), March 2012), Project No. (FKZ) 3707 62 301 Report No. (UBA-FB) 001580/KURZ, E.

⁵⁷⁵ Eva Bodemer, Miriam Kleinhenz, and Stefan Winter, 'HOMERA Gesundheitliche Interaktion von Holz - Mensch -Raum', Abschlussbericht (München, Germany: Technische Universität München, Lehrstuhl für Holzbau und Baukonstruktion, October 2017); Marutzky, 'Europäische und nationale Regulierungen für VOC aus Bauprodukten – Auswirkungen auf den Holzbau'.

A range of smaller studies has even found wooden surfaces to have positive effects on heartrate, sleep quality, general physical and mental condition, social extroversion, emotion, behaviour, and recovery speed.⁵⁷⁶

A comprehensive literature study by Elaheh Jalilzadehazhari and Jimmy Johansson offers deeper insight into the psychological effects of exposure to indoor wooden surfaces resulting from visual, auditory, olfactory and tactile stimulation. These stimuli affect brain activity, as well as activity in the autonomic nervous system, the endocrine system and the immune system.⁵⁷⁷

So-called evidence-based design that consciously implements design features that have been scientifically proven beneficial for well-being and healing is mostly applied in health-care settings, e.g. in hospitals.⁵⁷⁸ Given the amount of time that people spend in their homes and workplaces however, evidence-based design should also be relevant for everyday architecture.

Biophilic design is a design strand that utilises research on the effects of exposure to elements of nature either visually or through building materials. The term 'biophilia' was coined by the psychoanalyst and philosopher Erich Fromm in 1964 and refers to a psychological orientation of being attracted to life and living systems, with effects on body and mind.

Its essence is love of life in contrast to love of death. (...) biophilia is not constituted by a single trait, but represents a total orientation, an entire way of being. It is manifested in a person's bodily processes, in his emotions, in his thoughts, in his gestures; the biophilous orientation expresses itself in the whole man.⁵⁷⁹

⁵⁷⁶ Vincent Grote et al., 'Gesundheitliche Auswirkungen einer Massivholzausstattung in der Hauptschule Haus im Ennstal [unpublished report]' (Weiz: Human Research Institut, 2010); Vincent Grote et al., 'Evaluation der Auswirkungen eines Zirbenholzumfeldes auf Kreislauf, Schlaf, Befinden und vegetative Regulation' (Joanneum Research Institut für Nichtinvasive Diagnostik, October 2003); Anders Q Nyrud and Tina Bringslimark, 'Is Interior Wood Use Psychologically Beneficial? A Review of Psychological Responses toward Wood', *Wood and Fiber Science: Journal of the Society of Wood Science and Technology* 42(2), April 2010; Anders Q. Nyrud and Tina Bringslimark, 'Opplevelse av trematerialer i innemiljø', Fokus på tre (Oslo, Norway: Trefokus, Treteknisk, 2012); Bysheim, Nyrud, and Strobel, 'Building Materials and Wellbeing in Indoor Environments. Project Wood2New Competitive Wood-Based Indoor Materials and Systems for Wood Construction'.

⁵⁷⁷ Elaheh Jalilzadehazhari and Jimmy Johansson, 'Material Properties of Wooden Surfaces Used in Interiors and Sensory Stimulation', *Wood Material Science & Engineering* 14, no. 4 (4 July 2019): 192–200.

⁵⁷⁸ Tina Bringslimark and Anders Q. Nyrud, 'Evidence-Based Biophilic Design', in *Science without Borders. Transactions of the International Academy of Science – Health and Ecology. Special Edition International Conference Oslo 2009*, Science without Borders (Conference on Ecology and Forests for Public Health, Oslo: SWB, 2010), 36.

⁵⁷⁹ Jalilzadehazhari and Johansson, 'Material Properties of Wooden Surfaces Used in Interiors and Sensory Stimulation'.

Edward O. Wilson sees this profound affiliation with other living beings and nature as a need that is anchored in human biology and genetically passed on.⁵⁸⁰

The term biophilia has also been adopted for an architectural strand in sustainable design that aims to reconnect people with nature; one design aspect of biophilic design is the use of natural materials.⁵⁸¹ Eliminating both environmental degradation and the alienation from nature in urban environments is supposed to have positive effects on human health, productivity and other sociological and psychological issues. Studies have been conducted about improved healing processes when hospital rooms feature living plants⁵⁸² or provide views of nature,⁵⁸³ or if part of the interior is made of wood.⁵⁸⁴

Associations with wood as a natural material

As industrialization progressed during the 19th century and criticism emerged of the depletion of natural resources, natural materials were associated with a return to a divine order and considered a counterpart to mass-production and consumerism.⁵⁸⁵ As described in the previous chapter, synthetic materials could be used for an increasing range of functions, and with this grew concerns about alienation from nature and thus about the loss of humankind's cultural roots.⁵⁸⁶

Many more recent studies have found that positive attitudes toward wood are related to the association of wood with nature or naturalness.⁵⁸⁷

⁵⁸⁰ Edward O. Wilson, *Biophilia: The Human Bond with Other Species* (Cambridge, Massachusetts: Harvard University Press, 1984).

⁵⁸¹ Elizabeth F. Calabrese and Steven R. Kellert, 'The Practice of Biophilic Design', May 2015.

⁵⁸² Seong-Hyun Park and Richard H. Mattson, 'Ornamental Indoor Plants in Hospital Rooms Enhanced Health Outcomes of Patients Recovering from Surgery', *The Journal of Alternative and Complementary Medicine* 15, no. 9 (September 2009).

⁵⁸³ Roger S. Ulrich, 'View Through a Window May Influence Recovery from Surgery', *Science* 224, no. 4647 (April 1984): 420–21.

⁵⁸⁴ Nyrud and Bringslimark, 'Is Interior Wood Use Psychologically Beneficial? A Review of Psychological Responses toward Wood'; Sally Augustin and David Fell, 'Wood as a Restorative Material in Healthcare Environments' (Québec City, Montréal, Vancouver: FPInnovations, 2015).

⁵⁸⁵ Rübel, Wagner, and Wolff, *Materialästhetik*, 15–16.

⁵⁸⁶ Rübel, Wagner, and Wolff, 60. Towards the end of the 19th century however, reverence for the simplicity of natural materials was mainly motivated aesthetically and educationally, with increasingly national undertones in countries like Germany or Japan. Likewise, the renewed interest in local materials and vernacular building methods was motivated by a growing focus on national identity, but also based on the general scarcity of building materials due to war activities. In the arts in contrast, the significance of natural (yet durable) materials came later, as a counterpart to technical culture (for example in arte povera or land art in the 1960s). Rübel, Wagner, and Wolff, 15–16.

⁵⁸⁷ Nyrud and Bringslimark, 'Is Interior Wood Use Psychologically Beneficial? A Review of Psychological Responses toward Wood'.

At present, and both within and external to professional circles, wood as a natural material is often ascribed 'living' qualities and characterized as a breathing material.⁵⁸⁸ The forest – although its trees have been unrectifiably transformed into something else – is still referred to in discussions about timber construction. The positive associations are linked to the standing forest and its recreative function. Thoughts of wood as a natural material rarely incorporate the harvesting of trees; this generally brings about more negative feelings.⁵⁸⁹ Various studies have shown that nature evokes positive reactions across cultural, social and geographic groups⁵⁹⁰ and has a stress-reducing effect.⁵⁹¹

A range of aspects may be extracted from literature to better understand the semantic dimension of wood as a living material: wood as a regenerating resource; wood's 'breathing' characteristics; wood as a being (dead, living, ageing); new materialism; human affinity to wood; and different ways to connect with nature in a building.

Regenerative

In contrast to many other common building materials, wood is a natural material; it is produced by living organisms, it regrows, and it has a number of characteristics that may be associated with a living material. The fact that it is a regenerating resource is part of its significance from a sustainability perspective. However, this should not be seen as an easy answer to environmental concerns for the building industry. The regrowth circumstances are decisive. Many timber buildings are promoted by how quickly the trees corresponding to the timber used for a building can be grown. As the architects interviewed also pointed out, it cannot always be taken for granted that the timber will be sourced from nearby forests. In addition, there are great differences between monocultural timber plantations with high turnover rates and sustainably managed and selectively harvested forests – not only for biodiversity or a forest's recreational value, but also for timber quality.

⁵⁸⁸ Hermann Kaufmann in Karin Tschavogova, 'Holzaltem – was für ein Thema', *Zuschnitt 4: Holzaltem*, December 2001; Tschofen, 'Weathering– Tricks against Transcience'; Krichmayr, 'Hölzerne Lunge - von atemaktiv bis schmalbrüstig'.

⁵⁸⁹ Some argue for the case of leaving forests untouched to preserve their CO₂ absorbing function, also acknowledging the forests' emotional value as recreational areas, whilst others point out that forests have been cultivated for centuries, that young trees absorb more CO₂ than mature trees, and that wood is the only regenerative material with which to replace energy and climate gas intensive materials. Still, the question of sustainable forest management, biodiversity, and harvesting method (e.g. selection cutting or retention cutting instead of clearcutting) remain important. See also Ewald Rametsteiner, Roland Oberwimmer, and Ingwald Gschwandtl, *Europeans and Wood: What Do Europeans Think about Wood and Its Uses : A Review of Consumer and Business Surveys in Europe* (Warsaw: Ministerial Conference on the Protection of Forests in Europe, Liaison Unit Warsaw, 2007).

⁵⁹⁰ Ulrich, 'Aesthetic and Affective Response to Natural Environment'.

⁵⁹¹ E.g. Roger S. Ulrich et al., 'Stress Recovery during Exposure to Natural and Urban Environments', *Journal of Environmental Psychology* 11, no. 3 (September 1991): 201–30.

Breathing

On the other hand, wood is also ascribed ‘living’ qualities in its harvested, manufactured or even industrially processed state; some even call it a breathing material. This usually refers to its hygroscopic properties and to hydrothermal effects: Wood takes up and releases humidity, balancing the indoor climate – this may cause dimensional changes, visual fissures and cracking sounds. In a technical sense (without being a technical term) and independently of its surface materials, the term ‘breathing walls’ is commonly used for wall build-ups that eliminate vapour proof sealing layers. These walls have wind barriers that prevent air from entering or leaving the building, but allow for vapour transmission from indoor spaces outwards, with the aim to prevent condensation within the wall construction.

In his book *Architecture Oriented Otherwise*, Leatherbarrow relates to ‘breathing walls’ in a different way. He describes the artful and sculptural as well as symbolic and associative qualities of a sunscreen wall; these merge with the wall’s climate-regulating and space defining functions, allowing for shelter, ventilation, sun protection, subtle zoning and a plurivalent division between inside and outside at the same time.⁵⁹²

While Leatherbarrow associates breathing qualities with the design and function of an entire wall, Harries traces notions of breath as an aura as linked more directly to materiality, and then turns to more abstract associations.

The Greek “aura” meant “breath” or “breeze”; the Latin “aura” a gentle wind or current of air; and “aura” thus came to name the subtle emanation of some substance, for example the special odour of a rose. (...) Aura here has a material basis. That basis became more elusive, was spiritualized, when aura came to be understood in the 19th century as a subtle emanation around living beings.⁵⁹³

Both to Harries and to Benjamin, the experience of the aura as a ‘response’ of an ‘inanimate or natural object’ makes it ‘speak’:

To experience the aura of something is to experience it as if it were another person, capable of speech.⁵⁹⁴

⁵⁹² Besides these physical aspects that regulate the indoor climate, structure events through a spatial framework, and create a unique atmosphere that varies over the course of a day, walls may also acquire a metaphorical, symbolic quality. Writing about the case of a church in Puerto Rico, Leatherbarrow likens the breeze entering the building through the wall openings to the in- and exhalations of a person in prayer. He is an advocate of building parts not being reduced to their functional role, but of adding latent, inherited, culturally anchored possibilities of interpretation to a building, interweaving them with the physical and social context. David Leatherbarrow, ‘Breathing Walls’, in *Architecture Oriented Otherwise*, 1st edition (New York: Princeton Architectural Press, 2008), 21–42.

⁵⁹³ Karsten Harries, ‘What Need Is There for an Environmental Aesthetics?’, *The Nordic Journal of Aesthetics* 22, no. 40–41 (2011): 20.

⁵⁹⁴ Harries, 21.

Living

In his building construction compendium, Moro matter-of-factly states that although wood – in contrast to its ‘competitors’ – is an organic material, it should be declared dead after it has been harvested. It is due to the manifold and complex deformations during use that it is sometimes falsely described as a living material.⁵⁹⁵

Over one and a half centuries before Moro, Friedrich Vischer also stated that wood was once living, but when dried, it became a dead substance.⁵⁹⁶ Jean Baudrillard (1968) however describes wood as alive

as it takes its substance from earth, as it lives, breathes and ‘works’. It possesses a hidden warmth, it does not simply shine like glass does, it burns from the inside. Its fibres capture time, and it is thus an ideal container and at once also content that one wishes to pull back from the grasp of time. Wood has a distinctive odour and even its own parasites. In short, this material is a being.⁵⁹⁷

In contrast to wood, a range of authors saw gypsum as a dead material⁵⁹⁸ – ‘something cold, dry, stalled, almost frozen’.⁵⁹⁹

Aalto relates his understanding of wood being a ‘living material’ to its fibres and the various natural colours of wood. In his creation of forms, Aalto aims to respect the direction of the wood’s fibres. To him, being reminded of human tissue has consequences for the manufacturing of wood – this association seems to imply ethical rules for the material’s processing and inhibit its mutilation.

For me, wood is not a neutral substance, it is more: it is a living material, produced by growing fibers, something like the human muscular system. It is therefore impossible for me to carve out figures out of wood as though it were cheese. In my wood forms, I therefore always (...) try to follow – the structure of the wood as it has grown. (...) forms

⁵⁹⁵ Moro, *Baukonstruktion*, 171.

⁵⁹⁶ Friedrich Theodor Vischer, ‘Das Material’, in *Asthetik oder Wissenschaft des Schönen. Zum Gebrauche für Vorlesungen. Dritter Theil: Die Kunstlehre. Zweiter Abschnitt: Die Künste. Erstes Heft: Die Baukunst.*, vol. 5, 10 vols (Stuttgart: Macken, 1852), 207–15.

⁵⁹⁷ Translated by the author; original: ‘(...) weil es seine Substanz der Erde entnimmt, weil es lebt, atmet und ‚arbeitet‘. Es besitzt eine verborgene Wärme, es glänzt nicht bloß wie Glas, es brennt von innen her. In seinem Gewebe hält es die Zeit gefangen, ist also ein ideales Gefäß und zugleich ein Inhalt, den man dem Griff der Zeit entziehen will. Das Holz hat einen eigentümlichen Geruch und sogar eigene Parasiten. Kurz, dieses Material ist ein Wesen.’ in Baudrillard, ‘Stimmungswert Material. Naturholz und Kulturholz’; Rübel, Wagner, and Wolff, *Materialästhetik*, 29–31.

⁵⁹⁸ Monika Wagner, Dietmar Rübel, and Sebastian Hackenschmidt, eds., *Lexikon des künstlerischen Materials: Werkstoffe der modernen Kunst von Abfall bis Zinn*, Orig.-Ausg., 2., durchges. Aufl., Beck’sche Reihe 1497 (München: Beck, 2010), 110.

⁵⁹⁹ Gypsum was seen as friable, frail and brittle, not with the fleshy spryness of clay. Moriz Carrière, ‘Maß, Material und Farbe’, in *Ästhetik: Die Idee des Schönen und ihre Verwirklichung im Leben und in der Kunst; Die Bildende Kunst, Die Musik, Die Poesie*, vol. 2 (Leipzig: Brockhaus, 1885), 141–45; also part of Rübel, Wagner, and Wolff, *Materialästhetik*, 54.

must mesh with the structure of the material, and even with its delicate nuances of colour.⁶⁰⁰

Today, the patterns and colours specific to different wood species – but also conditioned by growing circumstances – seem to pass on the individuality of each once living tree to a room. Rather than a testimony of death, the wooden material may be associated with the life that once made the trees grow.

Ageing

For some however, ageing wooden façades have less positive connotations. As Karin Tschavgorova states, the acceptance of timber buildings is also determined by their outer appearance.⁶⁰¹ If a wooden wall or façade is properly designed and constructed, its changing surface appearance does not affect its technical serviceability at all – the consequences are solely aesthetic.⁶⁰² However, the ageing of wood is judged ‘less technically rather than emotionally’, as it seems to ‘touch low mental layers in humans.’⁶⁰³ As Bernhard Tschofen aptly highlighted, its ageing seems to remind us displeasingly of life’s transience and our own mortality. Pérez-Gómez also described our tendency to deny and technically restrain signs of the existence of death.⁶⁰⁴

Tschofen writes that apart from regions where wood ‘has remained a commonly used (and consequently not frequently discussed) building material (...) [we] feel ambiguous about the ageing of wood’:

We value its natural properties, while using all our cultural tools to keep nature at bay. While we appreciate the naturally grown, we prefer a type of wood that neither shrinks nor distorts. We idealize originality and authenticity, yet we also value homogeneity. We praise the liveliness of the material, but we are horrified to witness its living qualities. (...) To put this paradox in modern ecological terms: We value the sustainable quality of natural resources that have the ability to grow back, while mistaking sustainability for immortality (and treating the natural resource in a way that is anything but sustainable).⁶⁰⁵

There is a discrepancy between wood as valued for being natural, and treating it to counteract its natural properties.

⁶⁰⁰ Alvar Aalto, ‘Die Beziehung zwischen Architektur, Malerei und Skulptur’, in *Synopsis. Architektur Malerei Skulptur* (Basel: Birkhäuser, 1970); Alvar Aalto and Göran Schildt, *Alvar Aalto in His Own Words* (Helsinki: Otava, 1997), 268 (265-269).

⁶⁰¹ Tschavgorova, ‘Holzaltem – was für ein Thema’.

⁶⁰² Jürgen Sell, Urs Wigger, and Jürg Fischer, ‘Oberflächenschutz von Holzfassaden’, *Zuschnitt 4: Holzaltem*, December 2001.

⁶⁰³ Tschavgorova, ‘Holzaltem – was für ein Thema’.

⁶⁰⁴ Pérez-Gómez, *Built upon Love*, 5.

⁶⁰⁵ Tschofen, ‘Weathering– Tricks against Transcience’, 214–17.

Vibrant matter

Depleting resources currently contribute to a ‘New Materialism’ and the popularity of material concepts that dwell on ideas related to vitalism⁶⁰⁶ (believing in a ‘vital force’ as a necessary non-physical element in living organisms,⁶⁰⁷ ‘élan vital’⁶⁰⁸ or ‘entelechy’) or emergentism (also including inorganic matter).⁶⁰⁹ Moravánszky names Jane Bennett and her book *Vibrant Matter* as one example of this ‘new interest in gnostic, animistic and vitalistic theories’ that mystify material – and that show a growing concern about depleting resources, but, according to Moravánszky, do not offer any tools to find solutions to these threats.⁶¹⁰

Human affinity

In an article about ‘Wood as A Building Material’, Aalto ascribes this ‘deeply human material’ an ‘affinity with man and living nature.’ Its qualities ‘that are most important in human and psychological terms’ cannot be substituted by synthetic materials and are jeopardised by ‘synthetic chemical processes.’⁶¹¹ Although Alvar Aalto used many other materials in his architectural works, he displayed his fondness of wood as a construction material and for furniture, and his respect for its natural properties was apparent. As his biographer Göran Schildt pointed out, in contrast to Eames and Saarinen, Aalto ‘refused to use synthetic wood (and later plastic) as a material for his free-form furniture.’⁶¹² Other articles and interviews point at his understanding of humanized architecture as incorporating ‘a combination of technical, physical, and psychological phenomena.’⁶¹³ He describes a ‘struggle against mechanization and machines’⁶¹⁴ where things might become more ‘effective’, but disregard people’s ‘well-being’. Aalto emphasizes the moral dimension of architecture along with formal issues.

⁶⁰⁶ Moravánszky, *Stoffwechsel*, 56.

⁶⁰⁷ William Bechtel and Robert C Richardson, ‘Vitalism’, in *Routledge Encyclopedia of Philosophy*, ed. Edward Craig (London; New York: Routledge, 1998). They conclude ‘Vitalism now has no credibility. This is sometimes credited to the view that vitalism posits an unknowable factor in explaining life; and further, vitalism is often viewed as unfalsifiable, and therefore a pernicious metaphysical doctrine.’

⁶⁰⁸ ‘Entelechy’ was described by the biologist and philosopher Hans Driesch (1867–1941).

Philosopher Henri Bergson (1874–1948) defended the idea of an ‘élan vital’.

⁶⁰⁹ Timothy O’Connor and Hong Yu Wong, ‘Emergent Properties’, in *Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, accessed 17 December 2019, <https://plato.stanford.edu/archives/sum2015/entries/properties-emergent/>.

⁶¹⁰ Moravánszky, *Metamorphism*, 57.

⁶¹¹ Alvar Aalto, ‘Wood as a Building Material’, *Arkkitehti*, 1956; Aalto and Schildt, *Alvar Aalto in His Own Words*, 101, 102.

⁶¹² Aalto, ‘Wood as a Building Material’; Aalto and Schildt, *Alvar Aalto in His Own Words*, 101.

⁶¹³ Alvar Aalto, ‘The Humanizing of Architecture’, *The Technology Review*, November 1940; Aalto and Schildt, *Alvar Aalto in His Own Words*, 103.

⁶¹⁴ Alvar Aalto, ‘Zwischen Humanismus und Materialismus’, *Der Bau*, 1955; Alvar Aalto and Göran Schildt, ‘Between Humanism and Materialism’, in *Alvar Aalto in His Own Words* (Helsinki: Otava, 1997), 177.

A lecture from 1957 on good housing implies the combined effect of architectural design on all scale levels on the human mind, from urban planning to material and detail decisions.⁶¹⁵ Material can play a role in letting architecture 'serve the people who use it as well as possible.'⁶¹⁶ Aalto describes ancient experiences that still evoke emotional responses to different materials today.⁶¹⁷ Besides favouring materials that do not need much maintenance, Aalto emphasizes an emotional connection that cannot be captured by theory but must be experienced. He describes materials'

humanist dimension in that the social function of a building is relevant to the choice of materials. There is a relation between people and building materials that can't be pinpointed by any amount of theorizing. (...) Materials must serve people emotionally; they mustn't be experienced as hostile.⁶¹⁸

Aalto ascribes wood a special role:

Wood is the natural material closest to man, both biologically and as the setting of primitive civilizations. (...) [As] a timeless material with an ancient tradition wood is readily available, and not merely for constructive purposes but also for psychological and biological ones. It should therefore not be despised on account of the availability of new combinations of materials.⁶¹⁹

Aalto seeks to establish wood as a well-known and not old-fashioned material, and argues for architectural advancement not through the use of new materials, but through the amelioration of how familiar materials are applied.⁶²⁰

Connection with nature

One of the roles of materials can be to re-establish a connection with nature. Aalto sees

interior decorating and external embellishments [as] attempts to compensate for the lack of contact between house and natural environment. (...) The fabrics employed in the home are symbols of natural elements (...), a world which man in the great metropolis no longer possesses.⁶²¹

⁶¹⁵ Alvar Aalto, 'Schöner Wohnen' (Aalto Archives, Munich, 1957); Aalto and Schildt, *Alvar Aalto in His Own Words*, 262.

⁶¹⁶ Alvar Aalto, Interview for Finnish Television, 1972, Archives of Göran Schildt; Aalto and Schildt, *Alvar Aalto in His Own Words*, 269.

⁶¹⁷ 'You shouldn't be a monomaniac on this point; you mustn't let your hands be tied by theory. (...) material is a humanist element. Our age-old attitudes to different materials – or the lack of fixed attitudes – come into play here.' Aalto, Interview for Finnish Television; Aalto and Schildt, *Alvar Aalto in His Own Words*, 269–70.

⁶¹⁸ Aalto, Interview for Finnish Television; Aalto and Schildt, *Alvar Aalto in His Own Words*, 270.

⁶¹⁹ Aalto, 'Die Beziehung zwischen Architektur, Malerei und Skulptur'; Aalto and Schildt, *Alvar Aalto in His Own Words*, 268 (265-269).

⁶²⁰ Aalto, 'Die Beziehung zwischen Architektur, Malerei und Skulptur'; Aalto and Schildt, *Alvar Aalto in His Own Words*, 268 (265-269).

⁶²¹ Aalto, 'Schöner Wohnen'; Aalto and Schildt, *Alvar Aalto in His Own Words*, 260–62.

Materiality – or the absence thereof – can establish contact with nature, even in the context of a city. Even where there are no plants, mountains or coastlines visible, light intensity, precipitation or the colour of the sky allow for an experience of the time of day, seasons or geographic location. The apparent absence of any material border suggests an immediate experience of these phenomena.

Leatherbarrow describes glass, ‘the most immaterial of materials’, as creating such ‘links between architecture and both natural and urban life’.⁶²² A contemporary architect who takes such an approach in his work is Jean Nouvel:

People want there to be nothing – nothing at all – between the heavens and us... we want an absence of materiality to put us in touch again with the non-synthetic world.⁶²³

However, this link is only of a visual nature, and no-one is literally put in touch again with nature. Nature cannot be touched through glass, not even smelled and only faintly heard, but its visual presence might be enough to touch people. Another aspect might be worth considering: this visual connection works only from the inside of a building outwards, as – at least in daytime – glass becomes invisible when one looks out, but appears dark when seen from the outside.

The much-referred-to thermal baths by Peter Zumthor offer an opposite approach to connecting a building and its surroundings – by the materials’ palpability and concreteness. With their heavy, massive appearance, the baths’ stone walls evoke a sensation of

architectural space [resulting] from the hollowing out of pre-existing substances.⁶²⁴

Space is defined by materials that have been there before, that are part of the building’s surroundings, and that continue into its interior.

The connections with nature described by Leatherbarrow result through the absence of visual material barriers on the one hand and through the continuity of the surrounding materiality on the other.⁶²⁵ The former creates a connection with the actual world outside a building through the sense of vision. The latter includes a level of abstraction, as materials are in a different state than when found outside, but may be experienced

⁶²² David Leatherbarrow, ‘Materials Matter’, in *Architecture Oriented Otherwise*, 1st edition (New York: Princeton Architectural Press, 2008), 74.

⁶²³ Jean Nouvel, ‘Presentation’, in *Technology, Place & Architecture: The Jerusalem Seminar in Architecture: 1996, Technology, Place & Architecture: 1994, Architecture, History & Memory: 1992, the Public Building, Form and Influence*, ed. Kenneth Frampton, Arthur Spector, and Lynne Reed Rosman (New York: Rizzoli, 1998), 83; as cited in Leatherbarrow, ‘Materials Matter’, 74.

⁶²⁴ Leatherbarrow, ‘Materials Matter’, 76.

⁶²⁵ Leatherbarrow calls the ‘pure connectivity by virtue of the absence of any gap’ of the thermal bath’s interior and surrounding ‘substantive spaces’; these contrast to the ‘trijective’ spaces described by Nouvel (who in turn refers to Virilio). As Leatherbarrow points out, both Nouvel and Zumthor are interested in the continuity and interconnectivity between a building and its environment – in one case via transparency (creating ‘trajective’ spaces), and in the other through materiality (creating ‘substantive’ spaces) Leatherbarrow, 76.

through a wider range of senses: they may be touched and smelled and influence a room's acoustics.

Leatherbarrow underlines the importance of materials in cities as much as in buildings, not only to moderate between different scales, but also as they entail a new and immediate way of engaging with the city, contributing to the 'cultural content that the city and its buildings have to offer'.⁶²⁶

The weather conditions observed from within a building also leave traces on its outer skin. Depending on the physical context of a building, its orientation and its constructive details, these traces may look different on each façade. The visual or tactile integration of a physical context into a building, the forces of nature specific to each site and the traces that mark a building according to its location and orientation point at another referential dimension of building materials, namely as situated in a geographic and temporal context. This situatedness is also conditioned by cultural and social aspects, as discussed further in Chapter 4.

Users' aesthetic preferences

A Norwegian report on the experience of wooden materials in indoor environments names a number of studies about aesthetic preferences of materials, referring to timber-specific user surveys as well as to more general psychologically-oriented literature and to sources about evidence-based design.⁶²⁷ There is a generally positive attitude towards wooden materials⁶²⁸ across European geographic, cultural, demographic and social groups; they are considered a warm, living, natural, healthy, environmentally friendly and easily applicable material.⁶²⁹ Three co-determining aspects of people's preferences for visible building surfaces – the perceived naturalness, the surfaces where wooden materials are visible, and the visual qualities of these surfaces – are described more in detail in the following.

The degree of perceived naturalness of a building material relates to the degree of chemical or mechanical processing and to the use of additives, e.g. in OSB, MDF or chipboards, which are considered less natural than pine wood with or without knots. Concerning material objects in general, chemical transformation has a much greater impact on the perception of their naturalness than physical transformation.⁶³⁰ The

⁶²⁶ Leatherbarrow, 76.

⁶²⁷ Nyrud and Bringslimark, 'Opplevelse av trematerialer i innemiljø'. Besides these aesthetic preferences, other aspects like the material's ease of cleaning and maintenance were also important.

⁶²⁸ Rametsteiner, Oberwimmer, and Gschwandtl, *Europeans and Wood*, 11.

⁶²⁹ Kristen Strobel, Anders Q. Nyrud, and Kristian Bysheim, 'Interior Wood Use: Linking User Perceptions to Physical Properties', *Scandinavian Journal of Forest Research* 32, no. 8 (17 November 2017): 798–806.

⁶³⁰ P. Rozin, 'The Meaning of "Natural": Process More Important Than Content', *Psychological Science* 16, no. 8 (1 August 2005): 652–58.

surface treatment of wooden products (e.g. painted panels) results in more ambiguous assessments of the naturalness of wooden materials. Another factor is whether the material is combined with other materials in a way that does not exist in nature, as in e.g. wood-plastic composites.⁶³¹

When it comes to indoor surfaces of a building, a combination of different materials, or of different expressions of wooden materiality is preferred to being completely surrounded by wood of the same kind.⁶³² People tend to dislike rooms where walls, ceiling, floor and furniture are all wooden. When combining different building materials or different wooden expressions (e.g. by mixing wood species, textures and surface treatments), a harmonious impression appears important, as do surfaces that match stylistically. Surfaces that can be experienced through both vision and touch – such as floors, handrails or furniture – were preferred as visible wooden elements.⁶³³

There is a general preference for surfaces that are perceived as homogenous⁶³⁴ and harmonious.⁶³⁵ This depends on wood species and their characteristic colour, growth ring pattern and branch growth.⁶³⁶ A greater number of knots in wooden indoor surfaces was found to relate to a higher probability of optical fatigue and resulting headache and eye strain.⁶³⁷ Studies link these aesthetic preferences for a moderate degree of complexity and their effect on bodily and emotional well-being to evolutionary conditioning with ‘either real or symbolic significance for survival’.⁶³⁸ Situations that are overly complex visually, with a large number of dissimilar elements, require too much engagement and attention in order to be understood and might distract from the detection of potential danger. Although high complexity may evoke greater levels of interest and attention, it is not necessarily preferred.⁶³⁹ Overly monotonous situations however make one lose interest

⁶³¹ Nyrud and Bringslimark, ‘Opplevelse av trematerialer i innemiljø’, 5.

⁶³² Anders Q. Nyrud et al., ‘Sammenhengen mellom byggematerialer og folks opplevelser av innemiljø. Correlation between building materials and the perception of indoor environment.’ (Oslo: Norsk Treteknisk Institutt, June 2010). It has been noted in Section 3.1 that in order to perceive a material as cold, one must acknowledge one’s body as warm. Perhaps in the same way, the experience of wood as a warm and living material is enhanced by the contrast with materials that are experienced differently.

⁶³³ Nyrud et al.

⁶³⁴ Olav Høibø and Anders Q. Nyrud, ‘Consumer Perception of Wood Surfaces: The Relationship between Stated Preferences and Visual Homogeneity’, *Journal of Wood Science* 56, no. 4 (August 2010): 276–83.

⁶³⁵ N. Olof Broman, ‘Aesthetic Properties in Knotty Wood Surfaces and Their Connection with People’s Preferences’, *Journal of Wood Science* 47, no. 3 (June 2001): 192–98.

⁶³⁶ Høibø and Nyrud, ‘Consumer Perception of Wood Surfaces’.

⁶³⁷ Mbc Aries, Mpij Aarts, and J van Hoof, ‘Daylight and Health: A Review of the Evidence and Consequences for the Built Environment’, *Lighting Research & Technology* 47, no. 1 (February 2015): 6–27.

⁶³⁸ Ulrich focusses on the visual judgement of natural environments, drawing on studies based on natural or urban scenes/elements as well as on more artificial stimuli such as art. Ulrich, ‘Aesthetic and Affective Response to Natural Environment’, 88; referring to Jay Appleton, *The Experience of Landscape*, Rev. ed (Chichester ; New York: Wiley, 1996).

⁶³⁹ Ulrich, ‘Aesthetic and Affective Response to Natural Environment’, 95–96.

and attention and thus cognitive appraisal of a situation, which again, might lead to an oversight of danger.⁶⁴⁰ Structured complexity, such as e.g. in patterns, is preferred as it is easier to overview. Examples are ‘homogeneous textures, redundant elements, groupings of elements, and properties that provide continuity among separated or dissimilar elements.’⁶⁴¹

The report from which this section departed concludes that as a material, wood can age well. Signs of use are not necessarily negative, but convey individual expression, personality, authenticity, and uniqueness.⁶⁴²

Sampled material aesthetics

The German philosopher Alexander Baumgarten coined the term ‘aesthetics’ in the mid-18th century; ‘sensory cognition’ and perceptual experience were at the centre of his appropriation of the Greek word ‘aisthesis’. Sensory cognition was thought to be an important (albeit not equally ranking) complement to logics – both formed part of Baumgarten’s philosophic theory of knowledge.⁶⁴³ Hale describes embodied perception based on bodily engagement as the foundation of ‘our often unconscious aesthetic preferences’ – before they enter consciousness and are ‘processed in intellectual terms and chopped up into concepts’.⁶⁴⁴ Aesthetic experience is thus not only pleasing to the senses, but also provides a way of understanding the world in general.

‘Material aesthetics’ does not only relate to the perception of a material’s beauty. More generally, it concerns a subjective, sensory-emotional experience of the concrete properties of a material. The perception and appreciation of these qualities is also influenced by associations with semantic aspects.

As described in the previous section, some authors mention both evolutionary explanations for ‘what is beneficial is pleasant’, and semantic aspects of aesthetic experience, such as ‘symbolic meaning, historical meaning, stylistic considerations, and emotional impact’.⁶⁴⁵ Both explanations have also been used for why a majority of people were found to prefer wooden surfaces that are neither too dark nor heavily patterned.

There has also been described a cognitive side of aesthetic experience and appreciation, related to constructive apprehension and changing with knowledge, e.g. with regard to perceiving ‘constructive beauty’. Aesthetic appreciation is also linked to how refined and

⁶⁴⁰ Ulrich, 95–97.

⁶⁴¹ Ulrich, 98.

⁶⁴² Nyrud and Bringslimark, ‘Opplevelse av trematerialer i innemiljø’, 7.

⁶⁴³ Alexander Gottlieb Baumgarten, *Aesthetica* (Vidtrum, 1750); Richard Shusterman, ‘Back to the Future - Aesthetics Today’, *The Nordic Journal of Aesthetics* 43 (2012): 104–24.

⁶⁴⁴ Hale, *Merleau-Ponty for Architects*, 5.

⁶⁴⁵ Francesca Bacci and David Melcher, eds., *Art and the Senses*, 1. publ (Oxford: Oxford University Press, 2011), 563–64.

advanced or in contrast alienating and kitschy deviations from familiar archetypes are perceived.⁶⁴⁶

The literature review in Chapter 2 touched briefly on the appeal of neutral white and on the sculptural abstraction of lined or painted surfaces. This section gathers a range of alternative views that in contrast describe enriching qualities of material – as found, as caused by working processes, or as accumulated over time. Rooted in concrete states of the material, these concepts all create a narrative and prompt associations, e.g. with the material's intrinsic concreteness, with the manual work behind them, with passing time, with life lived. The sensory perception of material qualities bridges between the material's concreteness and its semantic interpretation.

As itself or as found

According to Loos, when aiming for timeless objects of use, the renunciation of ornaments was necessary, as ornamentation could make them to go out of style even if fully functional.⁶⁴⁷ He appreciated instead finely crafted materials and the abstract decorative qualities of patterns inherent to natural materials, such as the grain of different wood species, or the veining of marble.^{648,649} Loos regarded ornament as either inauthentic imitations of past styles or as superfluous new additions. Embellishment was to be found in what already existed, not added to it. As Hill describes,

often the material is itself the ornament.⁶⁵⁰

The material aesthetics of the brutalist movement demanded that materials be displayed 'as found' and as being part of the real world, thus contributing to the magic and beauty of the ordinary.

⁶⁴⁶ Baumberger, 'Konstruktive Schönheit: Zur ästhetischen Erfahrung und Wertschätzung von Architektur'.

⁶⁴⁷ Adolf Loos, *Ornament and Crime: Selected Essays*, ed. Adolf Opel, trans. Michael Mitchell, Studies in Austrian Literature, Culture, and Thought (Riverside, California: Ariadne Press, 1998), 172. Even though Loos polemically related ornament to crime in the beginning of the 20th century and rejected ornamentation without function as well as fake materials, Loos was also criticized for contradicting his writings and using architectural elements with no load-bearing function. It is important however to understand the distinction that Loos made between ornament and decoration. Christopher Long, 'The Origins and Context of Adolf Loos's "Ornament and Crime"', *Journal of the Society of Architectural Historians* 68, no. 2 (1 June 2009): 200–223; Panayotis Tournikiotis, *Adolf Loos*, 1st ed (New York, New York: Princeton Architectural Press, 1994), 49.

⁶⁴⁸ Tournikiotis, *Adolf Loos*, 56–58.

⁶⁴⁹ His adherence to craft production typical of the 19th century may be attributable to his family background as well as to Viennese customs of the time; in contrast to Germany, handicraft still prevailed there. Long describes the traditional crafts as being destroyed by the 'swift advance of mass production' in Germany. Indeed, the industrial production of ornaments downgrading the status of craftsmanship formed part of Loos' critique. Long, 'The Origins and Context of Adolf Loos's "Ornament and Crime"', 211.

⁶⁵⁰ Jonathan Hill, *Immaterial Architecture* (New York: Routledge, 2006), 177.

While Loos adhered to craft production, Alison and Peter Smithson cherished the materiality of simple and anonymous buildings ‘not in the craft sense but in intellectual appraisal [as] (...) a poetry without rhetoric’.⁶⁵¹

Traces of workmanship

Other sources see the working and treating of materials as rendering the material’s beauty visible and vivid in the first place, and as adding new qualities to those inherent to the material.

Henry van de Velde values traces of workmanship; according to van de Velde, a material’s beauty only becomes perceivable through the traces of artistic processing, as only then is dead matter brought to life and thus capable of engaging the viewer’s senses:

No material is beautiful as such (...) Wood, metal, stones and precious stones owe their peculiar beauty to the life imprinted in them by workmanship, tool traces, the different ways in which the passion or sensibility of the worker are manifested.⁶⁵²

Similarly, the architect and engineer Hans Schwippert – a contemporary of the Smithsons – writes that one loves to see the traces of tools and working processes on materials that allow for an understanding of how a work has come to be. Referring to the theory of material change, he describes how materials used to dictate their processing, for example related to the limits of how much one could bend wood. To Schwippert, new materials and new processing methods however changed the restrictions imposed by a material and eliminated the once appreciated traces of processing and craftsmanship.⁶⁵³

The appreciation of traces of new ways to process wooden materials may however also evolve together with the technical development. In the kindergarten of the student housing project Moholt, the CNC machines’ end mill radius is discernible in the windows’ rounded corner; not covered by added gypsum layers, the corner detail narrates the circumstances of its becoming.

Continually renewed, or ageing gracefully

The appeal of the new and pristine has been described as characteristic to modern architecture.

⁶⁵¹ Alison Smithson and Peter Smithson, *Without Rhetoric: An Architectural Aesthetic, 1955-1972* (Cambridge, Massachusetts: MIT Press, 1974), 6; as quoted in Moravánszky, *Metamorphism*, 40.

⁶⁵² Henry van de Velde, ‘Die Belebung des Stoffes als Prinzip der Schönheit’, in *Essays* (Leipzig: Insel-Verlag, 1910), 13. Translation by the author.

⁶⁵³ Schwippert illustrates this with the permanent deformation and curving of wood with the help of ultrasound as a new technology. Rübél, Wagner, and Wolff, *Materialästhetik*, 84–87; originally in Hans Schwippert, ‘Mensch und Technik’, in *Darmstädter Gespräch. Mensch und Technik. Erzeugnis – Form – Gebrauch*, ed. Hans Schwippert, vol. 3, Darmstädter Gespräch (Darmstadt: Neue Darmstädter Verlagsanstalt, 1952), 83–85.

The architecture of the modern era aspires to evoke an air of ageless youth and of a perpetual present.⁶⁵⁴

The transformation of materials by events outside the architect's control – through weathering, use and time – modify the initial immaculacy of a recently finished architectural work, which some perceive as a threat. Pallasmaa is referring to Leatherbarrow when he writes:

The inevitable processes of ageing, weathering and wear are not usually considered as conscious and positive elements in design; the architectural artefact exists in a timeless space, an artificial condition separated from the reality of time.⁶⁵⁵

To Harries, the aesthetic preference for the new requires fighting against signs of age,

[providing] defenses against the terror of time. (...) The language of beauty is the language of a timeless reality.⁶⁵⁶

According to Brand, buildings decay quickly if not properly maintained or even when standing empty.⁶⁵⁷ He deems North American buildings 'impressive to the eye, flimsy to the touch, and incapable of aging well.'⁶⁵⁸

Leatherbarrow is also sceptical when it comes to buildings living their potential lifetime:

Once begun, the process of destruction can be retarded through periodic maintenance, but never abated. While they generally outlive their designers, buildings do not last forever.⁶⁵⁹

Mostafavi and Leatherbarrow describe the ritual of renewal, e.g. when repainting a wall, as something that is also morally elevating. They refer to Le Corbusier who sees a reinstallment of purity in the repeated whitewashing of walls. To him, this regular whitening serves to clean and renew both the built environment and the mind, 'mediating thus moral and objective values'.⁶⁶⁰

In a book chapter dedicated to 'The Romance of Maintenance' however, Brand writes about less positive connotations of maintenance, and people's ambiguous feelings about the decay of buildings, the fading of the efforts of workmanship, and their attempts to impede it:

⁶⁵⁴ Pallasmaa, 'Hapticity and Time: Notes on Fragile Architecture'.

⁶⁵⁵ Pallasmaa.

⁶⁵⁶ Karsten Harries, 'Building and the Terror of Time', *Perspecta* 19 (1982): 59,63.

⁶⁵⁷ In the form of rain or groundwater, water threatens even 'low-maintenance or well-maintained buildings'. Vapour is still more dangerous. Stewart Brand, 'The Romance of Maintenance', in *How Buildings Learn: What Happens after They're Built* (New York, New York: Penguin Books, 1995), 114ff.

⁶⁵⁸ Brand, *How Buildings Learn*, 113.

⁶⁵⁹ Leatherbarrow, 'Roughness', 111.

⁶⁶⁰ Le Corbusier, *The Decorative Art of Today*, 1st MIT Press ed (Cambridge, Mass: MIT Press, 1987), 188ff.; Mohsen Mostafavi and David Leatherbarrow, *On Weathering: The Life of Buildings in Time* (Cambridge, Massachusetts: MIT Press, 1993), 76.

No wonder people get in a permanent state of denial about the need for building maintenance. It is all about negativity, never about rewards. Doing it is a pain. Not doing it can be catastrophic. A constant draining expense, it never makes money. You could say it does save money in the long run, but even that is negative because you never see the saving in any accountable way. (...) When (...) you finally do the work (...) you have nothing new and positive, just a negated negative. (...) Yet the issue is core and absolute: no maintenance, no building. (...) Every building is potentially immortal, but very few last half the life of a human.⁶⁶¹

Brand mentions two standard methods of preventing dilapidation and the reasons why they are rarely practiced: Preventive maintenance – ‘routinely servicing materials and systems in the building *before* they fail’ – is dismissed as ‘boring’; and solid construction – ‘designing and constructing the building in such a way that it does not need a lot of maintenance’ – is objectionable for being expensive.

The treatment of wood creates the need for continuous maintenance due to dimensional changes when adapting to temperature and humidity. Karin Tschavгова thus points out the resistance to any surface treatment as intrinsic (‘immanent’) to wood.⁶⁶² The degree of this resistance depends on the wood type.⁶⁶³ It results in the need to laboriously renew chemical wood protection periodically – be it by covering, coating, or impregnation. An alternative is to leave the wood untreated (which requires a conscious choice of tree species and part of the stem in order to make the material last). If the material is installed properly and with constructive protection against water, the changes to the material are optical and do not affect structural integrity.

Leatherbarrow even sees these changes as making visible what constitutes the structure’s more permanent parts,⁶⁶⁴ and thereby ‘individuating’ architecture:

The destruction of a work’s finishes (...) [shows] what strengthens [the building’s surfaces] makeup. (...) Facing south, the timber wall is bleached white; to the north, the moisture sheltered in its shadows deepens its colours. Certainly, these changes give voice to the building’s orientation, but they also show its capacities, strengths possessed by it alone, local capacities of resistance. Here again, we see that roughness individuates works; it shows the building’s resolve to stand against the flows of the environment, and this resolve endows it with particularity.⁶⁶⁵

⁶⁶¹ Brand, ‘The Romance of Maintenance’, 110–11.

⁶⁶² Tschavгова, ‘Holzaltern – was für ein Thema’.

⁶⁶³ Sell, Wigger, and Fischer, ‘Oberflächenschutz von Holzfassaden’, 22 ff.

⁶⁶⁴ ‘This happens when the material (whether natural or artificial) used in making a certain structure grows beautiful with the passing of time, and also when a structure is well and truly built from the beginning. In which case, even when it falls into ruin... it allows its initial complete form to appear through its deterioration or mutilation.’ Aris Konstantinidis, *Elements For Self-Knowledge. Towards A True Architecture. Photographs, Drawings, Notes*, trans. Kay Cicellis (Athens: American School of Classical Studies, 1975), 301–2; as cited in Leatherbarrow, ‘Roughness’, 113.

⁶⁶⁵ Leatherbarrow, ‘Roughness’, 115.

Symbolic value emerges when the efforts to maintain a building fail or cease to be effective: Signs of wear and tear can attain a positive connotation and even upgrade a building by individualizing it and adding a narrative dimension. This would mean

a shift of focus, from preserving the look of the new to understanding the ways that a work could remain significant, even graceful, as it aged.⁶⁶⁶

Weathering has however also an approximating effect on wooden façades. Wood does not always weather evenly. Weathered façades reveal a building's orientation towards the main wind directions – north and south – and reveal how well its detailing and execution are adapted to the building's ambient conditions. While these traces make a building distinct and particular, weathering also optically equalizes different wood types. Surface appearances change in such a similar way that distinguishing the wood types is difficult after several years.⁶⁶⁷

Richness and sedimentation

Leatherbarrow adds two perspectives on ageing to the ones mentioned by Brand. In addition to solid construction and continuous renewal and maintenance,⁶⁶⁸ the 'sedimentation' of accumulated traces of use that testify to a social function is a way of chronicling past events and behaviours, of letting the past be present thereafter.

The materials of a building invite modes of behavior and environmental influence that, as they recur over time, are registered onto the building's surfaces in the form of traces constituting the memory of those events. This makes each surface something of a clock, calendar, and chronicle.⁶⁶⁹

Distinguishing [sedimentation] from the time of renewal, one could say this is not a now as then, but a now plus then.⁶⁷⁰

Over time and through use, meaningful qualities are continuously added to a building's surfaces and furnish materials with qualities that they did not initially possess. The conditions that make these qualities come forth are important and beautiful.

Patina is both a physical deposit and a narrative composed through the use and misuse of setting⁶⁷¹

writes Leatherbarrow. And, quoting Zumthor:

⁶⁶⁶ Leatherbarrow, 111.

⁶⁶⁷ Sell, Wigger, and Fischer, 'Oberflächenschutz von Holzfassaden', 22 ff.

⁶⁶⁸ Renewal: 'this process was without end, that renewal was a task that lasted as long as the building did.' Leatherbarrow, 'Roughness', 112.

⁶⁶⁹ Leatherbarrow, 'Materials Matter', 92.

⁶⁷⁰ 'Distinguishing [sedimentation] from the time of renewal, one could say this is not a now as then, but a now plus then.' Leatherbarrow, 'Roughness', 113.

⁶⁷¹ Leatherbarrow, 'Materials Matter', 81.

“[The] innumerable small scratches on surfaces, of varnish that has grown dull and brittle, and of edges polished by use”⁶⁷² bear witness to the lives lived within specific settings.⁶⁷³

They document the amount of time that has passed and the ways a building or building parts have been used and maintained. The passing of time is understood by the visual changes of materials, but also by the narratives these traces evoke, by the life sequences one imagines having taken place there. This inscription charges the materials with new meaning and not only goes beyond what the material has been, but also what the architect can predict, prevent or predefine. Leatherbarrow thus sees materials not only as chronicles of past events, but also as hints of possible futures.⁶⁷⁴

The present neither sediments, renews, nor recalls earlier times, but reaches toward those yet to come.⁶⁷⁵

Zumthor refers to ‘a specific richness’⁶⁷⁶ (beyond formal expressiveness) that is mainly accumulated in a building’s materials over time.⁶⁷⁷ Leatherbarrow points out that in order to accrue this richness, architecture must first accept a state of ‘receptivity (...) [and tolerate] additions to its finished surfaces’⁶⁷⁸ beyond the design and construction efforts made before a building is taken into use. This requires to recognize a ‘preoccupancy poverty’⁶⁷⁹ in new building materials that turns the established [Western] value system upside down.

Architecture can be eloquent if the designer first recognizes the preliminary poverty (thus also the potential) of unfinished materials – not their (natural) richness.⁶⁸⁰

Acknowledging the importance of ‘other, nontechnical or nonprofessional, agencies of enrichment and articulation’ could motivate a redefinition of the architect’s role and self-conception. Buildings are not finished when the construction workers leave the building site but are gradually and continuously completed by the user. Leatherbarrow’s understanding – and conscious integration – of materiality and experience goes beyond the design and construction phase:

⁶⁷² Peter Zumthor, ‘A Way of Looking at Things’, in *Thinking Architecture*, 2nd, expanded edition. ed. (Basel; Boston: Birkhäuser, 2006), 24,26.

⁶⁷³ Leatherbarrow, ‘Materials Matter’, 81–82.

⁶⁷⁴ [The] vectors of architectural time do not only point toward the past; each trace also prompts or invites subsequent events. The chronology that is particular to urban architecture allows its heritage to be renewed through acts of appropriation that obey no obligation to the past other than its use for purpose of redefinition. In the built world, past, present, and future (...) overlap in the present. Leatherbarrow, 92–93.

⁶⁷⁵ Leatherbarrow, ‘Roughness’, 113.

⁶⁷⁶ Zumthor, ‘A Way of Looking at Things’, 24.

⁶⁷⁷ Leatherbarrow, ‘Materials Matter’, 78.

⁶⁷⁸ Leatherbarrow, 78.

⁶⁷⁹ Leatherbarrow, 78.

⁶⁸⁰ Leatherbarrow, 81.

Both sedimentation and saturation accomplish their results in the building's open and extended history. Construction does not end the process of articulation; it is its beginning.⁶⁸¹

This contradicts the common habit to publish images of architectural works that are taken before inhabitants or companies move in and that are devoid of objects and people, as if they will be spoiled by inhabitants' furniture and personal effects, traces of use or weathering and decay.

To Pallasmaa, these traces are part of an additional dimension that 'immaterial abstractness and timelessness' omits. Rather than considering timelessness a quality, Pallasmaa deplores modernist architecture with its flat and abstract surfaces for having become 'mute' matter.⁶⁸² Wood however is one of the materials that, according to Pallasmaa, 'speak pleurably of time'.⁶⁸³

Leatherbarrow suggests the contemporary relevance of human and environmental abrasive forces combined that inscribe passing time into a building's material, register the traces of lived lives, habits and practices, and reveal the building's situatedness in a geographical and cultural context.⁶⁸⁴ They

particularize a project and give voice to ways of living and patterns of the environment.⁶⁸⁵

Leatherbarrow sees both additive and subtractive forces at work.⁶⁸⁶ Traces of use and weathering can have both a roughening and a softening effect.⁶⁸⁷ Leatherbarrow describes the abrasive power of wind, rain and sunlight as reinstalling a roughness in building materials that had been present prior to their machining and refinement.

Over time, which is to say through use, the unevenness of the entry step becomes apparent once again; also, the door frame's abrasiveness, the shutter's graininess, and the wall's cracks. Roughness returns because it had only been covered over.⁶⁸⁸

⁶⁸¹ Leatherbarrow, 92.

⁶⁸² Abstraction and perfection transport us into the world of ideas, whereas matter, weathering and decay strengthen the experience of time, causality and reality. Pallasmaa, 'Hapticity and Time: Notes on Fragile Architecture'.

⁶⁸³ Wood speaks of its two existences and time scales; its first life as a growing tree and the second as a human artefact made by the caring hand of a carpenter or cabinet maker. Pallasmaa.

⁶⁸⁴ While it may seem sensible to distinguish two agencies at work in the process of sedimentation whereby architecture accrues and extends history – human and environmental forces – only their compound effects give it its proper voice. Leatherbarrow, 'Materials Matter', 92–93.

⁶⁸⁵ David Leatherbarrow, *Architecture Oriented Otherwise*, 1st edition (New York: Princeton Architectural Press, 2008), 116.

⁶⁸⁶ 'Although wear and tear results in subtraction, they also allow for a significant sort of addition.

(...) Time does not pass in architecture, it accumulates.' Leatherbarrow, 'Materials Matter', 82.

⁶⁸⁷ Both the smooth and the rough were appreciated in the 18th century, as Leatherbarrow describes; the former was considered an attribute of beauty, and the latter an indicator for the sublime. He traces this understanding back to Plato, followed by Burke (1757) and Price (1794). Leatherbarrow, 'Roughness', 97–98.

⁶⁸⁸ Leatherbarrow, 115.

At the same time, repeated touch and continuous use smoothen once sharp and articulated forms. Surfaces that come into contact with the human body, that are touched or stepped upon, become softer. This is a different kind of softness however than that of recently completed or renewed finishes.

Just as edges are smoothed by the foot and hand, they are softened by the forces of the environment. This softening cannot be avoided.⁶⁸⁹

It may go beyond what can be intended, rationalized, planned and controlled by the architect. 'Materials [become] more than they were', and experiences go further than what can be planned.⁶⁹⁰ According to Leatherbarrow, the effects of roughness often are 'unplanned, even unthought'.⁶⁹¹ In many cases, they might all the more be unwanted, and maybe neglected. If implemented consciously into design however – permitted or provoked, roughness defined as traces of use and weathering also possesses design potential, inviting the embracing of qualities that change over time and with wear and tear. The interpretation of patina, use, ageing and weathering of materials can also have implications for industrialized prefabrication: As David Leatherbarrow and Moshe Mostafavi argue, even anonymous mass-produced elements can obtain individuality.⁶⁹²

The ambiguity of architectural elements, the possibility to read them in contrary ways, may be seen as a quality in itself, as it passes the notion of beauty on to what conditions their interpretation:

The beautifying, not the beautified, is really the beautiful.⁶⁹³

Atmosphere and poetic qualities

While Zumthor and his thermal baths are referred to in a considerable number of texts on phenomenology, according to Zumthor himself, his architectural interest is in 'atmospheres'.⁶⁹⁴ To Zumthor, an architectural atmosphere that evokes emotion is synonymous with architectural quality.⁶⁹⁵ For architecture to move him, it must remain open, vague, multi-faceted, undetermined, and allow for different interpretations.⁶⁹⁶ When it is too expressive and overloaded with the architect's concepts and intentions however – when it becomes too 'chatty',⁶⁹⁷ – it loses its enigmatic qualities. According to

⁶⁸⁹ Leatherbarrow, 115.

⁶⁹⁰ Leatherbarrow, 'Materials Matter', 91.

⁶⁹¹ Leatherbarrow, *Architecture Oriented Otherwise*, 116.

⁶⁹² Mostafavi and Leatherbarrow, *On Weathering*; David Leatherbarrow and Mohsen Mostafavi, *Surface Architecture* (Cambridge, Massachusetts: MIT Press, 2002).

⁶⁹³ '(...) concern for a material's quality (...) is less important than interest in the conditions under which that quality becomes apparent.' Leatherbarrow, 'Roughness', 110.

⁶⁹⁴ Zumthor, *Atmospheres*.

⁶⁹⁵ Zumthor, 11.

⁶⁹⁶ Peter Zumthor, Maureen Oberli-Turner, and Catherine Schelbert, *Thinking Architecture*, 2nd, expanded edition ed. (Basel; Boston: Birkhäuser, 2006), 30.

⁶⁹⁷ As coined by Leatherbarrow, *Architecture Oriented Otherwise*, 78–80.

David Chipperfield, ‘the superfluous narrative of so much contemporary architecture’⁶⁹⁸ is dismissed in Zumthor’s thermal baths; the semiotics, the ‘language’ of architecture,⁶⁹⁹ and its ‘forgotten symbolism’⁷⁰⁰ are replaced by bodily perception. Leatherbarrow acknowledges that rather than being ‘excessively communicative’, Zumthor’s architecture has an ‘expressive materiality’.⁷⁰¹

Although prompted by a corporeal, haptic encounter with concrete materiality, atmospheric experience evades clear definition or even description.

When we look at (...) buildings that seem to be at peace within themselves, (...) [it] is as if we could see something on which we cannot focus our consciousness.⁷⁰²

Zumthor describes this experience as something ‘mystical’, ‘magic’ and ‘secret’.⁷⁰³ Wegerhoff emphasizes the material’s role in the creation of atmosphere:

This mysticism somehow seems to emanate from the material and it is (...) to a large extent identical with what other authors come to call ‘atmosphere’.⁷⁰⁴

According to Zumthor, architectural materials can reveal their ‘own inherent sensuous qualities’ and ‘specific meanings’ if installed correctly; they can ‘shine and vibrate’ and obtain ‘a poetic quality’.⁷⁰⁵ However, ‘materials as such are not poetic’, but a formal and semantic context has to be created within the object itself, as ‘[there] are no ideas except in things’.⁷⁰⁶

Zumthor dismisses architecture that is too talkative, when the architect’s focus on either traditional or fanciful forms misses out on a specific interaction with the site and with a larger contemporary context.⁷⁰⁷

Good architecture should receive the human visitor, should enable him to experience it and live in it, but it should not constantly talk at him.⁷⁰⁸

⁶⁹⁸ David Chipperfield, ‘Thermal Bath at Vals by Peter Zumthor’, *AA Files*, Autumn 1996, 72.

⁶⁹⁹ Charles Jencks, *The Language of Post-Modern Architecture* (Rizzoli, 1977).

⁷⁰⁰ Venturi, Scott Brown, and Izenour, *Learning from Las Vegas*.

⁷⁰¹ Leatherbarrow, ‘Materials Matter’, 80.

⁷⁰² Zumthor, Oberli-Turner, and Schelbert, *Thinking Architecture*, 17.

⁷⁰³ Manfred Sack and Peter Zumthor, *Drei Konzepte: Peter Zumthor; Thermalbad Vals, Kunsthaus Bregenz, ‘Topographie des Terrors’ Berlin; [Katalog der Ausstellung Architekturgalerie Luzern, 28. September bis 2. November 1997]*, ed. Hannele Grönlund and Architekturgalerie Luzern (Basel: Birkhäuser, 1997); Zumthor, *Atmospheres*, 19,23,25.

⁷⁰⁴ Wegerhoff, ‘Neue Sinnlichkeit: Postcritical Issues Regarding an Architecture of Sensuousness’. Wegerhoff suggested ‘New Sensuousness’ as an alternative to the term ‘atmosphere’.

⁷⁰⁵ Zumthor, Oberli-Turner, and Schelbert, *Thinking Architecture*, 10.

⁷⁰⁶ Zumthor, Oberli-Turner, and Schelbert, 37.

⁷⁰⁷ ‘It seems to be part of the essence of its place, and at the same time it speaks of the world as a whole. When an architectural design draws solely from tradition and only repeats the dictates of its site, I sense a lack of a genuine concern with the world and the emanations of contemporary life. If a work of architecture speaks only of contemporary trends and sophisticated visions without triggering vibrations in its place, this work is not anchored in its site, and I miss the specific gravity of the ground it stands on.’ Zumthor, Oberli-Turner, and Schelbert, 42.

⁷⁰⁸ Zumthor, Oberli-Turner, and Schelbert, 33.

However,

in a society that celebrates the inessential, architecture can put up a resistance, counteract the waste of forms and meanings, and speak its own language.⁷⁰⁹

In order to let a materials' expressive quality come forth, the excessive communicativeness of the setting otherwise has to be reduced, as Leatherbarrow reasons. A '[reduction] of style to the utmost' by limitation of materials, simplified expression and elimination of everything non-essential, as Tadao Ando aims for,⁷¹⁰ requires however comprehensive technical elaborateness. It has been mentioned in the previous chapter that what seems reduced to the essential in Zumthor's baths requires in reality a multitude of layers and complicated transitions. Furthermore, installations need to act in concert with the atmospheric intentions, as a cold air draught or a buzzing sound would inspire rather annoyance than awe.

Loveability

The previous sections put conclusions made in Chapter 2 into perspective and raise a number of questions.

The previous chapter's claim for 'telling materiality' that would allow inhabitants to discover and act upon their homes' affordances more easily seems to be at odds with the creation of sensation-rich atmospheres which may be drowned out by too 'chatty' architecture. Will an overly explicit communication of a material's or building part's affordances mute its poetic offerings?

Moreover, if taste and preferences differ so much among individuals and change over time as well, how should architecture position itself? Should one provide solutions that maximise neutrality and generality ('One fits all')? Or does this produce indifferent, faceless neighbourhoods that look the same everywhere, and one should on the contrary focus on specificity and identity combined with a variety of choices ('Everyone may find a fit')? Or is the continuous adaptability a viable alternative that also acknowledges the inhabitant's authority and competence with regard to space, functions and surface qualities ('Make it fit')?

All the above options are directed towards making the built environment more loveable to its inhabitants. Besides various benefits for each inhabitant and the larger community, this also aims at reducing the need for replacement (and preferably also treatment) of entire buildings or their parts before this is technically inevitable. But what answers best to the inhabitants' needs and desires?

⁷⁰⁹ Zumthor, Oberli-Turner, and Schelbert, 27.

⁷¹⁰ Francesco Dal Co and Tadao Andō, *Tadao Ando: Complete Works* (London: Phaidon Press, 1995), 458; Leatherbarrow, 'Materials Matter', 80.

Needs and desire

The current WHO definition of health comprises ‘not merely the absence of disease or infirmity’, but formulates health as ‘a state of complete physical, mental and social well-being’.⁷¹¹ Pérez-Gómez’ demand for an architecture that is ‘Built Upon Love’ leans on the conviction that questions of ethics and aesthetics in architecture can impact the well-being of humanity positively. Even facing large and complex societal and environmental problems, he sees this take on architecture as making an important contribution otherwise uncaptured by global planning, written and unwritten codes and norms, or computer-aided form generation. To his mind, neither logical, rational, abstract and conceptual approaches nor fashionable, affordable or sustainable architecture suffice to remedy an aesthetic, sensory and emotional deficiency he describes in contemporary building design.⁷¹² Instead, he explores how complex human desire and other bonds of affection relate to architecture.

On the search for what makes architecture connect better to our dreams, Pérez-Gómez describes desire as the insatiable attraction to an otherness that might fill a perceived void within us, and the unsteady and changeable nature of our longings towards ‘a fuller wholeness’.⁷¹³

In his ‘Theory of Human Motivation’, Abraham H. Maslow states:

Man is a perpetually wanting animal.⁷¹⁴

Among what Maslow defines as basic needs, he later differs between ‘deficiency needs’ that can be gratified (motivation decreases as physiological, safety, love and esteem needs are met) and ‘growth needs’ that are not a lack of something, but the desire to grow as a person (motivation rather increases as needs are met). Besides a longing for self-fulfilment (‘to become everything that one is capable of becoming’) and self-transcendence, the growth needs also include the ‘desires to know and understand’ and the appreciation and search for beauty and balance.⁷¹⁵

But Pérez-Gómez’ demand for desire entails some problems in its own. Desire as the longing for something that can never be fully satisfied or only temporarily so constantly craves for more. As Pérez-Gómez acknowledges himself, this can be met by blind consumerism, claiming the right to ‘the greatest pleasure and least pain’ at all times.

Our technological building practices, even when mindful of ecological responsibility or claiming high artistic aspirations, still pursue a functionalist utopia in which all desires are

⁷¹¹ ‘Constitution of the World Health Organization’ (WHO, October 2006), www.who.int/governance/eb/who_constitution_en.pdf.

⁷¹² Pérez-Gómez, *Built upon Love*, 28; Alberto Pérez-Gómez, ‘Built upon Love: Towards Beauty and Justice in Architecture’, *Mosaic* 44, no. 3 (September 2011): 43–59.

⁷¹³ Pérez-Gómez, *Built upon Love*, 29.

⁷¹⁴ Abraham H Maslow, ‘A Theory of Human Motivation’, *Psychological Review* 50, no. 4 (1943): 395.

⁷¹⁵ Maslow, 382, 384; A. H. Maslow, *Motivation And Personality* (Harper & Row, 1981), 2.

fulfilled through material means, eliminating all irritants and always aiming at greater economy and comfort (...). Consumption and possession prevail as the bastard aims of desire.⁷¹⁶

This materialist reaction is certainly not what Pérez-Gómez is after. He rather suggests desire as a driving force, a perpetuated source of inspiration that cannot be satisfied by consumption as it comes from within oneself. As for the architect, this inspiration cannot be put into operation through methodical procedure but relies on playful process-based approaches that do not control the outcome by means of logical prediction.⁷¹⁷ As for the inhabitant, it is less clear what kind of architecture accommodates this wanted side of desire best.

Neither ‘mute materiality’ nor ‘chatty materiality’ crystallized as favourable for being either too indifferent or too constraining. ‘Expressive materiality’ with toned-down technical detailing to enhance atmospheric experience and ‘telling materiality’ with an easily graspable tectonic readability to enhance the realization of affordances seem to require to be carefully negotiated. Pérez-Gómez recurrently speaks of eloquence, which might provide another view on this predicament.

Eloquence

Pérez-Gómez maintains that

true architecture (...) responds to a desire for an eloquent place to dwell, one that lovingly provides a sense of order resonant with our dreams, a gift contributing to our self-understanding as humans inhabiting a mortal world.⁷¹⁸

By dictionary definition, eloquence stands for being ‘fluent or persuasive in speaking or writing’, ‘clearly expressing or indicating something’.⁷¹⁹

Pérez-Gómez frames eloquence not as ‘an ideal exactness’, but as ‘evident to the embodied, synaesthetic consciousness of an observer or inhabitant’,⁷²⁰ capable to ‘convince and engage our hearts’.⁷²¹ The poetic artifact does not do so by conveying ‘more or less univocal meanings’, but instead ‘may be polysemic and yet often [inviting] silence, in the most eloquent way’.⁷²² This introduces poetic architecture as something

⁷¹⁶ Pérez-Gómez, *Built upon Love*, 4–5.

⁷¹⁷ Pérez-Gómez, 29.

⁷¹⁸ Pérez-Gómez, 4.

⁷¹⁹ ‘Eloquent’, Lexico Dictionaries | English, accessed 20 February 2021, <https://www.lexico.com/en/definition/eloquent>.

⁷²⁰ Referring to ‘optical correction’ as promoted by Vitruvius, e.g. the adjustment of distances or proportions of columns so that they appear regular and harmonic from the observer’s perspective. Pérez-Gómez, *Built upon Love*, 152.

⁷²¹ This would be fostered by harmonic relationships of parts as may be observed in nature; with reference to Étienne-Louis Boullée and Charles-François Viel; Pérez-Gómez, 176.

⁷²² Pérez-Gómez, 98.

that is not only aesthetically or atmospherically pleasing, but that is defined by social participation, becoming ‘both eloquent and truly intersubjective’.⁷²³

The WHO definition of health mentioned above as a state of complete well-being, formulated in 1948, was ground-breaking at that time for its broad ambition. It has been challenged by Machteld Huber et al. in 2011, proposing to rather emphasize ‘the ability to adapt and self manage in the face of social, physical, and emotional challenges’.⁷²⁴ The constataion of illness or ascertainment of quality of life is also consigned to people’s perception of these, which will be greatly influenced by the possibilities to adjust oneself, and presumably also with options to influence one’s surroundings.

An engagement of the heart based on intersubjectivity might furthermore be more suitable to influence people’s behaviour towards more sustainable choices than either purely aesthetic efforts to create loveability or perpetual apocalyptic messages.

Affect

Karsten Harries raises the question of whether aesthetics and art can make any substantial contribution at all to more pressing (environmental) concerns, or if they merely provide pleasant experiences or illusions.⁷²⁵

Statistics and surveys show that increasingly threatening headlines about the consequences of global warming or ethical commandments are insufficient.⁷²⁶ Neither environmental technologies, nor – as Harries writes – ‘cold reason’ will change hearts; what is needed is an experience of ‘what transcends the reach of such reason’.⁷²⁷

Per Espen Stoknes sees emotions, habits and knowledge, and the sense of belonging to a social group as an important part of people’s attitudes.

Our climate attitudes are doubly embedded, both in an internal matrix (affect, behaviour, and cognition) and in an external network (social relations).⁷²⁸

This points at an ‘engagement of the heart’ through emotions, feelings and mood, which may be addressed through a concept used both in psychology and philosophy. As one of modern psychology’s three main divisions, affect complements behaviour (or conation)

⁷²³ Pérez-Gómez, 186.

⁷²⁴ Machteld Huber et al., ‘How Should We Define Health?’, *BMJ (Clinical Research Ed.)* 343 (26 July 2011): d4163.

⁷²⁵ He asks why, in spite of vast amounts of available information, ‘if the problems that face us are indeed so evident, do our responses remain so half-hearted?’ Harries, ‘What Need Is There for an Environmental Aesthetics?’, 7.

⁷²⁶ Per Espen Stoknes, *What We Think about When We Try Not to Think about Global Warming: Toward a New Psychology of Climate Action* (White River Junction, Vermont: Chelsea Green Publishing, 2015).

⁷²⁷ Harries, ‘What Need Is There for an Environmental Aesthetics?’, 7, 21.

⁷²⁸ Stoknes, *What We Think about When We Try Not to Think about Global Warming*, 69.

and cognition.⁷²⁹ Ulrich describes affect as an immediate, pre-cognitive response to an environment⁷³⁰ that is innate and cross-cultural,⁷³¹ and ‘adaptive to evolutionary survival requirements’.⁷³² In contrast to this instinctive emotional reaction, its cognitive implications are also learned and can thus be trained; they are thus situated in a cultural context.⁷³³

Intersubjectivity

As Harries suggests, the design of houses must be based on lived experiences and participation in communal encounters. Otherwise, one is merely able to design ‘aesthetic constructions of a houselike character’, failing to grasp their essence.⁷³⁴ Pérez-Gómez also highlights the importance of authentic experience in order to understand its meaning.

The meaning of architecture, like that of a poem, is reenacted by the participant. It is surely different to “visit” a building as a modern tourist than to experience it through ritual, or to live and work in it. The building may be relatively permanent, yet at least a portion of its meaning is impermanent.⁷³⁵

Even though every architect also has dwelling experience, these views elevate the inhabitant to an expert of dwelling, of residential architecture. Meaning is (partially) open to interpretation according to each expert inhabitant, and the inhabitant’s options to act upon this interpretation should inform design decisions. Harries downplays however what the architect can effect.

Above all, we should not expect too much from architects: whether what they build turns out to be a real house (...) will depend on how their work is appropriated. This they cannot control. All they can hope is to furnish a suitable framework. To do so they must of course

⁷²⁹ Joseph P Forgas and Craig A Smith, ‘Affect and Emotion’, in *The Sage Handbook of Social Psychology*, ed. Michael A Hogg and Joel M Cooper (SAGE, 2003), 161.

⁷³⁰ Ulrich describes initial affective responses such as dislike or interest as ‘emerging with minimal cognition and before recognition or identification has occurred.’ Ulrich, ‘Aesthetic and Affective Response to Natural Environment’, 97.

⁷³¹ Ulrich, 87.

⁷³² Ulrich, 88.

⁷³³ ‘Whereas affects are universal, the cognitive accompaniments of a given emotion can vary greatly with factors such as age, experience, and culture; therefore, the quality and complexity of conscious experience change throughout an individual’s life as affects become associated with cognition, or as affective-cognitive structures are formed.’ Ulrich, 87. As Kaplan argues, cognition might even become a source of affect. Jack L. Nasar, ed., *Environmental Aesthetics: Theory, Research, and Applications*, 1. paperback ed (Cambridge: Cambridge University Press, 1992), 59. Repeated exposure may also influence affect positively. This might provide an explanation for learned aesthetic preferences and preferences due to customary usage and tradition. Robert F. Bornstein, ‘Exposure and Affect: Overview and Meta-Analysis of Research, 1968–1987’, *Psychological Bulletin* 106, no. 2 (September 1989): 265–89; Robert B. Zajonc, ‘Attitudinal Effects of Mere Exposure.’, *Journal of Personality and Social Psychology* 9, no. 2, Pt.2 (1968): 1–27.

⁷³⁴ Karsten Harries, *The Ethical Function of Architecture* (Cambridge, Massachusetts: MIT Press, 1997), 363.

⁷³⁵ Pérez-Gómez, *Built upon Love*, 67.

attempt to anticipate such appropriation, help shape it, but they cannot and should not try to dictate what form dwelling will take.⁷³⁶

Pérez-Gómez in contrast sees a shared but tacit cultural framework as coming forth through both architectural creation and an involvement of the general public and the individual inhabitant as 'true' participants.

Yet *ethical* projects depend for their significance on public participation. For the architect, this implies the *engagement* of a tacit common ground, a physical and cultural context, which in our times of globalization is often indistinct and made visible only by the act of creation itself.⁷³⁷

Built upon love, architecture engages the inhabitant as true *participant*, unlike the remote spectator (...) or the consumer of (...) images.⁷³⁸

True and actual participation should not only be envisaged as effects on the perception of architecture, but be considered as mutually beneficial in all conceptualization, design and planning stages, and involve communication between architect and inhabitant beyond these stages as well. As the interviews have shown, the architect's ambition and dedication does not need to be at odds with the inhabitant's perception and appreciation.

⁷³⁶ Harries, *The Ethical Function of Architecture*, 363.

⁷³⁷ Pérez-Gómez, 196.

⁷³⁸ Pérez-Gómez, 5.

3.2 Architects

Beauty and atmosphere

All interviewees emphasized different aspects when discussing how they perceive wood.

For Kaufmann, the primary motivation for using the material is its beauty. Besides this emotional affection, he also named the more rational justification of versatility of timber products. He claimed that beyond a desire to display the material with which the office designs, there is no general dogma dictating how and where to expose it. Other aspects, such as environmental- or health-related benefits, are used as supporting arguments rather than being primary goals in themselves.

This is actually my main motivation. I perceive timber as a beautiful building material that offers diverse options for architecture. This is something that has always fascinated me, and what really drives me the most. Of course, there's the entire sustainability debate and everything that comes with it. It is also quite logical and obvious to build with this material that modernism has forgotten in a land that is full of timber. But the main motivation is simply this incredibly interesting and beautiful and exciting building material (...) We could talk about the surface or its haptics or what do I know, but it is just a gorgeous building material that fascinates me. And that's why I will stick with it and will continue to work with timber all my life.⁷³⁹

Experiencing the beauty of wooden materials involves all senses as well as the mind, as Kropf describes.

It is not just an intellectually beautiful material, (...) just seeing it activates the other senses as well.⁷⁴⁰

Several architects described wood as a warm material,⁷⁴¹ either as part of the physical sensation⁷⁴² or as part of its atmospheric qualities.⁷⁴³ For Untertrifaller,

it is incredibly atmospheric, warm.⁷⁴⁴

He expressed doubt though that all users perceive and appreciate these atmospheric traits.

It alarms me that many simply seem to be completely unresponsive. They actually manage to create an atmosphere inside a timber building that makes you feel cold.⁷⁴⁵

⁷³⁹ Kaufmann, Transcription AA1, 1–2.

⁷⁴⁰ Kropf, Transcription AN1, 5.

⁷⁴¹ Kropf, 1; Untertrifaller, Transcription AA2.

⁷⁴² Kropf, Transcription AN1, 1.

⁷⁴³ Untertrifaller, Transcription AA2, 2.

⁷⁴⁴ Untertrifaller, 8.

⁷⁴⁵ Untertrifaller, 14.

Other architects consciously promote the technical advantages of industrialized wood construction to avoid being categorised as ‘tree-huggers’ and being relegated to a health and well-being or even esoteric corner.

Kaden was exasperated by the cosiness associated with wooden materials, which he felt was reminiscent of cabins or saunas; he sought to explore different stylistic expressions in the urban context in which most of Kaden + Lager's work takes place. For him, the beauty lies in the constructive features of wood, not in the perception of its materiality.

This is the topic at many events where I hold presentations: how cosy and comfy and warm timber is. I can't stand it any longer, to be honest. Of course, for a ski lodge, no question about it; it is no accident that this material has been used there. But when talking about urban buildings... if the [construction parts] have a beautiful surface that you can leave exposed, that's OK, but that's also sort of the end of the line for us. First of all, it's a wonderful construction. Beautiful structure. Wonderful building physics.⁷⁴⁶

Lager also strove to avoid ‘Finnish sauna hut’ aesthetics. He expressed appreciation of exposed timber structures for making the building's structure readable and sensitizing inhabitants and society to architecture, feeling that this could stimulate the appreciation of good craftsmanship – when the structure is concealed, workmanship is not considered a matter of importance.⁷⁴⁷

The beauty of a material is seen as related to how well the materials have been worked and to the quality of craftsmanship. Although Kaden + Lager do not aim to showcase timber in the façades and inner surfaces of their urban buildings, they often leave the wooden slab underside visible and appreciate the visual effect when looking into the windows from outside.

Well-being and all of the senses

In the interviews, Kropf particularly emphasized the sensory experience of architecture and its materiality, maintaining that wood addresses intellectual and intuitive parts of the human brain and the entire body equally. He emphasized that architecture should possess other qualities beyond visual appeal, and its tactile and sensuous properties should activate all senses. In order to make these experiences accessible, Helen & Hard prefer to showcase the materiality of the construction and leave it exposed.

Kropf includes health and well-being in his overall argumentation in favour of timber, as well as a multi-sensory experience of architecture that also affects the emotions and behaviour. Helen & Hard, he said, aims to make constructive systems that create architectural spaces with high experiential value, generating an energizing and uplifting

⁷⁴⁶ Kaden, Transcription AD2, 7.

⁷⁴⁷ Lager, Transcription AD1.

feeling of well-being. He sees timber as highly relevant in the described context, for '[connecting] one with nature'. He stated:

Because timber is a material that we know, that our bodies know. And it is not just an intellectually beautiful material, but it is also something, as I believe, that creates well-being in timber houses. Because you can smell it then, and because you can touch it, and because it is a warm material. And because, just by seeing it, it activates the other senses as well. (...) It addresses the oldest or the most primeval parts in our brain, or [better] in our system not only in the brain, but in our entire body. It has to do with orientation and behaviour. (...) When you enter a room, you know how to move. How your body relates to the room. These are really primeval things that animals have as well. (...) How you move and feel and if you want to stay in these rooms, [if you] get calm.⁷⁴⁸

This brings to mind the previously described assumptions on which both biophilic design principles and the notion of aesthetic preferences are based: elements of nature provoke emotional and behavioural reactions with evolutionary roots in the human brain.

Some of the interviewed architects seemed to take research about the stress-reducing effect of being exposed to natural elements and about the potential health benefits of being exposed to timber with a pinch of salt however, rather than embracing it for evidence-based design choices.

The smaller studies about the positive health effects of indoor wooden materials mentioned earlier are often cited when timber suppliers or developers specialized in wood construction are promoting the advantages of building with timber. These studies were also mentioned in the architect interviews, but mostly by architects who work occasionally – but not exclusively – with timber.⁷⁴⁹ Dünser, an architect with many years of varied experience with timber was more reluctant to rely on them.

It's about more than just creating a healthy environment that somehow can be statistically proven. In essence, it is about creating spaces that are pleasant to inhabit, however they are shaped or designed. And usually, as we have experienced it, rooms with healthier materials (...) are generally experienced as more pleasant. I personally like exposed concrete. But I wouldn't want to live surrounded by it. (...) well that's the problem. You cannot [build with timber] just for one reason, but a whole lot of reasons are involved.⁷⁵⁰

As he stated, most of the clients by whom they are contacted are already determined to build with wood, and the office is chosen for its reputation in timber architecture. Perhaps firms that need to convince clients to choose wooden materials are also more prone to refer to small-scale studies with more illustrative than representative significance.

⁷⁴⁸ Kropf, Transcription AN1, 5.

⁷⁴⁹ Zohar, Transcription AN2.

⁷⁵⁰ Dünser, Transcription AA3, 3.

According to Zohar, many of the characteristics of wooden materials are perceived subconsciously:

You have so many different things unfolded in one material. Some of them, we notice, [for example,] the surface, but some of them, we don't notice but they still affect us. Like heat regulation, like humidity regulation.⁷⁵¹

Zohar expressed that comfort when it comes to humidity, heat regulation or ventilation should not depend on HVAC systems,⁷⁵² but rather take advantage of the building material's passive capacity:

Today (...) you can have a mattress that tells you how you slept tonight. Is that so smart? (...) It's much smarter to have timber which does it without noticing because this is at the molecular level. This is in the nature of things. This is smart.⁷⁵³

In one project, they tried to avoid balanced ventilation to improve the living environment for people with allergies, asthma or other disorders; the air enters naturally without passing through a duct first.

Zohar also spoke about Haugen / Zohar's wish to take advantage of timber's properties and how they suggested overcoming challenges. Wood has the capacity to absorb humidity in bathrooms and slowly release it again. Heat is also emitted during this process, and this should remain in the bathroom to be considered in the energy calculations; it would thus be necessary to avoid ventilation in the bathroom, but as the toilet was located in the bathroom, there were issues of odour control. He recounted with a half laugh that the office had suggested installing a switch that would produce a spark to eliminate unpleasant odours, but the client had rejected the idea.⁷⁵⁴ Ventilation was installed in the built solution.

Lager criticized profit-oriented developers who want to build as cheaply as possible and disregard the toxicity of different materials, and their combined effects.⁷⁵⁵

Dünser spoke about the choice of nailed timber elements for one project. He said that health aspects supported this choice, but that the main reason was the office's interest in a decentralisation of the supply of timber products.⁷⁵⁶ (See also Chapter 4.)

⁷⁵¹ Zohar, Transcription AN2, 3.

⁷⁵² HVAC: heating, ventilation and air conditioning

⁷⁵³ Zohar, Transcription AN2, 3. Retrospective clarification by the architect: 'The smartness is about understanding the material properties at a molecular level and using them to your benefit in your design.'

⁷⁵⁴ Zohar, Transcription AN2, 5.

⁷⁵⁵ Lager, Transcription AD1, 9.

⁷⁵⁶ Dünser, Transcription AA3.

Associations with nature

Architects addressed the fact that wood is a natural material in two ways. On the one hand, they focused on it being a renewable resource and thus as an environmental contribution, and on what this local resource means for keeping local identity, community, economy and knowledge alive. On the other hand, for some, the material speaks to a larger anthroposophical context of which both trees and humans are part, and that becomes experienceable through whole body sensations and instinctive reactions. None of the architects however went so far as to link this feeling of being part of a larger natural entity to a spiritual consideration of materials as suggested by propagators of 'new materialism'. For some architects, even the association with warmth or cosiness went too far.

As mentioned above, Kropf saw a symbolic connection with nature in the use of wooden materials through its appeals to all of the senses, also on an intuitive, subconscious level.⁷⁵⁷

Otherwise, the architects saw wood as an obviously favourable renewable resource with many benefits due to its inherent properties (e.g. hygroscopicity) rather than emphasizing other associations with nature or life.

Timelessness

Timeless qualities are seen as important. While it is not necessarily possible to pin them down in detail, they are expected to be respected in the distant future as well, and not only according to current paradigms.⁷⁵⁸

Another approach when thinking beyond the present is to see buildings as unfinished when construction is completed, and to design them to tolerate changes.⁷⁵⁹ Timber as a material accommodates these changes more easily than other materials.

In addition to constructive or spatial flexibility and adaptability,⁷⁶⁰ simplicity in details along with the use of few materials ('one material doing many things')⁷⁶¹ contributes to robustness with respect to changing users, and thus to a building's longevity. Timber is seen as a robust material that allows for constructive changes, and thus as sustainable.

⁷⁵⁷ Kropf, Transcription AN1.

⁷⁵⁸ Zohar, Transcription AN2, 1.

⁷⁵⁹ Zohar, 13.

⁷⁶⁰ Kaufmann, Transcription AA1, 22.

⁷⁶¹ Zohar, Transcription AN2, 16.

Action

Kropf described an instinctive choice of action or behaviour as a response to architecture's materiality, and people's movements, duration of stay, or choice to touch surfaces as influenced by an emotional reaction to materiality.

None of the interviewed architects addressed other practical and everyday activities or chores, but several architects expressed interest in how the users' well-being is affected by their buildings and material choice.⁷⁶² Kaufmann was interested in whether timber as a material changes anything for the inhabitants and whether they notice differences in their health or well-being; he suspected that people's sensibility on the matter varies greatly.⁷⁶³

Assumptions about user preferences

While many of the architects interviewed expressed a preference for exposed timber surfaces for various reasons – e.g. the material's beauty, or because uncovered surfaces can mediate the building's construction system or the materials' origin – decisions about whether it should be exposed, and to which degree and where, are made based on a number of other aspects as well. Some are mentioned in Chapter 2, e.g. concerning the building's safety and soundness, and in Chapter 4, e.g. situating the building in a specific geographic or cultural context. The architects often decide to cover or paint the surfaces in many projects, either for practical reasons (especially in rental projects) or because they assume that the users' preferences are different.

When making assumptions about inhabitants' aesthetic preferences, architects expect that they will prefer white surfaces, such as white gypsum walls, that provide a neutral background for their furniture and other belongings. If wood is left visible indoors, the architects expect users to prefer painted or white-stained wood surfaces.

Kaufmann stated that the office wanted inhabitants to both be aware of and experience living in a timber building and to appreciate its visual and haptic qualities. He relativized the suitability of exposed timber surfaces however for rental apartments and felt that exposed ceilings were preferable to exposed walls, as the timber species might not match the inhabitant's furniture in other types of wood; anonymous and changing users in rental apartments might have different preferences and furniture. In Kaufmann's experience, developers preferred neutral surfaces for this reason, and also because they are low-maintenance and easy to repair. He later remarked however that timber surfaces can also be visually homogeneous.⁷⁶⁴

⁷⁶² Kaufmann, Transcription AA1; Lager, Transcription AD1.

⁷⁶³ Kaufmann, Transcription AA1.

⁷⁶⁴ Kaufmann.

Reminiscent of Loos' pitiful client whose tailor-made home does not allow for later modifications, Untertrifaller spoke about the room's materiality and the users' furniture:

Even here, people perceive visible timber surfaces as somewhat limiting creative potential. [The user] might have a beech cupboard or an oak table that he does not want to combine with spruce. Of course, this is different for single family houses where you design a finished scenario. But someone who wants to move in with IKEA furniture or something sees it as a limitation. That is one of the reasons why so much gets covered up with gypsum boards in multi-storey housing projects.⁷⁶⁵

Zohar reflects on changing habits and cultural norms having an effect on aesthetic preferences and perceived soundness. In the project Ulsholtveien, they left ceilings and walls exposed towards the rooms, also in bathrooms and kitchen.

The walls in the rooms are very commonly left exposed, but in bathrooms – very uncommon. (...) What's funny is that it used to be very common and if you go to cabins, everything is in timber (.), [and] very often in the bathrooms. Just somehow, you know, things just went the other direction and [exposed timber] became almost unacceptable.⁷⁶⁶

The exposed indoor surfaces of massive timber elements are treated with natural oil⁷⁶⁷ with white pigments, also in the bathrooms.⁷⁶⁸

According to Kropf, untreated weathered wood is less acceptable in Norway than in Vorarlberg. Most of the Norwegian timber buildings along the coast are painted. He considers untreated wood best for the environment and appreciates the changing appearance of timber as it yellows and weathers, but says that clients do not. In his experience, inhabitants dislike yellowing timber with distinctly visible knots and wood grain. He said that Norwegians often associate untreated wooden surfaces with cabins from the 70s, with darkened, yellowed walls with prominent knots and wood grain, and that in the office's experience, this is not something that they like.⁷⁶⁹

Their project Vindmøllebakken involved future inhabitants in the design process; they were allowed to choose the surface treatment for the walls in their apartments themselves. The outer walls however have been determined painted white by the architects, for aesthetic reasons and to relate to the surrounding timber buildings.⁷⁷⁰ Despite considering untreated wood best for the environment, Kropf did not consider the coating they use for aesthetic reasons environmentally harmful. When coating, painting, or whitening timber surfaces in their projects, Helen & Hard seek to ensure that this will not impede the timber's hygroscopic quality or the elements' reusability or recyclability.

⁷⁶⁵ Untertrifaller, Transcription AA2, 11.

⁷⁶⁶ Zohar, Transcription AN2, 5.

⁷⁶⁷ Based on plant oil (OSMO)

⁷⁶⁸ Zohar, Transcription AN2.

⁷⁶⁹ Kropf, Transcription AN1, 6.

⁷⁷⁰ Kropf, 7 Most of the surrounding timber buildings are painted white. A few are yellow or red, and some single buildings are green, grey, blue or brown.

3.3 Inhabitants

Inhabitants reflected deeply on their preferences regarding the amount, placement and treatment of exposed wooden surfaces. The way in which they talk about how they experience wooden materials in their homes – both as hidden construction and as visible surfaces – suggests the involvement of all of the senses (vision, olfaction, hearing, touch, but also sensations of temperature, air humidity and balance), and also includes imagination. Many thought of wood as a likeable,⁷⁷¹ beautiful⁷⁷² and atmospheric⁷⁷³ material with charisma,⁷⁷⁴ but not all wanted to be surrounded by it. The interviews also provided surprising insights into what influences or changes the inhabitants' preferences or focus on certain aspects of materiality.

Atmosphere and associations with nature

Many inhabitants appreciated timber as a 'natural material'.⁷⁷⁵

I always like everything that is natural. Because that cannot be bad in any case.⁷⁷⁶

Nature. That's the most important. Nature. And simply some breathability. Concrete doesn't do it for me.⁷⁷⁷

Some use the terms 'natural' and 'ecological' material as synonymous. Most of them related this to supposedly positive effects on health and well-being and associate it with not polluting the environment. Many see wood as part of a natural cycle, where the material has grown and will decompose again when it is no longer in use.⁷⁷⁸ The inhabitants' views on sustainability are described in greater detail in Section 4.3.

Several inhabitants described timber as a 'living'⁷⁷⁹ material; this was also a reason for their appreciation of it and distinguishes wood from other materials.

⁷⁷¹ sw40 - Inhabitant 3, Transcription ID4.

⁷⁷² Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b; wk65 - Inhabitant 3, Transcription ID2; sw40 - Inhabitant 1+2, Transcription ID3a+b; p1 - Inhabitant 1, Transcription ID7, 25 November 2017; c13 - Inhabitant 1, Transcription ID8, 5 December 2017.

⁷⁷³ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b.

⁷⁷⁴ wk65 - Inhabitant 3, Transcription ID2.

⁷⁷⁵ Ölbündt - Inhabitant 1, Transcription IA1; Ölbündt - Inhabitant 2, Transcription IA2; Mühlweg (A) - Inhabitant 2, Transcription IA5; Wagramer Straße (B) - Inhabitant 1, Transcription IA7; Skadbergbakken - Inhabitant 4, Transcription IN3; Vindmøllebakken - Inhabitant 1, Transcription IN5, 27 November 2017; wk65 - Inhabitant 1+2, Transcription ID1a+b; p1 - Inhabitant 1, Transcription ID7.

⁷⁷⁶ Wagramer Straße (B) - Inhabitant 1, Transcription IA7, 3.

⁷⁷⁷ Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b, 6.

⁷⁷⁸ Ölbündt - Inhabitant 2, Transcription IA2.

⁷⁷⁹ Ölbündt - Inhabitant 1, Transcription IA1; Skadbergbakken - Inhabitant 4, Transcription IN3; wk65 - Inhabitant 1+2, Transcription ID1a+b; Vindmøllebakken - Inhabitant 1, Transcription IN5.

Somehow vitality, even though the wood is dead of course. (...) And it's just aesthetic. I like wood and I like looking at it.⁷⁸⁰

It is natural, warm, somehow alive as well. And very versatile. Wood is not just wood, there is a lot of [different] wood. (...)I think it is a great material.⁷⁸¹

Timber is more living. (...) It is a natural product. It has better air exchange, better insulation. It has kind of a feel-good effect. Tell me what is positive about gypsum other than it's dead.⁷⁸²

A certain degree of porosity seems to be important to see a material as living and welcoming.

They advertise for concrete on television. I don't understand that at all. Concrete just has something cold about it, something impenetrable, it's a bit 'Eastern bloc'. I don't know... (...) [Concrete] is just an unappealing material. Also concerning the living quality. (...) We're really fond of timber as you see.⁷⁸³

When asked what they associate with timber, many answers expressed a similar appreciation of these characteristics and associations.

I find wood really, really pleasant. It's simply warm and... it really is a pleasant warmth, or how should I describe it? A warm sensation. (...) It's its visual and natural [quality].⁷⁸⁴

Cosiness and, by all means, beauty (...). I find that timber is gorgeous as a material.⁷⁸⁵

Well, cosiness, beautiful, atmospherically pleasing.⁷⁸⁶

It's sort of a design feature that radiates a certain warmth. I think I wouldn't go so far to say that it radiates a feeling of being sheltered and secure (German: 'Geborgenheit'), but has a warm shade and it's something natural of course. [It's] a natural building material that conveys well-being, that – hopefully – also concerns the indoor climate.⁷⁸⁷

This warm feeling [and cosiness]. White is cold.⁷⁸⁸

The agreeable atmosphere of wooden materials is unique to them, as an inhabitant from wk65 stated:

Timber does have a different charisma to me than brick or concrete or such. It has something to do with comfort. I simply find that timber is sensuous as well, as a material. (...) The material is just agreeable to me.⁷⁸⁹

⁷⁸⁰ c13 - Inhabitant 1, Transcription ID8, 5.

⁷⁸¹ Ölzbündt - Inhabitant 1, Transcription IA1, 16.

⁷⁸² Vindmøllebakken - Inhabitant 1, Transcription IN5, 4.

⁷⁸³ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b, 5,9.

⁷⁸⁴ Ölzbündt - Inhabitant 1, Transcription IA1, 10.

⁷⁸⁵ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b, 10.

⁷⁸⁶ Mühlweg (B) - Inhabitant 1+2, 10.

⁷⁸⁷ p1 - Inhabitant 1, Transcription ID7, 4.

⁷⁸⁸ sw40 - Inhabitant 4+5, Transcription ID5a+b, 18.

⁷⁸⁹ wk65 - Inhabitant 3, Transcription ID2, 4.

A number of conversations indicated that indoor climate and atmosphere are experienced jointly. Many interviewees associate wood with warmth.⁷⁹⁰ This warmth relates to the natural shades of wooden materials as much as to associations with feelings of safety, comfort, snugness or cosiness.⁷⁹¹ As also indicated in this chapter's literature review, these associations, but also actual sensations of the indoor climate or surface temperature inform the perception of a room's atmosphere. Warmth is reported as sensed when touching the material directly, but also as comfort related to room temperature.⁷⁹² When describing an indoor climate as warm, dry or humid, this is experienced through the skin as well as through the respiratory system. The experience of warmth however is also influenced by visual impressions and associations with these impulses. It might also relate to a physical memory of the sensation of touching a material that does not conduct warmth away from the body as much as for example steel or glass.

Comfort and perceived health

Indoor climate

Most interviewees commented on pleasant ambient temperature and air humidity when talking about indoor climate. Many emphasized the importance of air quality as well, and most perceived the indoor climate as comfortable and well-balanced.⁷⁹³ Many inhabitants experienced that the walls in their timber-built homes felt warmer than in other buildings in which they had lived previously⁷⁹⁴ or where their friends lived;⁷⁹⁵ some wondered

⁷⁹⁰ Ölbündt - Inhabitant 1, Transcription IA1; Mühlweg (A) - Inhabitant 2, Transcription IA5; Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b; sw40 - Inhabitant 4+5, Transcription ID5a+b; p1 - Inhabitant 1, Transcription ID7.

⁷⁹¹ Ölbündt - Inhabitant 1, Transcription IA1; Mühlweg (A) - Inhabitant 2, Transcription IA5; Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b; wk65 - Inhabitant 1+2, Transcription ID1a+b; sw40 - Inhabitant 4+5, Transcription ID5a+b; wk65 - Inhabitant 3, Transcription ID2; c13 - Inhabitant 1, Transcription ID8; p1 - Inhabitant 1, Transcription ID7.

⁷⁹² sw40 - Inhabitant 1+2, Transcription ID3a+b.

⁷⁹³ Ölbündt - Inhabitant 1, Transcription IA1; Mühlweg (A) - Inhabitant 1, Transcription IA3; Skadbergbakken - Inhabitant 4, Transcription IN3; wk65 - Inhabitant 1+2, Transcription ID1a+b; sw40 - Inhabitant 4+5, Transcription ID5a+b; sw40 - Inhabitant 6, Transcription ID6, 25 November 2017.

⁷⁹⁴ An inhabitant from Mühlweg (A) with visible wooden materials on the floor and ceiling claimed that timber houses provide a warmer feeling and ambience compared with the feeling in a building made of reinforced concrete. Mühlweg (A) - Inhabitant 1, Transcription IA3, 5; wk65 - Inhabitant 1+2, Transcription ID1a+b.

⁷⁹⁵ An interviewee from Skadbergbakken stated that living in her house was very comfortable compared to the cold, damp old houses her friends had bought. Skadbergbakken - Inhabitant 4, Transcription IN3.

whether this might also be due to better insulation,⁷⁹⁶ the heating system⁷⁹⁷ or the ventilation system.⁷⁹⁸

One interviewee from Ölbündt described the walls with (non-exposed) wooden construction as warm in winter as well, while the concrete wall separating the flats from an office was always cool; this could be pleasant in summer.⁷⁹⁹ An inhabitant of Mühlweg (A) expressed liking the window shutters and found that they worked very well for darkening the rooms and keeping them cool. He talked about a temperature difference of 10°C between inside and outside,⁸⁰⁰ while another inhabitant from the same project complained that the indoor and outdoor temperatures differed by only one degree Celsius in their apartment; she reported that her flat was very hot in the summer. She said repeatedly that otherwise, it was ‘really, really pleasant to live’ in her apartment.⁸⁰¹ As the two apartments were located in different buildings, variations in sun exposure might be an explanation, as well as individual temperature range comfort.

Almost all inhabitants reported a balanced humidity level, although they did not all have exposed wooden surfaces in their homes. Furthermore, in two apartments where the bathroom’s wooden ceilings are not covered up, the indoor climate was experienced as balanced with no mould or mildew growth, even though the bathrooms had fixed glazing, and in one case the door was usually kept closed and the automatic ventilation switched off.⁸⁰²

A few inhabitants however reported that they experienced their dwellings as either too humid or too dry. They speculated about whether this was due to the materials with which the timber construction was covered or sealed, because of one concrete wall, or related to the space’s geometry, where one part was located below ground level.

At Lobaugasse, the wooden ceilings were exposed, and the walls covered in plaster. The inhabitant suspected that the moisture barrier was the reason she experienced the indoor climate as poor.

This is a wood frame construction with a moisture barrier. There’s a plastic bag inside. And that doesn’t really make a good indoor climate. One has the feeling that it doesn’t breathe. It’s humid. Now for example my laundry doesn’t dry. It doesn’t dry fully. The walls are damp as well.⁸⁰³

⁷⁹⁶ wk65 - Inhabitant 1+2, Transcription ID1a+b; sw40 - Inhabitant 4+5, Transcription ID5a+b; sw40 - Inhabitant 6, Transcription ID6.

⁷⁹⁷ sw40 - Inhabitant 4+5, Transcription ID5a+b; sw40 - Inhabitant 6, Transcription ID6.

⁷⁹⁸ sw40 - Inhabitant 1+2, Transcription ID3a+b.

⁷⁹⁹ Ölbündt - Inhabitant 1, Transcription IA1.

⁸⁰⁰ Mühlweg (A) - Inhabitant 2, Transcription IA5.

⁸⁰¹ Mühlweg (A) - Inhabitant 1, Transcription IA3, 5,10.

⁸⁰² Mühlweg (A) - Inhabitant 1, Transcription IA3; Mühlweg (A) - Inhabitant 2, Transcription IA5.

⁸⁰³ Lobaugasse - Inhabitant 1, Transcription IA4, 5.

The living room in her house is recessed into the ground.⁸⁰⁴ The inhabitant remarked that while this looks good, she did not like it because the lower level was always cooler. She felt that both indoor climate and atmosphere (which she referred to as ‘energy’) could be improved if she changed the laminate floor to an oak parquet, like one of her neighbours had.

Well, [the house] has benefitted incredibly. Optically, but also energetically.⁸⁰⁵

Some interviewees commented on the good air quality; this might be equally related to the dwelling’s ventilation concept, or its location (e.g. in a less dense urban area with more green areas).⁸⁰⁶

A couple living at sw40 spoke fondly about the indoor climate in a reference project and in their own apartment. They related it to natural building materials and to the possibility to ventilate naturally.

I’m kind of an airy person, I always worry about [living] hermetically. These plastic houses where you can’t open any windows drive me nuts.⁸⁰⁷

He stated that it is very pleasant inside their apartment, always warm and never stuffy. The windows have adjustable ventilation slots. Especially when coming home after being away, they noticed that the apartment smells a bit like wood. They had never experienced dryness in their respiratory systems there, and visitors often remarked on the agreeable indoor climate. He stated:

I didn’t really know very much about timber, but nevertheless the feeling with timber was that it is a natural material and it’s simply beautiful. I also prefer wearing non-synthetic clothing.⁸⁰⁸

For a couple from Spöttlgasse, it was important to avoid an airtight construction. They had previously owned different detached houses with timber constructions where they had put focus on the buildings

[being] built ecologically, I mean to a large degree ecologically. This means without any plastic foil, vapor barrier, synthetic plaster.⁸⁰⁹

Only one interviewee experienced his apartment as difficult to ventilate and speculated that it might be due to the good insulation, or because a wall that was added later impeded ventilation. He reported needing to ventilate for about 15 minutes each

⁸⁰⁴ Viennese building regulations for allotments (German: ‘Kleingartensiedlung’) stipulate that the house on the property can only be 5m high; for this reason, the height of the regular rooms was only 2.20m and the living room lowered in order to increase its height.

⁸⁰⁵ Lobaugasse - Inhabitant 1, Transcription IA4, 7.

⁸⁰⁶ Mühlweg (A) - Inhabitant 1, Transcription IA3.

⁸⁰⁷ sw40 - Inhabitant 1+2, Transcription ID3a+b, 5.

⁸⁰⁸ sw40 - Inhabitant 1+2, 8.

⁸⁰⁹ Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b, 2.

morning and evening to prevent condensation from forming on the large window with fixed glazing in one corner of the apartment.⁸¹⁰

For many, an agreeable smell was part of the positive experience of their apartment's indoor climate. One family who had been attracted to the project sw40 for its timber construction had moved into several new buildings throughout their lives and always noticed that

it smelled of concrete and building materials afterwards. (...) Everything stinks of cement. (...) If you enter a new building today, there's a really unpleasant smell of newly built house.

In contrast, in their current apartment,

it didn't smell like that at all. There was a pleasant air and atmosphere in here right away. - And there still is. - It's a great indoor climate.⁸¹¹

Perceived health

Many of the aspects of well-being and health reported by the interviewees were related to a balanced indoor climate as described in the previous section. Direct consequences on the inhabitants' health primarily concerned respiratory complaints (e.g. sore throats or head colds).

An inhabitant of an apartment at sw40 with wood only on the floor experienced the air quality as beneficial to her family's health.

For me, it is always about being able to breathe well; it also has something to do with health, or with feeling well in this regard. I feel like we have had very few respiratory issues since we've been living here. Much fewer than before. (...) Of course, the kids were younger then and [brought things] from kindergarten. (...) But [my partner had frequent head colds before]. I had a sore throat much more often ... There are other factors as well for sure. You can go completely overboard with this idea. Who knows. But the good indoor climate here is definitely related to the light and the wood; somehow it is good for the health in some way. I believe this at least.⁸¹²

Two couples from Mühlweg (B) and Spöttlgasse consciously chose Swiss stone pine in their bedrooms⁸¹³ for its supposedly beneficial effects on sleep quality and against insects.

It's really so incredible, the effect [of Swiss stone pine wood] on health, and for the sleep quality as well... - And it smells good. (...) If you stick your nose into the wardrobe, it still

⁸¹⁰ c13 - Inhabitant 1, Transcription ID8.

⁸¹¹ sw40 - Inhabitant 4+5, Transcription ID5a+b, 15 (together with Inhabitant 6; all three talking).

⁸¹² sw40 - Inhabitant 1+2, Transcription ID3a+b, 8.

⁸¹³ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b, 9; Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b.

smells. (...) And it is not just foolish talk, it also has a scientifically documented effect against moths.⁸¹⁴

However, not all of the interviewees related their improved health to their building's materials or to the degree of wood exposure.

Although an interviewee from Mühlweg (A) considered the air quality much better than in her previous homes, she would not claim to feel better or have become healthier from living in a timber building.⁸¹⁵

The senses and the mind

Sensing and knowing

The precise material composition of a synthetic flooring material is often unspecified, and one may be sceptical about its health impact whilst still believing that wood is good, healthy and honest. As observed in the interviews, sometimes this trust goes as far that inhabitants perceive a superior indoor climate despite not being directly exposed to the material. This perception however – if not due to a placebo effect – might also be attributable to other additional design aspects such as e.g. ventilation.

Several inhabitants reflected on ways in which a hidden timber construction makes a difference for them and whether knowledge of the (invisible) wooden construction changes their experience of the indoor climate. In some dwellings, all wooden elements are covered with gypsum, and inhabitants reported nonetheless that they experienced the indoor climate as superior to that in previous homes with different construction materials. Others wondered whether they would notice the difference between wooden and mineral constructions if they were concealed and they were unaware of them.

Asked about whether there was any way in which she perceived the covered timber construction in her dwelling, an inhabitant from wk65 said that knowing about the inner composition of the construction might have a positive influence on her perception of it.

I think that's really difficult to answer. Because here, I now know that there is timber. If I entered buildings where I didn't know what was inside the walls at all, I don't know if I would feel it, honestly. But as it is now, I know it, and I have also seen it [during construction], how it looks and so on... then it can be that, as one knows about it, one senses: 'Oh, how beautiful this is'.⁸¹⁶

Knowing the construction material also made a difference to a couple from Mühlweg (B):

⁸¹⁴ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b, 9.

⁸¹⁵ Mühlweg (A) - Inhabitant 1, Transcription IA3.

⁸¹⁶ wk65 - Inhabitant 3, Transcription ID2, 3–4.

I wouldn't dare to say that I can sense it – enter a house somewhere and say: this is a timber building. Well, the awareness [of it being timber] is important for us. It feels good.⁸¹⁷

An inhabitant from sw40 however relativized the wooden part:

But then one has to be careful [calling it a] timber building – of course there is a timber frame construction inside and they have used a lot of wood. But in the end, it also contains a lot of composite material.⁸¹⁸

All of the senses

As expressed by several inhabitants above, the olfactory sense is involved in the experience of the overall indoor air quality. It is also referred to as part of the experience of characteristics of specific wood types that are supposed to be beneficial to health (e.g. Swiss stone pine).

An elderly interviewee reported liking the smell of the wooden ceiling in her apartment.⁸¹⁹ A couple remarked that they could still smell the wood after a year.⁸²⁰ Others say that they do not smell the timber itself, but that their apartment has a pleasant smell.⁸²¹

Not all interviewees experienced the construction as smelling different however. Although her house had exposed timber ceilings, one interviewee said that she did not take particular notice of the presence of wood:

Well I think that I don't really notice the timber. (...) A client of mine lives in a natural solid wood house and she rhapsodises about it: It's so great, and the smell and so on. Well, I don't feel that. I don't have that sensation.⁸²²

Others report that the feeling of wood is experienced through the hands, and sometimes even enjoyed with the entire body, e.g. when lying down on the floor:

This worktop... I always like putting my hands on it. I always notice [the difference] when I'm in other kitchens. It is so beautiful. (...) It is only oiled. You have to be really careful to not put just anything on it. Sometimes we curse it. (...) [But] it just feels incredibly nice. I also like to just lie on the [wooden] floor, because I really like it haptically.⁸²³

Several interviewees had hands-on experience with woodworking; they felt especially connected to wood as they also work with it in art projects or to make furniture.⁸²⁴

⁸¹⁷ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b, 6.

⁸¹⁸ sw40 - Inhabitant 3, Transcription ID4, 7.

⁸¹⁹ Breitenfurter Straße - Inhabitant 1, Transcription IA8, 12 October 2017, 2.

⁸²⁰ Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b.

⁸²¹ sw40 - Inhabitant 4+5, Transcription ID5a+b; sw40 - Inhabitant 6, Transcription ID6.

⁸²² Lobaugasse - Inhabitant 1, Transcription IA4, 6–7.

⁸²³ sw40 - Inhabitant 1+2, Transcription ID3a+b, 7.

⁸²⁴ sw40 - Inhabitant 3, Transcription ID4, 5; Ölzbündt - Inhabitant 1, Transcription IA1, 13.



Figure 3.1 Wood where hand and feet touch in sw40.

I think it is very beautiful, I like timber. It fits me very well. I also like to make [wooden] furniture myself. I came in and I felt comfortable at once. I knew, yes, this is where I would like to live. At first sight. (...) And it's just aesthetic. I like wood and I like looking at it.⁸²⁵

Together with haptic sensations, even taste might be part of a toddler's pleasure when putting wooden toys into his mouth.

My son also really likes wood. (...) He really likes to touch materials.⁸²⁶

The sense of sight is involved in impressions that are judged as aesthetically pleasant or unfavourable. Aesthetic preferences will be described in a section below. One elderly inhabitant from Breitenfurter Straße commented that her eyes are sensitive to bright colours and that she thus likes the relaxing effect of her ceiling's toned-down hue of untreated timber (Figure 3.2). Hence, the eyes work as transmitters of information to the brain, but they also convey direct physical sensations.⁸²⁷

Interviewees also mentioned how wooden materials affected walking barefoot, making it either easier or less comfortable. Wooden floors do not become as hot as e.g. metal in the sunlight. One inhabitant would have preferred wooden materials on the access balcony, as the metal there deforms in the summer, making loud noises as it warps. It also became too hot to walk barefoot on.⁸²⁸ On the other hand, weathered wood in particular might splinter and injure bare feet.⁸²⁹

⁸²⁵ c13 - Inhabitant 1, Transcription ID8, 5.

⁸²⁶ Ölbündt - Inhabitant 1, Transcription IA1, 16.

⁸²⁷ Breitenfurter Straße - Inhabitant 1, Transcription IA8, 2.

⁸²⁸ Ölbündt - Inhabitant 1, Transcription IA1.

⁸²⁹ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b.)



Figure 3.2 a) Wooden ceiling at Breitenfurter Straße, relaxing to the eyes. Photo: Bruno Klomfar
 b) Wooden ceiling at c13, calming to the mind. Photo: Bernd Borchardt

Others described a calming or restorative effect on body and mind. One inhabitant from c13 noted a direct emotional and physical reaction when exposed to visible timber surfaces (Figure 3.2 b):

Tranquillity, tranquillisation. It makes me calm to look at wood.⁸³⁰

Sound

The sense of hearing has also been mentioned in Chapter 2 in relation to technical requirements for sound insulation that sometimes are in conflict with aesthetically motivated reasons to expose wooden constructions. This section focuses more on how hearing their neighbours is perceived by the interviewees. The subsequent section on ‘worrying vitality’ also mentions perturbing sounds from or within the wooden construction itself.⁸³¹

Multi-apartment buildings regulate social interaction in order to eliminate that which can create conflict and to foster what can be beneficial about living in close proximity to others. The interviewees commented on the degree to which they heard their neighbours indoors, but also outdoors, and reflected on what was disturbing and what they in fact enjoyed hearing from their neighbours. This perception differed significantly according to how the community between neighbours was experienced, and with the visibility of the noise source. The type of sound is also important for its experience as disturbing or bearable.

⁸³⁰ c13 - Inhabitant 1, Transcription ID8, 5.

⁸³¹ One inhabitant from Ölbündt complained however about the sound from the metal access balcony – especially in summer, when warm temperatures caused audible warping of the metal flooring plates. Ölbündt - Inhabitant 1, Transcription IA1.

One of the inhabitants from c13 reported hearing some low impact noise from his neighbours, but was not disturbed by the kids practising musical instruments. He sometimes asked his neighbours to oil the swing they have mounted in the ceiling.

That's no problem at all.⁸³²

A couple living at Spöttlgasse reported that they rarely hear their neighbours; in the event that they do feel disturbed by their neighbours, they can easily communicate it.⁸³³

A group of inhabitants of the co-housing project Vindmøllebakken agreed to being interviewed some time after the initial interviews when Vindmøllebakken had not been completed yet.⁸³⁴ While the sound insulation between apartments and towards the common areas is experienced as adequate, it is less satisfactory with regard to impact noise from the apartments above. The interviewees focused however much more on the social benefits of their community than on these technical drawbacks. It seems that both experiencing a community as positive and taking pride in one's home renders other problems less impairing.

When it comes to noise, outdoor areas can present a challenge. They are not related to the buildings' construction material, but as the interviewees' statements illustrate how non-technical factors influence whether noise is experienced as disturbing, they are included here.

Buildings whose outdoor spaces are interwoven with enclosed spaces and have few noise-breaking elements were experienced as too loud.⁸³⁵ It appears that hearing neighbours without seeing them is particularly unpleasant, both due to the contradiction of a view that suggests silence being interrupted by indeterminate source of noise, and also because it represents a covert entry into one's private sphere.⁸³⁶ One involuntarily overhears private conversations and also needs to worry about one's own privacy. The inhabitant

⁸³² c13 - Inhabitant 1, Transcription ID8, 8.

⁸³³ Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b, 5.

⁸³⁴ 3 inhabitants from Vindmøllebakken, 'Digital Visit' Vindmøllebakken as part of the studio course 'Housing Individuals', group meeting on Zoom together with 17 students (replacing a planned study trip due to Covid-19 related restrictions), 7 October 2020.

⁸³⁵ One inhabitant of c13 found the building design with its many courtyards and outdoor interspaces visually appealing, but noted acoustic challenges. The many hard surfaces are not interrupted by any plants or awnings, and he reported feeling disturbed by the other functions in the house or by being able to overhear his neighbours conversing on their balcony. c13 - Inhabitant 1, Transcription ID8.

⁸³⁶ The small houses at Lobaugasse each have their own plot. One of its inhabitants said that she hears her neighbours frequently, especially when they talk in the garden. Her garden has a visually shielded corner, but she still hears every word her neighbours say there. She was not bothered by the small children's noise, but she found the adults talking disturbing and reported that she could even hear them when her windows were closed; she suspected that her house was not as well insulated as regular houses. This is indeed possible, as there are special conditions for fixed residences on allotments ('Kleingartensiedlung' in German) in Vienna. Lobaugasse - Inhabitant 1, Transcription IA4, 11.

experiences a disturbance, but the social benefits of being part of a community are absent.

The indoor acoustics are not always experienced as well-balanced. The interviewees reported experiencing excessive reverberation in rooms with extra height or large open spaces in particular. Others talked about sounds being softer than when reflected from hard surfaces. The acoustics in high-ceilinged rooms with predominantly uninterrupted, plain and straight surfaces need to be considered more carefully. Arguably, this concerns many construction and surface materials.

An inhabitant of Skadbergbakken where the wooden walls and ceilings are exposed reported that she was unhappy with the acoustics in her house and said that there are too many hard surfaces;⁸³⁷ a couple from the same project commented that there is too much reverberation when they have guests, especially in an open space in their apartment with double room height.⁸³⁸ The inhabitant of a flat at sw40 with gypsum walls and ceilings also experienced the acoustics there as poorly balanced. He suspected that this had to do with the many hard and even surfaces; in classical old buildings, there is stucco on the ceilings breaking the sound. In addition, the apartment in sw40 has a more open room arrangement extending over two floors.

It echoes. It clangs. (...) I perceive every sound as much louder than it was before. When something falls down, it sounds equally loud everywhere.⁸³⁹

An interviewee involved in the Vindmøllebakken project however said:

Timber is sound, and it's not such a hard sound, it's a soft sound.⁸⁴⁰

Worrying vitality

Only few of the interviewees related cracks, sounds and colour changes to timber as a living material. Most of them were either concerned about what this meant for the building in terms of soundness and durability, or about the material being too inviting to other living creatures.

One inhabitant stated that she did not notice any visible cracks in the exposed wooden ceiling, but that she could hear the timber 'working', with cracking sounds, day and night. She found it somewhat uncomfortable and spooky, as it made her wonder whether there was something creeping around in the construction. She was afraid that vermin (e.g. mice or rats) might find a way into the construction.⁸⁴¹

⁸³⁷ Skadbergbakken - Inhabitant 4, Transcription IN3.

⁸³⁸ Skadbergbakken - Inhabitant 2+3, Transcription IN2a+b.

⁸³⁹ sw40 - Inhabitant 3, Transcription ID4, 9.

⁸⁴⁰ Vindmøllebakken - Inhabitant 1, Transcription IN5, 4 This was before moving in and based on his experience with other timber buildings and cabins.

⁸⁴¹ Lobaugasse - Inhabitant 1, Transcription IA4.

Another inhabitant wondered whether wooden constructions were vulnerable to woodworms or other bugs. He mentioned that there had been a lot of wasps the previous summer and guessed that they thrived in the small gaps of the wooden façade.⁸⁴²

Others did not relate the cracking to wood being a living material, but rather to poor maintenance or improper handling during construction. One inhabitant was displeased with the cracks in the interior surfaces, which were probably caused by improper treatment of the building materials during the construction phase, e.g. by leaving the timber elements in the rain prior to mounting. The cracks appeared in the solid walls shortly after they had moved in. The interviewee had filled in most of the cracks by the time of the interview and felt that the walls now looked fine. However, he did not accept 'natural' as an excuse for handling the material wrong.

There are a lot of cracks (...) Some people would argue [in line] with the builders, they'd say: Oh, that's just natural. It's a living material. Initially, there was a lot of cracking after we moved in. For the first six months it was like gunshots. (...) And part of the reason for that is that when you're building with this solid timber it should be kept very, very dry. In other words, when it's dry you need to keep it out of the rain. And to save money, the builders and developers just ignored that. They just treated it like... So, the result is that when it dries out as soon as you've moved in, it's going to dry out too quickly and start cracking.⁸⁴³

Aesthetic preferences

Preferences differed among inhabitants: some would rather have wood exposed indoors than a wooden façade, and others preferred it just the other way around. Some did not consider visual changes problematic or even appreciated them as individualizing buildings. Others viewed changes over time, such as those resulting from the exposure to sunlight, rain and wind, as damaging and associated them with decay and neglect.

Location and amount

Imagining being overwhelmed by too much exposed wood indoors, one inhabitant of project wk65 however liked the wooden façade cladding.

Well I mean in this project it didn't come up, but generally, timber façades appeal greatly to me. I really like that a lot, but not at all inside.⁸⁴⁴

⁸⁴² Mühlweg (A) - Inhabitant 2, Transcription IA5.

⁸⁴³ Skadbergbakken - Inhabitant 1, Transcription IN1, 6.

⁸⁴⁴ wk65 - Inhabitant 3, Transcription ID2, 13.

Some would even appreciate visible timber on all surfaces of their home for the material's beauty and for positive associations with it.⁸⁴⁵

Well, we liked the design, we really liked the wood both inside – that's a solid interior wood – and the Kebony outside, so we're really happy with those points.^{846,847}

In contrast to these inhabitants, most of the interviewees would prefer timber on only some surfaces and in combination with other materials.⁸⁴⁸ Preferences varied with regard to the amount of timber surfaces, their location, and their treatment.

An inhabitant of c13 expressed fondness for his apartment's materiality with its combination of exposed wooden ceilings and plastered walls, saying that he would also like more exposed and preferably untreated wooden ceilings or walls, but not on all surrounding walls.

That would be kind of a block house feeling. I would have to think about that. Maybe it would also depend on the kind of timber it is, how it is treated, how it turns out to be.⁸⁴⁹

One of the German interviewees liked wood, but preferred it in controlled doses.

[Wood] is simply aesthetically beautiful, if it – as we prefer it – is varied with other materials.⁸⁵⁰

He considered variations in the materiality interesting, such as the combination of concrete or screed with timber. The family was ultimately not able to choose loam rendering for the walls, but wanted to combine the gypsum walls with concrete floors and wooden ceilings.

A number of interviewees chose or generally preferred exposed wood on ceilings rather than on wall surfaces.

A couple from Skadbergbakken was not fond of wooden materials on all indoor surfaces and saw this as outdated, but was happy with their wooden ceiling in a room with extra height and an unusual geometry.

⁸⁴⁵ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b (The couple had divided opinions.); Wagramer Straße (B) - Inhabitant 1, Transcription IA7; sw40 - Inhabitant 4+5, Transcription ID5a+b (The couple had divided opinions.); Skadbergbakken - Inhabitant 1, Transcription IN1.

⁸⁴⁶ Skadbergbakken - Inhabitant 1, Transcription IN1, 3.

⁸⁴⁷ Kebony is a wood product impregnated with a bio-based liquid with the help of heat, pressure and vacuum, permanently modifying its cell structure in order to make it last longer without requiring maintenance.

⁸⁴⁸ Ölbündt - Inhabitant 1, Transcription IA1; Ölbündt - Inhabitant 2, Transcription IA2; Mühlweg (A) - Inhabitant 2, Transcription IA5; Skadbergbakken - Inhabitant 2+3, Transcription IN2a+b; sw40 - Inhabitant 4+5, Transcription ID5a+b (The couple had divided opinions.); p1 - Inhabitant 1, Transcription ID7; c13 - Inhabitant 1, Transcription ID8.

⁸⁴⁹ c13 - Inhabitant 1, Transcription ID8, 12.

⁸⁵⁰ p1 - Inhabitant 1, Transcription ID7, 4–5.

We don't like this cabin pine very much. [It's] cabin style. If you get a house and [there is pine all over] it's a little... (...) We wouldn't have bought it if there had been [exposed] pine walls.⁸⁵¹

When buying a house or a cabin you can look at [the website] Finn.no. If there's a lot of pine and wood you scroll by quickly. This is not interesting now, no. It was so popular back in the 1970s and '80s, but it can get to be too much. If you have timber on the wall and timber on the ceiling and panels all over – no, we're over that panel thing. Here [in this place] it isn't so dominant, but there is wood anyway.⁸⁵²

The ceiling here, that's OK, but I couldn't have both ceiling and walls like this.⁸⁵³

An interviewee from Mühlweg (A) who had recently moved to Vienna from a more rural area was happy to finally find a place where he felt more connected to nature. However, he was somewhat sceptical about a dark [= wooden] ceiling before moving in; especially because a former tenant had moved out because he felt the ceiling was pressing down on him. His own experiences in nature made him rather want something darker on the ground and lighter hues upwards in a room, like it would be outside in nature.

So, I was sceptical, if it would feel like pressing down. Because when you enter for the first time it is odd, that's true. But I really got used to it very quickly. It doesn't bother me. I find it really beautiful. The only thing I have thought about already was if you could stain it somehow. Stain it white somehow. (...) But I like it. It is beautiful. It is different.⁸⁵⁴

He imagined that he would be more disturbed by wooden walls than ceilings; he was used to wooden walls from his father's block house, but believed that they would be rather unusual in Vienna. He suspected that wooden CLT walls would have a more disquieting effect as they would be more present in his visual field than the ceiling. He was mostly sceptical about potentially too dark or overly patterned surfaces with knots as he was not used to this or had not experienced it before. On the whole, he was also uncertain about the vertical windows in his flat instead of familiar horizontal. Both dark walls and vertical windows went against his instinctive wish for a broad and distant view at eye level. He wondered if he would prefer it stained with white pigments. He was however accustomed to wooden floors, having grown up with them and having always associated them with high quality.

For a number of interviewees, room height and view made a difference for their acceptance of wooden ceilings.

A future inhabitant of p1 doubted that he would have chosen to leave the timber construction exposed if he had been given the choice – although he would have liked to take advantage of the positive effects on the indoor climate. He would not want to be surrounded by only wooden walls and ceilings in an urban context. He had seen exposed

⁸⁵¹ Skadbergbakken - Inhabitant 2+3, Transcription IN2a+b, 6.

⁸⁵² Skadbergbakken - Inhabitant 2+3, 7.

⁸⁵³ Skadbergbakken - Inhabitant 2+3, 6.

⁸⁵⁴ Mühlweg (A) - Inhabitant 2, Transcription IA5, 3–4.

wooden ceilings in another project by the same architects but believed that it was different because of its

penthouse style (...) and a fantastic view. One didn't feel cramped by the timber. I can imagine that apartments that don't have that openness in Berlin look a bit alien when they are so much encased by timber.⁸⁵⁵

An inhabitant of sw40 feared that visible timber ceilings would be too dominant despite the large windows in his 2.50m high souterrain rooms. In the upper rooms, where he does not come as close to the ceilings, he might have liked wooden ceilings.⁸⁵⁶

Several interviewees are afraid that too many exposed timber surfaces, especially in the ceiling, might make their rooms feel oppressive or too dark, or thought that exposed wood might be too dominant.⁸⁵⁷

One inhabitant from sw40 would not have wanted a wooden ceiling

like you had in the 80s. (...) I find that overwhelming.⁸⁵⁸

Other interviewees even remarked that 'especially wooden ceilings would drive me crazy'⁸⁵⁹ or that a wooden ceiling would remind her of a coffin.⁸⁶⁰

A couple from Mühlweg (B) discussed their preference for exposed timber surfaces. While she expected that they would be too much and too dark for her, he had grown up with such surfaces on a farm and felt certain that he would like it. She had grown up in suburban America with ample space. She stated:

I think it would be a bit too much for me. Then it would be too dark for me I think. A timber parlour or so wouldn't be for me. (...) I find it a bit claustrophobic. I'm not really comfortable with it. (...) I could imagine one wall. Or the ceiling. If it is light. I wouldn't do it really dark.⁸⁶¹

While an inhabitant from wk65 would not have liked to be made aware of the timber construction by its visual presence, she appreciates knowing of it. She is not fond of

a sort of a block house style. (...) You see in here, you don't really see any of the timber. There are many people who have these wooden houses where there is wood everywhere. That wouldn't have matched my expectations. I would have been overwhelmed by it. It wouldn't be my housing style. It would be a bit too cosy for me then, I think. But it's nice to know [that the construction is timber]. Well I don't really have to see it.⁸⁶²

⁸⁵⁵ p1 - Inhabitant 1, Transcription ID7, 4.

⁸⁵⁶ sw40 - Inhabitant 3, Transcription ID4.

⁸⁵⁷ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b (The couple had divided opinions.); Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b; wk65 - Inhabitant 1+2, Transcription ID1a+b; wk65 - Inhabitant 3, Transcription ID2; sw40 - Inhabitant 6, Transcription ID6.

⁸⁵⁸ sw40 - Inhabitant 6, Transcription ID6, 20.

⁸⁵⁹ wk65 - Inhabitant 3, Transcription ID2, 13.

⁸⁶⁰ Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b.

⁸⁶¹ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b, 7–8.

⁸⁶² wk65 - Inhabitant 3, Transcription ID2, 3–4.

Some expressed concern that exposed wooden surfaces might be a passing trend, and that they would tire of what they had initially liked. A plastered white surface is regarded as more timeless. One interviewee said that he would not want exposed timber surfaces indoors, as he was afraid that if he tired of it after a while he might lack the courage to change the original design intent and cover it up.

For the moment it might be tempting, just like exposed concrete; I see it as a similar problem. Well initially you might let yourself get carried away, but I think in the long run, you have this dominant element that you need to live with. It might be a floor space where you can't put anything, or nor do you want to. It's always present. I don't know if one can deal with it in the long run, but I'd have a problem with it after some years, and I'd feel sorry. (...) It wouldn't stand the test of time. (...) One could cover it [with gypsum], but then again, I'd probably have inhibitions. I'd have too much respect to just say 'it was actually designed like this but I'll close it off.' Well, I don't know what I'd think. But when I imagine it now, I'd say that it could be that it wouldn't last in the long run.⁸⁶³

Others decided to tone down the wooden materiality by glazing or painting surfaces, as described in the section about interior surfaces below.

Wooden details

Generally speaking, the inhabitants interviewed appreciated wooden details, especially in dwellings with otherwise mineral surfaces. In inhabitant from the project sw40 discussed the wooden blinds prescribed as sun protection for the entire house.

I love the wooden accents [here], meaning the floor with the gorgeous parquet, and also the wooden blinds (...) that bring the look of wood in here. Recently, a colleague said: 'Ah the house with the beautiful wooden blinds.' It is noticeable from outside, [that] there is wood. Just used in other places than you would associate with wood. Visible wood comes into effect. The windows are wooden as well. Wooden, and with the [natural] wooden colour. And that's why this is enough for me. I like it like this.⁸⁶⁴

Another couple from the same project also found the wooden blinds gorgeous, particularly in contrast to metal blinds, since they change the atmosphere of the apartment positively. They discussed whether they would have liked more wooden surfaces in their apartment than just the floor. While they liked white walls, they consciously chose a wooden kitchen and other wooden furniture. He felt that a wooden ceiling would have been excessive, while she said that they then would have made different decisions for the kitchen in order to find a balance. Both liked the wooden ceiling in a reference building. They had considered leaving the concrete ceiling in their current apartment exposed, but reported that the workers had missed that. They stated that their children sometimes said they would prefer it less white and solemn, and cosier

⁸⁶³ sw40 - Inhabitant 3, Transcription ID4, 7–8.

⁸⁶⁴ sw40 - Inhabitant 6, Transcription ID6, 20.

instead.⁸⁶⁵ Another interviewee saw the ‘very beautiful, rather expensive wooden blinds’ as a substitute for the lack of timber on outer and inner walls.⁸⁶⁶

Others also claimed to prefer white surfaces indoors, if anything with minor wooden elements like a column, or a wooden façade outdoors. A couple living at wk65 would have preferred to see the wooden pillar exposed in their apartment. They would have found this beautiful, but it had to be clad for fire safety reasons. He stated that

this relativizes the benefits of timber construction. One knows that there is timber somewhere inside. But one doesn’t see it anymore. It is only there in an abstract way because it is completely built in.⁸⁶⁷

They would not, however, want entire walls or ceilings in wood. She explained:

I think I wouldn’t like it optically. I’d have the feeling... I’m thinking of those wood-panelled things from the 1970s (*laugs*). I wouldn’t like that. But of course, the atmosphere of a wooden house would be different. Then it would be clear: one is in a wooden house.⁸⁶⁸

They both preferred simple white surfaces for walls and ceilings.

Interior surfaces, wood species, furniture and belongings

While some people were happy with the untreated wooden surfaces in their homes, many were afraid that it might be too dark or not match their furniture, paintings or other wooden surfaces in their rooms. Some inhabitants were sceptical about combining different wood types either in the different surfaces (walls, ceilings and floors), or in combination with their wooden furniture. They felt more comfortable with toned-down, glazed wooden surfaces that approximated the appearance of different wood species. Some interviewees emphasized that they wanted the wooden structure to remain visible when glazing timber surfaces, or that the natural properties of timber should not be impeded.

A couple from Spöttlgasse said that neither in their previous wooden houses nor in the apartment they live in now had an exposed timber construction.

It wouldn’t really have fit, because we had antique furniture and a lot of [oil] paintings and so. It wouldn’t have matched the timber, too rustic.⁸⁶⁹

Although they had not brought their paintings and furniture from before, they said that they would not want visible wood in the apartment, but that they liked it in the loggia.

A future inhabitant of Vindmøllebakken was less worried about only being able to bring a selection of the furniture from the larger apartment where he lived at the time of the

⁸⁶⁵ sw40 - Inhabitant 1+2, Transcription ID3a+b.

⁸⁶⁶ sw40 - Inhabitant 4+5, Transcription ID5a+b.

⁸⁶⁷ wk65 - Inhabitant 1+2, Transcription ID1a+b, 7.

⁸⁶⁸ wk65 - Inhabitant 1+2, 7.

⁸⁶⁹ Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b, 3.



Figure 3.3 a) Different wood species and treatments in walls, vertical wood slats (added by owner), shelf, floor and stairs at Skadbergbakken. b) Different wood species in floor and furniture at sw40.

interview than finding enough space and fitting surroundings for his large paintings. He wants to adjust the wood treatment gradually in order find the best background for the artworks. He is less concerned about his furniture.

I want to have my painting on the large wall there. Then I can think of which colours I want behind it afterwards. (...) The wall will be neutral for sure, as the paintings are massive – I mean colourful, with a lot, lot of message – so the walls can't be that intense, they have to be gentle and cautious in the background.⁸⁷⁰

One inhabitant from Mühlweg (A) reported having grown less fond of a mix of different wooden materials. She would not cover the ceilings, but paint or stain them with white pigments so the wood structure would remain visible.

At this point I think I would prefer to not see the wooden ceiling, but to have it painted instead, because now it is a material mix. The ceiling is a different colour than the floors. The windows are two-coloured – and then the furnishings...⁸⁷¹

An interviewee from Lobaugasse had glazed the exposed wooden ceiling white as she felt that it didn't go well with the wood type of her floor.

It was raw spruce wood and I glazed it. I painted it with a white glaze. (...) Because this spruce wood – I didn't like it at all, it was so rustic. It didn't fit me. First and foremost, the spruce wood clashed totally with the oak laminate floor. That is an entirely different wood shade and I didn't like it. (...) It was this yellowish spruce hue. It didn't fit at all. It didn't fit the house either. And now I find that it looks really nice with that white glaze. (...) I've

⁸⁷⁰ Vindmøllebakken - Inhabitant 1, Transcription IN5, 3.

⁸⁷¹ Mühlweg (A) - Inhabitant 1, Transcription IA3, 13.

had the feeling that the ceiling is coming down on my head with all that spruce wood. It really looked cloddish. Now it looks so light and airy and delicate.⁸⁷²

One family decided against wooden doors as they wanted the wooden floor to tell its own tale. They were also afraid of clashing wood types.⁸⁷³

Some however did not mind or even liked the combination of different wood species and had added built-in furniture to their dwellings. One couple had cupboards custom-made for their apartment in two different beech types. The furniture was treated to prevent yellowing, so the colour play between the different wood species with whitish and reddish shades was preserved.⁸⁷⁴

One interviewee would however prefer not to treat the wooden surfaces in his apartment at all.

Here, the ceiling is varnished with a light gloss. I personally wouldn't do it like that, I like it better matte. But it's simply a question of taste and something the owner decides. (...) Not varnished at all – wonderful.⁸⁷⁵

Others felt that paint destroyed the qualities they appreciated in visible wooden surfaces. A couple living at Skadbergbakken had a timber pillar in their living room with scribbling on its untreated wooden surface. They liked the wooden surface and asked the contractor to sand the marks off, but the pillar was painted white instead. The inhabitants claim that this spoiled the pillar. Other wooden surfaces in their apartment on the ceiling of the upper floor had been glazed white from the outset.⁸⁷⁶

One of the interviewees from Skadbergbakken found wooden surfaces much more beautiful and vibrant than others. She likes white glazes through which one can still see the structure of the wood.⁸⁷⁷

Gradual adjustment and reversibility

It is difficult to imagine how one will actually react to an unfamiliar materiality without experiencing it in its spatial setting. One interviewee found it hard to envision his future home beforehand; it was under construction at the time of the interview. He said that they would probably be able to choose if and how to treat the wooden surfaces in their apartments or leave them untreated (Norwegian: 'trehvit'), with transparent stain, or opaque paint. Visiting a built prototype that exhibited several options helped. He found it reassuring that the appearance of a range of features still can be adapted later.

⁸⁷² Lobaugasse - Inhabitant 1, Transcription IA4, 24.

⁸⁷³ sw40 - Inhabitant 3, Transcription ID4.

⁸⁷⁴ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b.

⁸⁷⁵ c13 - Inhabitant 1, Transcription ID8, 12.

⁸⁷⁶ Skadbergbakken - Inhabitant 2+3, Transcription IN2a+b.

⁸⁷⁷ Skadbergbakken - Inhabitant 4, Transcription IN3.

I am really curious about what the others [who will move into Vindmøllebakken] will choose to do. Maybe we can look around a little. If some apartments are finished we can go around and look at the resulting expression. I am also curious about long hallways in timber. Are we supposed to walk into a kind of timber box? How will it be? I haven't been worried. (...) It is possible to add mouldings in the corners, it is possible to add more paint, it is possible to plaster. I'm sure it's going to be fine.⁸⁷⁸

He planned to start treating the walls carefully, as this is not reversible.

If you paint everything a lot, then it's difficult to get the wood back again. If you put on a little bit and [still] see the wood, you can always add paint afterwards, later. You have to proceed carefully. When we move into a wooden building, we have to try to let the timber dominate as much as possible. If it doesn't work, if it becomes too much, you can rather mute it afterwards.⁸⁷⁹

The retrospective modification of surfaces (e.g. tinting a ceiling with white wood stain) is problematic in rented apartments, as one inhabitant noted:

You only have to be careful, as the building manager said, to use special, breathable paint, as the ceilings are part of the building physics calculations. (...) and also, legal issues are complicated. I will have to hand back the apartment in the same condition it was in when I took it over. That means sanding down the ceiling. To sand it twice, overhead. Just the amount of work and the level of difficulty are insane.⁸⁸⁰

Façades as inwards or outwards references

Some inhabitants would have liked at least a reference to the construction material in the plastered façades, both as a distinguishing feature and as a representation of the building's (and possibly also the inhabitants') 'inner values'.

Some interviewees said they wished the timber building in which they lived provided information about the material of its load-bearing construction by using the same material in the façade as a 'quote' or 'reference'. They did not think it was necessary to clad the entire façade with wooden materials in order to link to the building's inner composition. Communicating this aspect of the building to passers-by and visitors appeared important to them, even though they did not necessarily want the indoor surfaces of their apartments to be wooden.⁸⁸¹

An inhabitant of sw40 says that he would not have liked more of the indoor wooden construction to be exposed, but that he would have appreciated façade elements in wood:

⁸⁷⁸ Vindmøllebakken - Inhabitant 1, Transcription IN5, 4.

⁸⁷⁹ Vindmøllebakken - Inhabitant 1, 4.

⁸⁸⁰ Mühlweg (A) - Inhabitant 2, Transcription IA5, 3–4.

⁸⁸¹ sw40 - Inhabitant 3, Transcription ID4; p1 - Inhabitant 1, Transcription ID7.

In the façade, yes. I would have wished for a kind of reference, like ‘well, this is a timber building’. Because you always have to explain it. If you said, ‘there’s a timber building’, everybody would walk by without noticing it.⁸⁸²

Commenting on the remark that any construction could be clad with wooden materials, he said:

Many do that, just a sheeting or panelling, and then it is more of an ornament (...). But here, it would have a different kind of justification in the background. Not everyone notices or knows when walking past it. But when you know that it is a timber building, then you understand this reference differently as well.⁸⁸³

He was fascinated by the old Japanese tradition of conserving wood by charring it. He would have liked charred wooden elements in his façade, as they require less maintenance and they would make the building stand out from other houses. He did not consider it necessary to clad the entire building in charred wood, but felt that charred wooden elements in the plastered façade would be a suitable reference to the building’s construction material.⁸⁸⁴

Another interviewee expressed a wish to maintain a reference to the building’s timber construction by means of the exposed timber ceiling indoors. To him, entirely wood-clad façades are out of context in the urban realm. He did not believe that the urban context always needs to be continuous, and he felt that a strong stance creating a break with the surroundings could be interesting; however, he saw residential projects as part of an urban zone in which context and specific characteristics should be retained.⁸⁸⁵

Adaptations to the materiality of the neighbouring buildings might override the desire to communicate the building’s main construction material.

Another inhabitant from sw40 would have liked to be able to see that he lives in a wooden house and was fond of modern timber architecture he had seen in Austria. His family discussed whether such a new timber building with a wooden façade would look too modern for their area and called the older wooden buildings in their urban district (Friedrichshagen) ‘real wooden buildings’.⁸⁸⁶ They were critical about naturally greying wooden façades in an urban context.

It wouldn’t fit here. It doesn’t fit. Except maybe out in the woods, in an individual house.

– I agree that it would fit a single-family house. Because in these large buildings I would be sceptical about whether it fit in. If it would be coherent in such a street of houses.⁸⁸⁷

⁸⁸² sw40 - Inhabitant 3, Transcription ID4, 6.

⁸⁸³ sw40 - Inhabitant 3, 6.

⁸⁸⁴ sw40 - Inhabitant 3, Transcription ID4.

⁸⁸⁵ p1 - Inhabitant 1, Transcription ID7.

⁸⁸⁶ sw40 - Inhabitant 4+5, Transcription ID5a+b, 17.

⁸⁸⁷ sw40 - Inhabitant 4+5, 19.

Greying façades

The greying of wooden façades has been interpreted in different ways – either as graceful ageing, or on the contrary, as a sign of neglect and lack of maintenance. Many inhabitants were positive when it came to naturally weathering and greying wood on the façade;⁸⁸⁸ some appreciated it as a natural part of life, as a sign of passing time or said that it reminded them that they are ageing and growing grey with the building in a good way.

An interviewee from Ölbündt, who had been living there since it was built, remarked that the façade had turned grey, just like the inhabitants (Figure 3.4). She said that the histories of people moving in and out make the building a home.

The façade has changed a lot. It has become grey. We've said already, [it's] like the inhabitants who have been here so long. (...) I like this. That is natural, when years get added to a building.⁸⁸⁹

A couple from Spöttlgasse stated that they had chosen to leave the wooden surface of their loggia untreated, and it had become silvery grey (Figure 3.7 above). They said that not all of their neighbours shared their taste:

They painted over it with some poisonous glaze. They just don't get it, see? You have to want it, be able to accept it: wood gets older and changes its appearance. And some people just can't bear it.⁸⁹⁰

She suggested that it might be a matter of acquired taste, which may change with access to information:

When we were younger, we didn't want it like that either. We just made a lot of enquiries. (...) Wood [just] has to change.⁸⁹¹

Not all buildings had changed to a silvery grey, but become dark, almost black. The colour tone is influenced by the façade's age, moisture content and surface mould growth. In dry climates, the colour may change towards dark brown rather than grey. The façade's detailing, the type of cladding and the chosen wood quality are more decisive for colour changes than the wood species.

The Kebony façades in the project Skadbergbakken have darkened remarkably since being installed (Figure 3.5). An inhabitant described the cladding as

a very nice material. But if there is an entire large wall only with such timber, then it gets very, very dark.⁸⁹²

⁸⁸⁸ Ölbündt - Inhabitant 1, Transcription IA1, 1; Ölbündt - Inhabitant 2, Transcription IA2; Mühlweg (A) - Inhabitant 1, Transcription IA3; Mühlweg (A) - Inhabitant 2, Transcription IA5; Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b; wk65 - Inhabitant 3, Transcription ID2; sw40 - Inhabitant 3, Transcription ID4; p1 - Inhabitant 1, Transcription ID7.

⁸⁸⁹ Ölbündt - Inhabitant 2, Transcription IA2, 4.

⁸⁹⁰ Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b, 1.

⁸⁹¹ Spöttlgasse - Inhabitant 1+2, 1,28.

⁸⁹² Skadbergbakken - Inhabitant 4, Transcription IN3, 10.



Figure 3.4 a) Ölzbündt is ageing together with its first inhabitants. Greying surface and long-lasting precision 20 years after completion. b) Uneven weather exposure of the façade at Mühlweg (A). Acceptance for both.

Rather than being associated with a living material, grey façades may be perceived as dead. An interviewee from Lobaugasse said that while she was attracted to the small gardens around the houses, she was rather put off by their timber construction and especially the wooden façades. Combined with the buildings' box-like geometries and regular arrangement, they reminded her of concentration camps. Now the area is greener, but she still wishes there had been more variety in the façades, for example by mixing materials or altering geometries and details to a greater degree than what had been done. She claimed to like the greying tone of naturally ageing wood, just not in that amount.

Well I do like it. I like it very much. Just in this massiveness, where everything is grey... It could have been done better. A little bit more creatively. (...) It appears a little bit dead.

[More variations in the façade panelling or materiality] might be livelier, homier, friendlier.⁸⁹³

However, she appreciated the visual unity of the area and would not want people to be allowed to decide their façade designs individually. While she advocated for greater variation through a combination of different façade materials, she emphasized that this variation should be the architect's responsibility.

That would be really terrible for me. (...) If my neighbours put up horrendous buildings. For God's sake, I'd have a fit.⁸⁹⁴

⁸⁹³ Lobaugasse - Inhabitant 1, Transcription IA4, 19.

⁸⁹⁴ Lobaugasse - Inhabitant 1, 21–22.



Figure 3.5 a) Dark and uneven surfaces, and b) individualizing colour changes at Skadbergbakken

Uneven greying

The couple from Skadbergbakken expressed dislike for the uneven greying of untreated façades due to exposure to sun and rain, but they liked that all the (pre-greyled) Kebony-clad buildings around them had slightly different shades because of different building periods, different roof angles or different drying speeds after a rain (Figure 3.5).

It can be [quite] cool to look at when you come driving up the road here as the block has four different colours. To see that it becomes yellow and brown, you really see the difference (...). Some walls are dry and then there is a play of colours. That I think is just beautiful. It's really lively (...) It is positive, then there's life in it. It's not grey and boring. (...) I find it really beautiful that the colours keep changing. Like the seasons. Wet [or] dry and warm – it's different.⁸⁹⁵

Some also accepted unevenly greying surfaces or even found them beautiful.

One of the interviewees living at wk65 liked naturally greying façades, even when they were not greying evenly. She says that the façades in her previous home also had different shades on each side, depending on the weather exposure. She found it 'very self-evident'.⁸⁹⁶

An inhabitant from Ölbündt reported liking the natural greying of the façade and 'shadows' of areas that are more exposed to rain than others (e.g. under wall recesses, see Figure 3.6) She had grown up with exposed and ageing wooden surfaces as well.

That is just life. I also think it is something you expect, or something I have known [as long as I have known] wood. The old beams and the panelling, they have shifted at home

⁸⁹⁵ Skadbergbakken - Inhabitant 2+3, Transcription IN2a+b, 13.

⁸⁹⁶ wk65 - Inhabitant 3, Transcription ID2, 13.



Figure 3.6 Two adjacent façade areas at Ölbündt: a) Little colour change in protected areas, and b) unevenly weathering horizontal boards where exposed to sun and rain. Every panel weathers differently, depending on its angle and position on the façade.

as well. (...) I find visual changes in a house fascinating. I don't find greying ugly at all. Many people have a problem with that. But I find it beautiful somehow. [About transitions in the grey shade of surfaces that are protected or exposed to rain:] To my mind, you should be allowed to see these natural influences.⁸⁹⁷

Others were more sceptical. Not everyone has positive associations with greying surfaces, especially when a wall does not change colour evenly, for example when only some parts are exposed to rain. Speaking about the untreated exposed wood on their loggia, one interviewee said that she did not like the uneven greying and that the surface becomes rugged (Figure 3.7 below):

Optically I don't find it ideal. Because in some places you see that it gets rained on, in others it doesn't, it doesn't weather evenly. (...) I don't really like it optically. I think it's more the unevenness that disturbs me than that it greys.⁸⁹⁸

Thirsty roughness and maintenance

An inhabitant from Wagramer Straße found greying wood 'a bit ugly' and thought that roughened surfaces communicated a thirst for oil:

Untreated wood gets so grey. I didn't really like that. (...) That it becomes grey, and then it also looked so chapped, so I thought maybe it was thirsty for oil or something. (...) I painted it with wood stain.⁸⁹⁹

⁸⁹⁷ Ölbündt - Inhabitant 1, Transcription IA1, 16,19.

⁸⁹⁸ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b, 10–11.

⁸⁹⁹ Wagramer Straße (B) - Inhabitant 1, Transcription IA7, 7.



Figure 3.7 above: Loggia wall turning silvery grey at Spöttlgasse (accepted) and below: Uneven weathering in the top floor loggia at Mühlweg (B) (disliked)

She had painted a garden playhouse because she did not like how it greyed, and she wondered whether the façade could also be re-treated with oil or something similar. She remarked that resin seeped out of the wooden façade. She reported that she also treated the terrace boards on top of the concrete terrace once a year with wood stain. Her husband had sanded the terrace as it had become brittle and the children were getting splinters. According to her, other inhabitants did not take as much care of their terraces.

The couple from Mühlweg (B) had divided opinions about the surfaces' roughening. She complained that

outside there are untreated wood boards on the floor and I have been wanting to remove them for a long time, because I always get splinters.⁹⁰⁰

⁹⁰⁰ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b, 10.

Her partner countered:

I don't. Until now I have defended against it. (...) The boards roughen as the weather and sun gnaw on them, so to speak. (...) You just have to lift your feet and it's fine.⁹⁰¹

Several interviewees expressed interest in maintenance-free surfaces.⁹⁰²

One interviewee from Skadbergbakken repeatedly emphasized the importance of a low-maintenance building that ages well.

An architect [might] design a house that looks beautiful when it's built and then requires repainting every three years, because for instance you get this green mould etc. (...) It looks good for the first year, and then the poor person who's bought the house spends the rest of his life having to maintain it.⁹⁰³

A couple from Skadbergbakken felt that the Kebony façade was primarily a practical advantage regarding maintenance.

The disadvantage is that there is a terrace that is not so [exposed] and it looks like the material is a little newer, and it's not, it's just all the light that makes it grey differently. It's not the world's nicest, but it's practical when it comes to maintenance.⁹⁰⁴

Speaking about patchy, unevenly weathered surfaces, an inhabitant from Mühlweg (B) said:

Well I find this is just part of it. If we are honest, we have that with other materials as well.⁹⁰⁵

But he also mentioned that a façade can be re-plastered after some decades, without reflecting on corresponding options available for wooden façades.

Many were much more positive about the natural ageing of wood than of other materials, e.g. composite façade systems.

I don't have anything against it when wood changes [optically]. It's intrinsic to wood, then it is allowed to change. When a mineral surface changes, then it's most often just ugly.⁹⁰⁶

External thermal insulation composite systems ages as well, but that is very ugly.⁹⁰⁷

Others wished they could reinstall the look of freshly cut, unweathered wood, especially when surfaces had greyed unevenly. Although they accepted greying as a natural process that does not need to impair a façade's functional integrity, they find its look more acceptable in utilitarian buildings.

⁹⁰¹ Mühlweg (B) - Inhabitant 1+2, 10–11.

⁹⁰² sw40 - Inhabitant 3, Transcription ID4; Skadbergbakken - Inhabitant 1, Transcription IN1; Skadbergbakken - Inhabitant 2+3, Transcription IN2a+b.

⁹⁰³ Skadbergbakken - Inhabitant 1, Transcription IN1, 1–2.

⁹⁰⁴ Skadbergbakken - Inhabitant 2+3, Transcription IN2a+b, 13.

⁹⁰⁵ Mühlweg (A) - Inhabitant 2, Transcription IA5, 11.

⁹⁰⁶ sw40 - Inhabitant 3, Transcription ID4, 16.

⁹⁰⁷ p1 - Inhabitant 1, Transcription ID7, 12.



Figure 3.8 Two ways of handling colour changes in parts with different weather exposure at Skadbergbakken, using a) wood that will retain its original colour where not exposed to sun and rain or b) applying coloured trespas.

[The greying] remains me of the time back in Stubaital, where the haybarns on the fields are all made from timber as well and they just weather. Of course, nice fresh wood, [recently] cut is more beautiful. But the other one has just aged. But when it is not constantly exposed to moisture, if it stays dry, it will last forever.⁹⁰⁸

One wishes that they would sand down the wood from time to time in a residential building, or somehow make it nicer again. (...) I would say that fresh or sanded wood looks more beautiful than weathered wood. That gives the impression that one doesn't do anything, one just lets things slide.⁹⁰⁹

Beautification

The inhabitant interviews indicate that a positive social environment eases communication in case of inconveniences and reduces the weight put on technical or aesthetic shortcomings or decline of the buildings.

The interviews also revealed that a verbal explanation of architectural qualities, or access to someone else's perspectives on architectural qualities through the image section and detail chosen in a photograph prompted or enhanced the perception of such qualities. Verbal or visual communication can 'beautify' a home for its owner – either during a conversation, through explaining the architect's intentions, or through pictures that capture a certain quality/aspect of the dwelling: inhabitants saw their houses from a new

⁹⁰⁸ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b, 10–11.

⁹⁰⁹ Mühlweg (B) - Inhabitant 1+2, 20.

perspective after distinct aspects had been pointed out. Others looked at the pictures taken after the interview and were surprised by how much they liked what they saw.

For some interviewees, the knowledge of an expert (in this case, that of the interviewer) made the appreciation of different features of their homes accessible. The interviewer usually did not comment on the projects during the interviews. Showing the interviewees the pictures taken at their homes for approval let some inhabitants perceive certain qualities differently, however; as an example, one group of inhabitants was positively surprised when looking at the pictures taken after the interviews. The pictures had been taken quickly, rather with mnemonic intention than with artistic ambition.

It really doesn't look bad at all! (*laughs*)

- I have to say I'm a bit surprised.

- That really looks different on the pictures, it feels totally different.

- Yes, it looks good with the [wooden] blinds down.⁹¹⁰

In another case, the inhabitant was initially unhappy about interior material choices, which she perceived as lowering the value of her house.

Well this is important for you, I thought that this is important for me to say: Timber houses are great. But what it needs, in my opinion, are high-quality interior fittings. This house has really cheap interior fittings with the laminate floor.⁹¹¹

After the official interview, the complaints about her home were met with an explanation of the assumed rationale behind the architect's design decisions: The original architects presumably put focus on designing permanent features of the house with high spatial, yet adaptable quality. Other aspects that probably had to be chosen in lower quality due to subsidy-related budget limits could be upgraded rather easily later. A range of careful detail decisions in the façade were pointed out as well. The inhabitant became aware of qualities she had not seen before and claimed that the conversation changed her view. During the conversation and also in a later email, she expressed her gratitude and the experienced value increase of her 'beautified' home:

You have mentally increased the value of the house for me a bit. I sometimes complain about things a lot. (...) You have explained it well to me now. (...) Well, I have gained a bit of a new view on the house. I'm really thankful. It was nice that we did this.⁹¹²

Thank you very much again for the conversation, it has been very interesting for me as well and you have "beautified" my house for me, I see many things with a fresh view now and can appreciate it better!⁹¹³

⁹¹⁰ sw40 - Inhabitant 4+5, Transcription ID5a+b, 32, and Inhabitant 6 (ID6), all three talking.

⁹¹¹ Lobaugasse - Inhabitant 1, Transcription IA4, 17.

⁹¹² Lobaugasse - Inhabitant 1, 42–43.

⁹¹³ „(...) Vielen Dank nochmal für das Gespräch, es war auch für mich sehr interessant und sie haben mir mein Haus „verschönt“, ich sehe jetzt einiges mit neuen Augen und kann's besser schätzen!“

There is potency in seeing things through the eyes of another in order to notice qualities and to value them. This could be an important impulse to reconsider the architect's routines. Communicating a project's design to the individuals who will actually be surrounded by it daily is at least as important as communication with those who pay the bills.

Lobaugasse - Inhabitant 1, 'Interview Urban Timber House', 2 November 2017, translation by the author.

3.4 Graphic surveys on preferences

Similarities and differences within and between the groups of interviewed architects and inhabitants concerning the preferences regarding the amount, placement and treatment of visible timber constructions have been described in the sections before. The graphic surveys provide additional information and allow for comparison between architects and inhabitants (see also Figure 3.9 for a graphic recap of responses to four of the 18 questions).

It is difficult to identify clear preferences among the inhabitants; one exception however is in regard to untreated wooden façades, which are preferred to mineral façades by a majority (with one exception and a number of undecided respondents). In this, they are in agreement with the architects. More inhabitants appreciate these façades for visually changing over time, but some find an unchanging visual expression preferable. More inhabitants prefer white ceilings as they give the impression of higher ceilings, whilst architects expressed a preference for wooden ceilings. A very slight majority of the interviewed inhabitants preferred natural wooden surfaces indoors; almost all of the architects preferred this. Opinions were more mixed regarding indoors than outdoors. Furthermore, the conversations revealed that most inhabitants preferred it if not all indoor surfaces were wooden and favoured toning down and stabilising wooden patterns and colours with whitening glaze. With few exceptions, the architects preferred wooden surfaces indoors and outdoors, including when their visual appearance changes. While the graphic surveys do not encompass whether they would like these wooden surfaces (walls, ceilings, façade) to all be exposed at once in a single room or rather in combination with other materials, the conversations indicate this.

Often, the architects of each country have similar preferences while the inhabitants' choices are more wide-spread, which might partly be due to the comparatively few architects who in several cases work in the same office. The most striking exceptions are the agreement on façade materials among Austrians and Norwegians and on visual change among Norwegians, and the disagreement on ceilings among Germans.

Some national tendencies could thus be assumed from the graphic surveys, but they should not be overemphasized since the architects represent a small selection of offices with distinct design profiles; their specific approaches and preferences cannot be presumed generally applicable to all Norwegian, Austrian or German offices. Neither should the inhabitants be thought of as representing general national preferences; their willingness to participate in the interviews might already imply a special interest in wooden materials.

The preferences suggested by the graphic surveys are more interesting in relation to how inhabitants and architects reflect over their preferences and how they are anchored in their daily lives or within other requirements for a building.

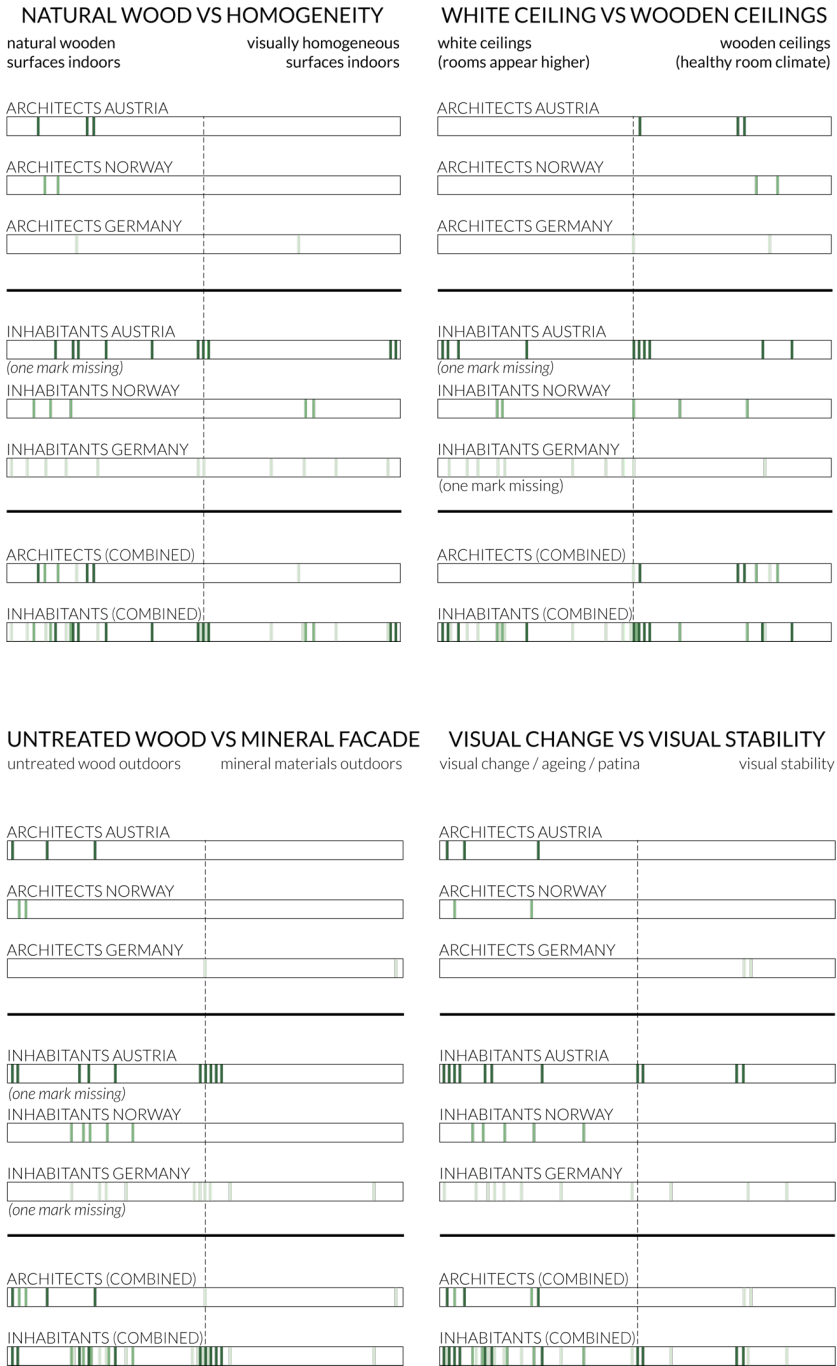


Figure 3.9 Graphic surveys - comparative analysis of selected aspects

3.5 Chapter summary and preliminary conclusions

The senses and the mind, the concrete and the imagined

The perception and appreciation of wooden materiality involves not only comprehensive sensory stimulation, but also cognitive appraisal, and concerns not only the physically present material, but also associated values and meanings interwoven with and beyond its concreteness. Perception exceeds the mere registration of aesthetic pleasantness or an agreeable indoor climate; it also both provokes associations with other places, people or events, and involves possible action upon sensory input. Perceived materiality is thus a thematic category that bridges concrete and semantic aspects.

Preferences

The interviewees expressed different preferences for the location, amount and possible treatment of wooden materials. These preferences differ more between individual architects and inhabitants than between architects and inhabitants in general. Timber was described alternately as warm, agreeable, cosy, natural, living, calming, atmospheric or beautiful, and as oppressive, overwhelming, coffin-like or inappropriately cosy.

Some inhabitants determined that exposed wood might affect their mood and feel weighty if on the ceiling, too dark, disquieting, or make one feel claustrophobic rather than calm. Others experienced wood as calming and as beneficial to the eyes for not being white. Some were afraid that it might not match stylistically and clash with furniture of another wood type. Others preferred balancing the amount of wood with other colours and surfaces. Accordingly, some appreciated natural changes in the appearance of wood over time, whilst others instead wanted to eliminate or minimize these changes by painting or glazing the wooden surfaces. White neutrality was not a general preference, but most inhabitants preferred a toned-down (e.g. whitened) material expression indoors.

The inhabitants' descriptions provided a more nuanced and multi-faceted picture than the cited surveys about users' wood preferences in terms of patterns, colour, complexity, lightness, wood species, degree of processing, visual impression, specific use, etc. Priorities are not only based on an instinctive preference of moderate complexity that could be explained with evolutionary patterns, but also on associations that are informed by the timber use culture in one's home region. Although timber may be generally appreciated across national and cultural borders (as described in a report on European preferences), the interviews suggest that preferences also differ quite significantly based on regional customs, for example, when naturally greying façades are appreciated but associated with the rural and thus deemed unfit for the urban realm.

Social and biographical associations and values also influenced the inhabitants' preferences. Some appreciated exposed wood because of personal memories that were linked to recollections of childhood or people, and positively connotated references, such

as one's home region. For others, they were reminiscent of exposed wooden surfaces from the past, which they rejected as outdated, undesirable or out of place (e.g. how they remember the 80s, what they associate with cabins or what they feel belongs to rural areas).

Perhaps detailing would make a difference to those who are not unconditionally positive to exposed wooden surfaces indoors. Just as many interviewees expressed dislike for yellowing wood for being too dark, too patterned and too 'present', it might also matter whether the surface consists of many profiled panels with visible joints and gaps, or whether the surface is large, continuous and even, as in cross-laminated boards.

Gradual adaption

Some inhabitants would prefer a greater adaptability of surface qualities, for example, by gradually adding surface treatment (e.g. adding several layers of pigmented glaze to test its effect), by having reversible surface treatment (e.g. to be able to hand back over a rental flat in its original state) or by the possibility of 'refreshing' a surface (e.g. by sanding down yellowed or greyed wood). While the aesthetic appreciation of weathered surfaces or traces of tools or use was found in literature and shared by some inhabitants, other inhabitants longed for renewal that would reinstate the pristine state of freshly machined wood. Practical implications, or the degree to which such reinstatement is possible, were not discussed at any length by the interviewees, nor will they be part of this reflection. Other inhabitants seemed content to have choices made for them on the basis of professional judgement – particularly when these choices were communicated and explained to them.

Neutral backgrounds for individual lives

Not all architects want to showcase wooden construction materials. Some believe that gypsum would provide more robust details, that white walls would be a neutral background for the inhabitants' belongings or that other materials are more suitable for an 'urban expression'.

Many of the architects interviewed were concerned with how well a wood type would match the inhabitants' wooden furniture; with the design's robustness regarding different inhabitants' lifestyles; with the reversibility of the inhabitants' modifications to surfaces; and with an overall stylistic expression that suits the building's context and represents the architect's architectural stance. Even among the architects who personally favour exposed wood, there is a sense of moral obligation to provide a neutral and aesthetically robust background for the unfolding of inhabitants' individual lives, with their personal taste and belongings. Most architects find this easier to accomplish with either white gypsum walls or whitening glaze for wood than with untreated wooden surfaces.

The consulted literature however suggests that alternatives to 'mute' materials might add a referential dimension that also gives voice to the lives lived within these walls.

The paradox of the natural

Sensory experiences and semantic notions are an important part of inhabitants' emotional connection to timber as a 'living' material. Theoretical texts have described the living qualities of a material with positive connotations in contrast to 'dead' materials, but also as difficult to control. Architects trust the controllability of wood properties – either by sound knowledge or experience, or by way of industrialized elements that allow for some simplification and thus make the realm of wood construction accessible for architects without a background or specialized studies in carpentry. As described in Chapter 2, inhabitants were more concerned about the soundness and durability of wooden constructions. Even though their homes were calculated, dimensioned and officially approved as complying with fire safety and structural stability requirements, they found it difficult to interpret the 'signs of life' of the wooden construction, such as visible cracks or cracking sounds.

Apart from the question of reliability, the inhabitants appreciated the natural connotation of wooden materials. Curiously, some preferred wood over concrete, but did not react to the wood being covered with sheetrock with which they had more direct visual and physical contact than with the main construction. Some texts described gypsum as a dead material. The inhabitants were more critical of concrete as a cold material.

As traced in the literature review, there can be a gap between the reasons people favour wooden construction and surface materials and how they want to experience them. Association with nature is one reason to use timber and a value associated with timber, but signs of life are nonetheless fought against, eliminated or cause insecurity. Chosen for their potentially sustainable, natural and healthy qualities, wooden materials are often treated to optically control natural changes and 'living qualities'; this simultaneously reduces sustainability and health advantages. For inhabitants, the associations evoked by the natural properties of timber, for example, yellowing, greying, uneven surfaces or cracks, either represented negative impressions, such as decay and negligence, or had positive connotations, such as ageing gracefully. Some inhabitants see the beauty in graceful ageing, which makes them feel connected with the course of life.

Some authors describe how naturally greying materials or accumulated traces of wear and tear can enhance a building's authenticity and carry forth an engraved narrative of usage patterns, local climate and passing time. Wooden materials create identity, individuality and uniqueness through the various transformations that result from weathering, use and maintenance, as well as through upgrades, modifications, adaptations or restoration. Wooden materiality establishes or exposes links to a place, its history and its current culture, and hence to a local, cultural and temporal situatedness, and provides an anchor in the tides of change. This will be discussed in greater detail in Chapter 4.

As both knowledge background and communicated information influenced the inhabitants' experience of beauty and value, both sensory and cognitive aspects of perception should be acknowledged as contributing to architecture's loveability. This

insight may be taken advantage of to overcome the unsettling sides of living materials through better understanding and interpreting them, and to counteract treatment that aims to control these signs of life, but at the same time jeopardizes the very reasons for which the material is seen as living, natural or healthy. Wood may otherwise become hazardous waste instead of maximising its environmental benefits by its cascaded use (reusing or recycling it).

Graceful ageing

On the façade, one can consciously determine the geometry and materiality of surfaces so that visual changes over time caused by weathering become part of the design. This means that the designer needs to take into consideration the constructive protection of surfaces, their orientation, water runoff, etc.

Rather than implying indestructible materiality or continuously reinstated timelessness, the call for robustness aiming at a building's longevity might emphasize its graceful ageing. This does not render sound planning and execution less important – quite the contrary; arguably, solid construction and high-quality materials will support a positive interpretation of signs of age. Many inhabitants were especially sceptical about composite insulation systems. Materials age differently and certainly, not all do so with grace.

Value increase for and with users

As they often make decisions on behalf of anonymous future inhabitants, the interviewed architects were interested in how their assumptions, or what developers convey, align with the inhabitants' lived reality. While some firms let inhabitants be part of (certain domains of) the design process even in larger housing projects (e.g. the choice of common functions, the private plan layout or surface qualities), such involvement is difficult in standard commissions and rental housing projects.

For inhabitants, the perceived value and appreciation of architectural and material design choices can increase significantly when they are explained (verbally) or shown (with photographs).

Appreciation is also enhanced by a good neighbourhood community and a unifying narrative about the building, as they were shown to distract from or mitigate a negative experience of eventual performative shortcomings. Building such a community is thus equally important as communicating intentions and design decisions, and giving the inhabitants pride and ownership. It was often reported that the planning process was an important part of establishing such a community with mutual trust and eased communication. (This will be described in greater detail in Chapter 4).

Immanent narratives

All designs yield a narrative around their becoming. Narratives thus do not need to nor should be something added to a finished design, but are already an inherent part of the design process and material choices. Conveying these to the users makes a more holistic experience accessible. Perception and appreciation can be influenced and potentially enhanced by explaining a building's underlying design decisions better and 'translating' its immanent narrative through words or images. This may reduce the wish to modify, change or renew homes; but when the need to do so is there, readable constructive principles make it easier to operate within the existing, to adapt or renew only the necessary and to see the value in existing structures and surfaces.

Eloquent materiality

The concept of 'eloquent materiality' proposed in this thesis is inspired by Pérez-Gómez' reflections around desirable architecture and suggests a balance between architecture's informative tectonics and more vague atmospheric qualities.

Furthermore, eloquent materiality fosters a connectedness with one's own senses and longings as a source of inspiration rather than a reason for constant renewal and consumption. Eloquent materiality does not dictate its interpretation; it welcomes different ways to read and interpret materiality; it recognizes the user's authority and competence to co-shape the specific ways in which a material is rich, beautiful or meaningful, and in which it can be operationalized and appropriated. Eloquent materiality is aware of the many facets of architectural experience and acknowledges the user's competence and contribution. Eloquence is strengthened by communication.

While 'chatty' materiality overloaded with the architect's intentions may be criticized, 'expressive' or 'eloquent' materiality that leaves room for semantic interpretation is seen as enriching. Furthermore, ways in which materiality permits and suggests alternative uses, subsequent changes or visual modifications, are relevant paths to explore with future design. There is potential to empower the inhabitant, increase satisfaction with individualized and appropriated homes, and hopefully extend both the time between renovations and the overall lifetime of a building.



Ölbündt

4

A Tale of Value Weighting and Context

4.1 Literature

Situatedness

As mentioned in the introductory chapter, how a building relates to its physical environment is part of determining its architectural qualities. The possibilities of reacting to surrounding buildings or elements of nature are manifold (see also 'Connection with nature' in Chapter 3) and can inform scale; proportion; detailing; number, size and shape of openings; ventilation and shading elements; colour; materiality etc. - this is without regarding functions and programme which of course also need to be decided with regard to a building's context.

The physical context also influences the valuation of materials and their appropriateness. When the use of materials was limited to the regions where they could be extracted, produced or processed, types of material and their accustomed use in buildings not only informed the region's visual identity. It also influenced the functions and societal roles that were associated with the material. Even though today, materials can be shipped around the globe and despite significant technical development, past resource availability and performance still have an effect on the semantic role and perceived value of materials.

Different notions of material value

In the introductory chapter, architectural qualities were described as single features, characteristics, attributes or properties of architecture that together may be defined as the architectural quality of a building; this can be ranked in comparison to other buildings according to how it scores in relation to a defined system of values. Value may be understood as the ideational importance, practical usefulness or financial worth of something. In contrast to quality, which is uncountable, value may be expressed in monetary terms. Whilst however not necessarily being related to price, value is defined by characteristics that render something desirable.

The different notions of material value traced in literature point at understandings of value beyond measurable and objectively comparable aspects. Different criteria can define a material's value and have been prevalent at different points in time, and partly interfering with each other. They have been discussed by philosophers, artists and architects alike. Meaning and associations may be culturally influenced, and personal preferences are related to individual taste, but also to the ways in which an artist or architect intends to use a material. In architecture, these value notions are never an isolated issue; they are embedded in how all elements of architecture together become coherent. Furthermore, a feature may be valued differently depending on the context in which it is assessed.

Economic and functional value

Some of the more undisputedly quantifiable aspects that are rather directly linked to a material's economic value are how easily it is to obtain (e.g. in terms of its rarity and concerning difficulties or costs related to its extraction, harvesting or production),⁹¹⁴ and how well it performs technically for a specific purpose (e.g. referring to its durability and how easily it can be worked or treated).

Symbolic value

Symbolic value is defined by the meanings associated with a material and might even take precedence over economic value.⁹¹⁵ Sometimes however, materials are appreciated for the absence of any historical precedent or cultural annotation associated with them.⁹¹⁶

Aesthetic value

Aesthetic values rank materials according to more individually perceived characteristics, such as a heavy versus a weightless appearance, its liveliness, how it can be manipulated by the artist, or according to other personal preferences for smooth, even and firm surfaces or structured, rough finishes.⁹¹⁷ These aesthetic qualities may even lead to emotional affection (see also Chapter 3).

Workmanship

The notion of a 'masterpiece' in art and architecture broadens the established notions of value. It implies the appreciation of a material according to the artistic workmanship performed on it and attaches value to how it is treated, used and mastered.⁹¹⁸

Narrative

In addition to how a material is worked, there is yet another dimension of material value that can only be accumulated with passing time and use. A material's value may be discovered not in its expressiveness, but in its richness, which imparts a narrative quality.⁹¹⁹ These ideas were described in Chapter 3 in the section 'Sampled material aesthetics'.

⁹¹⁴ Rübel, Wagner, and Wolff, *Materialästhetik*, 35.

⁹¹⁵ Rübel, Wagner, and Wolff, 35; Monika Wagner, 'Materialwert, Materialgerechtigkeit, Materialbedeutung', *Kunsthistorische Arbeitsblätter*, 2008, 6–7.

⁹¹⁶ Some artists of the Russian avantgarde appreciated concrete and cast iron for having 'no history'. These new materials were instead associated with hope for political change. Rübel, Wagner, and Wolff, *Materialästhetik*, 60.

⁹¹⁷ Rübel, Wagner, and Wolff, 36.

⁹¹⁸ Rübel, Wagner, and Wolff, 35.

⁹¹⁹ Zumthor, 'A Way of Looking at Things', 24; Leatherbarrow, 'Materials Matter'.

Material hierarchies

Records show that material hierarchies relating to these value notions have existed between – and also within – different material groups since antiquity: they concern different material groups, such as stone, metal and wood, but also materials within the same group, for example different species of wood.⁹²⁰ How a material's position within such a hierarchy influenced the judgement of formal appropriateness has been described in Chapter 2.

Material hierarchies have changed throughout history as the importance of these value aspects grew or faded away with new ideals or doctrines, as well as by new materials and production possibilities (see also the section about surrogates and falsification in Chapter 2). While material hierarchies may reflect common understandings, the different value criteria can also be conflicting and subject to individual interpretations.

Associated with gods or emperors, gold often ranked highest in such hierarchies. This reflects the material's rarity and the aesthetic fascination with it, which also became a symbolic notion that has continued until today. Although there are other materials that are rarer, more difficult to extract or longer-lasting and therefore more expensive, gold still has a symbolic function, for example in sports events or even in sustainability assessment systems such as DGNB or LEED – where it however is subordinate to platinum (and can be topped off with a diamond distinction in the DGNB system).⁹²¹

Since the Renaissance, materials have also been valued according to artistic workmanship. As Rübel et al. pointed out, material hierarchies were thus relativized by the notion of the masterpiece. Criticism of material hierarchies oriented according to profane values had already been voiced by medieval Christian authors, and now, the valuation of artistic form and of the masterpiece both questioned and relativized material hierarchies.

Industrialization disrupted the inherited material hierarchies even more, and the material aspect lost importance. The machine processing and new artificial materials of the Machine Age challenged the hitherto commonly understood order of natural materials. Materials had not only become available everywhere, but also unboundedly mouldable. Aesthetic and symbolic value persisted, however.⁹²²

Rübel et al. describe material hierarchies further as redefined from the perspective of the arts, with aesthetics as a link between art and philosophy. Artists would rank materials according to how 'heavy [and] physically bound' or how 'light [and] intangible' they appeared (for example wooden sculptures as compared to marble). Other criteria for

⁹²⁰ Rübel, Wagner, and Wolff, *Materialästhetik*, 35.

⁹²¹ 'Evaluation and Awards', accessed 14 March 2020, https://www.dgnb-system.de/en/system/evaluation_and_awards/index.php; 'LEED Rating System | U.S. Green Building Council', accessed 14 March 2020, <https://www.usgbc.org/leed>.

⁹²² Rübel, Wagner, and Wolff, *Materialästhetik*, 35–36.

artists' prioritization could be the perceived liveliness of a material, or how easily a material could be manipulated.

According to Rübél et al., the end of the 19th century marked an end of a normative ideal of art. From then on, materials were ranked more equally. Artificial materials however would not find their place in the arts' material canon until several decades later. Although material hierarchies have been replaced by a more 'additive coexistence of different materials' since the 20th century, Rübél et al. predict that digital material research and the possibility to analyse and develop materials on the atomic or molecular level will stir up the debate about material aesthetics anew.⁹²³

In architecture, like in art, a material's value is furthermore defined by its integration into a masterful work. (See also the section 'Material value as defined by the architect's skills below').

Associations with different tree species

As mentioned above, materials have not only been ranked according to material groups, but also within material groups. Today still, while many may generally have positive attitudes about wood and its use in buildings, these may also relate to different tree species. Assumptions about the evolutionary or cultural origins of aesthetic preferences were addressed in Chapter 3.

The appreciation of certain wood species over others seems to be based on changing values. The rarity of a wood species is not necessarily a bonus any longer. Rather than exotic wood species, the use of which is considered unethical, local species or even trees from the building site itself have a value as they bear meaning and identity for precisely that project. Using local wood is not necessarily easier or cheaper, as industrial providers usually offer a limited number of standard wood species, the provenience of which can be difficult to know or define. Only recently have hardwood species been used to an increasing degree again, as tools, glues and joining products that were developed for softwood products had to be adapted to the properties of these new wood types. Although many hardwood types may grow close to a construction site, they are not as accessible as standardized softwood products, even if these use wood from abroad or are entirely imported from abroad. In contrast, workability and durability still play an important role.

In their review of empirical studies on perception, preferences and psychophysiological responses to indoor wood, Nyrud and Bringslimark reason that people's preferences are also influenced by their associations with different wood species.⁹²⁴ The various attributes and values assigned to different tree species are e.g. modern or old-fashioned, durable and

⁹²³ Rübél, Wagner, and Wolff, 11,36.

⁹²⁴ Nyrud and Bringslimark, 'Is Interior Wood Use Psychologically Beneficial? A Review of Psychological Responses toward Wood'.

strong, beautiful and elegant, or practical;⁹²⁵ interestingly, comparisons of name-based and appearance-based evaluations suggest that these vary when people know the tree species' names.⁹²⁶ Value is then attached to associations with certain wood species, and detached from the direct experience of their appearance.

Wooden values

The varying general appreciation of timber as a building material is closely related to its performance and availability. The following sections will describe the ambivalent role of timber in architectural history and from a Norwegian perspective, where the abundance of wood is reflected in its widespread use and in styles specific to the material's and to a building's geographic and cultural context.

Resource availability and significance in architectural history

From the dawn of human culture until the beginning of the 19th century, wood has been so dominant wherever it was accessible – as a basic material for tools and objects of utility, as a construction material and as a combustible – that some historians dub the entire period the Wood Age.⁹²⁷ As described in Chapter 2, the availability of wood also influenced the development of tools, which in turn had – and continues to have – an influence on the obtainable forms of wooden objects and construction. Knowledge and skills gathered from experience with wood were also transferred to other materials.

The extensive use of wooden building materials is however not reflected in the description of architectural styles in architectural history to the same degree.

⁹²⁵ G.W. Blomgren, 'The Psychological Image of Wood', *Forest Products Journal*, 149-151, 15 (1965).

⁹²⁶ Matthew S Bumgardner and Scott A Bowe, 'Species Selection in Secondary Wood Products: Implications for Product Design and Promotion', *Wood and Fiber Science: Journal of the Society of Wood Science and Technology* 34, no. 3 (July 2002): 408–18; Scott A Bowe and Matthew S Bumgardner, 'Species Selection in Secondary Wood Products: Perspectives from Different Consumers', *Wood and Fiber Science: Journal of the Society of Wood Science and Technology* 36, no. 3 (2004): 319–28.

⁹²⁷ Aimé Bocquet and Michel Noël, 'The Neolithic or Wood Age', *Endeavour* 9, no. 1 (January 1985): 34–41 arguing for a reinterpretation of the Stone Age as the Wood Age; Joachim Radkau and Ingrid Schäfer, *Holz: ein Naturstoff in der Technikgeschichte*, Orig.-Ausg. Rororo Rororo-Sachbuch Kulturgeschichte der Naturwissenschaften und der Technik 7728 (Reinbek bei Hamburg: Rowohlt, 1987), 21ff., 135ff., 209ff. on the importance of wooden construction materials until the Industrial Revolution; Joachim Radkau, 'Das hölzerne Zeitalter und der deutsche Sonderweg in der Forsttechnik', in *'Nützliche Künste': Kultur- und Sozialgeschichte der Technik im 18. Jahrhundert*, ed. Ulrich Troitzsch, Cottbuser Studien zur Geschichte von Technik, Arbeit und Umwelt 13 (Münster: Waxmann, 1999), 97–117 on an emerging awareness of the finiteness of wooden resources in Central and Western Europe towards the end of the 18th century. Some refer to the period when wooden materials grew scarce as the end of the 'timber age'; Joachim Radkau argues however that this was when people first became aware of their dependence of wood, and that it was thus the height of the timber age.

While some styles are entirely based on wood as a form giving material (Osthaus names Chinese and Japanese style, or German half-timbered *Fachwerk* houses, and Weston also mentions log constructions in the ‘coniferous belt of the northern tempered zone’ and Norwegian stave constructions),⁹²⁸ stone was generally the most influential material during the Romanesque, Gothic or Renaissance period in Europe.⁹²⁹

In Europe, representational buildings mainly feature stone or masonry in their visible parts. Although indispensable in all buildings, timber had mainly concealed functions in the foundations, roof structures or interior fittings of representative sacral or profane buildings (to which art history refers). As a main construction or cladding material, timber was mostly used in residential and utility buildings but was often rejected as a fire hazard⁹³⁰ or as rural and old-fashioned.⁹³¹

As wood was mostly used for simple and utilitarian buildings and objects, philosopher Moriz Carrière ascribed it a primitive and rural character in 1885.⁹³² Also Vischer sees the aesthetic value of wood as rural, patriarchal, primitive and primordial and regards natural stone as the ‘real monumental material’. However, to Vischer, these qualities also have a positive connotation; if not plastered over, the ‘strictly constructive’ of wooden frameworks reminds him of the essence of human community, which elevates them to something higher, poetic. This semantic connotation of wooden construction bare of redundant elements may even be carried over to noble residences and representative public or cultural buildings.⁹³³

European architectural styles have thus mainly been described with reference to other building materials than wood, such as stone, or later concrete, steel and glass. Stylistic

⁹²⁸ While Osthaus describes them as independent styles, Weston sees similarities in Japanese, German and Swedish buildings, as their forms are based on the same constructional logic. Richard Weston, *Materials, Form and Architecture* (London: Laurence King, 2003); Karl Ernst Osthaus, ‘Material und Stil (1910)’, in *Die Durchgeistigung der deutschen Arbeit. Wege und Ziele in Zusammenhang von Industrie, Handwerk und Kunst*, vol. 1, Jahrbuch des Deutschen Werkbundes (Jena, 1912), 23–29; issued also in Rübel, Wagner, and Wolff, *Materialästhetik*, 134–39.

⁹²⁹ Osthaus also remarks that styles that were based on locally available materials other than stone existed at the same time and in close geographic proximity; they differed fundamentally in their constructive principles, but often shared secondary elements such as details or ornamentation. Osthaus argues that material is a more important factor for architectural style than function, as very different stylistic expression still served similar types of function and spatial organizations in plan. Osthaus, ‘Material und Stil (1910)’.

⁹³⁰ While in the beginning of the 20th century in Germany, wooden constructions were no longer considered reconcilable with urban fire security requirements, large parts of urban ‘stone’ buildings from the turn of the century were still made of wood. Cheret and Seidel, ‘Der neue Holzbau’, 10.

⁹³¹ Schindler, *Ein architektonisches Periodisierungsmodell anhand fertigungstechnischer Kriterien, dargestellt am Beispiel des Holzbaus*, 93.

⁹³² Rübel, Wagner, and Wolff, *Materialästhetik*, 51–54; originally in Carrière, ‘Maß, Material und Farbe’.

⁹³³ Vischer, ‘Das Material’; also in: Rübel, Wagner, and Wolff, *Materialästhetik*, 46.

terms and categories are mainly based on stone constructions and only rarely include preindustrial timber construction (half-timbered houses are one such exception).⁹³⁴

The limited availability of wood in satisfactory sizes to serve as a construction material influenced artist and Arts and Crafts co-founder William Morris' judgement in 1892. His example of a material hierarchy is in part personal, but also based on an understanding that was more commonly shared by his contemporaries. Despite his 'great liking of wood' and his appreciation of the beauty of wooden houses, and although he considered wood more noble and thus superior to brick, he acknowledged a functional superiority of bricks for walls:

I mean to indicate the relative position of nobility between [the more homely and everyday materials (...) for the building of a wall]. Stone is definitely the most noble material, the most satisfactory material; wood is the next, and brick is a makeshift material.⁹³⁵

However, wood in satisfactory dimensions is not obtainable at his time.

You can no longer use wood as a material for a wall as frankly as it used to be used in medieval times, when good oak was almost a drug on the market. To build wooden houses with the framing of small dimensions seems to me one of the poorest things one can possibly do. You want (...) to be able to indulge in the greatest possible generosity of material, to have no sparing whatever, or else your wooden house will look like nothing but a feeble attempt to imitate the results of the architecture of the past.⁹³⁶

He concludes that sufficiently solid wooden walls are unachievable at the moment:

In spite of my great liking for wood, for I think there is nothing more beautiful than a beautiful wooden house, I am afraid we must at present put the use of wood clean out of the question. We cannot build a house with wooden walls at present.⁹³⁷

In times of timber shortage – which was especially severe in Europe between the 16th and early 19th century – bricks were often used as a substitute for wooden construction materials.⁹³⁸

⁹³⁴ Seeking to explain the lack of suitable art historical terms to classify preindustrial timber buildings, Schindler refers to Großmann, who describes this shortcoming with regard to half-timbered buildings (Fachwerkbau) in G. Ulrich Großmann, *Der Fachwerkbau in Deutschland: das historische Fachwerkhau, seine Entstehung, Farbgebung, Nutzung und Restaurierung* (Köln: DuMont, 2004), 100; Schindler, *Ein architektonisches Periodisierungsmodell anhand fertigungstechnischer Kriterien, dargestellt am Beispiel des Holzbaus*, 93.

⁹³⁵ William Morris, 'The Influence of Building Materials Upon Architecture (Delivered before the Art Workers' Guild at Barnard's Inn Hall, London, January 1892)', in *Hopes and Fears for Art; Lectures on Art and Industry*, vol. XXII, The Collected Works of William Morris (London: Longmans, Green and Company, 1914), 392.

⁹³⁶ Morris, 396.

⁹³⁷ Morris, 396.

⁹³⁸ Rondo E. Cameron, *A Concise Economic History of the World: From Paleolithic Times to the Present*, 2nd ed (New York: Oxford University Press, 1993), 119,307.

In 1973, Christopher Alexander names a range of criteria that a building material should fulfil to which – if handled correctly – wooden materials live up:

The central problem of materials (...) is to find a collection of materials which are small in scale, easy to cut on site, easy to work on site without the aid of huge and expensive machinery, easy to vary and adapt, heavy enough to be solid, longlasting or easy to maintain, and yet easy to build, not needing specialized labor, not expensive in labor, and universally obtainable and cheap.⁹³⁹

Alexander names an additional requirement that a building material should fulfil, which is even more in focus at present times:

Furthermore, this class of good materials must be ecologically sound: biodegradable, low in energy consumption, and not based on depletable resources.⁹⁴⁰

He points out wood as a relevant and suitable material:

Wood is excellent in many ways. Where it is available people use it in great quantities, and where it is not available people are trying to get hold of it.⁹⁴¹

However, he dismisses it as a main construction material due to a wood shortage at his time and place, and suggests its use for ‘doors, finishes, windows, furniture’.⁹⁴²

Unfortunately the forests have been terribly managed; many have been devastated; and the price of heavy lumber has skyrocketed. (...) We shall therefore look upon wood as a precious material, which should not be used as a bulk material or for structural purpose.⁹⁴³

In the above examples, aesthetic qualities are often superseded by concerns about technical appropriateness or by the symbolic and semantic value of a material. While some cherished it for its beauty, others saw timber as symbolically inferior and thus unfit for representative buildings or building parts. Although times of timber shortage would elevate its status to that of a rare and precious material, this did not prompt its use in more representative building parts; it was rather relegated to minor elements such as windows or interior elements, as other materials such as brick were favoured.

In an industrial context however, timber is not easily replaced with other materials. In 1993, twenty years after Alexander’s above mentioned reflection on building materials, the price of lumber increased dramatically in the United States, becoming almost the same as steel; as a consequence, the use of steel in residential projects increased. According to Ford, the architecture’s interior and exterior appearance was the same and people accepted the different material, but the residential building industry was hesitant to change their tried and true routines and did not accept the industrial production

⁹³⁹ Alexander, Ishikawa, and Silverstein, *A Pattern Language*, 956–57.

⁹⁴⁰ Alexander, Ishikawa, and Silverstein, 956.

⁹⁴¹ Alexander, Ishikawa, and Silverstein, 957.

⁹⁴² Alexander, Ishikawa, and Silverstein, 959.

⁹⁴³ Alexander, Ishikawa, and Silverstein, 957.

process, and the different processing and production methods prevented a more widespread use before prices readjusted.

Availability and resulting prices continue to vary and to have an impact on the discussion of the most suitable construction systems, e.g. massive timber construction which stores a greater amount of CO₂ versus skeleton systems which can replace a greater number of more harmful load-bearing constructions with the same amount of timber. Earlier, both storm- or fire losses and the need for farmland or for fuel for the iron industries (e.g. for ship building) have reduced the availability of wood and the Earth's forest cover altogether. More recently, rising oil prices and the mandate to replace fossil fuels with alternative energy sources put forestry under pressure. In Germany in the early 2000s, sawdust and wood chips were in such high demand that some saw mills sold their byproducts to wood pellet producers right away and passed over osb- or wood particle board producers. Even log wood was directly made into wood pellets for combustion instead of burning wooden construction materials first after the desirable cascading of uses described in the introductory chapter.⁹⁴⁴

Contemporary industrial context

When advocating iron concrete as a new, scientific and industrialized building material in 1928, Sigfried Giedion also predicts a rediscovery of timber.⁹⁴⁵

Promptly, in the light of industrialization in the early 20th century, architect Konrad Wachsmann argued in favour of timber as a cost-effective industrial construction material:

As standardized, machine-produced, pre-fabricated product wood can compete in terms of cost and utility with any other building material.⁹⁴⁶

A broader application of wooden construction materials in an industrial context first gained momentum in the second half of the 20th century, when the off-site production of pre-cut components advanced to prefabricating planar timber frame elements or even room modules.⁹⁴⁷

With the development of CLT in the 1990s, an increasing focus on environmental aspects and updated building codes, timber has been regaining popularity and relevance for urban multi-story buildings.

⁹⁴⁴ Ludger Dederich, Vorrang für die stoffliche Nutzung von Holz, September 2009.

⁹⁴⁵ Rübel, Wagner, and Wolff, *Materialästhetik*, 77–79; originally in Sigfried Giedion, *Bauen in Frankreich. Eisen. Eisenbeton.* (Leipzig: Klinkhardt & Biermann Verlag, 1928), 66–67.

⁹⁴⁶ Konrad Wachsmann, *Holzhausbau. Technik und Gestaltung*, original edition (Berlin: Ernst Wasmuth Verlag AG., 1930); English quote from: Konrad Wachsmann et al., *Building the Wooden House: Technique and Design* (Basel; Boston: Birkhäuser, 1995).

⁹⁴⁷ Peter Cheret and Kurt Schwaner, 'Holzbausysteme - eine Übersicht', in *Urbaner Holzbau: Chancen und Potenziale für die Stadt; Handbuch und Planungshilfe*, Handbuch und Planungshilfe (Berlin: DOM Publishers, 2014), 114–29.

On its rise in recent years, timber architecture has certainly benefited from the growing relevance of climate protection and the conservation of resources for the building sector.⁹⁴⁸

As the demands placed on environmentally sound construction increase, wood – a renewable resource – is undoubtedly gaining significance.⁹⁴⁹

Not only the potential ecological advantages of timber, but also new product and processing developments have changed the image of the material. Today, various degrees of prefabrication offer still other advantages that save time and costs as well as reduce area needs on building sites. They increase independence from weather and seasons, from site conditions, and from having skilled carpenters on site. Controlled off-site working environments allow for predictable working processes, greater precision and easier quality control. Wooden constructions entail on-site working environments that are less noisy and humid and thus preferred by workers. In addition, buildings can often remain in use while being added onto or modified. With ‘just-in-time delivery’, installation times are drastically reduced in comparison to on-site construction. This is particularly compatible with urban sites where space and time are limited, and building activities usually happen while the neighbouring buildings are in use. This has also been commented by the architects (see ‘Weighting wooden values’ in Section 4.2 below, and statements about advantages of timber regarding off-site production and on-site logistics mentioned in Section 2.2).

Although industrial developments in timber architecture have meant that stylistic expression develops based on the broader and international availability of the same constructive elements (e.g. CLT), wooden construction is still an important part of many countries’ cultural identities, as will be described more in detail for Norway.

Norwegian perspective

Christian Norberg-Schulz sees Norway as outstanding in the versatile use of wooden materials and maintains that Norwegian wooden architecture is enriched by the accessibility of high-quality timber that is suitable for the Norwegian climate, as well as by the flourishing folk art developed by Norway’s free peasants.⁹⁵⁰

⁹⁴⁸ Architektur Fachmagazin, ‘Auf Holz bauen’, *architektur-online* (blog), 15 March 2013, <http://www.architektur-online.com/kolumnen/auf-holz-bauen>, translation by the author.

⁹⁴⁹ ‘Timber Construction’, Detail-online.com, accessed 7 February 2018, <https://www.detail-online.com/magazine/timber-construction-26708/>.

⁹⁵⁰ Christian Norberg-Schulz, ‘The Norwegian Tradition’, in *Treprisesen 1961, 1962, 1964, 1966, 1969, 1971, 1973, 1975, 1978, 1981, 1983, 1986 = Thirteen Norwegian prize-winning architects*, 3rd ed. (Oslo: Arkitektnytt, 1988), 7–15. According to Norwegian architect Knut Hjeltnes, the quality of timber crafts in Norway is still special today. He designs mostly small residential buildings. Jensen and Skodvin, *10 arkitekter intervjuet*, 30–31.

The timber award ‘Treprisen’ is among the most prestigious Norwegian architectural distinctions.⁹⁵¹ Both jury members and laureates from the years 1961-1986 emphasize the importance of architecture’s originality; it should be independent of current trends and create a balanced and harmonious relation between the known and the new, order and variation, openness and closeness. Furthermore, they emphasize its naturalness and simplicity, which refers to a modest expression and material use, but also to technically systematized solutions with controlled variations in architectural expression. The award description still emphasizes the desired timeless qualities of location-specific architecture that should also be bold and original. Both technical and artistic aspects are considered, and there is an increasing focus on the building’s sustainability.⁹⁵²

The traditional predominance of wooden construction materials has not persisted into modern times, where they are mostly associated with cabins and suburban housing. Several circumstances may have contributed to this. As a consequence of several fire disasters in the past centuries, from the early 17th century on a number of Norwegian cities successively introduced restrictions for the use of timber. According to this ban known as *murtvang*, buildings in urban centres were to be made of fireproof materials such as brick or stone. Wooden constructions were thus mainly used for smaller residential buildings outside the city limits. By the end of the 20th century, new timber products and technologies as well as updated Norwegian planning and building codes opened up for a return of wooden building materials to the city centres. Function-based requirements for buildings and building materials now allow wooden constructions on the condition of documented compliance with the necessary regulations regarding fire safety, load-bearing capacity, etc.⁹⁵³

Meanwhile however, the Norwegian timber industry has not kept up with the development of other building industries, which have also benefited from the demands of a prospering oil sector and its supporting infrastructure. Moreover, the engineering expertise related to concrete and steel constructions was advanced by the booming oil industry, while a lack of knowledge about and experience with advanced wooden constructions often leads to higher pricing for these alternatives by contractors.

One may also suspect that building traditions formed in the 20th century and architectural styles to which people grew accustomed are a reason why concrete and steel still are predominant as building materials.⁹⁵⁴ Advanced wooden constructions have often

⁹⁵¹ Among others, it has been awarded to Sverre Fehn, Lund & Slaatto, Wenche and Jens Selmer, and more recently to Jensen & Skodvin and Helen & Hard.

⁹⁵² ‘Treprisen’, Store norske leksikon, 5 May 2015, <https://snl.no/Treprisen>; ‘Treprisen’, Norske arkitekters landsforbund, 21 November 2016, <https://www.arkitektur.no/treprisen2>.

⁹⁵³ Kittang, Narvestad, and Nyrud, ‘Tre i by – en kunnskapsoversikt’.

⁹⁵⁴ Karine Denizou, Sigurd Hveem, and Berit Time, ‘Tre i by – Hvilke mekanismer styrer materialvalget for større urbane byggverk?’, KMB-forprosjekt (NFR) ‘Fellesatsing Tre’ (Oslo, Norway: SINTEF Byggforsk, 2007).

been met with scepticism by clients, consultants and contractors, and until recently, wooden constructions have been limited to smaller projects outside city centres.

According to requirements for universal access in Norway, new buildings exceeding two floors need to be equipped with an elevator (exceptions apply); these buildings must thus be outfitted with sprinklers, regardless of their construction materials. This greatly facilitates fire safety compliance when building with timber.⁹⁵⁵ Moreover, there are pre-approved fire safety solutions for buildings in Norwegian fire class 1 or 2 with up to four floors.⁹⁵⁶ This range of buildings potentially allows for faster building permit processes and thus economic advantages, and is highly suitable for an extended use of wooden construction materials.⁹⁵⁷ In addition, housing projects with up to four floors allow the surface of wooden constructions to be exposed towards the interior to a great degree. To achieve the required fire resistance, the dimensions of load-bearing elements can be calculated to allow for the formation of a protective charring layer in the case of fire, while still maintaining the necessary stability.⁹⁵⁸

As it has turned out more recently, sound insulation represents a greater challenge when wanting to expose the wooden construction; added layers of heavy or dampening materials are often needed to reduce noise transmission from one apartment to another. As calculations often fail to meet consumer satisfaction, there is a recent tendency to decide for these added layers on all surfaces and less willingness to expose the wooden construction in parts where this should be unproblematic.

Unlike in the Alpine region (especially in Austria, Switzerland and southern Germany), the translation of traditional wood construction knowledge and skills into mainstream modern and industrial timber constructions has been delayed, so that it has often been necessary to import engineering competence, wooden products (sometimes sourced from Norwegian forests but engineered in Austria), and workforce to mount the constructions of larger projects.

As a result, Norway's forestry industry is still not able to use its resources to capacity.⁹⁵⁹ Current initiatives to re-establish Norwegian timber production promise a change, however. Technical development of the timber industries in Central Europe and a new

⁹⁵⁵ Lars Erik Sorthe, Henrik Bjelland, and Nils Erik Forsén, 'Utredning: Muligheter for Reduserte Branntekniske Ytelser Ved Installasjon Av Automatisk Slokkeanlegg' (Direktoratet for Byggkvalitet (DiBK), 23 March 2015), 126972-TVF-RAP-001.

⁹⁵⁶ Eight floors is equal to the length of many fire ladders and thus represents another threshold for the use of wooden construction materials in Norway. Effort and costs for taller residential buildings with wooden construction materials are considerably greater (e.g. additional staircases are required).

⁹⁵⁷ Informal conversations with AHO university professor and fire safety engineer Nils Erik Forsén, 2016.

⁹⁵⁸ Cheret, Schwaner, and Seidel, *Urbaner Holzbau*; Mayo, *Solid Wood*.

⁹⁵⁹ 'Bærekraftig skogbruk i Norge' (Ås, Norway: Norsk institutt for skog og landskap, Mai 2014), http://www.skogoglandskap.no/filearchive/baerekraftig_skogbruk_web.pdf.

formal interpretation of timber architecture in Alpine countries have been an important source of inspiration for Nordic countries.⁹⁶⁰

Values as embedded into building codes

Fire risk in buildings and urban areas and the associated potential damage and loss are interpreted and managed differently from country to country, and sometimes even regionally. To protect lives, possessions and representations of cultural identity, different precautionary measurements can be implemented to manage these risks, some of which are independent of building materials and some specific for e.g. timber. Embedded in building codes, these become a manifestation of a weighting of values and their protection in national law.

The value that a country or region ascribes timber is also reflected in specific subsidies, competitions or initiatives to advance the use of timber.

The overview in Section 1.5 includes a simple survey of building code updates and political incentives in Austria, Germany and Norway and how they coincide with the built precedents in this study (Figure 1.13). Codes and initiatives were also mentioned by the interviewed architects and are described based on these conversations in Section 4.2.

Material value as defined by the architect's skills

A number of architects emphasized the importance of the artist's or architect's work for making assembled materials into something of value. When Mies van der Rohe reflects on the essence of architecture's value, he considers it misleading to define value merely via apparent aspects and by focusing on functional and practical questions instead of intellectual value.

What matters is not the what but only the how. (...) Whether we build high or flat, with steel or with glass, says nothing as to the value of this building. (...) But it is exactly this question of values that is decisive.⁹⁶¹

The value of architecture, and of the materials of which it is made, likewise depends on other factors than the economic or ideological value of the resources used, and 'it is here that the intellectual problems begin'.⁹⁶²

⁹⁶⁰ Kittang, Narvestad, and Nyrud, 'Tre i by – en kunnskapsoversikt', 21.

⁹⁶¹ Fritz Neumeyer, *The Artless Word: Mies van Der Rohe on the Building Art* (Cambridge, Massachusetts: MIT Press, 1991), xi–xii.

⁹⁶² Ludwig Mies van der Rohe, 'Die neue Zeit' (Schlußworte des Referats, Wiener Tagung des Deutschen Werkbundes, Wien, 22 June 1930); as appended to Fritz Neumeyer, *Mies van der Rohe. Das kunstlose Wort. Gedanken zur Baukunst*. (Berlin: Siedler Verlag, 1986), 372–73; the author has translated 'geistig' as 'intellectual' rather than as 'spiritual', which was used in the English version referred to above.

To begin with, these materials are all of equal value, but how they are applied makes a difference, as Adolf Loos describes:

Which is worth more, a kilogram of stone or a kilogram of gold? The question probably seems ridiculous. But only to the merchant. The artist will answer: All materials are equally valuable as far as I am concerned. (...) The artist has only one ambition: to master his material in such a way that his work is independent of the value of the raw material.⁹⁶³

Loos bemoans the average architectural practice of his time and the level of general awareness, which disregarded the qualitative aspect of the work with materials, instead determining material value by the time spent by laborers, and later by machines; the focus was on the amount of work necessary to extract and process materials and not on the quality of the work, and thus restricted to quantitative aspects that are easier to assess than artistic value.⁹⁶⁴

Other architects also defended the idea that artistic work influences a material's value. Quoting a presentation by his friend Frank Lloyd Wright, Alvar Aalto said:

Ladies and gentlemen, do you know what a brick is? It is a mere trifle that costs eleven cents, a worthless, ordinary object, but it has one unique quality. Give me that brick, and it will immediately become worth its weight in gold.⁹⁶⁵

This statement inspired Alvar Aalto to conclude that

Architecture is about turning a worthless brick to gold.⁹⁶⁶

In turn, Rasmussen declared,

Even the noblest materials lose their character when employed without skill and understanding.⁹⁶⁷

Ford would agree that the different notions of material value not always are reflected in the price of a material. He extends this understanding to include industrial materials or finished products that do not require manipulation by hand. He suggests that the way in which standard building elements are assembled may contribute much more to a building's value than the materials' price, or their project-specific production.

Not the standardized building, but the building made of standard parts (...) made the mundane virtuous [and] isolated the apparently ordinary in order to display its inherent beauty. Thus the best building material might be the least expensive and the most ordinary, and the best design might be the one that was selected and assembled rather than fabricated.⁹⁶⁸

Also Leatherbarrow points out that

⁹⁶³ Loos, 'Building Materials', 63.

⁹⁶⁴ Loos, 'Building Materials'; see also Leatherbarrow and Mostafavi, *Surface Architecture*, 69.

⁹⁶⁵ Aalto and Schildt, 'Between Humanism and Materialism', 179.

⁹⁶⁶ Aalto and Schildt, 179.

⁹⁶⁷ Rasmussen, *Experiencing Architecture*, 165.

⁹⁶⁸ Ford, *The Details of Modern Architecture. 1928 to 1988*, 2:21.

value or significance arises not from things, but from the way they are handled, worked or treated.⁹⁶⁹

According to Leatherbarrow, processes besides how materials are worked by hand or assembled to a building also generate value. The accumulated traces of time and use described in Chapter 3 lend a unique identity and narrative to each building. The traces not only recount how a building or building part has been used, but also how much maintenance was put into the building and its parts. If building parts have been damaged or vandalized or in contrast treated with respect, repaired and maintained also allows assumptions to be made about how well a building was liked by its users and valued by budgeting authorities.

Architecture exhibits cultural values, but as the interviews will show, it can also take part in creating and sustaining cultural and societal values.

⁹⁶⁹ Leatherbarrow, 'Materials Matter', 81.

4.2 Architects

In the architect interviews, the conversations deliberately addressed general architectural values first, before focusing on wooden materiality. The intention was to avoid falling into a ‘timber- selling conversation’ right away, and to link the way in which the architects use materials to their overall architectural ambitions. For this reason, the architects’ statements about values relate to architecture in general and to the value of wooden materials in particular. Its initial perspective is broader than that of the theory section, which directly addresses material value. The introductory sections about sustainability and architectural qualities in Chapter 1 may serve as a backdrop for the architects’ statements.

Architectural values

In the interviews, architects started their narratives from the abstract end, talking about the value and meaning of wood for them. What they said became more graspable and vivid when the discussion progressed to their actual projects and specific details.

The architects all had different motivations for their approaches to the use of timber. In many cases, the use of timber, or the office’s specific way of planning with timber, was indeed not an end goal in itself, but a means to reach other ends.

Both architects for whom timber was the first choice among building materials and architects for whom timber is one option among many had architectural ideals that were tightly connected to their material choices. For some architects, the understanding of sustainability was of the greatest importance for this core motivation. For others, it was the understanding of architectural quality. Other interviewees made no distinction between sustainability and architectural quality.

Sustainability

Sustainability was addressed briefly in the background chapter (Chapter 1), as it is seen as a framing precondition for this research. Likewise, an interest in deepening an understanding of different takes on architectural quality is an underlying motivation. As argued in the introductory chapter, these topics overlap in a range of areas.

The contemporary relevance of sustainability matters was noticeable in the interviews. While all of the interviewed architects claimed to consider timber a sustainable building material, or as contributing to architectural sustainability, they displayed broadly differing attitudes to the sustainability discussion – either rejecting it, being sceptical of its criteria, using it to support their own agendas, or embracing it and making it a productive part of their own design philosophy. Almost none of the interviewees saw sustainability as the main reason for working with wooden materials. The architect who

was most positive toward sustainability related many different timber related aspects to sustainability. Others had a more narrow understanding of the term.

For some, sustainability is a goal in itself, whilst for others it is a supportive argument as a means towards another goal, and for others still, it is a meaningless label. Three of the seven interviewed architects almost immediately reacted in a deprecatory way to the topic of sustainability. They criticised the terminology of sustainability and its ‘inflationary’ use, which they claimed makes it non-credible.⁹⁷⁰ In the words of Kaden,

ecological sustainability [has become] somewhat inflationary: You look at whatever real estate advertisement and magazine in the weekend, no matter where, and everything is sustainable. No matter what and how they build.⁹⁷¹

Furthermore, rating systems are perceived as easy to manipulate and thus as hardly trustworthy, says Dünser.⁹⁷²

The focus areas of sustainability rating systems and as manifested in building codes are not accepted by all interviewees either.⁹⁷³ The basic parameters on which sustainability evaluations are based are questioned; it was argued that a per capita assessment might make more sense.⁹⁷⁴ This would also bring possible rebound effects to awareness, such as improving energy performance due to better insulation whilst area consumption increases.⁹⁷⁵

According to Untertrifaller, classifications or labels (e.g. passive house standard) with the goal to achieve sustainable buildings can lead to a one-dimensional view where the focus is on the calculation of energy-related values that might not have great informative value. Likewise, an exclusive focus on aspects such as compactness, increased insulation or passive house standard might overlook a bigger or more holistic picture. Instead of following prescriptions for a few aspects, it is much more important to plan intelligently to bring about sustainability, where any measure taken is appropriate, well balanced and coordinated. According to Untertrifaller, this is as much about avoiding mistakes as it is about avoiding unnecessary or meaningless measures. The materiality of a building is of great importance, which is why the upgraded insulation required for passive houses might end up being a ‘hazardous waste deposit’ [if not chosen carefully].⁹⁷⁶

⁹⁷⁰ Kaden, Transcription AD2, 2.

⁹⁷¹ Kaden, 2.

⁹⁷² Dünser, Transcription AA3, 8,15.

⁹⁷³ Untertrifaller, Transcription AA2; Dünser, Transcription AA3, 3.

⁹⁷⁴ Dünser, Transcription AA3, 8.

⁹⁷⁵ The interviewee referred to a presentation by Werner Sobek, telling that the same amount of energy saved due to better insulation (now as compared to the 1970s) often is consumed anyway, as the area consumption per capita has also increased. He favours the Swiss ‘2000Watt-Gesellschaft’ instead, which is based on per capita calculations.

⁹⁷⁶ Untertrifaller, Transcription AA2, 6. In his experience, buildings designed by his office in reality (as monitored) performed either much better or much worse than calculated in advance. He was also critical of the nearly exclusive propagation of compact building volumes at present and exemplified

Both Kropf and Zohar however embraced sustainability as a fundamental part of their self-conception and architectural ambitions. This also included various aspects of social sustainability, for example a feeling of belonging, identification and shared values⁹⁷⁷ or spaces for casual everyday encounters⁹⁷⁸ or shared facilities.⁹⁷⁹

For Helen & Hard, sustainability is an integral part of the office's working motivation, of their architectural ambitions, and of how they communicate their office profile. He considered sustainable architecture congruent with 'good architecture', and saw timber, as a renewable resource, as the best material choice.⁹⁸⁰

Many architects relativized the direct significance of sustainability for their daily work. They acknowledged the relevance of the current sustainability debate, but did not rank it highest among their architectural ambitions or motivations to work with timber. Kaufmann ascribed greater importance to other aspects of timber as a building material. To him, sustainability arguments have more of an auxiliary role to support other goals (namely to work with a locally available material that is considered beautiful, as described in Chapter 3).⁹⁸¹

Kaden + Lager use timber constructions to store CO₂, but stated that they considered the constructive properties and prefabrication possibilities of timber an even more important reason to use it where it performs well. Besides such practical reasons, they saw it as an essential advantage that wood is a renewable resource, but otherwise saw timber as one basic material among many. They did not want to be perceived as ideologists when it comes to timber.⁹⁸²

Untertrifaller stated that while timber architecture cannot solve the current housing shortage (as little as it can stop climate change), it can 'make a significant contribution'.⁹⁸³

Zohar focused mainly on social aspects as one of the three main fields of sustainability that is not necessarily material-related. He saw wooden materials as especially suitable in this context, tolerating many varied usages and living habits.⁹⁸⁴

At the same time, many factors of sustainability need to be considered simultaneously, and they might at times be in conflict. As an example, universal access requirements increase area consumption, so social sustainability has to be negotiated with ecological

this stance with an economically and ecologically successful project by his office with a looser spatial arrangement.

⁹⁷⁷ Kropf, Transcription AN1, 1.

⁹⁷⁸ Zohar, Transcription AN2, 2,11,12.

⁹⁷⁹ Zohar, Transcription AN2; Kropf, Transcription AN1. Several of the other architects who were more reluctant to depend explicitly on sustainability arguments also focused on these aspects.

⁹⁸⁰ Kropf, Transcription AN1, 2.

⁹⁸¹ Kaufmann, Transcription AA1.

⁹⁸² Lager, Transcription AD1; Kaden, Transcription AD2.

⁹⁸³ Kaden, Transcription AD2, 9.

⁹⁸⁴ Zohar, Transcription AN2, 3.

sustainability, as Zohar points out.⁹⁸⁵ Generally however, he saw social sustainability and environmental sustainability as connected, such as in well-working neighbourhoods that have less fluctuation and thus longer building lifetimes and fewer renovations.⁹⁸⁶

Some architects' architectural and sustainability ambitions were tightly related to their appreciation of the high-quality local craftsmanship that they wish to support. Several architects mentioned supporting local industry by conscious design, detail or material choices, which contributes to social sustainability.⁹⁸⁷ This is described more in detail in a section below.

Tacit qualities

While some of the interviewed architects are rather clear about the values they aim to realize with their built projects, many find it difficult to talk explicitly about qualities that contribute to 'good architecture'. They signal the tacit character of these architectural features or aspects.⁹⁸⁸

This tacitness is not only apparent when the architects are asked to talk about their understanding of architectural quality, but it is also referred to in the context of teaching. Context is ascribed great importance, but beyond this, creating good architecture requires an architect's sensibility (and tacit knowledge). The term 'architectural quality' seems to be avoided at schools; it is not addressed explicitly, but instead lurks somewhere in the overlaps of the taught subjects. As some architects indicate, it would depend on the student's ability and sensibility whether – although more explicit constructive rules or programmatic requirements are being followed – the building turns out well or 'ugly'.⁹⁸⁹

The interviewees point out that many aspects, including 'soft' ones, need to contribute to a meaningful whole. Their project-specific interplay makes an explicit delineation of architectural quality difficult; it must be judged 'on a gut level'.⁹⁹⁰

When talking about a more concrete subject however, the interviewed architects conveyed their firm convictions about how to build well with timber, how to construct 'honestly' and according to the material's properties, which relates to the concrete materiality of timber (see also Chapter 2). Everyday practicalities were not addressed to the same degree.

⁹⁸⁵ Zohar, 20. According to Zohar, while trying to make the apartments as small as possible, it feels absurd to call a 50m² apartment in Norway sustainable while people in Nepal live in 7m². He mentions volume (instead of m²) as contributing to housing quality. Reducing square meterage and increasing heights instead leads to more compact building volumes. Zohar did not discuss how this might impact energy consumption.

⁹⁸⁶ Zohar, Transcription AN2, 6.

⁹⁸⁷ Kaufmann, Transcription AA1; Dünser, Transcription AA3; Zohar, Transcription AN2.

⁹⁸⁸ Kaufmann, Transcription AA1; Untertrifaller, Transcription AA2.

⁹⁸⁹ Kaufmann, Transcription AA1, 3.

⁹⁹⁰ Untertrifaller, Transcription AA2, 6.

Weighting wooden values

As all firms interviewed for this research were selected on the basis of their built examples with timber constructions, this pre-selection presumes a generally positive attitude towards timber as a construction material. The architects' material preferences differ however, as does the degree to which the material is present in their architecture as a visual surface or as a form-giving factor.

Most of the interviewed architects had a very clear position concerning their office's material preferences and how to design well with these materials.

The value the architects assigned to wooden materials relate to concrete properties such as workability, versatility,⁹⁹¹ robustness, precision⁹⁹² or prefabrication possibilities;⁹⁹³ to perceived qualities such as aesthetic qualities⁹⁹⁴ or multi-sensory experiences,⁹⁹⁵ and to their semantic role, for example as both bearer and shaper of local identity.

Some architects seemed convinced that timber is generally the preferable building material, and they used a broad range of arguments to support this conviction.

Others relativized the supremacy of wooden building materials either for functional reasons or by dissociating themselves from a discourse that highlights its aesthetic or health-related advantages. For them, it was important to emphasize that they did not necessarily, or not always, value all of these aspects. For example, for some, the use of timber was motivated by mainly practical advantages. Kaden sees the short construction periods that prefabrication grants as the main advantage of timber construction. Urban construction sites offer limited space for the storage of materials or elements. A building can be made rainproof within 3-4 weeks. The material's visual appearance would be hidden in favour of what was seen as a more neutral background.⁹⁹⁶

Others highlighted both technical and aesthetic reasons for using timber only where it performs best, or in combination with other materials.⁹⁹⁷

Some of the interviewees reported that clients approach them with a desire to build in timber, or that they contact them precisely because of the office's reputation with timber buildings, and they thus do not need to convince clients of the advantages of building with timber or to reassure them that challenges can be controlled. Architects do however still need to argue in favour of timber in other contexts, for example for using timber as a surface material, or utilising it in unconventional ways. Despite technical assessments and legal approval, there are still some prejudices in the public perception of timber

⁹⁹¹ Kaufmann, Transcription AA1; Kropf, Transcription AN1.

⁹⁹² Untertrifaller, Transcription AA2; Lager, Transcription AD1.

⁹⁹³ Lager, Transcription AD1, 1.

⁹⁹⁴ Kaufmann, Transcription AA1; Kropf, Transcription AN1.

⁹⁹⁵ Kropf, Transcription AN1, 5.

⁹⁹⁶ Kaden, Transcription AD2, 7.

⁹⁹⁷ Lager, Transcription AD1; Untertrifaller, Transcription AA2.

architecture; some doubt the technical suitability of wooden construction and fear that it compromises both security and comfort, as Kaufmann reported:

We still have to fight against many prejudices, right? [We] still [have to]. Timber is afflicted with many prejudices; we know that. Sound and fire and water, and (...) it has no value, and it crackles and creaks, and what more. And there is a draught, and...⁹⁹⁸

Added value and social aspects

For several architects, creating ‘added value’ and common benefits for everyone involved in a project and for the building’s surroundings is an important aim.⁹⁹⁹ This additional value implies for example a positive influence on the health, well-being and emotions of the people using or being exposed to architecture. In addition to facilitating everyday use, it can create shared values, identification, and a feeling of belonging. This might also result in economic value. A financial, or ideal surplus feeds back into a system, instead of drawing something from people or from the building’s surrounding (e.g. using energy, or by producing waste that cannot be reabsorbed by the system).¹⁰⁰⁰

Added value and common benefits may also be linked to environmental issues, social stability, durability and other long-term aspects, or re-use.¹⁰⁰¹

Many interviewees emphasized the importance of social sustainability and suggested contributing to it through the experience of architectural features,¹⁰⁰² through shared functions and areas¹⁰⁰³ and by involving users in the design process.¹⁰⁰⁴ Zohar highlighted the relevance of creating spaces for people to meet and talk to each other in times where direct conversation is often replaced by electronic messages and social media.¹⁰⁰⁵ Lager talked about how they try to support contact and communication between neighbours by planning open access staircases and ‘productive spaces’ within the dwellings that are not negatively affected by being exposed to the neighbours, like kitchens or home offices close to staircases.¹⁰⁰⁶ Kaden talked about participative building; a collective process to find the design which is not dictated by the architect, and which brings about results that would have never been realized together with an investor.¹⁰⁰⁷ While many of these aspects are not directly related to a building’s materiality, there are material-related design choices that have an impact on social issues; for example, external staircases may

⁹⁹⁸ Kaufmann, Transcription AA1, 30.

⁹⁹⁹ Kropf, Transcription AN1, 1; Zohar, Transcription AN2, 1.

¹⁰⁰⁰ Kropf, Transcription AN1, 1. During the interview, the production of additional value in contrast to balanced systems was discussed in more detail.

¹⁰⁰¹ Zohar, Transcription AN2, 1,2.

¹⁰⁰² Kropf, Transcription AN1, 5.

¹⁰⁰³ Zohar, Transcription AN2. Other architects also implement shared areas and facilities into their designs, but without addressing this explicitly as social sustainability in the interviews.

¹⁰⁰⁴ Lager, Transcription AD1; Kaden, Transcription AD2.

¹⁰⁰⁵ Zohar, Transcription AN2, 3.

¹⁰⁰⁶ Lager, Transcription AD1, 14.

¹⁰⁰⁷ Kaden, Transcription AD2, 8.

be part of a fire protection strategy, but also foster communication and interaction between inhabitants in a different way. Furthermore, materials are mentioned as creating a certain atmosphere¹⁰⁰⁸ and as contributing to an architecture that is beneficial to the health and well-being of its users.¹⁰⁰⁹ The architects' views on health and well-being are part of Chapter 3.2. Values related to social aspects and as anchored in building codes are described later in this chapter.

Building codes, initiatives and subsidies, and costs

Building codes

As mentioned earlier, building codes have been adapted to new timber product developments and construction methods. Risks and precautionary measurements related to building projects in general and timber as a material specifically are handled differently from country to country, and sometimes even regionally. As the architect interviews reveal, this concerns not only the building codes themselves (defining for example building heights, constructive solutions or sprinkler systems), but also how these are applied in projects by the architects (sometimes depending on the availability and costs of different systems), and practices to ensure that building codes are followed.

Despite there being greater restrictions imposed on residential buildings regarding budget, time frames, programme or public interest than there are on cultural or other public or representational buildings, there is a certain degree of freedom in design choices regarding whether wooden surfaces should be concealed or left exposed. One may even say that average multi-storey housing projects are 'low-hanging fruit' for wooden construction:¹⁰¹⁰ According to requirements for universal access in Norway, new buildings exceeding two floors need to be equipped with an elevator (exceptions apply); these buildings must thus be outfitted with sprinklers, regardless of their construction materials. This greatly facilitates fire safety compliance when building with timber.¹⁰¹¹ Moreover, there are pre-approved fire safety solutions for buildings in Norwegian fire class 1 or 2 with up to four floors.¹⁰¹² This range of buildings potentially allows for faster building permit processes and thus economic advantages, and is highly suitable for an extended use of wooden construction materials.¹⁰¹³ In addition, housing projects with up

¹⁰⁰⁸ Lager, Transcription AD1, 4; Unterrifaller, Transcription AA2, 8.

¹⁰⁰⁹ Dünser, Transcription AA3, 2,3; Kropf, Transcription AN1, 1; Zohar, Transcription AN2, 13.

¹⁰¹⁰ Informal conversations with AHO university professor and fire safety engineer Forsén, interview.

¹⁰¹¹ Sorthe, Bjelland, and Forsén, 'Utredning: Muligheter for Reduserte Brann tekniske Ytelser Ved Installasjon Av Automatisk Slokkeanlegg'.

¹⁰¹² Eight floors are equal to the length of many fire ladders and thus represents another threshold for the use of wooden construction materials in Norway. Effort and costs for taller residential buildings with wooden construction materials are considerably greater (e.g. additional staircases are required).

¹⁰¹³ Informal conversations with professor and fire safety engineer Forsén, interview.

to four floors allow the surface of wooden constructions to be exposed towards the interior to a great degree. To achieve the required fire resistance, the dimensions of load-bearing elements can be calculated to allow for the formation of a protective charring layer in the case of fire, while still maintaining the necessary stability.¹⁰¹⁴

As it has turned out more recently, sound insulation represents a greater challenge when wanting to expose the wooden construction; added layers of heavy or dampening materials are often needed to reduce noise transmission from one apartment to another. As calculations often fail to meet consumer satisfaction and complaints may end up as court cases, there is a recent tendency to decide for these added layers on all surfaces and less willingness to expose the wooden construction in parts where this should be unproblematic.

Austria and Germany have height limits for the use of wooden constructions. Exceptions require a laborious permit procedure. In Norway, there is no height limit as long as compliance with fire protection requirements is documented. Generally, Norway and Austria have preapproved solutions for timber buildings with up to four floors that expose their constructive elements indoors.

Building codes vary slightly in Germany's 16 federal states, so each timber project must follow rules that are specific to its location.¹⁰¹⁵ Kaden + Lager is part of a group of architects who give input for Berlin building code amendments in order to advance timber construction. The gradual changes open up for more extended uses of timber and for exposed timber, but exposed timber is generally only permitted in buildings with up to five floors.¹⁰¹⁶ Many federal states in Germany allow timber constructions up to building class 4, with the highest floor at max. 13m above ground (this corresponds to four to five floors). Multi-storey buildings in timber whose uppermost floors are between 13 and 22m above the ground (building class 5) deviate from the fire regulation. Proof must be provided that the safety objectives are fulfilled by the construction system, or by technical compensation measures (e.g. with sufficient escape routes, installing a sprinkler system or a dry rising pipe). Depending on the building class and federal state, the timber construction needs to be enclosed by one or several layers of e.g. gypsum board, or over-dimensioned to provide a charring layer that will protect the construction from further damage in case of fire.¹⁰¹⁷

In both Austria and Germany, sprinkler systems are expensive and thus unusual; in Norway however, sprinklers are mandatory for all buildings with an elevator. As mentioned above, elevators are in general required for buildings over two-storeys-high in Norway to ensure universal accessibility.

¹⁰¹⁴ Cheret, Schwaner, and Seidel, *Urbaner Holzbau*; Mayo, *Solid Wood*.

¹⁰¹⁵ Kaden, Transcription AD2, 6.

¹⁰¹⁶ Kaden, 6.

¹⁰¹⁷ Lager, Transcription AD1, 3,4.

Dünser found the mentality in the Austrian capital different to that in other regions: room heights, sound performance and the like are checked in the built project instead of only from calculations or drawings. In addition to the general mentality, he mentioned that attitudes are different in Vorarlberg than in Vienna, where deviating dimensions easily become legal disputes:

In Vienna, they measure. That's really different in Vienna than in Vorarlberg. There, the lawyer is always [present] on site. There, you build 2.52 meter in order to end up with 2.50 after deflection under load. Because that is what the client is entitled to.¹⁰¹⁸

As described in Chapter 2, the architects operate within the respective legal frameworks which sometimes spark creative and innovative ways to comply with the building codes. Other times, projects that obtain exceptional permission set new standards and ultimately effect an adjustment of building codes.

Initiatives, subsidies and feasibility

There are a number of initiatives aimed at supporting multi-storey timber housing in the Austrian capital in the form of for example subsidies or competitions (see also Figure 1.13). Both short-term initiatives and the subsidy system entail two challenges: to repeat a project so that it becomes economically feasible for an office and the developer; and to ensure long-term qualities whose costs might exceed the limits defined by the subsidies for social housing (as e.g. in Austria).

The initiated development of multi-storey timber housing projects did not continue at the anticipated speed and intensity, as Untertrifaller recounted; after an initial run on these projects, costs were seen as too high and the interest in or acceptance of them was too low. The Mühlweg projects (subsidized housing) were a special case because the timber industry sponsored them as a prototype. But under normal circumstances, it is difficult to restrict costs enough to qualify for subsidies.¹⁰¹⁹

In Austria, most multi-apartment housing projects are state-subsidized social housing projects. In contrast, most housing projects in Scandinavian countries are privately developed; Dünser reported that he perceived them as more luxurious for this reason.¹⁰²⁰

Others however believe that subsidized social housing projects ensure better quality than housing developed by private developers in Austria and thus saw them as an interesting task, as the developer remains the owner and manager of a building and its rental apartments and has greater long-term interests in the building and its qualities than private developers, who simply sell them and focus more on the immediate profit; the time-related perspectives and interests are different. According to Kaufmann's

¹⁰¹⁸ Dünser, Transcription AA3, 12.

¹⁰¹⁹ Untertrifaller, Transcription AA2, 2.

¹⁰²⁰ Dünser, Transcription AA3, 11.

experience, subsidised housing developers only build what they know they will be able to rent out.¹⁰²¹

Some concepts also mix owned and rental apartments within a single building. Dünser considered this mix an especially interesting design challenge for housing, as one has to create high quality and at the same time compete price-wise with ‘the cheapest and the most disgusting in the building business’.¹⁰²²

However, as subsidies are only granted if the project is within a certain budget, it is sometimes difficult to establish new ways to construct, or it becomes necessary to compromise on quality. Untertrifaller identified another challenge as a huge thinking flaw in the present system: considering life cycle costs, it would be much cheaper to be able to disassemble and reuse the building or parts of it, as discussed in Chapter 2. Life cycle costs should be considered instead of short-term budgets; this is very rarely done however. At present, the cost pressure caused by the subsidies’ framework prevents social housing builders from realizing long-term interests.¹⁰²³

Another aspect might explain why the timber initiatives have not resulted in more follow-up projects in Vienna: according to Dünser, a collaborating developer had claimed said that he would need to build the exact same project five times in order to make money from it. But as all plots are sold through competitions in Vienna, chances to win a commission with the same developer five times are ‘practically zero’.¹⁰²⁴ Most often, then, the usual practice of allocating real estate makes it impossible to earn money by building an approved project.

Several architects complained that building sites had become too expensive.¹⁰²⁵ Kaden believed that state- or municipality owned sites should be granted based on tender content, not finances.¹⁰²⁶ He was happy to be able to build for some housing societies with a focus on good dwellings for average families, and not only for investors who have their own profit in mind.¹⁰²⁷

Costs

The interviewed architects discussed costs as relating to the materials’ price, detailing and specific constructive systems, surface qualities, and the complexity of the project. They also mentioned the costs of specialized engineers and general, material-independent insecurities in a cost estimate.

¹⁰²¹ Kaufmann, Transcription AA1, 28.

¹⁰²² Dünser, Transcription AA3, 11.

¹⁰²³ Untertrifaller, Transcription AA2, 5.

¹⁰²⁴ Dünser, Transcription AA3, 12.

¹⁰²⁵ Kaufmann, Transcription AA1, 29; Kaden, Transcription AD2, 11.

¹⁰²⁶ Kaden, Transcription AD2, 11–12.

¹⁰²⁷ Kaden, 9.

Kaufmann pointed out the importance of balancing costs and architectural ambitions, especially in housing projects, stating that they in particular require smart, cost-efficient solutions that at the same time produce ‘reasonably decent architecture’.¹⁰²⁸

Kropf named three risks for cost increases, which he did not however consider specific to timber. These were generally increasing construction costs; changes in the housing market; and delays related to building authorities.¹⁰²⁹

Kaufmann mentioned constructive complexity as a factor that increases costs (see also the section on constructive complexity in Chapter 2).¹⁰³⁰ Zohar's description of the project Ulsholtveien showed how they negotiated design intention and the resulting complex geometry with timber characteristics, e.g. regarding sound. Complicated details lead to compromises regarding constructive stringency and building physics and thus to increased costs. Zohar stated they had been weighing this against the upsides of the design, such as meeting places, geometric variety, etc.¹⁰³¹

There seems to be no universal view among the interviewees on whether leaving timber exposed is more expensive than covering it up with e.g. gypsum. Usually, when the construction is left exposed, a higher quality wooden surface is chosen, which makes the product more expensive. It must also be handled with greater care during transport, installation and use. On the other hand, there are neither materials nor working hours for the covering layer. Untertrifaller referred to a building where the construction was left uncovered for cost reasons.

We have built a school now where the primary structure is literally the finished building because it would have been unpayable otherwise. But I was happy about it.¹⁰³²

According to him, until six or eight years prior to the interview, mostly box-section elements were used; now they mainly used CLT. These hollow box elements could be filled with sound or heat insulation, but they are too expensive today and are mainly used to bridge large spans.

According to Untertrifaller, high costs were the reason why multi-apartment timber housing project prototypes in Vienna did not lead to successive projects. While he estimated the raw material prices of concrete and timber to be similar, his experience was that building labour for timber constructions was more expensive than for massive construction as they require more specialized knowledge and experience. In addition, sound insulation requirements are more difficult to meet with timber construction, so the constructive details of complex multi-layer constructions or clad constructions

¹⁰²⁸ Kaufmann, Transcription AA1, 11.

¹⁰²⁹ Kropf, Transcription AN1, 13,14.

¹⁰³⁰ Kaufmann, Transcription AA1, 11.

¹⁰³¹ Zohar, Transcription AN2, 7,8.

¹⁰³² Untertrifaller, Transcription AA2, 10–11.

increase the costs. In projects with lowered sound insulation requirements, he considered timber construction as easily able to compete in price.¹⁰³³

Local and regional situatedness

Context and craftsmanship

The interviewed architects talked about local differences in traditional style as an inspiration and source of knowledge for locally suitable architectural principles, but also as locally anchored knowledge, skills and experience of the timber industry and carpentries. A way of securing that this knowledge is kept alive or continues developing is to maintain the demand for it by appointing local firms and/or by using local timber. It is not always easy to achieve either of these due to rules for tendering in public projects and resources not always matching the demand. The attractiveness of education related to timber building is also important.

Several interviewees emphasized the importance of a project's context for design as well as for the actual realization. This refers most obviously to local climate and the physical surroundings of the building site, as well as its societal and cultural settings. As Kaufmann pointed out however, a project's context also includes material properties (see also Chapter 2); and production possibilities are also important framing conditions.

Kropf saw wooden boat builders and Norwegian coastal towns (traditionally built of timber) as a source of inspiration for his office's timber architecture, as well as a reason that timber is a generally accepted construction material in Norway. While there are still old wood houses with up to six floors on the coast, timber construction has lost ground to other industrialized construction methods in Norway (e.g. concrete), especially for multi-storey buildings; this has an influence on the availability as well as the acceptance of products and surface treatments.¹⁰³⁴

Beyond neighbouring building volumes, landscape or natural elements, physical context may inform a project when learning from the local building principles of vernacular architecture, which have been tested and approved over time as adequate for local climatic conditions and the building material utilised.¹⁰³⁵

In Vorarlberg, the vernacular precedents communicate location-specific character and identity. At the same time, they are a testimony of passing time and how the tectonic principles have been adapted to new products, technologies and changing tastes. Kaufmann stated the aim to build simply and based on these centuries-old principles, but instead of reproducing historical stylistic elements, Hermann Kaufmann Architekten

¹⁰³³ Untertrifaller, 2–3.

¹⁰³⁴ Kropf, Transcription AN1, 2,3.

¹⁰³⁵ Kaufmann, Transcription AA1, 2,3.

preferred 'modern' forms derived from and possibly with industrialized timber products.¹⁰³⁶ A new building might thus adapt some stylistic principles or details whilst also introducing new architectural language into this context, for example when adapting the programme or spatial constellation to current needs; when production methods change; or when a different formal expression is sought. In addition to reacting to its context, a project thus also takes part in shaping this context; an example of influencing the context is consciously supporting local industry and craftspeople in order to keep knowledge and skills alive, as their high-quality contribution is seen as crucial for a project's success.

The quality of craftsmanship may be exceptional in one region without this necessarily being true for the entire country. The local quality craft in Vorarlberg and the entire Alpine region is unique, as Dünser states:

Now I've been almost all around the world. And that's when I noticed that we don't have the better architects or the better or smarter carpenters or whatnot in Vorarlberg or in this part of Central Europe. But this is one of the few places in the world where handcraft didn't die out in the 70ies and 80ies and gets replaced by just ordering semi-finished or finished products, and where craftsmen have degenerated into assemblers.¹⁰³⁷

In his experience, the quality of the timber delivered elsewhere is much lower than in Vorarlberg:

In France for example it is really bad. (...) They have huge forests as well, and we lined [one of our projects] with larch. They delivered larch panelling that looked like it had fallen off the truck. No sorting, no cutting, nothing. Just wood cut into boards.¹⁰³⁸

Dünser thus sees architectural quality as interlinked with locally anchored factors.

[Architecture] is no isolated [building project]. It is the end product of a really long [value] chain that we think needs to be conserved.¹⁰³⁹

Hermann Kaufmann Architekten are aware of the importance of good and experienced craftspeople for creating high-quality buildings, as well as for developing innovative solutions in collaboration; according to Kaufmann, they work with carpenters and producers on equal footing and cooperate with them to break new ground together, predominantly with regard to scale, dimension and precision.¹⁰⁴⁰

While both Kaufmann and Dünser maintained that the quality of local craftsmanship is acknowledged by society and politics, both also expressed concern that the high quality for which Vorarlberg is known could become lost, as young people are increasingly losing interest in learning trades. Attracting a new generation of carpenters is important in order to keep local knowledge, experience, practical expertise and skills alive. As mentioned

¹⁰³⁶ Kaufmann, 3,4.

¹⁰³⁷ Dünser, Transcription AA3, 3.

¹⁰³⁸ Dünser, 6.

¹⁰³⁹ Dünser, 3.

¹⁰⁴⁰ Kaufmann, Transcription AA1, 4.

earlier, the Austrian political and educational system supports craft professions as an educational choice without excluding options for further education: the dual vocational training of craftspeople increases the prestige and popularity of these professions. In addition, the social status of carpenters is affected by the sustained demand for local carpenters' work.¹⁰⁴¹ Kaufmann said that

that would be the message [to other architects interested in timber construction who look at Vorarlberg for inspiration and knowledge]. To do more to make the carpentry profession a lot more attractive for young people. We also have a huge run on young people, in everything, and we have a really good metalworking industry and electric export firms, global market leaders, and so on in this small country, and they suck all of the young working force out of the valleys who would be great craftspeople. This is going to be a huge problem, also for us.¹⁰⁴²

Dünser elaborated on how the awareness of depending on a living carpentry culture in Vorarlberg informed the office's design decisions, even down to the material specifications. He reported an interest in the decentralisation of the supply of timber products; many companies had been bought by other companies and become 'big players'. The small-scale owner structures, especially in the western Austrian forest, exclude these from this market. The land parcels often also have a steep topography, which increases the harvesting costs. The small amounts of timber yielded are of no interest to larger companies, in contrast to local sawmills. They are able to produce glue-free cross-layered timber with a fluted surface, which improves the u-value as well. Hermann Kaufmann Architekten had found a way to specify wooden products in the tender documents so as to comply with the rules of not favouring only one bidder, but knowing that only regional bidders (and no big players) would be able to manufacture the requested products that deviated from standards for which large production facilities are optimized.

If we include this in a call for tender, even an open one, we don't have to consider offers by large CLT producers, as long as they cannot meet these requirements. Well, the reason for doing this is very clear. First of all, we of course want to favour the local [manufacturer], and secondly, we of course also want to arrive at higher quality, because we want to advance the development.¹⁰⁴³

Giving local carpenters a more competitive position in the bidding processes strengthens local industries and communities and thus contributes to social sustainability.

Some architects consciously try to support local industries by designing for the local conditions and equipment of local firms,¹⁰⁴⁴ or designing in a way that will enable local industries to invest in machinery that will keep them competitive.¹⁰⁴⁵ Whilst a number of

¹⁰⁴¹ Kaufmann, 5,25; Dünser, Transcription AA3, 3,6.

¹⁰⁴² Kaufmann, Transcription AA1, 25.

¹⁰⁴³ Dünser, Transcription AA3, 7.

¹⁰⁴⁴ Kaufmann, Transcription AA1; Dünser, Transcription AA3.

¹⁰⁴⁵ Zohar, Transcription AN2, 16.

firms claimed that supporting local industry was a goal for them, they offered different explanations for this.

Kaufmann wanted to build with timber and maintained that the abundance of wooden raw material in their country made its use self-evident.¹⁰⁴⁶ Hermann Kaufmann Architekten sought ways to ensure the high-quality execution of their designs.

Other architects' give-and-take attitude towards local industry started at the opposite end: Haugen / Zohar did not have a specific material in mind and had first come to building with wooden materials via the desire to support the local industry with one of their projects, a sculptural furniture installation. They departed from what the local industry needed and designed accordingly:

It might seem like a timber profile was a very specific target for us, but it was not [the case] actually. (...) We targeted synergy with the local industry, and the local industry was timber.¹⁰⁴⁷

We wanted to help [the] local industry and asked them: 'What kind of tools will make you more relevant?' They told us: 'We would like to have a project with a 5-axis CNC [machine]. We would like to buy a 5-axis CNC but we don't have the budget. Give us the project so we can finance it.'¹⁰⁴⁸

Lager mentioned that local carpenters are able to deliver skeleton structures as a simple system suitable for four- to five-storey buildings, which represents the largest market for exposed timber constructions in Germany. He sees the value chain as remaining entirely within the carpentries, as they can produce the construction with handheld machines from semi-manufactured products. Massive timber construction uses industrial products that are more difficult to convert for small carpentries, which means that the value chain shifts away from the carpentries to the manufacturers. However, supporting local craftsmen and small carpentries is not a major goal for Kaden + Lager, but rather a non-prioritized side effect.¹⁰⁴⁹

Identity and resources

In the previous chapter, a visual connection with the physical context has been described as an absence of materiality that allows views on nearby natural features or buildings, or as a presence of local materials in the interior that recalls the building's location.

In some projects, such a connection becomes quite concrete and immediate, and literally palpable when trees that have grown nearby or on the site itself are used for construction. Then one can see, smell, touch, sit and walk on wooden building parts of a certain species and at the same time see a living tree of the same sort outside. This immediate

¹⁰⁴⁶ Kaufmann, Transcription AA1; Dünser, Transcription AA3.

¹⁰⁴⁷ Zohar, Transcription AN2, 16–17.

¹⁰⁴⁸ Zohar, 16.

¹⁰⁴⁹ Lager, Transcription AD1, 6.

connection with the building's natural context contributes to an atmosphere that is unique to the building and its surroundings. It creates a specific narrative about local identity. Sometimes these trees harvested on or around the building site are species that are rarely used in industrial products, but that can be worked by local carpenters.

Using local resources was an important motivation for Dünser to work with timber, more important than more general sustainability arguments or potential health benefits.

This begins in the forest – finally reconsidering what [tree species] grow around here, in our forests. For example, this is highly topical in Vorarlberg: no one uses beech. Beech trees overage in the forests. There is no money for beech.¹⁰⁵⁰

Dünser gave an example of how supporting the local economy also fostered local identity: For one project, they used local ash trees that urgently needed to be felled due to their age. The ash trees had been planted and tended by previous generations to reforest steep slopes, and there had been hopes of later investment return. The property on which they stood could not be sold due to a fungal infestation and the price had fallen dramatically. Ash trees are a hardwood species with very different characteristics to the knotless white fir typically used.¹⁰⁵¹ The architects decided to use it nonetheless, and the trees that once grew in a nearby valley became part of the buildings as furniture or flooring. Dünser maintained that this created a different kind of identity and connection, telling a story that reflected its location and origins.¹⁰⁵² Untertrifaller also commented however that one usually can only build a few projects with local timber before this resource is used up.¹⁰⁵³

Most of the interviewed architects stated however that it is often difficult or impossible to control the provenience of timber materials used for a project¹⁰⁵⁴ due to legal restrictions for calls for tender,¹⁰⁵⁵ limited local availability,¹⁰⁵⁶ or uncertainty about which provider to trust.¹⁰⁵⁷ Initiatives to promote local timber with subsidies, or by including this as a requirement in the call for tender, might be introduced by a municipality, a region, or on a national level.

While private clients may engage local firms and timber deliverers directly and without tender,¹⁰⁵⁸ or define in the tender specifications that local raw materials have to be used,¹⁰⁵⁹ pre-determining the provenience of building materials in public projects is more

¹⁰⁵⁰ Dünser, Transcription AA3, 3–4. Obviously, beech as a hardwood species requires different processing than the more commonly used softwood species, so a decision to use this locally available species entails a number of production related consequences.

¹⁰⁵¹ It seemed that Dünser considered the use of knotless white fir cliché.

¹⁰⁵² Dünser, Transcription AA3, 10.

¹⁰⁵³ Untertrifaller, Transcription AA2, 8.

¹⁰⁵⁴ Kaufmann, Transcription AA1; Untertrifaller, Transcription AA2.

¹⁰⁵⁵ Kaufmann, Transcription AA1, 23,24.

¹⁰⁵⁶ Untertrifaller, Transcription AA2, 8.

¹⁰⁵⁷ Zohar, Transcription AN2, 15.

¹⁰⁵⁸ Kaufmann, Transcription AA1, 24.

¹⁰⁵⁹ Lager, Transcription AD1, 7.

challenging. In Austria, there is sometimes political support for the use of local timber, for example it can be specified that the timber for a public building has to be from nearby forests owned by the municipality. There are similar initiatives in Germany; a larger project in Munich for example grants clients municipal subsidies for using regional wood.¹⁰⁶⁰ In Switzerland, the incentive 'Holz von hier' ('wood from here') promotes the use of local timber where there is competition from cheaper timber from Austria.¹⁰⁶¹

Public procurement regulations in Austria allow the tender specification to stipulate that local materials be used only if the client owns the material or the forest; otherwise, excluding the European market is not permitted. Specific tender requirements have to be set up that give a high score in a point-based system to evaluate tender submissions. A company that scores highly might win the bid despite being more expensive. This is a complex procedure, strictly controlled by public procurement law.¹⁰⁶²

More often than not, it is not possible to control the origin of the wooden materials used. Kaufmann said that they

leave it to the carpenter where he gets his boards and beams from which he probably will buy at the market.¹⁰⁶³

In some cases however, the office designs and details in a way that gives local producers an advantage in the bidding process without excluding other bidders.

Of course, you will always be able to order the familiar timber species from somewhere, but the quality might not be the same as what we are used to from our local timber. (...) One really has to give some serious thought to finding a way that gives an edge to the carpenter who fells the tree himself an edge, one that is not unfair but that's based on quality.¹⁰⁶⁴

This could for example concern which parts of the stem are used (e.g. rift or half rift); as another example, they specified the use of nailed cross layered massive timber elements instead of CLT in one project, as only regional firms would be able to offer this product.¹⁰⁶⁵ In other cases, they exclude the use of finger joints in order to favour local firms and to obtain high quality at a reasonable price, but not the lowest.

The idea emerged in connection with a project where Hermann Kaufmann Architekten had asked a carpenter to prepare a report for a sustainability certification. A great deal of work was required to document the quantities and origin of each piece, and the carpenter ultimately declared that he considered the sustainability discourse redundant and that he instead led his company according to Benedictine rules; this was evident e.g. in the way he used the entire tree stem. He bought his wooden material 'standing'; i.e. as living trees. With a rift and half-rift cutting pattern, he would be left with everything that was

¹⁰⁶⁰ Lager, 7.

¹⁰⁶¹ Kaufmann, Transcription AA1, 24,25.

¹⁰⁶² Kaufmann, 24.

¹⁰⁶³ Kaufmann, 23.

¹⁰⁶⁴ Dünser, Transcription AA3, 4.

¹⁰⁶⁵ Dünser, 4.

removed to obtain plane boards. In a sawing mill, these aesthetically inferior leftovers would be incinerated to produce energy, but he was able to use them for sub constructions; he maintained that these parts of the stem are much more resistant than standard laths, as they take up all the tensile and compressive forces in the living tree. He thus uses the entire stem for boards, and everything that does not meet visual requirements becomes sub construction. This also had a financial advantage, he claimed: other carpenters had to buy material of the highest visual quality for sub construction because there were no other qualities available on the market. As he bought his material directly from the forest and eliminated one link of the value chain, he was able to meet market prices. In one case, this resulted in two tenders for a project offering the same price. The office requested two samples from the bidders; one was from Siberian timber with finger joints, and the other one from Vorarlberg, without finger joints. Dünser remembers that both samples looked fine initially, but colour changes could make the lower quality timber problematic; one was 'buying a pig in a poke'. This gave them the idea to specify finger joint free timber in their calls for tender in order to be able to favour local producers.¹⁰⁶⁶

Even if tender procedures can be influenced by detail- or material specifications, procuring suitable local products is not always possible, however. According to Untertrifaller's contacts in Norway, Norwegian timber is transported to Austria for many projects, where it is manufactured before being shipped back north. He found this hard to understand.¹⁰⁶⁷ While this was addressed explicitly in relation to the project Skadbergbakken in the interviews, it is very likely the case for other projects as well. In that specific case, all of the timber had to be imported from Austria, although there are many forests in Norway; the Norwegian timber industry was not as highly developed at that time and could not deliver the products required to realize Helen & Hard's design, which was not adapted to the capacity of the local industry. The Austrian firm even had to send their own employees to assemble the timber elements.¹⁰⁶⁸

The raw materials used in these Austrian CLT products are also not necessarily from Austria, as Untertrifaller pointed out.¹⁰⁶⁹ The amount of timber needed for the timber products currently exported from Austria is not available regionally. He reported that virtually the entire silver fir population in Vorarlberg had been cut down as this tree species is in fashion, and it is expected to take 20 to 30 years before larger amounts of silver fir from sustainable reforestation are available again. The supply does not meet the demand. According to Untertrifaller, a great deal of the timber converted into CLT elements is from Romania, Siberia, Finland and occasionally Canada, and it is frequently very difficult to control where the raw material comes from, which is an obstacle to building up a regional value-added chain. He claimed that this is more plausible in

¹⁰⁶⁶ Dünser, 9.

¹⁰⁶⁷ Untertrifaller, Transcription AA2, 9.

¹⁰⁶⁸ Kropf, Transcription AN1, 7,8.

¹⁰⁶⁹ Untertrifaller, Transcription AA2, 8.

France than in Austria, as France does not build as much in timber but has an enormous stand of some tree species.

Zohar found it difficult to know whom to trust in the timber industry; they sometimes asked competing firms why they should not use the other firm's product.¹⁰⁷⁰ Other architects rely on certificates that e.g. exclude the use of tropical wood such as FSC labels, as required by German public tender.¹⁰⁷¹

Dünser mentioned Canada, where there are abundant resources that cannot be used cost effectively as there are only two producers. Cutting the wood in Austria and shipping it to Canada would have been much cheaper.

It was a political initiative to use local timber nevertheless. They need to build up the entire industry that we still have in Austria. Many of the good carpenters over there speak German because they come from Austria, Germany or Switzerland.¹⁰⁷²

Dünser was sceptical however that a few timber buildings would suffice as a start to solve this complex problem; he maintained that it takes generations before clients also want timber buildings, and that the value of the locally-produced was acknowledged far earlier in Vorarlberg than in other places (e.g. Germany).

Project planning

Project team and collaboration

In addition to building codes and official initiatives, how project teams are qualified and organized is also important for successful projects. All interviewees emphasized the importance of collaboration already in early project phases. They pointed out various aspects such as interdisciplinarity, the role of craftspeople and execution firms, the power and responsibility of the architect in timber projects, and related fees.

Lager emphasized that interdisciplinary planning is of crucial importance in timber construction, e.g. with fire consultants.¹⁰⁷³ Kropf pointed out that not only an interdisciplinary planning team that is knowledgeable about timber was important; it was also vital that consultants have a positive attitude towards this building material.¹⁰⁷⁴

As mentioned above, Kaufmann highlighted the crucial importance of good and experienced craftspeople – not only for achieving high quality buildings with flawless execution, but also for developing innovative solutions together with the craftspeople. He

¹⁰⁷⁰ Zohar, Transcription AN2, 15.

¹⁰⁷¹ Lager, Transcription AD1, 7.

¹⁰⁷² Dünser, Transcription AA3, 5.

¹⁰⁷³ Lager, Transcription AD1, 3.

¹⁰⁷⁴ Kropf, Transcription AN1, 10.

saw prefabrication and digitalization as a way to decrease dependence on qualified craftspeople.¹⁰⁷⁵

Other architects from different countries had experienced problems and damage in projects incurred by unqualified or not trustworthy contractors (see also Chapter 2.2 on robustness and risks and on multi-layered complexity).¹⁰⁷⁶

The interviewees considered that the architects have a responsibility to influence processes and choices even if they are not formally responsible for them, and also saw this as an opportunity to regain a more important role in the project development.

For Kropf, one lesson learned from a challenging multi-apartment timber project was that, even though their firm was not responsible for project management, construction site management, the call for tenders, etc. are crucial for a successful project. Even without formal responsibility, one should ensure that those engaged are knowledgeable about timber construction and have a positive attitude about timber construction. This is one reason why Helen & Hard had joined a professional network that aims at sharing knowledge and to linking together firms with relevant interest in and experience with timber construction.¹⁰⁷⁷

Zohar maintained that the architectural profession was threatened by other professions, but saw timber as a way to regain control: the lacking (or lost) experience with larger timber projects in his country possibly gave architects an advantage and greater power in the team.

There are so many other professions biting in our profession, you know. We have the energy consultant, we have the building physics, and they [make decisions in our place], so we always have to find our niche to protect our profession (...). When it comes to massive timber, it gives you a golden chance to bite into the other [professions] quite a lot because everything is served on your table. We are collecting all the information for the consultant and we are doing the BIM coordination.¹⁰⁷⁸

Kaden pointed out that the planning phase for timber construction increases while the production time decreases. He did not feel that the architect's fees had been adjusted adequately, which posed a challenge for his office. In this respect, Kaden + Lager's consequent use of timber was due to the architects' conviction of its potential rather than financial gain, even though they experienced a real 'hype' around their projects in the first years.¹⁰⁷⁹

¹⁰⁷⁵ Kaufmann, Transcription AA1, 25.

¹⁰⁷⁶ Kaden, Transcription AD2; Kropf, Transcription AN1.

¹⁰⁷⁷ Kropf, Transcription AN1, 10–11.

¹⁰⁷⁸ Zohar, Transcription AN2, 14.

¹⁰⁷⁹ Kaden, Transcription AD2, 7,16.

Professional environment

Some architects see the use of wooden construction materials as part of a good cause, aiming both for a more sustainable building industry and for more sustainable built environments. Part of promoting the advantages of timber is to convince clients and contractors of their approach; another part is to further the development of the local timber industry. One might assume that getting other architects to ‘hop on the timber band wagon’ would be in their interest. However, the increased competition among timber architects in which this results is not always welcome. While some share their knowledge freely through books and lectures, others tend to hold their cards more tightly and keep for example test results or collaboration networks to themselves.

User Participation

The role of the user was ambivalent for many of the interviewed architects. Some architects put focus on creating added value for the user and others affected by the building, and this was at the core of their efforts and design decisions. Three of the five interviewed firms reported that they involve the user actively at different stages and to different degrees in the design process.¹⁰⁸⁰ Others in contrast claimed that direct contact is often impossible¹⁰⁸¹ or even undesirable.¹⁰⁸² Some architects see the user almost as a disturbance or an obstacle when realizing design visions and try to keep them at a distance. They might see clients or users as unable to perceive, understand and value good architecture, or in the worst case, as even unwittingly destroying it. All firms showed interest in the inhabitants’ feedback however, both concerning effects of their material choices and how well plan layouts and other design choices corresponded to actual needs.

Side effects of involving users are that social bonds among them are established in the planning phase, and a socially attractive co-housing model can be another way to introduce wooden constructions. Kropf remembers about Vindmøllebakken:

A positive thing with this process was that we got to know each other during the workshops. And one reason for the people who want to live there now is a certain social willingness, or intelligence. They really want to create something together; otherwise they would not have chosen this concept. And that's why really good synergies sometimes arose. That was fun, and the surprises were many. We simply brought up all kinds of topics. It was mainly about the interface between privacy and community – what is private? Where are the fears? Where is the delight? What would you like to do together? (...) The main activity in the workshops was to find out about these things.¹⁰⁸³

¹⁰⁸⁰ Kropf, Transcription AN1; Zohar, Transcription AN2; Lager, Transcription AD1; Kaden, Transcription AD2.

¹⁰⁸¹ Kaufmann, Transcription AA1, 21.

¹⁰⁸² Untertrifaller, Transcription AA2, 11–12.

¹⁰⁸³ Kropf, Transcription AN1, 15.

Dünser reported that thanks to the reputation and profile of their office, they rarely have to discuss quality standards with the clients who contact them.¹⁰⁸⁴ In addition, Kaufmann expressed that the appreciation of ‘good architecture’ had increased, and with it the wish to represent and express oneself through it.¹⁰⁸⁵

In contrast, Untertrifaller found it difficult to convince clients and developers of the qualities the office wants to achieve; this was either due to a lack of knowledge or to disinterest, or in order to avoid investments for which there was no immediate turnover. He had experienced virtually defending architectural quality to clients, authorities and users, as part of the architect’s societal responsibility, and he doubted the ability of some users to appreciate or even perceive architectural quality. He was resigned about users who do not take proper care of buildings and thus cause damages.¹⁰⁸⁶

Other interviewees criticized formal and legal circumstances that complicate the realization of how they want to advance architecture. Lager found fault with standardized building codes and rental contracts that limit innovation.¹⁰⁸⁷ Kaden criticized common plot allocation practice and said that one should instead focus on tender content, not only on financial aspects.¹⁰⁸⁸

The architects who actively involve users (most often for owner-occupied housing projects) allow them to give input on the planning of shared functions and common areas¹⁰⁸⁹ or develop individualized plan solutions within larger projects with them.¹⁰⁹⁰ Some also let them participate in design workshops at different stages of the project, where both the degree of (also financial) commitment and of influence on concrete solutions increase towards the completion of the project’s design phase.

Kaden talked about participative building projects – a collective process to find the design which is not dictated by the architect, and which brings about results that would not have been realized together with an investor.¹⁰⁹¹ Lager said that they are experienced with individualized planning from these private building associations, but that they would like to do more for the urban rental market in future projects, with more standardized solutions to give everyone the possibility to live in a timber building. They spoke of a range of effects of including users. As Lager reported, their office has had a range of multi-storey housing projects (with owner-occupied flats) with individualized floor plans. Sometimes they have friends who become part of such *Baugruppen*. In general, clients come with the desire to build in timber and contact the office because it is known for its timber projects, but some are mostly interested in the participatory

¹⁰⁸⁴ Dünser, Transcription AA3, 8.

¹⁰⁸⁵ Kaufmann, Transcription AA1, 6–7.

¹⁰⁸⁶ Untertrifaller, Transcription AA2, 3,7.

¹⁰⁸⁷ Lager, Transcription AD1, 13.

¹⁰⁸⁸ Kaden, Transcription AD2, 12.

¹⁰⁸⁹ Zohar, Transcription AN2.

¹⁰⁹⁰ Lager, Transcription AD1; Kaden, Transcription AD2.

¹⁰⁹¹ Kaden, Transcription AD2, 8.

approach. In a *Baugruppe*, there is sometimes someone whom they first need to convince of timber construction and whose own wishes have to be adapted to the larger project community when it comes to material choices.¹⁰⁹²

Kaden reported that he had observed a change in society: their first housing projects organized as *Baugruppen* were based on living moderately in a community. But families were now seeking high individuality at a low price when joining a *Baugruppe* to realize their dwelling dreams, and the community aspect had become less important.

Vindmøllebakken was developed together with potential future inhabitants in different workshop stages. In the workshops, Helen & Hard wanted to find out about what people really were willing to share and what they want to have on their own, how large common areas should be, how they would be used and by whom. The focus was on the interface between private and shared. Where are fears and where is delight? This had direct impact on the design. Not everybody from the first workshops ended up moving in. Nevertheless, all of the people involved got to know each other well during the process, and there were a variety of challenging and positive surprises.

Untertrifaller reported trying to minimize the contact with users in privately financed multi-storey dwellings in order to avoid excessive feedback loops. The supposed client preferences are communicated through the developers.¹⁰⁹³

When asked whether they involve inhabitants in the design process, Kaufmann replied that this was never possible for subsidized housing projects. There, the developer (who is the client) decides everything, including the basic [urban and access] typologies and the mix of apartment types. The apartments are built accordingly and then rented out.¹⁰⁹⁴

None of the firms had routines for getting feedback from inhabitants after they have moved into their buildings. One architect mentioned having visited a finished building. Other buildings had been part of a research project.

Both architects who involve users in the planning process and architects who are not in contact with users when designing multi-apartment housing projects wondered how inhabitants feel in their buildings,¹⁰⁹⁵ how the chosen apartment size and typology suited their family constellation,¹⁰⁹⁶ and if timber as a material has an effect or makes a difference.¹⁰⁹⁷

Kaufmann reported interest in knowing about the social constellations in which inhabitants live and how the apartment's size and layout worked for them.

¹⁰⁹² Lager, Transcription AD1, 7–9.

¹⁰⁹³ Untertrifaller, Transcription AA2, 11–12.

¹⁰⁹⁴ Kaufmann, Transcription AA1, 21.

¹⁰⁹⁵ Untertrifaller, Transcription AA2; Kaden, Transcription AD2.

¹⁰⁹⁶ Kaufmann, Transcription AA1, 21.

¹⁰⁹⁷ Kaufmann, 21–22; Lager, Transcription AD1, 11.

It would be interesting to see a large field study of what the people really need, how and in what constellations they live in such flats. Because we always act on the assumption of a family. And the family is becoming less the norm; there are patchwork families etc.; singles and shared flats and so on. (...) Maybe there is so much variety by now that you can't do anything that fits. (...) The plan solution that we design – is it clever? Are the room sizes clever? Are these zonings clever?¹⁰⁹⁸

Many guidelines are conveyed by contractors and offer little variety.

Because we always build the same types that are prescribed by the developers. 55-, 75-, 95-square meter dwelling units. One-room, two-room, three-room apartments. So much for variety. That is more or less what they offer. And when we do something differently, they say: We can't rent that out. Well, ok.¹⁰⁹⁹

Zohar would like feedback from the inhabitants of their project – young renters – how the areas that are meant to support social interaction and relations work for them.

The project was very much about how to create a community beyond just creating good spaces. (...) I think we'll understand the results in five years – if it's really working.¹¹⁰⁰

Several architects also wondered how inhabitants experienced living in a timber building, whether the material had changed anything for them and if it had an effect on their well-being. Kaufmann remarks:

However, if you ask all of them, probably some would say 'sure, cosy', and others 'I couldn't care less if the ceiling is wooden', and yet others 'Yeah, that damn ceiling, my cupboard doesn't go with that ceiling. I'd rather paint it white.' That's probably how it will be. People's sensitivity is very different on that matter (*laughs*).¹¹⁰¹

Besides health and well-being, Lager was interested in how timber construction affects stress. He was personally concerned with acoustics.¹¹⁰²

Untertrifaller was interested in knowing more about the inhabitants' sensations in the building, what they are concerned with or react to, even though he doubted the average client's ability to perceive and appreciate architectural quality. Usually, the focus group's preferences are communicated through a developer. Untertrifaller suspected that developers pass on the wishes that also suit them well and that they influence clients according to their own interests. He had only experienced a limited number of clients or inhabitants who wanted exposed timber surfaces, or timber apartment buildings at all.¹¹⁰³

Kaden was interested in knowing how the inhabitants of their projects felt and whether they liked living in the buildings. He was aware that this depends on many factors

¹⁰⁹⁸ Kaufmann, Transcription AA1, 16.

¹⁰⁹⁹ Kaufmann, 21.

¹¹⁰⁰ Zohar, Transcription AN2, 11.

¹¹⁰¹ Kaufmann, Transcription AA1, 22.

¹¹⁰² Lager, Transcription AD1, 11.

¹¹⁰³ Untertrifaller, Transcription AA2, 7,14.

outside of the architect's influence; i.e. not only the building itself or its materials, but also neighbours, the borough, public transport, etc.¹¹⁰⁴

Lager went to visit a project designed for elderly people a while after it was completed; he found the different daily routines noteworthy, with everyone at home during daytime. The visiting architects inquired into e.g. how the inhabitants experienced sound insulation. On average, inhabitants were rather satisfied. According to Lager, they generally received little negative feedback on (naturally) yellowing or darkening surfaces. He stated that people are prepared for yellowing and to some extent also probably like it. When there is negative feedback, it is mostly from single-family houses where the material probably was a conscious choice though.¹¹⁰⁵ Developers often do not want to have visible timber on the façades.¹¹⁰⁶ Feedback was mixed on the open access staircases and balconies.¹¹⁰⁷

Mühlweg was accompanied by a research project. Sound, energy consumption and user behaviour were monitored after completion. Untertrifaller reported that group dynamics played a role; 'ringleaders' motivated others to compete for 'absurdly low energy consumption data'.¹¹⁰⁸

However, this almost borders on neighbourhood watch. People who do not want to participate are pressured. When someone leaves the window ajar in winter, he will catch hell from the neighbour right away.¹¹⁰⁹

¹¹⁰⁴ Kaden, Transcription AD2, 15.

¹¹⁰⁵ Lager, Transcription AD1, 10,11.

¹¹⁰⁶ Lager, 15.

¹¹⁰⁷ Lager, 12.

¹¹⁰⁸ Untertrifaller, Transcription AA2, 12.

¹¹⁰⁹ Untertrifaller, 13.

4.3 Inhabitants

This section will shed light on the different notions of a material's value that emerged from the inhabitant interviews, and how these were prioritized among other aspects when choosing a place to live.

In order to discuss the values that the inhabitants associated with timber independently, but also to facilitate comparison to other materials and other architectural features, the conversations also addressed the inhabitants' reasons for moving into their current home, the length of time they had lived there, and their plans for the future.

Inhabitants emphasized different aspects than the architects as co-determining the value of architecture. The interviews also revealed that they had different reasons to move in than to move out; both need to be considered when aiming for loveable timber housing and its prolonged use.

Architectural values

Decisive values

Most of the interviewed inhabitants had positive attitudes about timber as a building material; this could be a reason why they had agreed on being interviewed on timber in the first place. For most interviewees however, their preference for timber and associations with health and sustainability did not impact their choice of their home, either rented or owned; materiality was a crucial requirement for few. The other aspects briefly listed here include more general qualities of a building.

Most of the interviewed inhabitants chose their dwelling for its location (e.g. close to work, close to the rest of the family, close to the city centre, close to green areas, a bikeable distance to amenities or close to public transportation).¹¹¹⁰

I can bike all the way up to my front door.¹¹¹¹

Only one inhabitant chose differently because she wanted to be part of a project with an architect with whom she had built a timber house earlier and whom she trusted. In hindsight however, she says that with what the project ended up costing, she would have been able to buy something in her preferred area instead.¹¹¹²

¹¹¹⁰ Ölbündt - Inhabitant 2, Transcription IA2, 8; Mühlweg (A) - Inhabitant 2, Transcription IA5; sw40 - Inhabitant 1+2, Transcription ID3a+b; sw40 - Inhabitant 3, Transcription ID4; c13 - Inhabitant 1, Transcription ID8; Skadbergbakken - Inhabitant 2+3, Transcription IN2a+b; Skadbergbakken - Inhabitant 1, Transcription IN1; Skadbergbakken - Inhabitant 4, Transcription IN3; Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b.

¹¹¹¹ Ölbündt - Inhabitant 2, Transcription IA2, 8.

¹¹¹² wk65 - Inhabitant 3, Transcription ID2.

Costs or financing models were the second most important reason for choosing a place to live,¹¹¹³ as described more in detail below. This was followed by equally weighted private or shared green areas,¹¹¹⁴ social mix¹¹¹⁵ and community,¹¹¹⁶ and the apartment's size.¹¹¹⁷

Almost all inhabitants emphasized the importance of practical solutions and the dwelling's functionality and usability.¹¹¹⁸ A number of inhabitants were attracted by sizes and spatial constellations that deviated from standards, or by a design that approached the project's social setting.

Interior qualities such as light conditions¹¹¹⁹ and views,¹¹²⁰ the design in general and the façade design,¹¹²¹ low maintenance requirements¹¹²² and a building that ages well¹¹²³ were also important factors for the appreciation of a dwelling, but not necessarily decisive factors when determining where to rent or buy, and often discovered in detail after moving in.

Several interviewees said that the fact that they knew and trusted the architects was important.¹¹²⁴

Residency period

The residency period can be an indicator for how well a project's design works, how adaptable it is to inhabitants' changing life situations, and the stability of the community amongst a building's inhabitants. Some had been living there since the building was built (up to twenty years). Several interviewees mentioned that they had already moved once or several times or were planning to move within the building in which they were living at the time of the interview. This was however not always possible or easy, for example

¹¹¹³ Wagramer Straße (B) - Inhabitant 1, Transcription IA7; Mühlweg (A) - Inhabitant 2, Transcription IA5; sw40 - Inhabitant 3, Transcription ID4; p1 - Inhabitant 1, Transcription ID7; Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b.

¹¹¹⁴ Ölbündt - Inhabitant 2, Transcription IA2; Lobaugasse - Inhabitant 1, Transcription IA4.

¹¹¹⁵ p1 - Inhabitant 1, Transcription ID7.

¹¹¹⁶ Ölbündt - Inhabitant 2, Transcription IA2.

¹¹¹⁷ Mühlweg (A) - Inhabitant 2, Transcription IA5; sw40 - Inhabitant 3, Transcription ID4.

¹¹¹⁸ wk65 - Inhabitant 1+2, Transcription ID1a+b; wk65 - Inhabitant 3, Transcription ID2; sw40 - Inhabitant 3, Transcription ID4; sw40 - Inhabitant 4+5, Transcription ID5a+b; c13 - Inhabitant 1, Transcription ID8; Skadbergbakken - Inhabitant 1, Transcription IN1; Skadbergbakken - Inhabitant 4, Transcription IN3; Vindmøllebakken - Inhabitant 1, Transcription IN5; Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b; Ölbündt - Inhabitant 2, Transcription IA2; Mühlweg (A) - Inhabitant 2, Transcription IA5.

¹¹¹⁹ Ölbündt - Inhabitant 1, Transcription IA1.

¹¹²⁰ Skadbergbakken - Inhabitant 2+3, Transcription IN2a+b.

¹¹²¹ sw40 - Inhabitant 1+2, Transcription ID3a+b.

¹¹²² Skadbergbakken - Inhabitant 2+3, Transcription IN2a+b.

¹¹²³ Ölbündt - Inhabitant 1, Transcription IA1.

¹¹²⁴ sw40 - Inhabitant 3, Transcription ID4; wk65 - Inhabitant 3, Transcription ID2; p1 - Inhabitant 1, Transcription ID7; p1 - Inhabitant 1.

when there are no suitable apartments available. The most important reason for inhabitants to move was the need of more space when their families grew.

A resident from Ölbündt had met her partner in her building; they had previously been neighbours. He moved in with her, and they were planning to move within the building again to be on the ground level with their toddler. As they needed more space for their growing family (e.g. for drying laundry, and for flexible areas that could be used as an office later) they were planning to build a single-family house.¹¹²⁵

Another inhabitant also reported plans to build a new home soon, as their four-person family needed more space and wanted more green areas, and also because of a conflict with a neighbour (he found their vacuuming disturbing and they disliked the smell of smoke that came into their flat from his). They would have been interested in moving to one of the building's larger apartments, but reported that they were hard to come by and that it was not always easy to understand how the apartments are distributed.¹¹²⁶

An inhabitant of c13 was looking for a new apartment in the vicinity for his growing family. While he would have liked to stay in the building, there was nobody moving out in the foreseeable future (nor did he wish for any neighbour to leave); in addition, no other apartment would come into question because of the acoustic conditions in the outdoor spaces.¹¹²⁷

Other reasons that might motivate moving at a later point in time were also mentioned. One inhabitant who had been living in her building for twenty years reported liking it a lot and lacking nothing there, but wanting to own something at some point later in her life.¹¹²⁸

'Say and pay'

As was the case for some interviewees, people might have a clear attitude about timber use or a co-housing model but ultimately act differently. When remuneration is involved, it comes apparent which values and ideas are rated highest.

Two interviewees were planning their own privately-owned homes at the time of the interviews. Both of them had relinquished aspects with which they were happy with in their current dwellings: in one case this was the timber construction, and in the other, community living. These were overridden by other interests, either their own or those of a partner.

Needing more space, one couple initially wanted to renovate and add on to an existing building with wooden materials as part of a joint building venture, but they had to give

¹¹²⁵ Ölbündt - Inhabitant 1, Transcription IA1.

¹¹²⁶ Mühlweg (A) - Inhabitant 1, Transcription IA3.

¹¹²⁷ c13 - Inhabitant 1, Transcription ID8.

¹¹²⁸ Ölbündt - Inhabitant 2, Transcription IA2.

up on this plan due to disagreements in the group. At the time of the interview they were planning a single-family house. They had gone from 75m² in their current home to 103m² in the planned community project from which they had withdrawn to more than double the size (about 260m²) in the future single-family home. They estimated that a wooden construction would be more expensive than massive materials and planned to build the ground floor of their new single-family house in concrete or masonry.¹¹²⁹

Another interviewee who was planning to build a new home in the near future stated that she was very fond of timber houses and the ‘living quality’¹¹³⁰ they offer. To her knowledge, the building process using timber is quicker and probably cost the same, so she would prefer to build in timber. Her partner said however that a massive brick house would retain its value over time better; for this reason, they ultimately decided against a load-bearing timber construction in their future home.

Obviously, all of these aspects were weighted and combined differently for each inhabitant. In the following, after an account of the inhabitants’ sustainability considerations, a number of these qualities (other than those related to timber) are illustrated with interview quotes.

Costs and financing models

Among inhabitants, there was much more focus on the cost of either buying or renting, in addition to durability and value stability than there was for the architects. For inhabitants, renting or purchasing a home is an important part of the private economy, and idealistic attitudes towards a building material must always be negotiated with more existential decisions about how to invest one’s money wisely.

While values associated with wooden materials are described as part of the semantic realm in this thesis, a building’s cost is closely related to tangible material and design choices. For the inhabitants, not only construction costs were important, but also subsidies and alternative financing models that made it possible for them to buy in the first place.

Building is expensive. And you should think long-term and consider ecology, and well, it should be affordable. For, of course, otherwise I cannot rent it. Otherwise only few will be able to afford it. But apart from that, sure, good architecture is sought-after.¹¹³¹

They also commented on different bases of rent or selling price calculation (e.g. based on m³ instead of m²) that account for other spatial qualities than standard apartment block

¹¹²⁹ Ölbündt - Inhabitant 1, Transcription IA1.

¹¹³⁰ sw40 - Inhabitant 1+2, Transcription ID3a+b, 4.

¹¹³¹ Mühlweg (A) - Inhabitant 2, Transcription IA5, 15.

cross sections. Several inhabitants from Skadbergbakken found that they got a lot of space for the money paid.¹¹³²

You pay as much for [the extra volume] as you do for the surface area here. Looking at it this way, you get a lot of value for the money, you get a special apartment.¹¹³³

Some perceived timber construction as more expensive than conventional constructions, e.g. due to the need for highly skilled workers and specialized consultants. Others however believed that the opposite was true and suspected that their dwelling had a lower price due to its wooden materials. Some also acknowledged the influence that either individual design wishes within one housing project or unforeseeable changes to the national economic situation might have on the building costs. Furthermore, constraints by the building authorities could challenge an initial budget.

A couple from wk65 said that they suspected the cost estimate of being unrealistic, as the structural engineer – one of few timber construction specialists – charged ‘astronomical prices’.¹¹³⁴ Another inhabitant from the same building pointed out that the material choice also entailed special fire protection measures with annual costs (annual fire drills and tests of the fire protection system). In return however, she said, heating costs were low.¹¹³⁵

According to a future inhabitant of Vindmøllebakken, all of his future neighbours found the apartments expensive. He suspected that this could be due to the timber construction, as well as to geothermal heating, which was expected to pay off in the long run. He pointed out that although the price per square metre was considered high, they would end up with over 500m² of shared areas. It would appear that buyers do not always add their share of this community area to their m² calculation.¹¹³⁶

An interviewee from wk65 reported that a delay in the planning phase caused an additional rise in prices when business activity in the entire country picked up again, but that they had been told that the timber construction would not be more expensive than a conventional construction. While the interviewee was happy with the result, he felt that some money could have been saved with better coordination of individual wishes if they had been aware of this.¹¹³⁷

Another inhabitant from the same building repeated that part of the problem was that every party realized their own wishes without being aware of that this might increase the building costs.¹¹³⁸

¹¹³² Skadbergbakken - Inhabitant 2+3, Transcription IN2a+b, 6; Skadbergbakken - Inhabitant 4, Transcription IN3, 9.

¹¹³³ Skadbergbakken - Inhabitant 2+3, Transcription IN2a+b, 6.

¹¹³⁴ wk65 - Inhabitant 1+2, Transcription ID1a+b, 12.

¹¹³⁵ wk65 - Inhabitant 3, Transcription ID2.

¹¹³⁶ Vindmøllebakken - Inhabitant 1, Transcription IN5.

¹¹³⁷ wk65 - Inhabitant 1+2, Transcription ID1a+b.

¹¹³⁸ wk65 - Inhabitant 3, Transcription ID2.

A future inhabitant of p1 reported that prices had increased significantly during the planning phase due to delays related to political disagreements that had arisen around questions of historical preservation. The project's complexity had increased a lot with a new plot and a greater number of group members. He felt that if that had been clear from the beginning, the architects would have probably left less room for users' design choices. He said that the mutual sympathy disappeared when everyone noticed that costs kept increasing.

Everyone was staring at the costs all the time, one had to lower one's sights concerning the building, and then it became a project that just didn't fly anymore.¹¹³⁹

The initial euphoria turned into a need to reduce or simplify the individual fittings. In addition, many had terminated their rental agreements before the new project was finished and needed to adjust their financial plans as well.

In contrast to many others, a couple from sw40 said that they were positively surprised by the price of the apartment and happy to have been able to buy it without much capital of their own or an inheritance. They suspected that it had to do with the timber construction, which they estimated to be 20% cheaper than a conventional construction.¹¹⁴⁰

How these costs are transferred to the renter or buyer makes an enormous difference for the inhabitants. The Viennese subsidy system¹¹⁴¹ had given a range of interviewees access to the dwellings they lived in at the time of the interview. Several German inhabitants said that they needed to move as rents were continuously increasing and expected to rise beyond what they could afford. New financing options had allowed one family to buy instead of rent.

One resident from Wagramer Straße and her family had moved in because of the heavily subsidized rent.¹¹⁴² At the time of the interview, an interviewee from Mühlweg (A) had been given the option to buy the flat she rented, which had been bound to rental contracts for ten years as part of the Viennese housing subsidies. She felt that it was a good deal.¹¹⁴³ Inhabitants of Mühlweg (B) however were shocked by the offer to buy, as it did not match their own estimations based on their contract with later buying option, but was about 25% higher; they were trying to understand the reason for this. They said that the price of a neighbour's corner apartment had increased 15% due to its 'top location'; they doubted the legality of this.¹¹⁴⁴

¹¹³⁹ p1 - Inhabitant 1, Transcription ID7, 9.

¹¹⁴⁰ sw40 - Inhabitant 1+2, Transcription ID3a+b.

¹¹⁴¹ Vienna has a social housing model with the option to buy apartments that have been rented for a fix number of years, at a price that takes the rent that has been paid into account. Rents have a price ceiling. Over half of the Viennese population is eligible for these government-funded apartments. The apartments need to comply with a determined quality standard.

¹¹⁴² Wagramer Straße (B) - Inhabitant 1, Transcription IA7.

¹¹⁴³ Mühlweg (A) - Inhabitant 1, Transcription IA3.

¹¹⁴⁴ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b.

An interviewee living at sw40 reported that rents had been increasing so much where he had lived with his family that they would probably not have been able to move into a larger rented apartment. The lease-purchase option made it possible for him to finance a privately-owned home as a freelancer.¹¹⁴⁵ A family planning to move into p1 upon its completion was looking for a new place to live when they became aware that they would not be able to cope with increasing rents for much longer in their current apartment.¹¹⁴⁶ An inhabitant of sw40 had financed her large apartment and rented out part of it to her parents.¹¹⁴⁷

For many, the question of economic value was not only related to the one-time or monthly bill to pay, but also to whether the investment would retain or even increase its value. This was tightly connected to their perception of the building's solidity, robustness and durability (see 'say and pay' above).

Rather than the house, an inhabitant from Lobaugasse expected the plot to gain value, which is why she wanted to pass it on to her son in the future.

But this has nothing to do with the timber construction as such, but with my concern that it was built sloppily.¹¹⁴⁸

As described in Chapter 3, some interviewees spoke of changing preferences and taste, which might be a reason for exposed wooden surfaces falling out of favour now after having been popular for many years.

It has also been mentioned that for inhabitants, timelessness is not necessarily equivalent to everlasting pristinity, but rather the amount of maintenance required for upkeep.

Interplay of qualities

Even though location and costs were the most important aspects for the inhabitants, their overall valuation of their homes was based on an interplay of qualities.

Several inhabitants mentioned the 'little something extra' beyond fulfilling functional requirements – something unexpected, individual and characteristic that makes good architecture. One interviewee emphasized that

it has to be functional. If it can also be aesthetically pleasing so that it has some sort of personality, so that you feel it has a kind of personality like a piece of art, then it becomes really good.¹¹⁴⁹

Another inhabitant stated:

¹¹⁴⁵ sw40 - Inhabitant 3, Transcription ID4.

¹¹⁴⁶ p1 - Inhabitant 1, Transcription ID7.

¹¹⁴⁷ sw40 - Inhabitant 6, Transcription ID6.

¹¹⁴⁸ Lobaugasse - Inhabitant 1, Transcription IA4, 25.

¹¹⁴⁹ Vindmøllebakken - Inhabitant 1, Transcription IN5, 6.

What is good architecture? I guess number one, it is practical and can be lived in, and then actually has something a little bit exciting or interesting or something.¹¹⁵⁰

This interviewee also mentioned

[making] the most of any natural features such as sunlight¹¹⁵¹

and taking into account wind, views, and the landscape. Places that are attractive to both live and work in are important.

One inhabitant mentioned that she moved in because she liked the architecture (how one arrives, the room distribution) and the materiality indoors and outdoors. She also found the low rent attractive. Among her favourite aspects of her current apartment were the materials, the combination of wooden surfaces and [plaster] walls, the window formats, the quiet and at the same time central location, and the balcony.

It is somehow kind of... a very... well I really feel at ease here. It is maybe (...) an interplay of everything.¹¹⁵²

Some of the interviewees mentioned how convinced they were by the use of timber with the specific architectural style of their buildings. Their preferences are as different as the projects in this case study – reticent or multi-angular, with naturally ageing wood or with pigmented or painted surfaces, with a sombre expression due to darkened wood or with light plastered façades.

An inhabitant from Skadbergbakken said:

I think the second [most important reason to buy the house] was obviously the design. It looked quite funky. It's five-sided. From the pictures it seemed pretty cool.¹¹⁵³

An interviewee from sw40 also reported being attracted by the building's design. He and his partner had attended planning meetings in a building by the architect in the same style, and the building had won them over with its materials and design language.

I remember it like it was yesterday, we were truly dazzled by this architecture, by the aesthetics, well we immediately said, watch it, you can't really imagine at all how beautiful it is, only it is probably unaffordable. We were really excited by the timber aesthetics right away, but precisely because it's not a pure timber building, like some Swabian wooden house, but ultimately this understated, cubic, somehow Bauhaus style [design].¹¹⁵⁴

Another couple from Skadbergbakken liked the angles and the spatial geometry of their apartment. The building materials were not important to them. They named various essential features of what they understood as good architecture, like designing with regard

¹¹⁵⁰ Skadbergbakken - Inhabitant 1, Transcription IN1, 1.

¹¹⁵¹ Skadbergbakken - Inhabitant 1, 1.

¹¹⁵² Ölbündt - Inhabitant 1, Transcription IA1, 15.

¹¹⁵³ Skadbergbakken - Inhabitant 1, Transcription IN1, 3.

¹¹⁵⁴ sw40 - Inhabitant 1+2, Transcription ID3a+b, 4.

to the building's location (sun, wind and views); well thought-out plan solutions; variety in the façade and other small details or unusual geometries.¹¹⁵⁵

Some inhabitants were critical of the architects' ambitions for architectural expression, however. One couple from wk65 felt that good architecture should respect the users' wishes instead of being 'artistic self-realization'. They emphasized the importance of functionality over aesthetics, and that costs do not exceed plans.

If it functions well, it may well look nice, too. But the function has to be fulfilled.¹¹⁵⁶

An example of the house they live in now are the window formats: the architects wanted a certain proportion between the fixed and opening parts of the windows, and the users fought for larger openable windows. The couple had chosen the project for its location and the views. They are generally unhappy with the project's cost, but what they mentioned specifically – the outdoor lighting – would be relatively easy to fix.

There are also qualities that first emerge with time. An interviewee from Lobaugasse reported especially liking that the small houses each have their own plot; she stated that there was a vacation feel to coming home to her little house in the garden. She was very proud of her garden, which she used to grow vegetables and flowers, and the sitting area with a pergola she built. When she first saw the site after construction however, she thought that she would never in her life move in there; she said that the box-like houses on the bare earth evoked negative associations (see also Chapter 3). After several years however, she realized that houses with gardens were not easy to come by, and she also needed a new place to live. By then, the vegetation had transformed the barren land and made it lush, and the façades and secondary elements delineating or subdividing planted areas had grown more similar in texture and colour (Figure 4.1).¹¹⁵⁷

Several inhabitants wondered whether their preferences would change with broader trends:

At present this kind of building is very in vogue, for years already, and who knows what one will think about it in 20 years, or 50. Ultimately, I don't care, I still like it.¹¹⁵⁸

Others experienced that their own needs and preferences had changed later in life, with social aspects often becoming more valuable.

One elderly interviewee from Breitenfurter Straße felt that the project was tailored to her needs, being universally accessible and senior-friendly with a mix of ages, mutual trust, little noise, comforting indoor surfaces,¹¹⁵⁹ well-ventilated, and good connections with public transportation. She considered the facilitation for elderly people especially

¹¹⁵⁵ Skadbergbakken - Inhabitant 2+3, Transcription IN2a+b.

¹¹⁵⁶ wk65 - Inhabitant 1+2, Transcription ID1a+b, 5.

¹¹⁵⁷ Lobaugasse - Inhabitant 1, Transcription IA4.

¹¹⁵⁸ sw40 - Inhabitant 3, Transcription ID4, 9.

¹¹⁵⁹ Timber ceilings contribute to her physical well-being; see Chapter 3.



Figure 4.1 a) Time, weathering and vegetation growth improving the aesthetic qualities at Lobaugasse.
 b) ‘Where we used to walk.’ Visual connection to a forest area that evokes positive memories, and elements of nature on the loggia walls at Spöttlgasse.

important – this was part of the physical design, and maybe even stronger as it housed a community centre offering social activities and affordable food.¹¹⁶⁰

A future inhabitant of Vindmøllebakken spoke of consciously choosing life within a community over possessions and space. He called for a reconsideration of the definitions and weighting of life quality and wealth.¹¹⁶¹

It is going against the tide. People want more space and to live a more and more individualistic life. (...) That is a great misunderstanding. You can use the money for something else. Because bigger doesn't make you happier. But that takes a lot of time to find out. Just a few generations ago people were living very closely. (...) Multiple generations around the same courtyard. (...) Now we see more loneliness, people isolate themselves more and more. Enormous houses with several bedrooms where they wait for a visit from someone who never comes. It has to do with your life philosophy and what you believe in, not what you can afford. It's less about money and more about quality of life.

(...) We have lived in several places. We had a big house, and now we have a big nice apartment that is on the top, prestige wise. So, when we scaled down to this [at Vindmøllebakken],¹¹⁶² many didn't understand us. Or they needed an explanation at least. (..) We have only one child, a boy. He is forty and unmarried, we have no grandchildren. If we want our later years to be socially pleasant, we cannot be dependent on our son creating a lot of activity around us.¹¹⁶³

¹¹⁶⁰ Breitenfurter Straße - Inhabitant 1, Transcription IA8.

¹¹⁶¹ Vindmøllebakken - Inhabitant 1, Transcription IN5.

¹¹⁶² The interviewee had not yet moved in at the time of the interview.

¹¹⁶³ Vindmøllebakken - Inhabitant 1, Transcription IN5, 6,7,11.

Another couple from Spöttlgasse also reported changes in their weighting of values: they had previously lived in large houses and had been personally involved in their planning. With age, social aspects and the view had become more important. They had made a conscious decision to live in a smaller apartment and liked the social relationships with their neighbours. They especially enjoyed the view from their living room and loggia towards a wooded area where they used to go walking (Figure 4.1b):

Just come over here to me for a moment. Sit down a little and look over there. (...) You just can't help but feel glad, I find.¹¹⁶⁴

He said that they enjoyed what they owned, while they were physically fit enough to enjoy their possessions.¹¹⁶⁵ She pointed out:

We had such big houses before. You just hang on to so much stuff. But [now, we] don't lack anything. And we – look, we also just sat in one corner in those big houses. It wasn't any different.¹¹⁶⁶

Different prioritizations of wooden materials

Materiality is never an isolated aspect around which to orient architectural design or to choose a place to live. The degree to which materiality played a role for the inhabitants when deciding for a home differed. The decisive values when choosing a place to live have been described above. Some inhabitants appreciated wood as a visible surface material, with different preferences for its treatment, as described in Chapter 3. Furthermore, the everyday handling of wooden surfaces was more important to them than for the architects.

This section describes the inhabitants' general liking of timber and different prioritizations.

Some inhabitants stated that if they were to buy a flat, they would want it to be made of timber ('Immediately timber. Yes.').¹¹⁶⁷ or that they envisioned their 'dream house' as having wooden materials and surfaces.¹¹⁶⁸ Others named the building's materiality as one of the reasons to become part of a joint building venture¹¹⁶⁹ or as one of the criteria when looking for a larger apartment for their family.¹¹⁷⁰

For an interviewee from Skadbergbakken, the exposed massive timber indoors was a reason to buy the house.¹¹⁷¹

¹¹⁶⁴ Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b, 4 (IA9a).

¹¹⁶⁵ Spöttlgasse - Inhabitant 1+2, 8 (IA9b).

¹¹⁶⁶ Spöttlgasse - Inhabitant 1+2, 8 (IA9a).

¹¹⁶⁷ Ölzbündt - Inhabitant 2, Transcription IA2, 5.

¹¹⁶⁸ c13 - Inhabitant 1, Transcription ID8.

¹¹⁶⁹ sw40 - Inhabitant 4+5, Transcription ID5a+b; sw40 - Inhabitant 6, Transcription ID6.

¹¹⁷⁰ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b.

¹¹⁷¹ Skadbergbakken - Inhabitant 4, Transcription IN3.

An elderly couple was happy to be living in a timber building again after positive experiences with previous timber homes. They were

actually excited about moving into a wooden building again.¹¹⁷²

One couple reported that although they had not been thinking of timber initially, materiality was very important when they were looking for a new home:

Well we have been searching for a very long while. Several things were important to us. First of all, we said that we would not move into a concrete building. That was very important. Either brick or... well we did not think about timber, but when we saw the project we thought it looked interesting.¹¹⁷³

For those with positive associations with timber, natural materials were important in general, which is why stone or brick would come second in their personal material hierarchy and concrete last.¹¹⁷⁴ (The inhabitants' associations with nature is described in greater detail in Chapter 3.)

Materiality was not equally important for all interviewees; for example, one inhabitant stated that materiality played no role in her decision for the apartment in which she lived with her family at the time of the interview. She was nevertheless pleased to learn that the construction was made of timber, even though there were no visible timber surfaces in her flat.¹¹⁷⁵ Another interviewee felt similarly. While the building's materiality was not a determining aspect for him, it made him even more interested in the project.¹¹⁷⁶ The same was true for yet another interviewee, who reported that while she did not know much about timber in the beginning, her associations were positive.¹¹⁷⁷ One interviewee said that while the ecological motivations for building with timber were not his highest priority, he was impressed by the degree of precision that was possible with timber prefabrication.¹¹⁷⁸ Another interviewee had moved for different reasons, but reported enjoying the wooden surfaces for their effect on her well-being (see also Section 3.3).

Well, I just love wood. I was very happy that the flat is like this [with exposed timber in the ceiling], but I would have taken it even if that hadn't been the case. But of course, it is a pleasure now.¹¹⁷⁹

There are also inhabitants who are rather indifferent, like one for whom the exposed ceiling was neither a plus nor a minus.¹¹⁸⁰ Others would not have selected timber as a first choice. According to one inhabitant, if given the option, he might have bought the

¹¹⁷² Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b, 3.

¹¹⁷³ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b, 5.

¹¹⁷⁴ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b; wk65 - Inhabitant 1+2, Transcription ID1a+b.

¹¹⁷⁵ Wagramer Straße (B) - Inhabitant 1, Transcription IA7, 3.

¹¹⁷⁶ sw40 - Inhabitant 3, Transcription ID4.

¹¹⁷⁷ Skadbergbakken - Inhabitant 4, Transcription IN3.

¹¹⁷⁸ p1 - Inhabitant 1, Transcription ID7.

¹¹⁷⁹ Breitenfurter Straße - Inhabitant 1, Transcription IA8, 2.

¹¹⁸⁰ Mühlweg (A) - Inhabitant 2, Transcription IA5.

same house made from concrete, which he believed might require less maintenance; nonetheless, he found that ‘timber is a great material’.¹¹⁸¹

Sustainability

Some emphasized the importance of choosing sustainable solutions, while others had different priorities or did not predominantly focus on timber as contributing to sustainability.

Several interviewees believed that ‘ecological considerations are important’,¹¹⁸² e.g. energy efficiency¹¹⁸³ or ‘ecologically reconcilable materials’.¹¹⁸⁴ While these statements not only concern timber, many associate timber with being ‘ecological’.¹¹⁸⁵

(...) and then, which is very important as well, [timber is renewable, as it] grows back.¹¹⁸⁶

One inhabitant from wk65 had also considered using a mud brick construction as an environmentally friendly building material before moving into her current home, but was afraid of the costs of this unconventional construction. Timber as a hidden construction was a good alternative to her.¹¹⁸⁷ Another interviewee from Skadbergbakken stated that if they should move again, it would be nice to have a house that is ‘environmentally friendly and such’.¹¹⁸⁸

An interviewee from Ölbündt had the impression that people who moved in were concerned with the environment, but she assumed that other aspects of the building were more important for them.¹¹⁸⁹ This is true of an inhabitant from Mühlweg (A), who said that although he could certainly identify with sustainability goals, the building material had no bearing on his decision to move in.¹¹⁹⁰

Some interviewees had been convinced by the architect’s sustainability claims about their building; others were unsure about them, and some found that not all of the claims had been fulfilled, or they were irritated about the vagueness of sustainability as a term and felt that it was not properly explained to customers; and some felt that the sustainability measurements could have been more comprehensive. One interviewee from sw40 said that she was totally convinced by what the architect told them about organic construction and insulation materials,

¹¹⁸¹ Skadbergbakken - Inhabitant 1, Transcription IN1.

¹¹⁸² wk65 - Inhabitant 3, Transcription ID2, 3.

¹¹⁸³ Skadbergbakken - Inhabitant 1, Transcription IN1.

¹¹⁸⁴ wk65 - Inhabitant 1+2, Transcription ID1a+b.

¹¹⁸⁵ wk65 - Inhabitant 1+2; wk65 - Inhabitant 3, Transcription ID2.

¹¹⁸⁶ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b, 10.

¹¹⁸⁷ wk65 - Inhabitant 3, Transcription ID2.

¹¹⁸⁸ Skadbergbakken - Inhabitant 4, Transcription IN3, 5.

¹¹⁸⁹ Rental apartments were scarce when she moved in which made the project attractive for many. Ölbündt - Inhabitant 2, Transcription IA2.

¹¹⁹⁰ Mühlweg (A) - Inhabitant 2, Transcription IA5.

how environmentally friendly and resource saving it is. And how sustainable it is.¹¹⁹¹

Other families disagreed on whether the building was sustainable or not,¹¹⁹² or were uncertain about the degree to which the wooden construction of their home was environmentally friendly and sustainable:

I didn't know much about it beforehand, but it was certainly positive that it was built in massive timber.¹¹⁹³

But there were also inhabitants who felt that their building or neighbourhood did not live up to the sustainability claims originally made. One inhabitant from Skadbergbakken had chosen the house for its advertised energy efficiency, but felt that the house did not live up to this. He felt that the term sustainability was too vague.¹¹⁹⁴ Another inhabitant from Skadbergbakken felt that the sustainability aims did not add up. The zoning plan for the area featured an extreme densification based on a planned train that was never realised. He felt that the urban lifestyle did not match the rural area well, and he and his family were looking for a new home at the time of the interview.

Energy efficiency and environmentally friendly are only words and not reality.¹¹⁹⁵

Finally, some inhabitants saw unexploited potential for further sustainability measurements. One family from sw40 would have appreciated the possibility to use the rainwater led off from the roof for the garden, but as the gutters are concealed within the building's construction for aesthetic reasons, they cannot be tapped.¹¹⁹⁶ Despite having only recently become acquainted with sustainability topics through an architect acquaintance, another inhabitant from c13 says that he was immediately thrilled upon moving in.

What I find fantastic is that so much timber has been used, because it is a renewable resource. In addition to that all-around thermal insulation and minimized energy consumption. What I miss in the house are solar panels. I don't understand that at all. (...) The roof hasn't been used at all. If not solar panels, at least a little garden or something that grows. But it's just empty. I thought that was wasted space somehow.¹¹⁹⁷

¹¹⁹¹ sw40 - Inhabitant 1+2, Transcription ID3a+b.

¹¹⁹² sw40 - Inhabitant 4+5, Transcription ID5a+b; sw40 - Inhabitant 6, Transcription ID6.

¹¹⁹³ Skadbergbakken - Inhabitant 4, Transcription IN3, 5.

¹¹⁹⁴ Skadbergbakken - Inhabitant 1, Transcription IN1.

¹¹⁹⁵ Skadbergbakken - Inhabitant 5, 'Email IN4', 14 November 2017.

¹¹⁹⁶ sw40 - Inhabitant 4+5, Transcription ID5a+b; sw40 - Inhabitant 6, Transcription ID6.

¹¹⁹⁷ c13 - Inhabitant 1, Transcription ID8, 2–3.

Local and regional situatedness

Association with a place and accustomed taste

Some interviewees had a positive attitude to timber constructions and surfaces and associated them with tradition and heritage; they were for example reminded of their childhood homes and how they grew up, or the regions from which they came.

As an example, one inhabitant associated the material with her home region, Tyrol, where almost every house has wooden interior surfaces, including the ceilings.¹¹⁹⁸

In some cases, these associations were welcome reminders; wooden surfaces were linked to memories connected to people or moments from the past: for example, one inhabitant from Mühlweg (A) talked about positive associations with her grandmother's room, which had a wooden floor.¹¹⁹⁹

For others, this association was less positive. The daughter of one interviewee suspected that he considered wood beautiful because he had grown up in a rural area. Although he still found exposed wooden surfaces beautiful, he was reminded of his childhood in humble circumstances and that they were always worried about the maintenance and robustness of their wooden detached house. They always hoped that the storm would not damage it.

Timber can be a hassle. The detached house was a barn covered with tar board. Scarcity reigned back then, after the war. Tar leaked from the cardboard. Back then it didn't work out. Wood wasn't actually a pleasure.¹²⁰⁰

Others found the rural connotations of the wooden surfaces inappropriate for an urban context.

One inhabitant talked about the influence of what people are accustomed to and have grown up with. Traditional wooden constructions have been replaced by other materials over the past century in Norway.

Norway is virtually built of timber. Timber frame housing is really the norm in Norway. We've grown up with it, we have wood around us all the time. Gypsum and steel and concrete have only been here since modern times. Now that has almost taken over, now there is almost only that. I see this as quite a step backwards.¹²⁰¹

He was critical of the renunciation of building tradition, but he also dismissed clinging excessively to how things have always been done:

¹¹⁹⁸ Ölbündt - Inhabitant 2, Transcription IA2, 5.

¹¹⁹⁹ Mühlweg (A) - Inhabitant 1, Transcription IA3.

¹²⁰⁰ sw40 - Inhabitant 4+5, Transcription ID5a+b, 21.

¹²⁰¹ Vindmøllebakken - Inhabitant 1, Transcription IN5, 4.

People are so conservative. Paint the timber, that's how it always has been. (...) where we have our cabin, the oldest houses are not painted. They've stood there for several hundred years. That also works fine.¹²⁰²

On the other hand, having experienced wooden surfaces all around only in holiday homes, he was also uncertain about how he would like Vindmøllebakken, the urban wooden building into which he would soon be moving.

I think we're talking a lot about habits and bad habits. We're not used to having timber in the ceiling. We had that in our mountain cabin, but not at home.¹²⁰³

Others come from regions where there is no tradition of timber houses and where climatic conditions for timber production are different. One interviewee said that he needed to get used to timber first.

I'm originally from [another country]. Nearly all the houses are made in concrete (...). Timber is very poor quality in [the country I come from] because it grows very, very quickly so it's not the ideal material [there].¹²⁰⁴

Local craftsmanship and execution quality

The occurrence of wooden buildings in a region does not only influence what people associate with urban and rural architecture and find appropriate in these areas; it is also related to local craftspeople's work experience with wooden construction (see also the inhabitants on a construction's reliability and execution flaws in Chapter 2).

One inhabitant from Mühlweg (A) had less confidence in urban multi-storey timber buildings than in lower buildings in rural areas where crafters have knowledge and experience with timber.

In those regions there is usually a master builder who does the constructions. If I think of Vorarlberg or Tyrol – they have learnt how to do this, and [the techniques] have been handed down for decades and centuries, and the right joints and all. Contemporary multi-storey housing doesn't have such a tradition. Saying it right out, and thinking pragmatically: How does that work here in Vienna?¹²⁰⁵

He maintained that contemporary political initiatives and plot allocation practice should be better coordinated to ensure that the desired increase in wooden constructions also comes with the desired quality. He tended to trust experienced craftsmen more than architects who might not have built with timber before:

The municipality of Vienna comes along and provides subsidies and a site for a competition, and 20 architects apply with their concepts. The winner is determined based on architecture and on these two models of Vienna housing subsidies and on sustainability

¹²⁰² Vindmøllebakken - Inhabitant 1, 6.

¹²⁰³ Vindmøllebakken - Inhabitant 1, 4.

¹²⁰⁴ Skadbergbakken - Inhabitant 1, Transcription IN1.

¹²⁰⁵ Mühlweg (A) - Inhabitant 2, Transcription IA5, 12–13.

and so on. But the architect does not necessarily need to know anything about timber construction. Whether or not he knows how to do good joints or what to look after is not considered when the tender is accepted.¹²⁰⁶

Social aspects

A number of aspects that were important to the inhabitants were in the social realm. They are not necessarily directly or entirely related to timber as a material choice, but considered jointly with this material, for example in fire concepts (as is the case with open access balconies or when different functions are housed within one building), in how materials facilitate an adaption of the building to changing user needs (e.g. when the number of household members or physical needs and abilities change), and in side effects of a collaborative planning process (not only for the choice of shared functions, but also for bonds within the housing community).

Neighbourly relations

In several cases, the social component of the project was more important to the inhabitants than its materiality and represented a reason to move in.

As an example, a future inhabitant of p1 liked the office's stance on urban projects as joint building ventures. The project model for urban housing and its aspired social mix were more important than the materiality and environmental reasons for building with timber.¹²⁰⁷

The interviewed inhabitants experienced the community among their actual neighbours quite differently. Many reported that although it was a loose community it worked well,¹²⁰⁸ even bringing joy¹²⁰⁹ or giving rise to close friendships,¹²¹⁰ and that they relied on each other and helped each other when necessary (e.g. knocking on each other's doors to borrow milk or eggs, checking in on neighbours who were ill and staying home, accepting mail for their neighbours or watering their plants when they are away).¹²¹¹ Others experienced that everyone was more on his or her own.¹²¹² Some inhabitants saw the age gap and different family situations as exclusive or dividing the group.¹²¹³ Many

¹²⁰⁶ Mühlweg (A) - Inhabitant 2, 12–13.

¹²⁰⁷ p1 - Inhabitant 1, Transcription ID7.

¹²⁰⁸ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b; Ölzbündt - Inhabitant 1, Transcription IA1; Mühlweg (A) - Inhabitant 1, Transcription IA3; Wagramer Straße (B) - Inhabitant 1, Transcription IA7; Spöttlgasse - Inhabitant 1+2, Transcription IA9a+b; Skadbergbakken - Inhabitant 1, Transcription IN1.

¹²⁰⁹ Breitenfurter Straße - Inhabitant 1, Transcription IA8.

¹²¹⁰ c13 - Inhabitant 1, Transcription ID8.

¹²¹¹ Skadbergbakken - Inhabitant 4, Transcription IN3; sw40 - Inhabitant 1+2, Transcription ID3a+b; sw40 - Inhabitant 4+5, Transcription ID5a+b; sw40 - Inhabitant 6, Transcription ID6.

¹²¹² Ölzbündt - Inhabitant 2, Transcription IA2; Lobaugasse - Inhabitant 1, Transcription IA4.

¹²¹³ Lobaugasse - Inhabitant 1, Transcription IA4; Mühlweg (A) - Inhabitant 2, Transcription IA5.

mentioned that children helped establishing contact,¹²¹⁴ whilst others felt excluded by the fact that they did not have (young) children.¹²¹⁵ One interviewee talked about consciously keeping a distance in order to avoid conflicts.¹²¹⁶ Some reported being more in contact with the immediate neighbours than with the larger project,¹²¹⁷ and some thought that the neighbours, although being irritating at times, also provided a sense of security.¹²¹⁸ Another emphasized the importance of giving as much back to a community as one would like to receive from it.¹²¹⁹

It appears that different expectations also influenced how inhabitants perceived the situation, and how actively they used common areas or have special responsibilities within the group also made a difference. Having participated in the planning phase together with future neighbours also impacted the sense of belonging to a group.

Access balconies facilitating everyday encounters

Most of the multi-storey projects visited have partially or entirely outdoor access balconies and staircases, and this specific design feature has thus been addressed in greater detail. Apart from the three detached or semi-detached houses with direct ground floor access at Skadbergbakken and Lobaugasse, only two buildings with five- and seven floors had entirely enclosed staircases (Mühlweg (B) and Skadbergbakken apartment building). Although these access systems are not made of timber, they seem to be a recurrent design feature of many multi-storey timber housing projects. There can be many reasons for an entirely or partially outdoor access system – e.g. fire safety considerations, maximum exploitation of a site's buildable area, or the architect's intentions to increase both contact with nature and communication between inhabitants whilst emphasizing the difference between shared and private areas, thus enhancing the feeling of entering one's own private space.

A number of the Austrian and German inhabitants appreciated these semi-public access areas.¹²²⁰ While many agreed that the open access fosters communication within their building, a few would have preferred more privacy. The designs are not always seen as optimally addressing shifting weather conditions however. Several interviewees commented on the lack of vestibules and porch roofs for their apartment doors, which open directly to outdoor staircases and access balconies.

¹²¹⁴ sw40 - Inhabitant 1+2, Transcription ID3a+b; Skadbergbakken - Inhabitant 4, Transcription IN3.

¹²¹⁵ Lobaugasse - Inhabitant 1, Transcription IA4; sw40 - Inhabitant 4+5, Transcription ID5a+b; sw40 - Inhabitant 6, Transcription ID6.

¹²¹⁶ Wagramer Straße (B) - Inhabitant 1, Transcription IA7.

¹²¹⁷ Skadbergbakken - Inhabitant 1, Transcription IN1.

¹²¹⁸ Lobaugasse - Inhabitant 1, Transcription IA4.

¹²¹⁹ Vindmøllebakken - Inhabitant 1, Transcription IN5.

¹²²⁰ In Norway, access balconies have a contested reputation. Inhabitants of the Norwegian project Ulsholtveien were not included in the interviews.

An inhabitant of Mühlweg (A) liked the access balcony for the light it provided the flat from two sides, but would have liked to be able to open windows on that side as well, where the glazing is fixed for fire protection. He was not disturbed by people passing by (there is only one flat behind his). Most residents there have put translucent coverings on their windows.¹²²¹

An inhabitant of Mühlweg (A) reported liking the airy feeling conveyed by the access balcony (German: 'Laubengang') but found that snow could be a challenge.¹²²²

The open staircase at c13 as well provided only little protection from snow and ice in front of an interviewee's entry door. 'With a toddler and a pregnant wife, that's not ideal.'¹²²³ As an upside, they could also use it as a balcony. The interviewee reported that since he had gone from primarily using the elevator to taking the stairs, he had had conversations with people whom he hadn't really noticed before.¹²²⁴

A couple living at wk65 had different opinions about the open staircase leading to their apartment; he liked the outdoor access, but she did not. She acknowledged however that the architects had been 'really innovative' to do this in order to be able to build on a small backyard plot. He believed that communication would be the same in an indoor staircase, but she disagreed, stating that people have more reasons to spend time outside, like gardening on their balconies, which makes more opportunities for neighbourly chats.¹²²⁵

Another inhabitant of wk65 maintained that the access balcony absolutely fostered communication, but sometimes she would rather sit on that side of the house in peace, as she felt very exposed on her terrace on the rear side of the house.¹²²⁶

A couple from sw40 liked the access balcony, which they see as related to fire regulations. When the wind and rain are heavy however, entering right into the living room is a disadvantage; they would like to have somewhere to hang wet clothes when entering their dwelling.¹²²⁷ Other inhabitants from the same building mentioned the same issues – commenting on the absence of overhangs over their entry doors and the windy open staircase,¹²²⁸ or reporting that they would have preferred a larger entrance area as there is no cover over the entrance:

For us as a family it's completely sufficient. Most of the time, only one or two arrive at the same time. But when there are more people arriving – we often have guests – it can get a

¹²²¹ Mühlweg (A) - Inhabitant 2, Transcription IA5.

¹²²² Mühlweg (A) - Inhabitant 1, Transcription IA3.

¹²²³ c13 - Inhabitant 1, ID8 in an email, received 05.12.2017

¹²²⁴ c13 - Inhabitant 1, Transcription ID8.

¹²²⁵ wk65 - Inhabitant 1+2, Transcription ID1a+b.

¹²²⁶ wk65 - Inhabitant 3, Transcription ID2.

¹²²⁷ sw40 - Inhabitant 1+2, Transcription ID3a+b.

¹²²⁸ sw40 - Inhabitant 4+5, Transcription ID5a+b; sw40 - Inhabitant 6, Transcription ID6.

bit cramped. As we don't have any porch roof, everyone has to come in right away if the weather is [bad].¹²²⁹

A future inhabitant of p1 liked the informal meeting points that the outdoor access balconies will provide. The open staircase will connect several houses. On a site visit, he noticed the 'incredibly beautiful vistas' of the surrounding urban quarter. Other shared rooms were voted down early in the planning process, which he regretted.¹²³⁰

Other shared functions

Most of the interviewees seemed to have experienced that shared functions that were not maintained by explicitly assigned persons in charge eventually stop being used; they tended to be filled up with too many things and used as storage for disused objects, or they were not tidied and cleaned properly (e.g. rooms for prams,¹²³¹ bicycle garages,¹²³² play rooms,¹²³³ or party rooms¹²³⁴). This was not always the case however: one inhabitant from Wagramer Straße reported that she happily used a large variety of shared rooms in her building (a laundry room, play room, pram room, bike workshop and party room). She often used the guest apartment when her parents came to visit.¹²³⁵

One couple from sw40 reported that the potential for conflict is somewhat higher among people who use the garden more extensively. For them personally however, living within a community with a certain distance to the others worked quite well. Nonetheless, they were also interested in other models of living together, where people swap, borrow and give things away to a greater degree.¹²³⁶

The project Vindmøllebakken not only focuses on shared functions, but also on correspondingly minimized areas of the private flats. At the time of the interviews, the construction of the project was yet to be finished. The future inhabitant could thus not report on experiences with this take on living together with one's neighbours. However, he had gotten to know his future neighbours during the planning process, where the type and degree of sharing was one of the topics discussed and negotiated. As described in Chapter 3.3, this later turned out to influence how design features were valued and technical performance experienced.

¹²²⁹ sw40 - Inhabitant 3, Transcription ID4, 3.

¹²³⁰ p1 - Inhabitant 1, Transcription ID7, 6.

¹²³¹ Mühlweg (A) - Inhabitant 1, Transcription IA3; Mühlweg (A) - Inhabitant 2, Transcription IA5.

¹²³² Mühlweg (A) - Inhabitant 1, Transcription IA3; Mühlweg (A) - Inhabitant 2, Transcription IA5; Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b.

¹²³³ Mühlweg (B) - Inhabitant 1+2, Transcription IA6a+b.

¹²³⁴ Wagner, 'Materialgerechtigkeit'.

¹²³⁵ Wagramer Straße (B) - Inhabitant 1, Transcription IA7.

¹²³⁶ sw40 - Inhabitant 1+2, Transcription ID3a+b.

Changing space requirements

Several inhabitants were happy to have found apartment sizes or layouts that matched their non-standard needs and could e.g. accommodate a large family or be subdivided.¹²³⁷ Others used shared facilities for overnight guests (as described above) or had bought additional units to accommodate their needs.

One of the interviewees from wk65 also owned a small ground floor apartment that she used as a studio space. She said that she did not know how long she would need the space, but that it was much easier to sell a separate apartment again than to partition off part of her own flat.¹²³⁸

User participation

Users had been involved in the planning phase of the buildings in one of the Norwegian and most of the German projects, and they were able to influence the design to different degrees; in addition, the planning phase was part of establishing a community.

Individual design input and subsequent adaptations

In some cases, architects determined the outer shell and architectural expression and the future inhabitants could make interior choices such as surface treatments, the placement of interior walls, or even the entire plan layout except for the connections to wet zones. In Vindmøllebakken, size, functions and equipment of shared areas were also up for discussion. The interviewees had different interests and expectations concerning their involvement in the planning process and thus evaluated their options accordingly. Although possibilities were more restricted in the rental dwellings, walls surfaces were painted, and some added or removed interior walls.

The built area at Lobaugasse where one interviewee lived in her little house cannot be changed substantially by inhabitants; otherwise, she would have turned her roofed sitting area into a winter garden. She also considered this restriction an advantage however – then no one can spoil the residential area with additions. Changes to the house's interior were permitted. The full range of possibilities and their potential impact on the organization of the daily life with other members of the household were not obvious to her. She gave expression to experiencing the conversation between interviewer and interviewee as eye-opening.¹²³⁹

One of the couples interviewed had moved into wk65 when basic decisions had already been made, like the choice of the planning architects, the project's location, its wooden

¹²³⁷ sw40 - Inhabitant 1+2; sw40 - Inhabitant 4+5, Transcription ID5a+b; sw40 - Inhabitant 6, Transcription ID6.

¹²³⁸ wk65 - Inhabitant 1+2, Transcription ID1a+b.

¹²³⁹ Lobaugasse - Inhabitant 1, Transcription IA4.



Figure 4.2 a) A wide range of choices for the 47 individual apartments at P1, where only load-bearing walls and main piping connection points are predefined. No group discussions among future neighbours. Drawing: Kaden + Lager. b) A limited number of choices for individual apartments at Vindmøllebakken, but extensive workshops and meetings to discuss and define the form of co-housing and to negotiate and plan the degree and type of shared features. Drawing: Helen & Hard. All drawings same scale.

construction and the apartments' outer delimitation. They moved some non-bearing walls and decided on interior fittings. They wished that they had been informed better and earlier about the effects of individual decisions on the costs of the entire project and believed that the water supply could have been rationalized if the parties had been aware of the consequences of their individual choices.¹²⁴⁰

Another inhabitant of the same project reported that some members of the joint building venture had shifted. She and her husband also left the project at some point and re-joined it again later. Some of the processes and decision-making went too fast for her. In retrospect, she would have distributed the rooms differently within her apartment.¹²⁴¹

An inhabitant of sw40 said that the outer walls and even windows (including sizes and glazing quality) were predetermined when she and her parents became involved in the design process for their dwelling.¹²⁴² They were able to place all inner walls according to their wishes and they had also rotated a bathroom window facing the external staircase from a vertical to a horizontal format. She stated that in hindsight, perhaps they should have tried to be more involved in the aesthetic decisions made by the architects as well and to design more actively together. But as

you don't do [such a project] that often, only once in a lifetime,¹²⁴³

¹²⁴⁰ wk65 - Inhabitant 1+2, Transcription ID1a+b.

¹²⁴¹ wk65 - Inhabitant 3, Transcription ID2.

¹²⁴² sw40 - Inhabitant 6, Transcription ID6.

¹²⁴³ sw40 - Inhabitant 4+5, Transcription ID5a+b, 9.

they did not think about getting more involved during the planning phase and focused mainly on the interior. Some of the inhabitants' wishes were overruled by the architects' overall design intentions. Nevertheless, the inhabitants respected the architectural intentions and generally liked the building's architectural style.

One of the future inhabitants of p1 said that the users were very involved in the first version of the housing project in particular. He was fascinated by the possibilities for different plan solutions and the flexibility that having only one fixed static wall granted. There was a determined number of possible connection points for the bathrooms and kitchen. At the same time, the architectonic expression of the building was not up for discussion. Outdoor access areas, façades and material choice were not part of the group discussions, and he was happy about that.

Growing a community

A couple living at sw40 said that the joint building venture worked right away for them, with a diverse mix of people:

[There are] different types, some crazy, some less, from the bus driver to the head physician.¹²⁴⁴

Another inhabitant of sw40 experienced the community with other inhabitants as very varied. During the project's planning phase, everyone saw things differently and tried to promote their own interests, but they always managed to come together again to advance the project as a whole. After moving in, the shared garden proved to stir up differences. In addition,

some neighbours show a lot of commitment (...) while others always just comment on things.¹²⁴⁵

Nevertheless,

there are, as in any group, people you like to have a beer with and others you wouldn't go on holiday with. There's a really broad spectre [of people] here.¹²⁴⁶

Although the internal community within their family was most important to them, another interviewee from sw40 also appreciated the larger house community as well. She stated that

in the end it's pleasant to live together with neighbours that you know from the building phase already. Here, really everyone is part of the community. Everyone has consciously decided to live in a community.¹²⁴⁷

¹²⁴⁴ sw40 - Inhabitant 1+2, Transcription ID3a+b, 9.

¹²⁴⁵ sw40 - Inhabitant 3, Transcription ID4, 13.

¹²⁴⁶ sw40 - Inhabitant 3, 13.

¹²⁴⁷ sw40 - Inhabitant 6, Transcription ID6, 14.

An inhabitant from wk65 said that they did not have high expectations of meeting privately with their neighbours, but that the community got to know each other well in the planning phase and had ‘survived all this stress quite well’.¹²⁴⁸

A future inhabitant of Vindmøllebakken had participated in several workshops. The changeable options within the flat were experienced as few – moving or removing walls and changing the surface treatment of walls and ceiling. However, many meetings had been held to find out about what they want to share and which extra functions the shared area should accommodate (Figure 4.2). He imagined that if the community had been smaller they would have been able to decide more, but he saw advantages to a large group, for example that tasks could be shared amongst more people. In addition, he felt that a larger community made it more probable to meet people with whom he really got along; the variety is larger and the options more numerous. The interviewee would have been interested in greater involvement in the planning process but accepted that this was not possible in a project for so many people.¹²⁴⁹

While future inhabitants of p1 were able to influence the layout and materiality of their apartments to a great degree (Figure 4.2), one inhabitant to be said however that as they did not have group meetings to discuss the general building design, there had not been a unifying element for the building group during the planning phase. As they all discussed individual solutions with the architects, he felt that they were mere shareholders in their joint building venture.

For me, good architecture has a social component that’s very important to me, and that’s why I think it’s really a pity that (...) 40 owner-occupied dwellings – detached houses if you will – will be generated and not a bit of city. The question of diversity in a social, but also functional dimension is important to me.¹²⁵⁰

The potential social benefits of collaborative design and planning process are not always reflected or accommodated in the design’s final layout and provision of spaces for chance encounters or planned shared or joint activities.

¹²⁴⁸ wk65 - Inhabitant 1+2, Transcription ID1a+b, 7.

¹²⁴⁹ Vindmøllebakken - Inhabitant 1, Transcription IN5.

¹²⁵⁰ p1 - Inhabitant 1, Transcription ID7, 5.

4.4 Chapter summary and preliminary conclusions

Rather than being a theoretically framed body of literature, the literature included in this chapter is informed by how the interviewed architects and inhabitants valued and discussed the aspects presented in the previous chapters.

Discussions during the interviews revealed that how a material is valued is always decided in the context of a number of frameworks (e.g. economic, ecological or social). Often, conclusions made within one framework would contradict another framework.

Value spheres

This chapter aimed to disentangle a semantic dimension of wooden construction materials. A number of 'value spheres' were identified:

- Economic value of the raw material (depending on e.g. availability / rarity / difficulty to obtain / demand / market, and also the costs of its planning, manufacturing and mounting);
- Functional value (depending on e.g. technical suitability / performance / durability, as discussed in Chapter 2);
- Aesthetic value (depending on e.g. individual appreciation / if it ages well / positive associations; described in Chapter 3);
- Artistic value, how it is part of the building's overall design, how it is detailed and how this relates to theoretical schools of thought;
- Workmanship related value (depending on e.g. high-quality execution / master piece; see also 'Traces of workmanship' as part of material aesthetics in Chapter 3);
- Symbolic value (depending on e.g. traditional use / a meaningful narrative / relation to location);
- Ethical concerns (depending on e.g. environmental or social sustainability);
- What value is assigned to it in a personal encounter, influenced by everyday practicalities, and loaded with emotional and affectual associations.

All of these notions must be negotiated in every project and certainly between the architect and client.

It is easiest to rank materials according to their functionality and economic value. Aesthetic qualities or symbolic significance may be agreed upon within certain (e.g. professional, social or cultural) groups, but are subject to less objective consideration than the former aspects mentioned.

Additional notions have emerged, so that in some cases, established notions of value have been mixed up, for example, when the use of rare species no longer represents exclusiveness, but is rather morally unacceptable. Although a range of tropical wood species are very durable, their import is generally regarded as unethical due to the difficulty of ensuring ecologically, economically and socially sustainable production.

Locally sourced lumber is more sustainable and thus more valuable, and also more expensive if harvested selectively from forests that maintain biodiversity. As the research revealed, high-quality workmanship is part of aesthetically appreciated and ethically accepted exclusivity.

Perceived value can increase with a narrative about the material's origin and situatedness, for example, if the construction material was grown near the building or if the purchase of materials contributed to the region's economic sustainability. However, this might also contribute to using up these resources; if their affectual value was tied to recreational or picturesque qualities, this is not readily replaceable by simply planting new trees.

Even quantifiable arguments are not always unambiguous. With the amount of wood required for a CLT-based construction, one would store more CO₂ compared to a skeleton construction, but one would also be able to replace fewer concrete or steel buildings with the same amount of timber.

In addition, architectural design ambitions are part of defining material value aspects beyond easily quantifiable or comparable value notions. All of the value notions discovered in the theoretical texts are alive and active in the thinking of today's architects.

As the interviews show however, users do not always share or even notice these (see also Chapter 3). It does not mean that users are unreceptive to these perspectives, but that architecture does not always speak for itself. Better communication between user and architect may unlock the potential to include additional qualities into architectural design and to increase both its appreciation and perceived value. As described in the following, the interviews revealed how this could be facilitated.

Inhabitants' decisive values

The meaning(s) that the inhabitants ascribed to timber constructions related to values on various levels. For example:

- understood as a 'price tag' for the building (as in Chapter 4);
- including a long-term view of the stability, durability or robustness of a building (see also Chapter 2);
- referring to personal convictions, such as sustainability or benefits of natural materials for health and well-being (as described in Chapters 3 and 4);
- associated with traditions and customs that might be specific to a certain region (as described in Chapter 4); and
- interpreted as a cultural good, in relation to the contribution of wooden materials to 'good' architecture (in Chapter 4).

For inhabitants, value is to a great extent related to investment revenue, stability and security and to how safe and sound a construction looks and feels, and only secondarily related to health considerations or aesthetic preferences. For many, economic aspects are important when deciding where to move, regardless of whether the intention is to rent or to buy. In the case of those seeking to rent, the rental price was obviously of concern.

Those seeking to purchase were not solely concerned with the one-time investment, but also with value stability.

For most of the inhabitants, location was the most important factor influencing the choice of their current apartment at the time of the interview, regardless of whether they owned or rented it. Price was cited as a second reason. While some acknowledged the interplay of different qualities, only a few said that materiality played a decisive role in their decision. Some said materials they liked were ‘nice to have’, while others did not care about materials. Some became aware of architectural qualities that they had previously overlooked through the discussion of materiality during the interview.

Inhabitants are sensitive towards and appreciate the manifold facets and mutual interplay of architectural qualities and wooden materiality. When deciding on a place to live however, a building’s location and price tend to override other values and preferences. Decisions to move away are mainly due to changing space requirements.

This means that while loveability and adaptability play an important part in buildings’ prolonged lifespans and preferably also prolonged residency periods, both the inhabitant’s receptivity for architecture’s ‘higher values’ and more existential needs should be acknowledged and considered in the design of residential timber architecture.

The housing market’s organisation around owning or renting was of great importance for how surfaces were judged or chosen, with regard to robustness and adaptability. Different cultures of cohabitation and their physical manifestations are reflected in politics and legislation, and new approaches often need to challenge established patterns. Traditions and regulations are part of the situatedness that influence development and innovation of timber housing.

Thus, architects with a ‘timber agenda’ need to promote the choice of wooden materials with additional arguments and communicate them better. Architectural qualities need to jointly form a meaningful whole, so promoting timber by its inherent concrete and perceived properties alone will not suffice. Timber architecture also needs to address the inhabitants’ everyday needs, private economy and social relations.

Situatedness

Situatedness is a thematic field identified within the semantic sphere that emerged from the interviews. Architects emphasized the importance of locally available resources and craftsmanship with a distinct quality. Inhabitants judged the suitability of exposed wooden surfaces depending on the building’s localization and on the regions of which the wooden surfaces reminded them. Aspects of situatedness are included both as a point of material origin and as socio-cultural identity linked to the use of materials.

While the literature consulted treated the topic on a more general level, the architects related it closely to a specific place or region. Inhabitants differ between urban and rural, the latter often associated with the regions in which they grew up.

Timber architecture shaped by and co-shaping its context

The buildings' design is influenced by a number of contextual conditions (e.g. the immediate surrounding, the locally available quality of materials and the locally available quality of craftsmanship). At the same time, design choices influence the context that they are part of in return. Timber architecture maintains or creates a demand, activates or depletes local resources, ignores or holds traditional knowledge alive, may maintain and further local craftsmanship, and by adopting, developing or changing stylistic peculiarities of a region informs or redefines the visual and social identity of a place. Architecture partakes in the economic, societal and physical shaping of its own context.

This is a central topic for the architects in particular, relating to the local development of building culture, skills and knowledge, and regarding local environments that condition stylistic and technical development.

The exceptional position of Vorarlberg when it comes to timber architecture is well-known. However, other settings must also be acknowledged as important areas of advancement for timber architecture. These include:

- the application in an urban context regarding density, building height, off-site production, just-in-time delivery and rapid installation;
- formal development, for example, drawing inspiration from natural shapes or experiences in nature; and
- the realization of new forms of housing at increased density, with overlapping functions, and novel ways to design interfaces between different units and public/private. All these have consequences for fire protection measurements and sound insulation which often get challenged or answered in unprecedented ways.

The relationship of situatedness to timber building culture is perhaps most obvious in Vorarlberg, where the quality of timber buildings is anchored in locally available resources and related industries as an economic foundation for the region. The traditions, skills and knowledge have been passed along for many generations, and related education and prestige are anchored within a social system. The firm Hermann Kaufmann Architekten operates predominantly within this context and reflects these conditions and the proximity to production and processing in the overall formal expression and constructive logics of their projects. An important aspect is that they have to fight to keep local knowledge, skills and material quality alive, inventing ways to manage legislation and political initiatives that encourage globalization of the flow of materials and workforce.

Helen & Hard introduce innovative formal language into the Scandinavian context. Formal inspiration from more abstract experiences and references to nature enrich and broaden the stylistic repertoire of timber architecture, not only in signature buildings (like their recently completed Finansparken Bjergsted in Stavanger), but also in housing projects (e.g. the pentagon shapes and vertically open interior in Skadbergbakken or the

mat building organization in Vindmøllebakken). Besides rethinking ways to live and work together, to communicate and consume, Helen & Hard also challenge and advance the use of digital tools and industrial products, as described in more detail in Chapter 2.

Kaden + Lager push boundaries regarding use of the materials in an urban context; they introduced a new industrialized material to central Berlin, pioneering new heights for residential timber buildings. Initiatives in Vienna of which several of the other included precedents were part have not initiated large-scale timber use. Perhaps Kaden + Lager, being situated within the urban context itself, strive to influence the urban realm more directly and in different ways than firms located in other regions.

Several firms applied new ways of involving users – this had consequences for the design as well as for the social cohesion in the group of neighbours-to-be.

Strategic details

Although it is not always possible to predetermine where the materials used in a building come from, this can be influenced by design choices (e.g. on detail level, or with material specification) in order to both ensure quality and support the local industry that depends on sustained demand.

Such purposeful specifications also mean that a greater percentage of the trees' stems can be used and a greater range of wood qualities can be used in timber constructions. In contrast to larger companies that have to use products in standard qualities from the shelf, smaller carpentries who buy their material directly from the forests are able to use parts of the stem that are strong but less aesthetically pleasing, or utilise leftover parts for sub-constructions to achieve an overall higher quality at a comparable price to off-the-shelf products whilst using the resource to full capacity.

Move on, not away

In the same way that an uncritical application of algorithmic design tools has been blamed for failing to produce loveable architecture, a thoughtless replication of the same type of timber architecture should be met with scepticism.

It is positive that the export of locally anchored expertise can inspire timber architecture around the world. However, this should not impede the local building culture and its specificity from continuing; if legislation and building codes make it difficult to use local resources, to employ local craftspeople and to produce locally, the high-quality expertise will diminish, or perhaps it will not be carried on into the following generation. Architectural and material situatedness can come into conflict with political and economic systems on another level. The stream of materials and workforce across regional and national boundaries can make it difficult to maintain material-specific and locally-anchored ways of developing and producing timber architecture.

When aiming to advance timber architecture around the globe by sharing expert knowledge and formal inspiration as well as product innovation and production expertise, this should remain attentive to retaining local specificity not only with regard to formal expression, but also conscious of the social and societal implications.

Materiality has the potential to bridge the past and future through the further development of (possibly local) formal language, products and production methods. Aspects of locality and time are deeply anchored in materiality, as the old buildings ‘teach’ about how timber behaves and needs to be handled. The past is kept alive and transferred into something new.

When knowledge, expertise and capacity grow within a local context, this may not only impact the visual identity of a place positively (recognizable instead of generic and nondescript); it also has the potential to maintain, enhance or create lasting societal benefits. The aim should be to innovate within a context, not to eliminate it. The focus should be on how to advance timber architecture without losing its manifold and locally-anchored identities – on how to move forward without moving away from its various origins.



Lobaugasse

5

Telling Timber

Concluding discussion

In the light of ever more urgent environmental concerns and the responsibilities incumbent on the building sector, contemporary timber products have gained significance as sustainable and efficient building materials suitable for urban contexts. Beyond a careful choice of construction materials and optimizing energy consumption, efforts need to aim at prolonging the life cycle of buildings and cascading the use of their components.

This qualitative study builds on the main argument that qualitative aspects need to complement quantitative benefits, and that buildings that are liked better last longer and thus contribute not only to ecological, but also to social sustainability.

In order to understand the 'loveability' of residential timber architecture, the author deems it essential to not only consult professional views, but to also include the user perspective. The research assesses how the qualitative aspects of wood are framed in the literature and operationalized, experienced and valued by architects and inhabitants, answering the following research questions:

How have materiality and particularly concepts related to wooden materials been discussed in architectural history and theory?

How do contemporary architects view wooden materiality's contribution to their architectural ambitions?

How do inhabitants perceive and value the materiality of wooden constructions in the buildings they inhabit?

How do these perspectives converge or diverge?

These questions have been addressed through a literature study in several takes; qualitative interviews and 'graphic surveys' with 7 architects and 27 inhabitants of 13 timber housing projects; and desktop studies and site visits to these buildings. The investigations were supported by the communication and exploration of preliminary research results in two master's studio courses taught at AHO.

A pilot study focused on volumetric, surface and detail features of wooden housing projects that accommodate desirable characteristics of residential urban environments. The results prompted a follow-up investigation that represents the main body of research, where interview statements inform the inclusion of additional literature.

Two broader thematic fields have been discerned in material related architectural discourse and form the starting point for two thesis chapters: the relation between material properties and architectural form, and the sensory experience of architectural features. A third chapter addresses how the architects' and inhabitants' weighting and valuing of aspects referring to the aforementioned fields relate to larger contexts (e.g. the

lived realities that inform inhabitants' choices and experiences, or the economic, legal and societal frameworks within which the architects operate).

A number of main insights across perspectives and chapters that may inspire future design and research are recapitulated and discussed in the following. Commenting back on the introductory literature quotes, the results propel a reimagination of the production of architectural values and qualities.

Eloquent materiality

On the one hand, inhabitants are less concerned with dogmatic design approaches such as material honesty than with a material's trustworthiness and reliability – with regard to security of investment and modern timber's promises to be a solid, healthy and environmentally friendly choice. Inhabitants furthermore care about what a material allows them to do. Constructive, surface and detail choices that clearly communicate a material's affordances (e.g. to move, mount or modify)¹²⁵¹ should therefore be seen as beneficial. However, architecture does not always speak for itself and inhabitants were not always able to notice or understand options to utilize and adapt wooden construction components.

On the other hand, architecture that is excessively expressive has been rejected by a number of authors for drowning out poetic and atmospheric qualities.¹²⁵² These are brought forward by a personal, multi-sensory experience of architecture that is difficult to verbalize or communicate explicitly. The interviewees' differentiated and well-articulated reflections proved the importance of sensuous, atmospheric qualities.

A synergistic balance of both aspects is part of reimagining surface choices and detailing options as contributions to 'eloquent materiality'. Eloquent materiality implies options for use and modification, invites multi-faceted experiences, inspires personal interpretations and stimulates one's imagination; it does not prescribe nor impose either of these. This take on loveable environments aims at augmenting the perceived options for appropriation and individualization together with the range of sensory appreciation as an alternative to the desire for constant renewal, replacement and possession.¹²⁵³

This also motivates a more nuanced view on the author's suggestion to update Brand's model of 'shearing layers' launched in the introductory chapter of this thesis.¹²⁵⁴ The interviews indeed grant insights into what might provoke the qualitative (or psychological) obsolescence¹²⁵⁵ of constructive parts and their surfaces, which would be met by making surface renewals or replacements possible and readily identifiable. These

¹²⁵¹ Gibson, *The Ecological Approach to Visual Perception*.

¹²⁵² Leatherbarrow, *Architecture Oriented Otherwise*; Zumthor, Oberli-Turner, and Schelbert, *Thinking Architecture*; Chipperfield, 'Thermal Bath at Vals by Peter Zumthor'.

¹²⁵³ Building on ideas in Pérez-Gómez, *Built upon Love*.

¹²⁵⁴ Brand, *How Buildings Learn*.

¹²⁵⁵ Schallmo et al., 'Clarifying Obsolescence: Definition, Types, Examples and Decision Tool'.

considerations are important to design approaches within a circularity perspective and require further investigation into ‘qualitative resilience’, with regard to how surface treatments impede re-use or recycling, whether treatments are reversible or if a degree of saturation will be reached. A ‘surface upgrade’ could result in a downgrade by making further changes impossible.

Eloquent materiality may however offer yet another approach and extend the materials’ life cycle by communicating that the most precious might be what one already is surrounded by, the most beautiful what is inherent in a material, and inventive adaptations to new needs possible within the existing.

Nudging value perception

The ability of architecture – and materiality as a specific part of it – to speak for itself may be overrated in literature and by architects. Communication turned out to have the potential to fundamentally change the inhabitants’ perception and appreciation of architecture; sharing interpretations of architectural qualities made the inhabitants realize features and potentials of their own homes they had been unaware of. These were options for spatial modification to improve functionality when a new family member moves in; upgradeability of parts and surfaces; spatial and atmospheric qualities (related to proportion, materiality, light, views); or the careful design and execution of details. This resulted in them judging the overall value of their homes anew. The conversations gave the inhabitants access to the qualities that are not readily communicated in sales brochures, and supplementary to the ones decisive for their residential choices. Conveying the expert’s view to the user has been reported to ‘upvalue’ and ‘beautify’ their homes for them. When aiming for eloquent materiality in architecture, increased and improved communication between architect and inhabitant yields benefits for both sides that are not fully utilized at present.

Intersubjective co-creation

When trying to balance the tacit and non-rational inspiration architecture may hold with the explicit articulation of a construction’s affordances, eloquent materiality acknowledges the inhabitant as an expert of dwelling and a true participant in the continuous realization of architectural design.¹²⁵⁶ Communication, discussion and development of architectural concepts and solutions should be facilitated during the design process. The interest and ability of inhabitants to take part in and be influenced by this may be underrated.

In the literature introduced in Chapter 1, ideas about the user’s perspective have been described as largely relying on models that are over-generalized or based on the architect’s

¹²⁵⁶ Harries, *The Ethical Function of Architecture*, Pérez-Gómez, *Built upon Love*.

own view.¹²⁵⁷ The interviews, however, motivate a pivotal change of these views and practices and also prompt an extended and more nuanced understanding of architecture's qualities and values (loveability) as a product of intersubjective co-creation.

Some of the interviewed architects described avoiding too much exchange with users, as they are experienced as unreceptive to the architectural qualities the architects strive for. The architects saw themselves as defending architectural quality for the greater good or as a societal responsibility, even though they might have to fight against the interests of others involved in a project (e.g. contractors or developers). However, all the architects expressed interest in how their design and material choices responded to the lived realities in their buildings and whether inhabitants appreciated or noticed them.

Although the increasing complexity regarding both the design and the facilitation of the dialogue can become difficult to manage or to render profitable, some architects actively and meticulously include the user in the design process in different stages of the planning phase. Future inhabitants were allowed to influence various aspects of the design (e.g. regarding their individual plan layouts, deciding the surface treatment of wooden elements in their dwelling, or choosing the type and extent of shared functions within a housing community).

Embracing intersubjective approaches to architectural design grants additional effects on the appreciation of residential architecture; the interviewees indicated that a participatory design process not only made their voices heard with regard to the individual dwelling or shared amenities, but that it also facilitated getting to know future neighbours and fostered a good community. Experiencing good neighbourly relations and identifying with a building positively influence the experience of its concrete features. It made it easy to communicate in case of disturbance; it also made inhabitants more tolerant towards eventual constructive or technical drawbacks.

Even though inhabitants named prosaic aspects that architects can only partly influence as decisive for their residential choices (location and price), this does not mean that inhabitants are uninterested in or unaffected by other features that architects are more passionately committed to. On the contrary, and as mentioned above, beyond these comprehensible necessities, precisely qualitative features that often remain tacit prompted a significant change in their perception of value when conveyed from a professional perspective. Inhabitants also addressed theoretical concepts that architects did not have on their agendas, but that may inspire broader design considerations (e.g. a material's affordance). While the architects' focus on realizing an architectural idea may seem contradictory to the inhabitants' focus on value stability and investment return, communication may soften the boundaries between these understandings.

¹²⁵⁷ Lang and Moleski, *Functionalism Revisited: Architectural Theory and Practice and the Behavioral Sciences*.

Furthermore, an increase in perceived value and satisfaction by the inhabitant may benefit the architect's reputation, which was an important reason for a number of the interviewed inhabitants to join a project, to trust them, or, as reported by the architects, to acknowledge and not question the architects' expertise, material choices and quality aspirations.

User feedback should also be valued in post-occupancy assessments. Feedback about the inhabitants' everyday experiences in their homes would add important information about the success of the design intentions; this should feed into a reflection of design decisions and their further development and refinement in future projects.

The inhabitants interviewed were interested in an exchange about architectural topics, capable of expressing their views and insights in a contemplated and nuanced way and receptive to learning from the expert's view. Some expressed that they would be interested in greater involvement in design decisions, whilst others reported being happy that the architects remained in control over the overall design and architectural expression and ensured stylistic coherence.

The call to include inhabitants to a greater degree in design processes does not restrict or render the architect's role less important. The architect's expertise and authority to coordinate diverse wishes and input and to translate them into a functionally and aesthetically consistent design is acknowledged and appreciated and might even be strengthened by such dialogue.

Rather than seeing architects and inhabitants as defending opposing interests, there is potency in realizing their complementary competences as being essential in intersubjective design development. Just as some architects reported to meet craftsmen on equal footing to advance constructive aspects of timber, inhabitant's dwelling related expertise and lived experiences with materials is vital in the advancement of architecture's loveability.

Even though multi-apartment projects – particularly rental properties – often do not allow for direct communication between architects and the actual inhabitants, seeking the exchange with (present or future) inhabitants of this housing type will lend specificity to the usually anonymous and simplified user models cited above.

Situated values

The interviews also spurred an understanding of the different ways of weighting and operationalizing values and qualities as situated within larger contexts - transcending the walls of one's home and in the architect's plan drawings.

What makes us use our buildings longer is not only the building itself, but also the neighbourhood it is part of, both with its physical features and its social fabric. To identify with and feel connected to something beyond the self seems to be important and

might be relatable to the cited definition of human needs.¹²⁵⁸ This something beyond the self could be the neighbourhood community that may co-shape one's perception of material related issues, or nature as a higher system beyond the own species. Both social relationships and nature provide a sense of comfort, belonging and meaning, but are also something that must be taken care of; both have a continuity beyond one's own life. Seeing options to influence one's environment has been mentioned as essential in an updated view of human health.¹²⁵⁹

The architect's influence exceeds the single project, with cultural, economic and societal impacts. Architecture responds to local conditions such as climate, elements of nature, built context, social constellations or cultural habits, available resources, craftsmanship and economy. At the same time, it also impacts this very same context, for example, by its own visual presence and formal expression, by the social encounters it fosters, or by the trades and industries it sustains. These again inform a project's achievable execution quality, technical standard and stylistic acceptance in return.

The situatedness of resources, knowledge, skills, interests, preferences and stylistic peculiarities, as well as visual change, have been found important for timber architecture, but this situatedness appears to be pressured by the globalization of resources, markets and workforce.

Reflection on research framing, choice of methods, and the author's own role

Breadth and depth

Owing to the study's holistic ambitions, the methodological choices offer a multi-faceted and broad perspective on the various qualitative contributions of wooden materials to timber architecture. The thesis attempts to find a balance between doing justice to the complexity of architectural practice whilst at the same time formulating and responding to a research interest with the required consistency. A rather broad focus was deliberately chosen in order to contrast existing theoretical approaches with the self-conception of practising architects and the experiences of inhabitants, and with the physical reality of built projects. This is rooted partly in the working habits of a practising architect, where all aspects of a building are interwoven and must make sense as a whole. A building will never be successful due to an isolated, brilliant aspect if this does not fit into the entirety of design decisions and details.

¹²⁵⁸ Maslow, 'A Theory of Human Motivation'.

¹²⁵⁹ Huber et al., 'How Should We Define Health?'

The shortcomings of a multi-faceted and broad research set-up unavoidably imply limited depth in the treatment of topics. Avoiding being too general on topics that are too large to handle in a few pages has been a concomitant challenge.

This parallels architectural practice; architects are sometimes belittled as ‘multi dilettantes’.¹²⁶⁰ Unless very specialized, they have to familiarise themselves with an entirely new field of knowledge with each new project, from housing to schools to hospitals. Their role as generalists who are able to coordinate and combine diverse types of information, requirements and aspirations into a coherent whole remains important. In this research however, focusing on very specific peculiarities and engaging more in detail with existing research often resulted in a sense of simultaneously raising one’s gaze and broadening the horizon, extending pre-existing understanding with larger contexts than what had been present in daily practice. Nonetheless, focusing attention on a more narrowly defined aspect or perspective would have allowed for a deeper discussion. Such a follow-up study is encouraged based on the overview provided through this thesis.

Bottom-up approach

Another trait of this thesis is the iterative process, where an initial overview of the literature considered relevant at an early stage formed the background for investigative measures, before a more informed selection of literature was revisited to enable the handling of the subsequently collected interview data.

An important ambition was to meet the inhabitants on their own terms, within their worlds, instead of superimposing existing theoretical concepts on their experiences. This bottom-up approach brought about topics that would not have been included otherwise, and a number of surprising discoveries that contradicted the researcher’s expectations and preconceptions. These views allowed for commenting back on literature, broadening the understanding of central concepts. They also helped realizing mutual benefits of enhancing communication between architect and inhabitant.

A more linear process might have led to methods being chosen differently, and questions for the interviews directed more specifically at the investigated aspects. This means that the interviewees were not questioned on the background of a defined set of categories and theoretical concepts, so that answers often are difficult to precisely relate to one of these. However, it also means that many of the issues emerged naturally in the interviewee’s reflections without words being put into their mouths. Perhaps some pitfalls were also avoided in this way, for example, meeting the interviewees with fixed preconceptions and unwittingly guiding their responses.

¹²⁶⁰ See also ‘professional dilettante’ in Deplazes, *Constructing Architecture: Materials Processes Structures. A Handbook*, 19.

Preconceptions and bias

As stated in the introductory chapter, there is a general assumption that wood is a sustainable material. At the outset of this research, the author had the persistent notion that ‘wood is good’, and that exposed wood must be even better. An additional presumption was that even if the inhabitants did not share this view, the interviewed architects would certainly agree. At the last office where the author was employed, the intention had always been to make wooden constructions as experienceable as possible and to convince clients, consultants and authorities of the added value of visible wooden constructive elements. It thus seemed likely that showcasing the building’s primary material was a higher goal for ‘timber architects’. As this thesis shows, this turned out to be true for some – but not all – architects, for different reasons. Inhabitants’ views also proved more differentiated than imagined.

Loyalty and independence

Through the author’s field of professional expertise, contact with some of the interviewed architects had been established prior to the doctoral research, or they were familiar with the author’s former workplace; there was thus a basic level of respect and trust in that there would be a tacit understanding regarding the topics discussed in the interviews and of the interview statements. Sometimes, the result was that assumed generalities were not addressed explicitly, and even more importantly, an underlying supposition that the interviewee and interviewer would be in agreement on some statements, coming as they did from the same profession and sharing an interest in the same material. In addition, architects usually present their ideas and projects to defend them in competitions, to mark their intellectual and creative ownership in podium discussions or conference presentations, or to promote their offices in exhibitions and broadcast interviews; there is usually no intention-free account of their design approach. Knowing participants beforehand and belonging to the same professional circles can create conflicting feelings; on one hand, there is a sense of loyalty and a wish to avoid presenting the architects in a bad light, and on the other hand, there is the researcher’s drive to reveal discrepancies and other matters of interest in their statements. This challenge was addressed by writing frank and direct accounts of the meetings, which then fed into the interview vignettes that were sent to the architects before publication of the thesis, as described in the section about ethics in Chapter 1.

Case and interviewee selection

While it would have been desirable to include a greater number of Norwegian projects, at the outset of the study, there were few Norwegian projects that met the criteria for height, density, construction materials and architectural acknowledgement. Additional interviews with inhabitants of Haugen / Zohar’s project Ulsholtveien could have fit into the data material. Apart from the rental apartments being for a special focus group

(disadvantaged young people) and thus differing from the other projects in that respect, the PhD research time limitations did not allow for further interviews.

Notably, only male architects were interviewed although both Norwegian offices also have female partners.¹²⁶¹ In offices with which the author had previously had contact, correspondence was addressed to both partners, and they were free to decide who would answer and follow up the interview request. If the author had been in contact with people from the office in other contexts prior to the research, contact with the office was made through these individuals, which might have led to them participating in the interview. Excluding female interviewees was not a conscious choice; the architects were free to choose who would like to contribute, who had time or who they felt would represent the office in the best way. In hindsight, including both male and female interviewees could have strengthened the maximum variation of interviewees.

As for the inhabitants, it seems like mostly those with academic inclinations answered the open invitation to participate in the interviews; that is, those with a certain degree of education and capacity to express their thoughts, and perhaps even an interest in supporting academic research. As mentioned before, the inhabitants' generally positive attitudes toward timber, also in an urban context, may partially have been a precondition for their willingness to participate. Most of them were native to the country in which they were living. Otherwise, there was a mix of ages, genders and family constellations.

If other architects or inhabitants were involved in the interviews, outcomes would have varied, possibly even when repeating the same set-up again after some time.

Categories and tales

The two approaches to material related qualities in architecture of the pilot study and the main body of research were very different in methodological nature and in the results they offered.

The pilot study addressed the identification of qualities and their translation into physical features straight-forwardly and produced lists, categories and pictograms. It culminated in a catalogue of design options for a variety of effects on the experience of architecture. Albeit in the limited depth of a paper, these results proved to be easily communicable and garnered attention in lectures and presentations. To a certain degree, these types of cause-and-effect results are more satisfactory and easier to communicate than the subsequent investigation, seen from a practice point of view.

Debunking less explicit and more complex, interrelated viewpoints, decision bases and experiences that are furthermore entangled with personal memories and associations does not result in clear-cut design recommendations, but discloses the multi-faceted character of material-related architectural experience.

¹²⁶¹ All interviewees were male and were aged between 38 and 62 at the time of the interview.

In a first take on the more complex data of the subsequent research phase, categories were again found instrumental in structuring and understanding the wide-spread opinions and experiences uttered in the interviews.

The categories emerged from the interview material itself and originated in the topics addressed by architects and inhabitants. Realizing concrete, perceived and semantic aspects of wooden materiality as constituents of the statements also informed the choice of added literature. Theory was also found to reflect these categories, and the interview data was supplemented with literature on theoretical concepts. These combined perspectives provided a broadened understanding of various theoretical concepts.

However, presenting the research material according to these categories turned out to be less true to the multi-faceted complexity of lived realities and failed to depict the interrelatedness and situatedness of value notions, requiring a less categorical understanding. Rather than as categories, concrete, perceived and semantic aspects are better understood as simultaneously present, interrelated and interdependent facets of wooden materiality (overlapping instead of separate).

While these three facets are still seen as productive in conveying the understanding of materiality and related notions of value, the narrative format of thematically organized 'tales' was deemed more suitable to structure the dissertation's content.

Generalizability

This qualitative study is not meant to generalize preferences for all inhabitants or architects based on what was said in the interviews, but rather to explore in depth what the aspects of materiality mean to them concretely and in a broad context.

Similar to the design operations presented in the pilot study in the first part of the thesis, which were derived from timber buildings, this discussion of qualities is derived from an investigation of qualitative aspects of timber. However, it has generic value. Many of the selected concepts, design impulses, user insights, etc. are not only valid for timber, but for other materials as well.

The general structuring along the three thematic categories and tales is also applicable for a consideration of qualitative aspects in contexts other than timber architecture.

Research impact and relevance

Communication of tacit qualities

An important aim of this research has been to make theory accessible for practitioners by selecting literature that relates to the topics addressed by the architects and inhabitants interviewed, as well as to timber. Part of this search has been the identification of terms,

keywords or labels by which related literature, academic fora and events, etc. can be detected.

Furthermore, this thesis suggests a vocabulary that renders material-related tacit qualities more tangible and addressable. A differentiation of generic timber qualities makes it easier to both apprehend and include them in design considerations.

This will give inhabitants the opportunity to see how their claims relate to architectural theory, and how they can be defended with more confidence. The thesis helps make ‘architect language’ and thinking more accessible and, at the same time, encourages architects to seek more contact and exchange with inhabitants. Architects and inhabitants may find common ground in a new language that is free of power connotations. Inhabitants might become more aware of what they want to prioritize and gain increased understanding of the capacities and potentials of timber architecture. The knowledge obtained might in turn change inhabitants’ priorities and preferences, and hopefully also the appreciation of architects’ design efforts beyond ‘what was ordered’.

Implications for architectural research

This study adds a ‘wooden lens’ to architectural theory, which has mostly been concerned with and based on materials other than wood. Framed as basic research, it extends beyond disciplines and schools of thought and combines thematic fields, providing a starting point for follow-up studies that focus on design, collaboration or theoretic exploration.

Research across disciplines, topics and methods is necessary and pertinent for practice. It provides an overview of relevant research fields and of theoretical approaches, helping to identify aims and possible solutions. This kind of overarching research has the potential to bridge a gap between research, practice and education.

A great deal of research focusing on the qualitative aspects of timber or on preferences uses short surveys or other quantitative methods. However, a qualitative approach linking in-depth interviews to theory and built reality can broaden the understanding of value-making, quality appreciation, practical concerns, and how these are embedded in the everyday realities of inhabitants, the design routines of architects and theoretical discourse. The thematic categories of concrete, perceived and semantic materiality provide a map for delineating existing fields of research, and areas where knowledge and tools should be developed.

Moreover, this research motivates the development of new transdisciplinary collaboration between professionals and residents, acknowledging their complementary expertise on different levels and integrating them into the design of loveable and sustainable residential timber buildings.

This may also make academic research about the selected topics more relevant and more accessible for both practitioners and laypeople.

Implications for architectural practice

The thesis is of interest to architects, as it supports and facilitates a more differentiated communication of qualitative aspects related to materiality and lends new impulses to the design of wooden architecture. The qualitative themes introduced may complement the quantitative considerations that often influence architectural and constructive decisions to a great degree. The thesis offers an overview of theory from which practitioners might draw inspiration as well as vocabulary for description and discussion.

It sensitizes the architect to design that communicates possible changes or adaptations whilst nurturing atmospheric qualities, and it substantiates design choices without prescribing them. The research also gives reasons for involving inhabitants in different project phases with the potential to make design decisions more accessible.

This research reveals the wealth, breadth and variety of associations, concerns, hopes and aversions relating to wooden construction materials expressed by different stakeholders. The results speak against uniform solutions, encouraging approaches that allow for more individual and location-specific solutions, and asking for innovative stances on the question of adaptability.

The architects who participated in the interviews were probably most interested in how inhabitants responded to their projects. In addition, they could compare the inhabitants' reactions to other architects' projects whilst at the same time drawing inspiration from their 'timber colleagues' general attitudes, design approaches and built examples. The thesis might also help them demarcate their own positions and specify their contribution to the field of timber architecture more distinctly.

A number of reflections throughout the thesis may provide inspiration for further design development. They have intentionally not been formulated as ready-made suggestions, that is, design recommendations or guidelines, but have rather been conceived as starting points for individual and diverse reflection and design innovation. Several design impulses have been sketched throughout the chapters.

Implications for architectural education

The thesis is also a contribution and complement to the constructive content in the teaching of timber architecture. Theory relating to timber has not been present in standard architecture theory to the same degree as other materials. This research enables teachers and lecturers to communicate material-related qualities more explicitly, differentiating their generic and specific (idiosyncratic) qualities. Architectural debate concerning materiality is extended by including users or other stakeholders. The development and testing of design principles could be a task for students, leading to various and diverse illustrations of the wooden potentials proposed in this dissertation.

Implications for inhabitants

This research suggests that the user is an undervalued resource in the design process. Communication through the building and its materials, but also through explicit explanations of design intentions and decisions to the users, who are often both interested and capable, can increase the building's adaptability and thus lifespan, and thereby enhance the users' experiences and appreciation of their dwellings. The architect could explain design choices, change options, sustainability concept, maintenance or care recommendations better and in a way that is also accessible for subsequent tenants or owners. In return, the architect could receive feedback on, for example, material preferences, the background for choices, doubts and fears, daily practicalities or changing needs over time.

Implications for other stakeholders

The research might help developers understand two of the stakeholders to whom they must relate better: architects and inhabitants. Competition hosts and juries are supported in formulating clearer requirements for the implementation of timber and goals for a user-oriented planning process. Qualities related to materiality can be requested or required but also discussed in a more explicit and differentiated way.

Future research

As a result of this study, further research into the following fields is suggested to strengthen the intended benefit for architectural practice as well as for the inhabitant.

Future research should expand the discussion of theoretical concepts that turned out to be key in the material context presented here. Theoretical studies should ideally be combined with an exploration of their design implications, both on the conceptual and technical level.

Several ways of including design activities in research have been considered for this thesis and only been applied in part; they could be explored further, for example, designing for a competition entry with a practice-oriented peer review, where timber-based suggestions would be discussed and compared to other (also non-timber) entries by a jury. Another option would be involving master's studio teaching.

A number of topics considered relevant for further investigation are briefly described in the following.

Telling timber

As argued throughout the dissertation, material and detail choices should be made with regard to both their functional affordances and their atmospheric qualities.

‘Telling timber’ design approaches could consider a differentiation of exposed permanent load-bearing wooden constructions and more temporary inner divisions that also contain ducts, pipes and electrical installations and that might be covered with replaceable, coverable or modifiable materials. The installations could then be changed or upgraded without disturbing wooden surfaces; the more temporary surfaces could be painted and repainted in colours to the residents’ taste. This might add to the readability and thus adaptability of the construction; this would also correspond with findings from the literature study that indicate a general aesthetic preference for mixed surface materials and qualities, as well as with the preference for few exposed wooden surfaces expressed by many users.

Exposed massive walls could be either chosen as a massive-timber load-bearing core (with an independent curtain façade) or as a massive timber load-bearing façade (with freely placed lightweight inner walls). Deciding where to have the load-bearing walls (in the façade layer or as an inner structure) might depend not only on the building’s flexibility and adaptability, but also on where and how one wants the visible wooden surfaces to affect atmospheric qualities.

One consideration is the interplay of light sources and surface qualities, for example, aiming for natural daylight directly on the wooden surfaces on wooden inner walls, or for a window view framed by a wooden surface (with wooden outer walls instead). If wooden surfaces should be visible from the street, they have to be wooden ceilings or inner walls, and they will mostly be seen at night, lit by artificial light sources.

Qualitative resilience

Technical and stylistic design consequences of the modified model of shearing layers need to be explored further, and include the questions around circular approaches raised in the concluding discussion.

The adequacy of either linear, massive or hybrid wood construction in supporting different areas of adaptability, in exploiting all potential benefits of exposed timber materials and in avoiding problematic consequences for their reuse or disposal needs to be studied.

Timber taxonomy

Identifying and naming constructive parts according to their experiential and functional differentiation might clarify both their constructive role and conceptual interpretation. This might be a base for establishing a ‘timber taxonomy’.

Intersubjective co-creation

Another field of research interest concerns how, when and in which ways to involve users in the design process; and finding constructive, organizational and communicative

principles that allow for user input while maintaining overarching structures or systems that rationalize the variety. Models that are rewarding for both parts, even if the potential resident will not move in, are of interest due to oftentimes long planning processes and in order to provide insights independent of developer constellations.

Various ways to coordinate the communication of architectural qualities and the construction's affordances, with or without the architect, need to be developed. They must be accessible over time, for example, when occupants change. Some options are: through the architecture itself (e.g. joining principles and surface choices for tectonic clarification), through direct communication between the architect and inhabitant, through communication via an intermediary (e.g. a developer or caretaker) or through auxiliary devices (e.g. a website, an app or a brochure). All of these ideas require further refinement.

Closing comment

As substantiated by this research, it is essential to complement the quantifiable benefits of wooden construction materials (e.g. for the environment or the logistics of urban construction processes) with a broad range of less explicit qualities that contribute to buildings' loveability. Buildings that are appreciated and thus used longer not only extend the storage time of CO₂ in their wooden materials whilst also reducing resource consumption, energy use and waste production; importantly, they also contribute to a built environment that allows for the identification with a place of home and fosters social relations. The social and cultural benefits of architecture's loveability are important for the lived experiences of individual residents and society at large.

Longer lifetimes are facilitated both by constructions that evidently allow to be adapted, modified, upgraded, customized, changed and eventually re-used, and by atmospheric and multi-sensory experiences that involve the inhabitant as a whole, welcoming sensation and reflection, inviting touch and inspiring new ideas. Housing projects, although forming a large share of all building activity, are often disregarded by architects because of the many constraints for creative freedom. They should however be recognized for their vast potential to enrich people's everyday lives, their immediate environments and sense of belonging, as well as framing their most intimate social interactions.

It is the author's hope that this dissertation will contribute to an expanded understanding of timber materiality with regard to its concrete, perceived and semantic qualities, and thereby bridge idea and palpability, sensation and reflection, situatedness and innovation. It is also hoped that the discussion of user involvement as presented in this thesis can be extended, as it not only promises to yield valuable results for practice and theory, but also for the residents' appreciation of their own environments and raised awareness of architectural qualities in general. Finally, the multi-faceted qualities identified in this research are hoped to advance a more comprehensive view on timber's contribution to a more sustainable building practice.

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Appendix

Inhabitant interviewee statistics

Most of the 27 interviewed inhabitants were aged between 40 and 49 at the time of the interviews in fall 2017 (30%), followed by people between 50 and 59 (22%). The youngest interviewees were between 30 and 39 years old (18%), and the oldest between 80 and 89 (4%).

Slightly more women (56%) than men (44%) were appointed to an interview. Most of them live as a family with their children still at home (41%) or with a partner (37%). The interviewed singles form the smallest group, one of them with shared custody for two children.




























The major part of the involved inhabitants are academics (44%). About half of these registered as manager (22%). It may be suspected that many of these work as self-employed persons. Almost a sixth of all participants were retired (15%).

In Austria, all the interviewees rent their dwellings, about half of them having the option to buy it after a determined time. All interviewees from Norway own their homes (as most common there). Among the German interviewees, the majority owns (while on average, most Germans rent). Two of the German tenants pay rent to their daughter who financed a large apartment that has been subdivided. More detailed information can be found in the table below.

Inhabitant interviewee statistics

TOPIC	BUILDING LOCATION			OF TOTAL	
AGE GROUP	AUSTRIA	NORWAY	GERMANY	SUM	PERCENTAGE
20-29	0	0	0	0	0%
30-39	3	1	1	5	18%
40-49	2	0	6	8	30%
50-59	3	2	1	6	22%
60-69	0	2	1	3	11%
70-79	3	0	1	4	15%
80-89	0	0	1	1	4%
<i>Sum</i>	<i>11</i>	<i>5</i>	<i>11</i>	<i>27</i>	<i>100%</i>
SEX	AUSTRIA	NORWAY	GERMANY	SUM	PERCENTAGE
Female	8 (73%)	2 (40%)	5 (45%)	15	56%
Male	3 (27%)	3 (60%)	6 (65%)	12	44%
<i>Sum</i>	<i>11</i>	<i>5</i>	<i>11</i>	<i>27</i>	<i>100%</i>
FAMILY STATUS	AUSTRIA	NORWAY	GERMANY	SUM	PERCENTAGE
Single	3	0	2	5	18%
Couple	4	4	2	10	37%
Shared parenthood	1	0	0	1	4%
Family	3	1	7	11	41%
<i>Sum</i>	<i>11</i>	<i>5</i>	<i>11</i>	<i>27</i>	<i>100%</i>
HOUSEHOLD MEMBERS	AUSTRIA	NORWAY	GERMANY	SUM	PERCENTAGE
1	3 (-4) *	0	1	4 (-5)	15%
2	4	4	3	11	41%
3	(1-) 2 *	0	3	(4-) 5	18%
4	2	1	4	7	26%
<i>Sum</i>	<i>11</i>	<i>5</i>	<i>11</i>	<i>27</i>	<i>100%</i>
<i>*changing every other week due to shared parenthood</i>					
OCCUPATION	AUSTRIA	NORWAY	GERMANY	SUM	PERCENTAGE
Manager	0	0	6	6	22%
Academic	7	2	3	12	44%
Technician	0	1	0	1	4%
Office	0	0	0	0	0%
Service/Seller	3	0	0	3	11%
Agriculture	0	0	0	0	0%
Trade	0	1	0	1	4%
Retired	1	1	2	4	15%
<i>Sum</i>	<i>11</i>	<i>5</i>	<i>11</i>	<i>27</i>	<i>100%</i>
OWNERSHIP	AUSTRIA	NORWAY	GERMANY	SUM	PERCENTAGE
Tenant	6	0	3	9	33%
Rent-to-own	5	0	0	5	19%
Private owner	0	5	8	13	48%
<i>Sum</i>	<i>11</i>	<i>5</i>	<i>11</i>	<i>27</i>	<i>100%</i>

Overview inhabitant interviewees (example: Austria)

INTERVIEWS AUSTRIA		access, storey, app. size, outdoor area	plan layout, orientation	exposed timber (interior)
1	 [30-39]	 access balcony top floor of 3 3 rooms, 75m ² balcony	 west (east: access balcony)	column parquet suspended ceiling
1	 [50-59]	 direct access / a. balcony ground floor of 3 2 rooms, 55m ² terrace	 (east: access balcony)	column parquet suspended ceiling
2	 [30-39]	 access balcony top floor of 4 3 rooms, 75m ² loggia	 west + north (east: access balcony)	ceiling (incl. baths) parquet
2	 [40-49] kids have 2 homes	 access balcony 1st floor of 4 3 rooms, 75m ² loggia	 west + north (east: access balcony)	ceiling (incl. baths) parquet
3	 [40-49] [50-59] kids moved out	 interior staircase top floor + roof top of 5 5 rooms, 105m ² roof loggia + roof terrace	 south-east + north-east	parquet loggia wall common staircase
4	 [70-79] [70-79] grown up kids never lived there	 access balcony top floor of 3 (4) 2 rooms, 50m ² loggia	 north-west (south-east: access balcony)	loggia
5	 [50-59] kid moved out	 direct access 2 floors 3 rooms, 83m ² garden	 south + north	ceiling (floor: laminat)
6	 [30-39]	 direct access / a. balcony ground floor of 3 (7) 3 rooms, 92m ² loggia + terrace	 south-west (north-east: access at street level)	terrace (some floor: laminat)
7	 [70-79] grown up kids never lived there, husband died	 access balcony ground floor of 4 2 rooms, 65m ² terrace	 west (east: access balcony)	ceiling (floor: laminat)

Information ahead of the interviews and form of consent (inhabitants)

Request for participation in an interview connected to a doctoral thesis on Urban Timber Housing

Background and purpose

As part of my doctoral thesis on urban timber housing at The Oslo School of Architecture and Design (AHO), I am interested in knowing more about the inhabitants' perspective. Architectural design decisions are often made „from above“. But how is the design perceived and accepted by the users? What are your preferences, everyday experiences and wishes for modification concerning your apartment generally, and relating to timber as a construction material?

What does the participation in an interview imply?

I would like to visit you in your apartment and to talk about your experiences as an inhabitant. I will take notes and use audio recordings that will be transcribed later. If you agree to it, I would also like to take pictures of your apartment (walls, ceilings, floors). It is possible to just agree to an interview or to pictures if you don't wish both. If not agreed upon specifically, I won't take any pictures of people. If you don't want to answer to some of the questions, we will omit them.

What will happen to the information about you?

All personal data will be treated confidentially. Personal data will be registered in categories (e.g. age range, occupational group, family status). Your real name will not appear in the published thesis. I won't publish the entire interview, but describe its content. I might use some quotes (translated to English if necessary, and without your real name). Audio recordings and digitally stored data will be made anonymous or deleted after completion of the thesis. The thesis is scheduled for completion by 2019.

Participation

It is voluntary to participate in the interview, and you can at any time choose to withdraw your consent without stating any reason. If you decide to withdraw, all your personal data will be made anonymous. If you would like to participate or if you have any questions concerning the project, please contact me until September 22. We will agree on date and time for the interview together.

Preferred time for the interview (multiple selections possible):

- Sunday November 26: morning / noon / afternoon / evening / at _____ o'clock.
- Monday November 27: morning / noon / afternoon / evening / at _____ o'clock.
- (possibly also Tuesday 28.11. morning / noon / afternoon / at _____ o'clock.)

Thank you very much in advance for your participation in my research project!

Yours sincerely,

Ute Groba

Ute.christina.groba@aho.no

Tel. [REDACTED]

Consent for participation in the interview (to be signed before the interview)

- I have received information about the projects and am willing to participate.
- I consent to photographs taken in my apartment.
- I consent to photographs that don't show (e.g. personal objects): _____

Date, signed by participant

phone number

This housing project has been chosen because of its construction and size. This interview request is sent to each inhabitant separately. 3 -5 participants will be selected from all volunteers. The study has been notified to the Data Protection Official for Research, NSD - Norwegian Centre for Research Data.

Information ahead of the interviews and form of consent (architects)

Request for participation in an interview connected to a doctoral thesis on Urban Timber Housing

Background and purpose

The main argument for building with timber seems to be motivated by CO₂ savings and advantages in the fabrication and mounting process. A broader understanding of sustainability beyond measurable facts includes qualitative aspects as well. As part of my doctoral thesis on urban timber housing at The Oslo School of Architecture and Design (AHO), I am interested in knowing more about what these “hard and soft” aspects of sustainability are for different leading architectural firms that work with timber, how these aspects are conceptualized by the architects, and how they are manifested in detailed design decisions for housing projects with 3-5 floors.

What does the participation in an interview imply?

I would like to meet you to talk about your approach to sustainable timber housing, and detailed design decisions and experiences with your housing projects. It would be great to have our conversation at one of the buildings. If this is not possible, I will be happy to visit you at your office. The interview will take about one hour. I will take notes and use audio recordings that will be transcribed later. If you agree to it, I would also like to take pictures of your office.

What will happen to the information about you?

All personal data will be treated confidentially. The interview will be translated to English and used entirely or in excerpts together with your name. With your permission, audio recordings and digitally stored data will be kept until end of 2020 for potential further research or teaching purposes. In this case, data and recordings will be archived at NSD (Norwegian Centre for Research Data). If you do not agree to this, data and recordings will be made anonymous or deleted after completion of the thesis. The thesis is scheduled for completion by February 28 in 2019.

Participation

It is voluntary to participate in the interview, and you can at any time choose to withdraw your consent without stating any reason. If you decide to withdraw, all your personal data will be made anonymous. Please do not hesitate to contact me if you have questions. We will agree on date and time for the interview together.

The study has been notified to the Data Protection Official for Research, NSD - Norwegian Centre for Research Data.

Thank you very much in advance for your participation in my research project!

Yours sincerely,

Ute Groba

Ute.christina.groba@aho.no

Tel. [REDACTED]

Consent for participation in the interview (to be signed before the interview)

- I have received information about the project and am willing to participate.
- I consent to quotes being published together with my name in the thesis.
- I consent to photographs taken in my office.
- I consent to photographs that don't show (e.g. computer screens): _____
- I consent to storage of audio recordings and digitally stored data related to the interview until end of 2020 at the Norwegian Centre for Research Data.

Date, signed by participant

phone number

Ute Christina Groba

TIMBER TALES

A Qualitative Study of Timber Materiality in Housing Projects

Qualitative aspects are underrepresented in the common argumentation for an increased use of wooden construction materials and in prevailing life cycle analyses. In addition, professional views are dominant, while the users' expectations and experiences receive little attention. This thesis aims to foster a more holistic approach to sustainability; it addresses how architects and residents employ, experience and value wooden building materials in housing projects, arguing that buildings that are loved last longer and thus contribute to both ecological and social sustainability.

In three 'timber tales', this research prompts a reimagination of the qualities and values that contribute to more loveable built environments. An overview of architectural theory related to materiality traces generalized approaches to designing with timber. The contextualized realities of recent multi-apartment housing projects in Norway and Central Europe are investigated through semi-structured qualitative interviews with seven internationally recognized timber architects and 27 residents, contrasting the experts' intentions with the users' perceptions. The results include findings that reveal an untapped potential and the mutual benefits of improved communication between architects and users as well as participatory design processes.

Ute Christina Groba (née Schmidt) is an architect, researcher and educator with a special interest in the theoretical and practical facets of wooden building materials and in user-centred design approaches. She studied architecture at RWTH Aachen in Germany and at ETSAM in Spain and holds an architectural degree (Dipl.-Ing.) from RWTH Aachen (2005). Groba has worked as an architect in Germany and in Norway and has taught at universities in both countries. She is currently affiliated with AHO's Master of Architecture programme where she teaches studio courses with a focus on timber construction.

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