creating social value through adaptive reuse

A study into social sustainability in adaptive reuse

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ABSTRACT – While urban development is essential to keep our cities alive, existing buildings and structures are essential for communities to thrive. Moreover, this development needs to minimise construction waste and pollution, which means that it is illogical to demolish existing buildings that contain valuable resources. However, transformation is often more expensive than new construction. Additionally, in academic literature a hiatus exists regarding the social side of sustainable development. Therefore, this research sheds light on the effectivity and costs of social sustainable measures in architecture to facilitate their implementation by answering the following research question: *"How is social sustainability included in the practice of adaptive reuse architecture and how does it impact the costs?"*

The results show several social sustainability benefits regarding adaptive reuse. However, the results confirm a hesitance amongst practitioners regarding its execution as well, thanks to unpredictable costs and a lack of expertise. Therefore, evidence suggests reducing uncertainty, by means of minimising change in favour of social sustainability. In turn, social sustainability and adaptive reuse issue several economic benefits that promote their further integration in development of the built environment, but are in need of further research.

Method – By means of a literature review a qualitative framework is produced on the topic of social sustainability in adaptive reuse projects. This is subsequently expanded with both qualitative data from case studies and semi-structured interviews with experts to relate the findings to practice.

Practical or social implications – This thesis provides an expansion of the adaptive reuse discourse by doing social research. It increases the knowledge on tangible phenomena regarding social sustainability in building transformation and make their benefits more explicit.

KEYWORDS – adaptive reuse, social sustainability, economic benefits, heritage, architecture, construction, transformation, cultural value, social value, costs, accessibility.

"Old ideas can sometimes use new buildings. New ideas must use old buildings"

\- Jane Jacobs (1961, pp. 188)

Cover page: Kareldoorman tower at Binnenwegplein, Rotterdam (Ossip van Duijvenbode n.d.)

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Summary

In the built environment of the Netherlands two mayor challenges exist. The first is the current housing shortage and the governmental ambition to build a million houses by 2030. The second challenge pertains to the need to achieve this goal sustainably, in accordance with EU aims of climate neutrality by 2050. The development of these houses is to happen in existing urban areas as much as possible. This means that many existing buildings are under threat of demolition.

However, existing buildings exhibit significant values. Especially since the paradigm of heritage has shifted. It attained wider criteria in extension of architectural or historical importance. Younger, more ordinary buildings are increasingly valued when they represent a significant place in a city or when they have potential for redevelopment. Even dilapidated or generally considered ugly buildings can be successfully transformed.

This means demolition is existing buildings is questionable to say the least. It generates large quantities of demolition waste that in most cases can't be reused in its original purpose and needs to be transported as well. The whole process takes more time as well. The ensuing nuisance could have a disruptive effect on communities which might, most importantly, already have been disrupted by forced displacement, gentrification and the loss of a familiar piece of architecture. However, it has become clear as well that existing buildings should not be preserved exactly as they are. In parallel with the constantly changing urban environment, buildings should adapt to accommodate current needs and demands to ensure functional continuity during its lifetime.

Still, in spite of literature acknowledging the value of adaptive reuse, it remains a difficult area in practice. Developers and construction companies still rather opt for demolition and new construction instead (Bullen & Love, 2011). The difficulty of transformation lies in its hidden risks because, much less than erecting a new building, is transforming an existing one predictable, leading to reluctance in investors.

Hence, to tackle the Dutch housing shortage and the global environmental crisis, a sustainable approach is sought that unites the need for urban densification with the preservation of the valuable building stock and its embedded resources. However, in contemporary academics a hiatus exists regarding the social side of sustainable development and its tangible aspects in particular. We must find which choices in the development and design process affect social sustainability and consequently investigate how it can be implemented. Therefore the main research question of this thesis is: *"How is social sustainability included in the practice of adaptive reuse architecture and how does it impact the costs?"*

Methodology

The data that this thesis generates consist mostly of qualitative data about social sustainability in addition to a quantitative tranche on costs. With qualitative research it is more important to garner credible data instead of valid data as validation might be very hard (Shenton, 2004). To make the results more credible it is necessary to collect data through various methods. Therefore, this research consists of 3 parts in triangulation to ensure qualitative validity, of which the structure is illustrated in figure 2.

1. Firstly, data is extracted from literature.
2. Afterwards, four case studies are performed which are informed by interviews and document analysis.
3. As the third step expert interviews are executed to discuss and reflect on the findings of the previous two components.

Literature

adaptive reuse

In conclusion, adaptive reuse is a means of subverting vacancy or obsolescence of buildings without demolition. By finding a suitable new function with creativity, the absolute life cycle of buildings is fully exploited and the continuity of significant embedded value like history, identity and energy safeguarded. Even when performance is not at the same level as new construction it can be compensated with higher social value. Moreover, relative to demolition and new construction, adaptive reuse is less disruptive to communities, less pollutive and increases the profitability of a building while contributing to a more diverse and meaningful urban form. As such it can play a crucial role in sustainable urban development with its potential of balancing the benefits in each category as illustrated by figure 6.

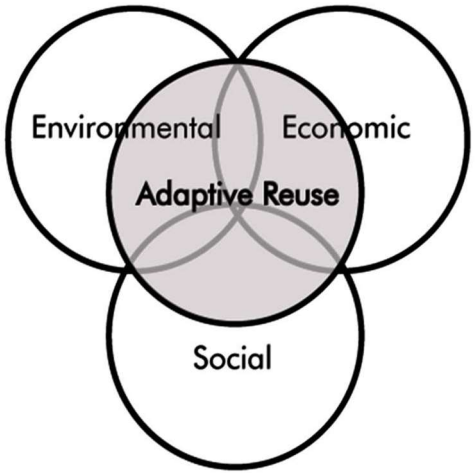


Figure 6. Sustainability benefits of adaptive reuse. (Adapted from Dyson et al., 2016).

However, many challenges remain. The highly specific act of adaptive reuse is characterised by unpredictable realisation costs as it requires extra attention, cooperation and skill of practitioners while the process is fraught with many uncertainties. Potential high costs push stakeholder preference towards demolition, in addition to threatening social sustainability. It is therefore of importance that both the costs and the potential benefits are more explicit in order for these stakeholders to pursue adaptive reuse instead.

social sustainability and how it is affected by adaptive reuse

Social sustainability entails the protection of sociocultural values, increasing residential satisfaction and strengthening communities to eventually establish a more durable connection with the direct urban environment. It is furthermore important because it relates to health, safety and comfort. Lastly, sustainable development as necessary as it is, has no guarantee of public support. Therefore, social sustainability is paramount in aligning all sustainability goals and realise them successfully.

In urban design, social sustainability can be summarised as the orchestration of fleeting unintentional encounters of recognition with spaces of quality, leaving room for serendipity and choice. In architectural design these concepts can be translated into the composition of collective spaces like circulation with a gradual transition from private to public. A condition for orchestrating interaction in these spaces is sufficient margins in surface area to converse without blocking the way. Additional aspects that relate to social sustainable housing are: local characteristics, architectural significance, identity, liveliness, diversity and flexibility.

Concerning adaptive reuse, several inherent aspects have a certain premium quality over new construction, leading to more distinct and meaningful forms that enhance residential satisfaction. It benefits social sustainability by being a healthier and less disruptive alternative as well. On the other hand, high costs and financial priorities can still generate community disruption, which means adaptive reuse has significant social sustainable approach potential with regard to subverting building obsolescence, provided that costs and financial gains are explicit.

Empirical study

social sustainability in practice of adaptive reuse

The case studies present the use of comparable measures to the benefit of social sustainability in their projects. Many spoke of interaction through circulation typologies and collectivity concepts like community gardens and courtyards after discussing social sustainability. Equitability is further named as an important driver behind circulation design. Other social sustainability principles are greenery, avoiding dead ends, open plinths, street-side front doors, authentic elements, flexibility, local identity, adaptability or individualisability, front doors or likewise gradual transitions from public to private.

Corridors are disadvantageous in residential architecture. Galleries and street access typologies however have the capacity to increase liveability and interaction in residential buildings, while streetside front doors are useful in transitioning to a more residential atmosphere. Especially when given additional quality like in 'De Raedt' and SUM, galleries can shed its negative connotation and increase interaction, in addition to providing equitable accessibility and financial benefits. To finish, elevators make dwellings more equitable and future proof, but only exist in combination with the others, barring 'street'.

Furthermore, social sustainable design is most effective when stimulating optional activities, by encouraging a common mission, but always stemming from proper target group research. Lastly, actual assessment methods of social sustainable design concepts are lacking. Their implementation largely follows trends in line with the overall preconceived building concept and is mostly based on gut feeling, which strains potential realisation. However, economic efficiency, higher house prices, less health care and maintenance costs as benefits of cohesion can be used order to quantify social sustainability.

costs of adaptive reuse and social sustainability

Transformations include to many unknown variables to make a valid generalisation. Therefore, case studies shouldn't be used to study cost calculation for elements of future projects but rather function to shed light on cost mechanisms in a broader sense and indicate a relationship with the construction process as a whole. In that sense, the cases studies indicate that a costly facade remodelling can induce a need for rigorous space optimisation to increase profits but reduce collective space that might host interaction. Additionally, the interviews imply that choices are too often informed by mere habit, which means, in the end, a better means of making decisions is required to spend budgets more wisely.

Furthermore, the interviewees unveil numerable examples of economic benefits. Unfortunately, a discrepancy exists between the in- and output of these benefits, which leads to limited investment that make it happen. Therefore, a more holistic approach is needed that takes all benefits in consideration in order to enable fair distribution of eventual benefits such as subsidies or tax allowance.

Conclusion

This research identified a gap in the knowledge regarding the social tranche of sustainable development and limited research to its relationship of with heritage conservation. Subsequently, it made apparent how social sustainability cannot be neglected in the pursuit of sustainable development. In this, adaptive reuse is can play a significant goal as it has benefits throughout all layers of sustainability. Many existing buildings possess intrinsic values worth saving. Transforming them with adaptive reuse results in a more meaningful form, a palimpsest of historical layers. Regardless, embedded energy remains a substantial reason to refrain from

demolition, while adaptive reuse additionally causes less disruption to communities and need less time to reintegrate in the urban tissue. These positive aspects of adaptive reuse fundamentally relate to social sustainability. Disrupted communities who lack a meaningful and satisfactory built environment, especially housing, and who are detached from control, may prove not as eager to support sustainable development, rather develop counterproductive resentment.

However, adaptive reuse projects include to many unknown variables to make a proper costs estimation, which leads to unwillingness of practitioners even though several examples of economic benefit exist. Yet, with better informed decisions, minimal change and public participation the chance of unnecessary spending decreases, for the good of social sustainability. Subsequently, social sustainability offers numerous economic benefits as well. Unfortunately, a discrepancy exists between the in- and output of these benefits, which leads to limited investment that make it happen. Therefore, a more holistic approach is needed that takes all benefits in consideration in order to enable fair distribution of eventual benefits.

1. Introduction

In the built environment of the Netherlands mayor challenges exist. One is the current housing shortage and the governmental ambition to build a million houses by 2030. Another challenge pertains to the need to achieve this goal sustainably, in accordance with EU aims of climate neutrality by 2050 and the sustainable development goals of the United Nations (UN, 2015). The current market economy affords little promise in catering to social equity and environmental preservation either ((Schoenmaker, 2020).

Given the fact that the Netherlands is already a densely urbanised country, sustainable development is a serious issue in itself as new construction, inevitably, must happen in either scarce green areas or in spite of extant architecture. The Dutch government expressed a focus on urban development in and around current cities to spare its scarce nature (Planbureau voor de leefomgeving, 2021). The consequent increase of urban density has several benefits too, such as reduced commuting time and more support for amenities like public transit.

However, significant trade-offs remain. Densification possibly leads to higher housing prices, gentrification and the possible destruction of existing buildings and urban green space that are crucial to liveability (Teller, 2021). The Dutch 'Planbureau voor de Leefomgeving' (2021), or the Netherlands Environmental Assessment Agency has identified this threat to heritage. Especially since research has stressed its importance as tangible manifestations of a society's culture and local identity, in order to preserve built heritage, this duality in urban development requires reconciliation (Buonincontri et al., 2017; Remøy in Wilkinson et al., 2014).

Yet, the paradigm in heritage preservation has shifted significantly. Where meticulous conservation used to be the standard, nowadays, researchers and practitioners are striving increasingly towards a more integrated reuse process that combines the heritage values with a focus on functional continuity and sustainable urban development (Bullen & Love, 2011; Li et al, 2021). Even the definition of heritage has widened significantly according to Spoormans and Pereira Roders (2020). The adaptive reuse of heritage buildings is employed as a fundamental tool to achieve this functional continuity. Indeed, many researchers have shown the positive effect the successful redevelopment of derelict heritage sites can have on the surrounding area (Aigwi et al. 2019).

Moreover, the perception of heritage has turned from the tradition of listed buildings wherein the conservation approach is informed by experts towards the current expansion of what heritage could entail (Tweed & Sutherland, 2007; Spoormans & Pereira Roders, 2020). Heritage attained wider criteria in extension of architectural or historical importance. Younger, more ordinary buildings are increasingly valued when they represent a significant place in a city or when they have potential for redevelopment. Out of a total of over 14 million extant buildings in Italy only one hundred thousand buildings have heritage status, but that not only those have value worth saving is fairly self-explanatory (Brunone et al., 2021). Even dilapidated or generally considered ugly buildings can be successfully transformed. The refurbishment of "the White Lady" in Eindhoven is one such example where the implicit values were hard to recognise, but have been made explicit to an extent that it resulted in becoming more of a landmark than it has ever been (Remøy in Wilkinson et al., 2014).

Keeping this in mind, destroying any building is questionable. It generates large quantities of demolition waste that in most cases can't be reused in its original purpose and needs to be transported as well. The whole process takes more time as well. The ensuing nuisance could have a disruptive effect on communities which might, most importantly, already have been disrupted by forced displacement, gentrification and the loss of a familiar piece of architecture. However, it has become clear as well that existing buildings should not be preserved exactly as they are. In parallel with the constantly changing urban environment, buildings should adapt to accommodate current needs and demands to ensure functional continuity during its lifetime.

1.1 Problem statement

As the 160 million buildings in the EU are responsible for 40% of its annual energy consumption, sustainable measures can have a huge impact on the global energy need (Balocco & Marmonti, 2013). Currently, sustainable development is therefore universally perceived as a staple of contemporary urbanism and architecture. (Alaie et al., 2022). The fact that adaptive reuse of heritage is a part of that process is also widely acknowledged as adaptive reuse, inherently, is a sustainable activity that eliminates pollution from demolition and new construction. Therefore, already much research has been done on its success factors and the effect of cultural values has been assessed. Awareness also exists that adaptive reuse and physical alteration of heritage are necessary tools to sustainably safeguard the functional continuity of the buildings to the users (Bullen & Love, 2011; Li et al., 2021; Strolenberg in Meurs et al., 2020).

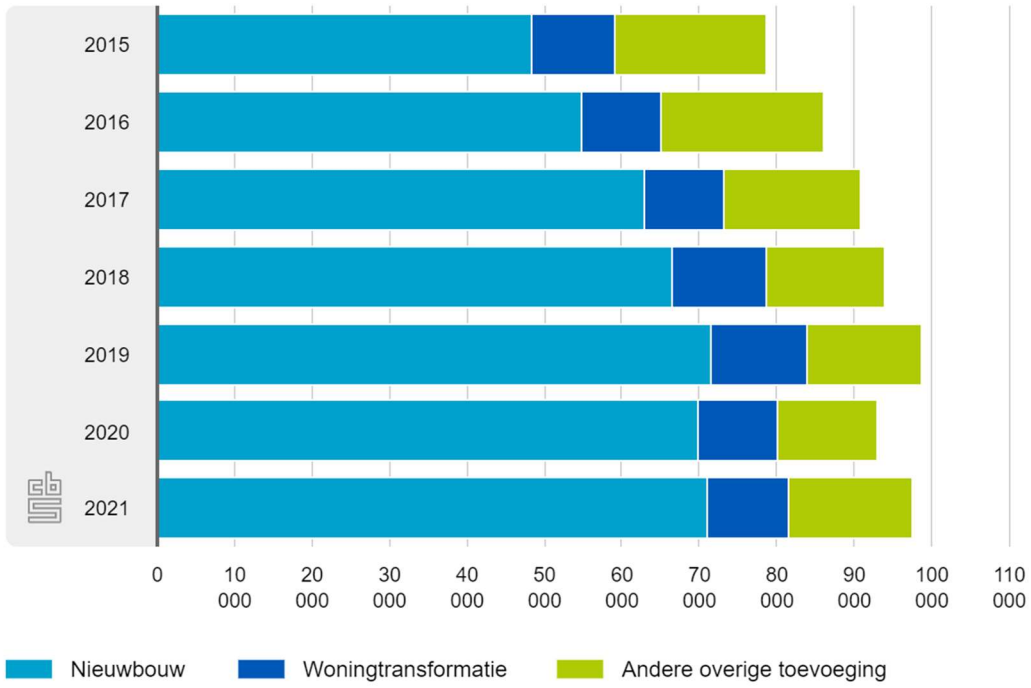


Figure 1. Addition of new dwellings by new construction, transformation and miscellaneous (CBS, 2021).

However, in spite of literature acknowledging the value of adaptive reuse, it remains a difficult area in practice. Sundling and Szentes (2021) notice a Europe-wide preference for demolition and new construction amongst practitioners. Figure 2 shows the growth of new construction projects over a stagnating adaptive reuse industry in the Netherlands. Gillot et al. (2022) correspondingly identified a need for more understanding of "key drivers, barriers and enablers" (pp. 2) as the completion of building extension projects falls behind. Apparently, demolition and new construction promise higher returns to market parties, which means that the social and environmental value of existing buildings require protection against them in order to achieve the sustainable development goals.

The difficulty of transformation lies in its hidden risks because, much less than erecting a new building, is transforming an existing one predictable, leading to reluctance in investors. On that account it appears that more data and insight regarding the costs of building transformation leads to a higher chance of project developers choosing for transformation instead of demolition. Furthermore, regarding building transformation, Burnham (1998) discussed the important but paradoxical goal of authenticity even though sustainability and the alteration of buildings are inevitable to ensure their future use for society (Strolenberg in Meurs et al., 2020).

"An efficient renovation process has to address society's ambition, e.g., to build socially mixed and attractive cities as well as the need for a functioning dialogue between the company

and the current and potential residents of the property that is renovated. This would make economic, environmental and social sustainability a more complex issue in housing renovation than in many other fields of industry, but it would also motivate an expectation that matters of sustainability would be easier to integrate in the generally long-term perspective of housing construction and management." (Liu et al, 2020, pp. 346). Therefore, a holistic approach is very much needed to achieve a functional and sustainable city in which a symbiosis of economy, environment and social equity exists (Tweed & Sutherland, 2007; Yigitcanlar & Teriman, 2015).

As mentioned before, heritage buildings play a huge part in social sustainability (Buonincontri et al. 2017). Social sustainability, however, is a topic that mainly has been researched on an intangible level, while the little research on physical aspects focuses on the urban scale instead of the architectural (Ghahramanpouri et al, 2015). The effect of built heritage on communities is also still obscure or in the words of Behbehani and Prokopy (2017, pp. 68): "While the environmental benefits of reuse and renovation are acknowledged, the link between built heritage and human and social dimensions of sustainability, […], has not been explored." This means that a research gap exists regarding the social sustainability performance of tangible architecture, which strains a potential symbiosis.

To tackle the Dutch housing shortage and the global environmental crisis, a sustainable approach is sought that unites the need for urban densification with the preservation of the valuable building stock and its embedded resources. However, in contemporary academics a hiatus exists with respect to the social side of sustainable development and its tangible aspects in particular, while the stagnation of adaptive reuse projects alludes to practitioner unwillingness to realise them, despite academic consensus of its unifying potential in sustainable densification. We must find which choices in the development and design process affect social sustainability and consequently investigate how practitioners can be encouraged of its implementation. Therefore, the main research question of this thesis is:

"How is social sustainability included in the practice of adaptive reuse architecture and how does it impact the costs?"

2. Methodology

2.1 Research questions

"How is social sustainability included in the practice of adaptive reuse architecture and how does it impact the costs?"

To answer the main research question, several sub-questions need to be answered first:

1. What is adaptive reuse?
    - What are current challenges of adaptive reuse?
    - What is its relevance?
    - How does it differ from new construction?

These questions are answered by a literature study and expert interviews.

2. What is social sustainability and how is it affected by adaptive reuse?
    - Why is social sustainability important?
    - What is its relationship with the built environment?
    - How is social sustainability related to adaptive reuse?

Social sustainability is defined by means of a literature review and expert interviews.

3. How do practitioners incorporate social sustainability in adaptive reuse?
    - Which tangible architectural elements affect social sustainability?
    - How are social concepts assessed?

Literature, case studies with document analysis and expert interviews.

4. How are costs related to social sustainability in adaptive reuse?
    - How can the costs be made explicit?
    - What financial benefits exist?

Literature, case studies with document analysis and expert interviews.

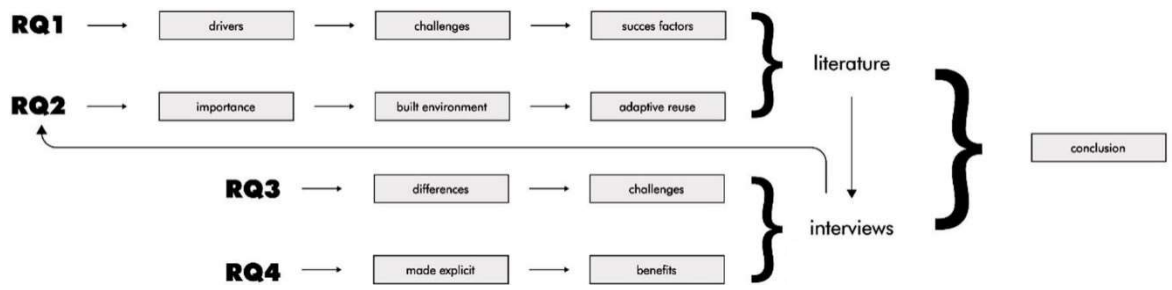


Figure 2. Research structure

2.2 Type of study

The data that this thesis generates consist mostly of qualitative data about social sustainability in addition to a quantitative tranche on costs. With qualitative research it is more important to garner credible data instead of valid data as validation might be very hard (Shenton, 2004). To make the results more credible it is necessary to collect data through various methods. Therefore, this research consists of 3 parts in triangulation to ensure qualitative validity.

1. Firstly, data is extracted from literature.
2. Afterwards, four case studies are performed which are informed by interviews and document analysis.
3. As the third step expert interviews are executed to discuss and reflect on the findings of the previous two components.

This means the research is composed of two types as it combines case studies with grounded theory. With literature and the in-depth analysis of cases, an understanding of the mechanisms around the implementation of social sustainability is attained, after which a theory is constructed.

As social sustainability is at the core of the interview the consequential data is qualitative, which brings several implications for the approach of the interviews. Qualitative knowledge is constructed rather than discovered. Therefore, despite the small sample of the research, still, the information from the interviews and case studies is relevant to further studies. Reality furthermore is interpretive instead of objective. Every experience observed by an academic researcher is a valuable addition to the concerned discourse (Yazan, 2015).

2.3 Case study

Case studies are performed to examine contemporary issues that cannot be sufficiently informed by historical events or experiments (Yin, 1994). Anyway, given the capricious nature of communities and society, the field of social studies is in need of perpetual research to remain state of the art. According to Yazan (2015) case studies are particularly useful to program evaluations and the study of people. Additionally, qualitative research as well as qualitative case studies are attributed with being holistic, empirical, interpretive and emphatic in nature. This makes it the right method of deeply analysing social phenomena in a specific context.

The empirical research examines not only deliberate efforts of practitioners to improve social sustainability in adaptive reuse, but also latent effects of design choices. To this extent interviews are held with relevant stakeholders of the cases like architects and developers in addition to neutral experts. The questions are derived from prior literature research, as it is crucial to define the theoretical framework of the studied subject beforehand (Yazan, 2015). The individual case studies are further informed by document analysis such as the comparison of old and new floor plans. Afterwards, the individual cases are compared in order to find both commonalities and disparities.

2.4 Case study selection criteria

As insight into the how and why of social sustainability in adaptive reuse is needed, this research entails collective instrumental case studies. An instrumental case is used to shed light on a certain phenomenon, while collective case studies are used to compare and generalise findings (Cousin, 2005. pp. 2). For research of this extent, where multiple case studies are performed, it is advised to use three to four cases. When doing more, focus would spread too much resulting in a less detailed study while the bigger sample size barely improves the basis for generalisation (Schoch, 2016. pp. 4).

Selection criteria

- Adaptive reuse projects
- New function is housing

This research assumes housing is the most relevant building typology to study social sustainability.

- Modern architecture

Modern architecture makes up most of the Dutch building stock while only representing a small part of its monuments. This means that modern architecture both offers the most promise as purveys fewer obvious monumental values to justify preservation.

- South Holland

First of all, a main reason to keep the cases within South Holland is proximity. This enables visits to the particular sites and project stakeholders. The Hague and especially Rotterdam furthermore contain numerous examples of modern architecture that have undergone adaptive reuse in a transition to contemporary urbanism.

- Changed circulation

It is of interest to this research how residential access routes are dealt with as social interaction occurs there and is usually at odds with original circulation.

- Access to information

The cases have been selected on account of available information and practitioners. Through an internship at VORM, most interviewees have been contacted and cases analysed.

Cases

- De Raedt
- De Rotterdamse School
- De Binck
- Noordsingel

2.5 Data collection literature

The literature review will be executed systematically searching academic databases through search engines like Google Scholar and Scopus. Subsequently, found literature will be organised in excel with distinction of title, author(s), year, keywords and abstract. In this way the abstract can be read and relevant articles can be identified. These, in turn will be read and analysed. If data is found, it will be copied to the excel and the reference is saved to Mendeley, resulting in explicit and clear documentation. The search terms are:

Adaptive reuse or refurbishment or renovation or transformation or conversion or adaptation

Built heritage or heritage buildings or architectural heritage or historic buildings or existing architecture

Social sustainability or social cohesion or social interaction or sociability

2.6 Data analysis

The literature is analysed through inductive reasoning as the field is not readily defined. From this a framework appears that support the questions of the case study interviews and the

consequential data is analysed with deduction. The transcripts of the interviews are read by the researcher and structured in a matrix according to the research questions, before analysing the results by hand.

As a representative population in a sample is not feasible within a thesis, this research will assume that values found through the interviews will be universal. Therefore, the sample will be a purposive non-probability sample: the sample is not a perfect representation of the population. Purposive non-probability sampling benefits qualitative research as it ensures the researchers with relevant data and opinions without having to generate an unfeasibly large population (Bryman, 2012). In qualitative data analysis begins during the data collection.

2.7 Data collection interviews

The interviews are semi-structured with experts as that leaves space to go deeply into a topic but answer to unforeseen questions as well. No focus groups as the personal opinions of the interviewee are needed. In-depth interview with practitioners to investigate the degree of application of user values in design processes.

2.8 Interviews

As interviewees, various experts and stakeholders will be chosen. Architect with experience regarding building transformation are an important category, but also developers and consultants are included. One of the characteristics of qualitative research is that the researcher does not yet know what will arise during the research (Jacob & Furgerson, 2012). Therefore, it is important to ask open questions and be flexible during the interview. An interviewee might just give an answer to something the researcher did not think of asking. This also means that it could be useful to return to earlier interviewees and post the question then.

2.9 Study goals

This thesis' primary aim is to answer all research questions. Learning to do research in general and developing a mixed-method social study is a personal study goal. At the end a general understanding of academic research and study method design is to be achieved.

2.10 Limitations

Case studies ever are at risk of generating biased results. The researcher should therefore avoid steering the subjects to a preferred direction with closed questions and a too structured interview plan. Furthermore, case studies give insight into phenomena in a specific context. This means that there is a danger of generalising its results without acknowledging this context, which could lead to invalid conclusions. Anyway, qualitative research will always be prone to interpretation.

This research is further limited by its scale. To really grasp the workings of social sustainability a more phenomenological approach might be needed, wherein people are observed and questioned throughout an extended period of time. This study has neither the scope nor the resources to perform such intricate methods. Therefore, the accounts of a small number of experts are regarded as more valuable.

3. Literature Review

3.1 Adaptive reuse

When confronted with obsolete buildings, four options exist: consolidation, renovation, demolition and conversion (or adaptive reuse or transformation)(Remøy in Wilkinson et al., 2014). The first is the most common and ranges from doing absolutely nothing to finding new tenants or a possible buyer. Renovation consists of the refurbishment of the building. This can involve technical or aesthetical measures that upgrade the building to a point where initial processes are viable again. The third approach speaks for itself, the demolition in order to start new construction. Lastly, conversion pertains the act of physically and economically transforming an obsolete building in such a way that it adequately accommodates a different function.

Thus, in contrast to renovation, adaptive reuse is the practice in which the use of existing structures is converted in order to ensure necessary functional continuity for the owners (Bullen & Love, 2011). Adaptive reuse is described as a major modification to both the building and its function (Remøy in Wilkinson et al., 2014). Yet, Bullen and Love (2011), also emphasise that adaptive reuse, when it is applied to heritage buildings, aims to conserve cultural values like its special quality and architectural characteristics. Conclusively, Vafaie et al. (2021, pp 2.) summarise the phenomenon beautifully as to "*create a beneficial connection between the old and new use of built heritage*".

In essence, adaptive reuse is used to overcome structural vacancy or obsolescence (Remøy in Wilkinson et al., 2014). It stems from, but is not limited to, either a social, economic or environmental incentive and serves the preservation of the urban image. Moreover, adaptive reuse of the existing building stock is an intrinsically sustainable activity as it exploits its full life cycle potential (Bullen & Love, 2011; Remøy in Wilkinson et al., 2014).

Both demolition and construction are heavy polluters of which the first is absent and the latter only present in a reduced fashion during the refurbishment or adaptive reuse of existing buildings. More importantly, however, existing buildings hold many memories and represent a variety of sociocultural sustainable features like local identity, social cohesion, recognisability and cultural tradition as well, which shows their value beyond the material. (Buonincontri et al., 2017). Jäger (2010) found that a public memory might be even accentuated when certain parts of a building are preserved, which coincides with what Remøy describes as 'familiar ugliness' (in Wilkinson et al., 2014).

All buildings exist under the threat of becoming obsolete eventually. Unfortunately, this is hard to predict since obsolescence in many cases occurs prematurely (i.e., before the end of its life cycle)(Langston et al., 2007). In one or more of the six following categories as described by Langston et al. (2007), premature obsolescence might ensue:

- physical obsolescence: the degradation beyond the acceptable of physical components like materials other than natural decay;
- economic obsolescence: the ownership or use of a building and its location offer no feasible business opportunities any longer;
- functional obsolescence: changed needs and objectives of occupants leads to underperformance of the original design;
- technical obsolescence: technologically superior buildings render the asset undesirable;
- social obsolescence: stylistic or behavioural changes result in a need for intervention;
- legal obsolescence: the building does not comply to new rules and regulations.

Whenever one or more of these categories of obsolescence has transpired, the owner must choose one of the four strategies described by Remøy in Wilkinson et al. (2014). All have different implications. If physical degradation can be solved by an upgrade or replacement of certain elements, renovation is an option but if it endangers the structural integrity demolition might be wiser. Through creative thinking, adaptive reuse can be used to subvert obsolescence in several categories (Dyson et al., 2016). Legal objections for a certain use could be negated by a more another and an economically obsolete office building could be made profitable with a commercial or residential function. Nevertheless, every choice remains highly dependent on the situation and the specific combination of categories.

When considering demolition, consolidation, renovation and adaptive reuse owners generally have financial motives. However, there are several other reasons to choose one over the other. Derelict and unused sites generate a negative atmosphere that radiates to surrounding areas in contrast to the liveability that use brings (Langston et al., 2007). Demolition has a disruptive effect as well. Firstly, thanks to the act of demolition itself which is eventually followed by construction work but second of all, because of the extra resources are then drawn from the planet. Lastly, renovation is an option in fewer instances than adaptive reuse. Whenever a building is functionally obsolete, only adaptive reuse remains as a way of providing functional continuity for the building.

Moreover, Bullen & Love (2011) define the following key drivers for the adoption of adaptive reuse:

- increased building life;
- lower material, transport and energy consumption;
- reduced resource consumption;
- less material waste;
- rising energy costs;
- less disruption;
- reduce negative impact of poor buildings;
- requirement for multiple use; and
- financial incentives.

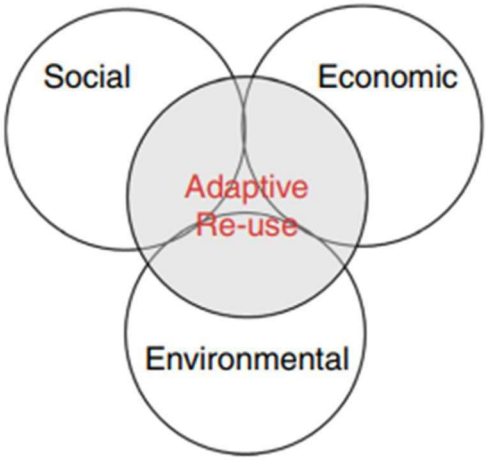


Figure 3. Sustainable development benefits of adaptive reuse (Dyson et al., 2016).

Dyson et al. (2016) describe adaptive reuse as a means to sustainable development. According

to their work, inherent characteristics of adaptive reuse are also criteria that constitute sustainable development such as economic diversification, meeting human needs, self-relying communities and minimising waste. This means that adaptive reuse offers substantial benefits to sustainable development. Figure 3 shows that the benefits are split into three interdependent aspects in a balance which implies that they cannot exclusively be reviewed individually. The three sustainable development benefits always affect each other. Economic gains might adversely impact the social or environmental component as is shown in the adaptive reuse program of downtown Los Angeles where low-income residents were displaced through gentrification (Dyson et al., 2016). Additionally, the three components sometimes overlap. Some social benefits are environmental as well, like improved indoor climate and the transformation of vacant buildings both increases liveability and profitability.

3.1.1 Challenges of adaptive reuse

Unfortunately, the field of adaptive reuse faces numerous issues that prevent realisation of many such projects, resulting in the demolition of buildings and new construction instead. Despite the recovery of building materials, adaptive reuse isn't necessarily cheaper than new construction (Jäger, 2010). Many uncertainties regarding the state of the building, such as structural complications or the usage of old-fashioned, possibly dangerous, materials like asbestos render existing buildings a liability to developers, contractors and, especially, investors (Bullen & Love, 2010; Dyson et al., 2016).

There is a lack of knowledge among stakeholders regarding the adaptive reuse process as well (Remøy in Wilkinson et al., 2014). This dissonance can be attributed to the interdisciplinary nature of adaptive reuse wherein, for example, office market actors lack understanding of the housing market. It also leads to unreasonable asking prices which interferes with conversion ambitions. Bullen and Love (2011) further notice higher rental prices in adaptive reuse projects and a lack of skilled labourers in addition to this knowledge deficiency of stakeholders.

Another challenge is the inherent lack of flexibility that an existing structure bears. This results in restricted options when unexpected problems, inevitable with such uncertainties, need to be mitigated. It also means that a new floor plan has to be imposed on a building made for a different function. Additional development work is required to tailor the adaptive reuse plan to the extant context, while working with contemporary needs and regulations, ultimately resulting to higher development costs (Dyson et al., 2016).

Working with existing buildings is also troublesome on account of energy efficiency which pertains to environmental sustainability. Incorporating proper insulation in construction projects to decrease energy demand is a recent phenomenon. Consequently, most buildings up for adaptive reuse do not meet contemporary standards and need extensive alterations to do so (Bullen & Love, 2011). These alterations are often of high difficulty. The existing structure leaves gaps in insulation layers that cause heat loss, especially if the original façade is to be preserved. Likewise, the gaps in insulation are sources of moisture thanks to temperature differences which could lead to mould growth and subsequent health issues.

Additionally, local governments often recognise value in buildings that national bodies do not. They appreciate its place in local history and identity despite its lack of a broader architectural significance that would make it eligible for listed status and subsequently, funding from the national government for preservation efforts. Local governments, however, do not have the funds to preserve the buildings themselves. Therefore, they are in need of support from third or private parties to maintain these sites 'minor heritage', who in turn require a financial incentive (Lupacchini, 2019).

These 'private-driven' projects influence the economic use of a site. Private parties need to achieve a return of investment, which influences the new function of the project, culminating

in the likely construction of housing, offices, commercial space or tourist attractions, yet show limited social impact (Lupacchini, 2019). In contrast, 'community driven' projects tend to rely, to a much smaller degree, on initial investment. Through methods like crowd funding and volunteering, smaller scale adaptions are realised that entail social or cultural, but often temporary functions. Consequentially though, these initiatives can improve the attractiveness of a place and "unlock market interest" for future development (Lupacchini, 2019). This method, however, is not particularly relevant to housing projects under the current housing shortage as the process is long, but it shows how public participation and involvement have positive qualities when aiming for social impact, but also provides opportunity to circumvent vacancy in buildings deemed too risky by investors.

Lastly, adaptive reuse could be challenging on account of advanced building regulations. Whether due to listed monument status or not, regulations increase the difficulty of adapting buildings by limiting possibilities as well. For instance, existing buildings could yield a serious fire hazard when not enough escape routes exist or they contain historical, but also flammable woodwork with a monumental status. Listed buildings confine the owner to preserving its predisposed cultural value while environmental demands as mentioned above might conflict with existing structures (Bullen & Love, 2010).

Corresponding with the challenges, several success factors regarding adaptive reuse exist. Figure 4 from Dyson et al. (2016) shows the adaptive reuse process and its four critical success factors in blue, that ultimately lead to sustainable development. The figure shows how the adaptive reuse process is a feedback loop that informs future projects. The success of this process however is dependent on deep analysis and good cooperation between involved parties. As the figure (4) displays, actors need an emphatic approach in order to unite their demands with the boundaries dictated by both the existing structure and regulations towards a consequential function that requires minimal change.

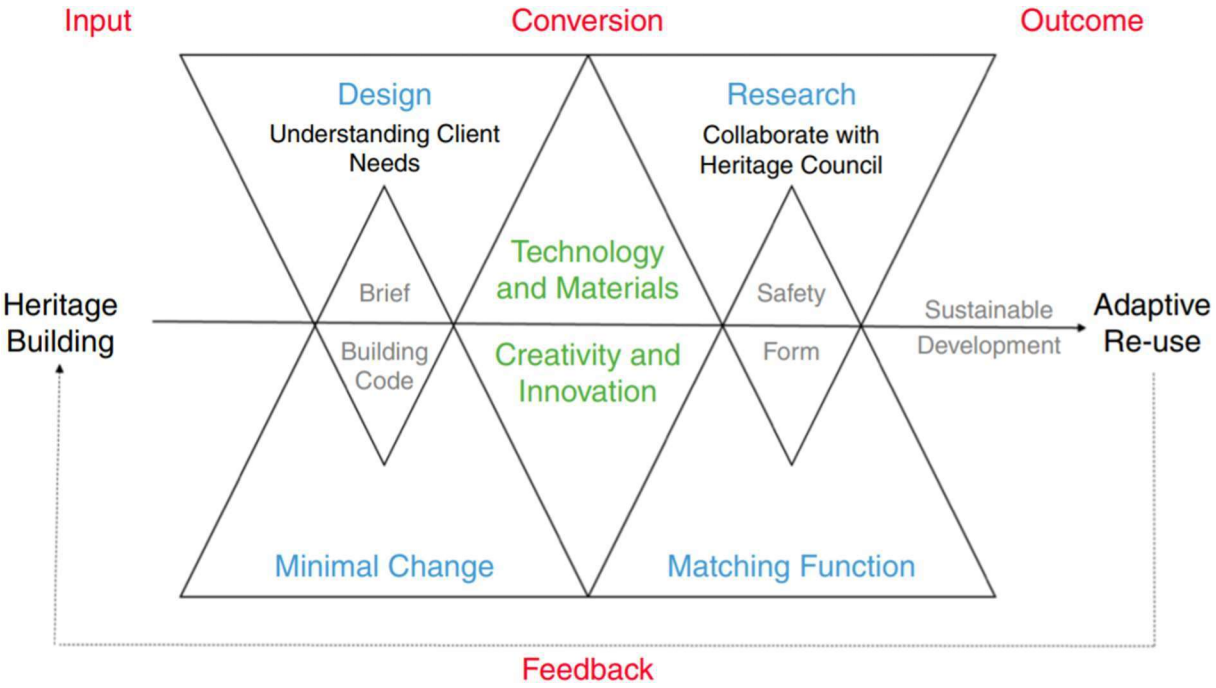


Figure 4. Systemic framework of critical success factors in adaptive reuse by Dyson et al. (2016).

3.1.2 Relevance of adaptive reuse

Thanks to rapid technological advancement and obsolescence as an inherent characteristic of the real estate market, adaptive reuse is increasingly relevant in the field of urban development (Langston et al., 2007). Vacancy is a structural part of the real estate market as well (Mackay, 2008). There will be a constant need to refurbish or adapt buildings that do not conform to

contemporary norms like energy efficiency or fashion and building typologies that suffer from decreased demand such as present-day churches. Office buildings for instance have a particular tendency to be structurally vacant, this is a phenomenon called the "pork cycle". The pork cycle is an economic theory that describes how fluctuation in market prices influences demand, which triggers a delayed response of supply which in turn causes new fluctuation.

In 2022, the Dutch office for statistics published an audit signalling 219.000 vacant buildings in the country (CBS, 2022). The preferential strategy to deal with vacancy is dependent on many factors. The real estate market, location, building state of repair and architectural characteristics like style, all influence the success according to Wilkinson and Remøy (2018). However, these researchers further state how "preferences and prerequisites of various stakeholders" (pp. 141) play a part in this success as well. This implies that it is not only the building and its context, but also the willingness of actors that make adaptive reuse projects happen. It is therefore key to convince them of its inherent societal value.

With respect to the sustainable development goals of the Dutch government and the European Union, adaptive reuse enables significant reduction of carbon emission by the construction industry (Brunone et al., 2021). Moreover, in the Netherlands a nitrogen surplus is straining numerous construction projects. Adaptive reuse poses a solution, as opposed to new construction, by decreasing transportation and material emissions amongst others.

Significant social benefits surround adaptive reuse as well. Dilapidated buildings contribute to a negative atmosphere where crime and antisocial behaviour thrive. This, however, is also countered by replacing the edifice with new construction. Whereas by implementing an adaptive reuse strategy, the sense of community that radiates from existing structures is preserved. Additionally, adapted buildings are generally more highly appreciated (Langston et al., 2007).

Cultural heritage buildings are the tangible representation of life in past societies (Dyson et al., 2016). Persoon (2019) has made an overview of cultural heritage values as described by academic literature in an attempt to make the indirect economic values more explicit. Figure 5 depicts this cultural heritage value division in a graph where Persoon has divided the values in economic and non-economic before further division. With adaptive reuse these values can be preserved. When considering sustainability defined as providing for current generations without taking from future ones (Chiu, 2003), adaptive reuse is equally fundamental in the sociocultural side of sustainability.

Although this graph pertains to cultural heritage, it is not exclusively relevant to cultural heritage as all existing buildings present, to some extent, these same values. Considering a residential building, the economic value is clear. Someone has purchased either an apartment or the whole building for a certain amount and might be charging rent or develop it further to increase its economic value as an investment. The positive indirect value on surrounding real estate that Persoon (2019) found in her thesis might be, in this case, negative, but it still is a value. Even with low artistic or aesthetic value a building could still be profitable, useful or authentic. Familiar ugliness certainly captures the appreciation that locals have for unsightly buildings which still serve a community purpose or are easily identifiable as points of reference for a neighbourhood.

This means that many existing buildings beyond those with heritage status have significance. Besides, it is hard to predict how a building, or a group of buildings is valued by future generations as history has proven many times over. Numerous European cities have demolished historic buildings and neighbourhoods for modern housing. After both World Wars the general sentiment led by architects like Le Corbusier was that industrially produced modernist housing would provide more equality than historic dwellings and improve city life. At present however, historic neighbourhoods are highly appreciated in particular by both residents and visitors. In the Netherlands for example, the city of Utrecht tore down a rundown section of the historic

inner city to construct, in modern fashion, housing, shopping mall Hoog Catharijne and its central station instead. Even today the area struggles to gain appreciation. The Jordaan, a historic neighbourhood in Amsterdam, on the other hand, once considered a slum as well, now serves as a testament to conservation and adaptation as a lively neighbourhood (Schuiling, 2007, pp. 2).

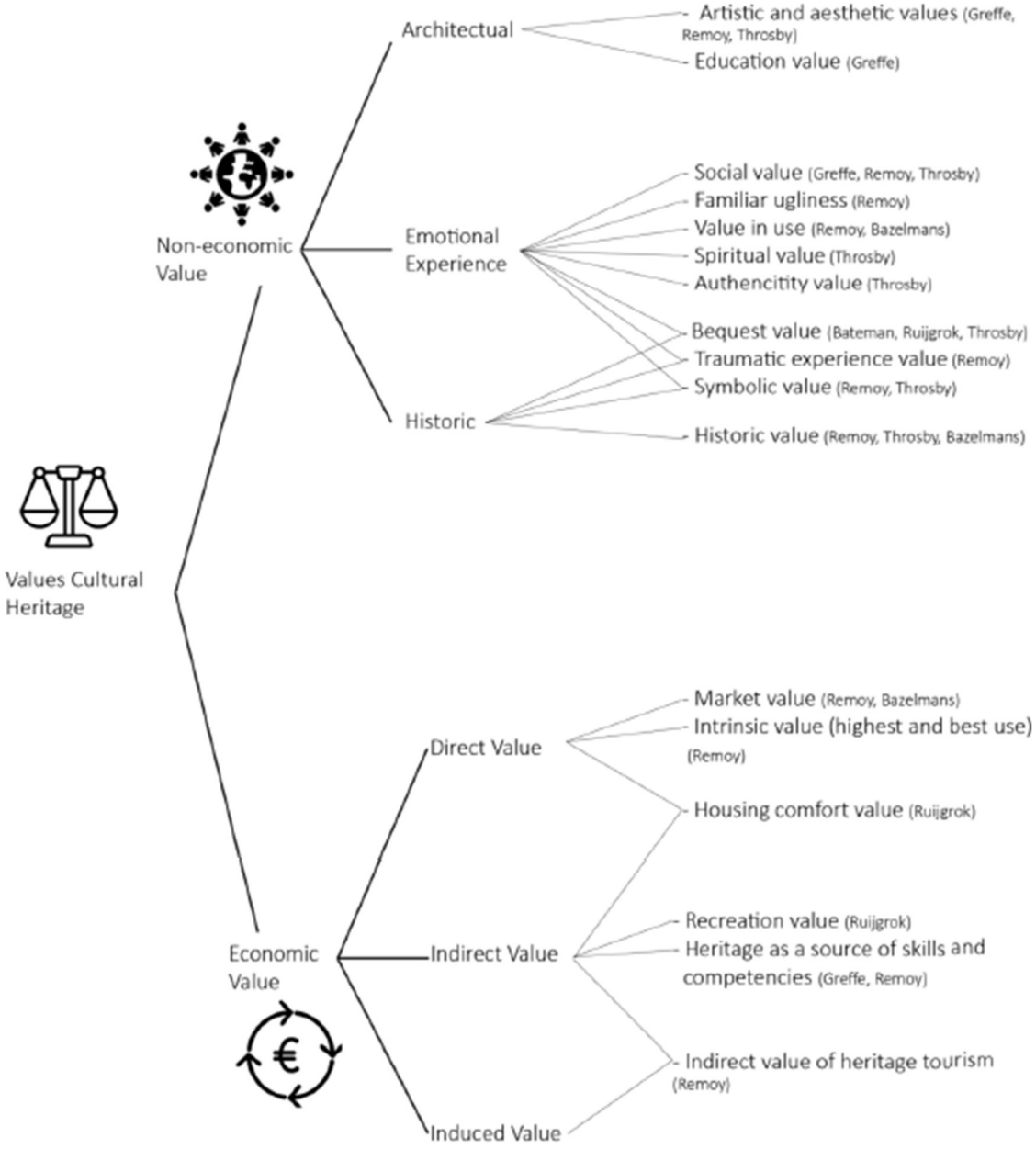


Figure 5. Cultural heritage value division (Persoon, 2019).

Brunone et al. (2021) make a case for the city as a palimpsest of past, present and future values, resulting in a layered quality that surpasses the potential of new construction. In Re-Arch (1995), Michelle Provoost describes the palimpsest metaphor as a conversation between urban sediments that shines through emphasising contrasting concepts. This means, adaptive reuse has the potential to becoming a driving force of urban development that integrates the preservation of building value with necessary densification, while contributing to a positive city image.

3.1.3 Differences from new construction

In many ways, the differences are similar to the drivers of adaptive reuse projects. They generally consume less materials and time, produce less waste, while also generating less nuisance and

disruption to social life opposed to the alternative, demolition and new construction (Bullen & Love, 2011). In general, adaptive reuse is also more highly appreciated than new construction. This is not only due to the fact that it happens a lot on premium locations but also to the conservation of authentic elements and unique characteristics of the original design. For example, adaptive reuse designers have to accurately fit floor plans into the building, which leads to a higher variety of houses in a single project.

Coincidentally, the challenges differentiate adaptive reuse from new construction as well, though negatively. The necessity of neatly measured design and specific floorplans not only increase design and development costs, but more importantly has its roots in a lack of flexibility that an existing shell present. This design freedom is further strained by regulations. Whenever buildings have a listed status for example, the amount of design choices become significantly limited or safety regulations might require expensive changes to a building's structural integrity. The most urgent negative difference, however, is the inherent uncertainty. Existing buildings are fraught with many uncertainties that are mitigated by simply tearing it down and building a something new.

These economic and technical challenges have the potential of becoming a danger in appreciating the architectural, cultural and social value that renovating existing buildings bring. It should therefore be approached differently than new construction. New construction is often a merely technical effort whereas the intrinsic value of renovation requires a more service-minded approach (Liu et al., 2020). Even when the technical and economic performance of an adaptive reuse project cannot match that of construction, the higher social value counteracts.

Lastly, Brunone et al. (2021) remark that adaptive reuse is more in line with historic development of European cities than full demolition. Buildings were often not fully destroyed but rather expanded and fitted with a new, more fashionable façade which resulted in a layering of styles representative of different eras of the city's history. In a sense, today's existing building stock represents the historic development towards urban densification just as society strives to right now.

3.1.4 Conclusion

In conclusion, adaptive reuse is a means of subverting vacancy or obsolescence of buildings without demolition. By finding a suitable new function with creativity, the absolute life cycle of buildings is fully exploited and the continuity of significant embedded value like history, identity and energy safeguarded. Even when performance is not at the same level as new construction it can be compensated with higher social value. Moreover, relative to demolition and new construction, adaptive reuse is less disruptive to communities, less pollutive and increases the profitability of a building while contributing to a more diverse and meaningful urban form. As such it can play a crucial role in sustainable urban development with its potential of balancing the benefits in each category as illustrated by figure 6.

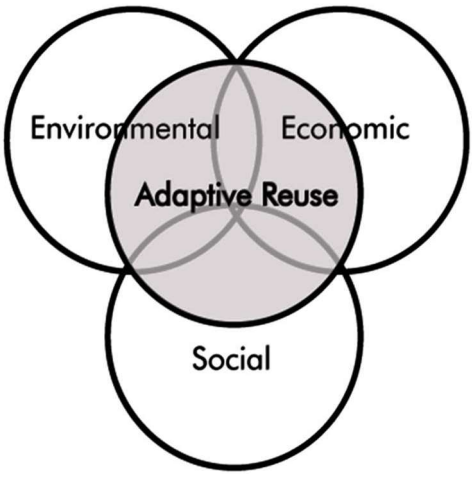


Figure 6. Sustainability benefits of adaptive reuse. (Adapted from Dyson et al., 2016).

However, many challenges remain. The highly specific act of adaptive reuse is characterised by unpredictable realisation costs as it requires extra attention, cooperation and skill of practitioners while the process is fraught with many uncertainties. Potential high costs push stakeholder preference towards demolition, in addition to threatening social sustainability. It is therefore of importance that both the costs and the potential benefits are more explicit in order for these stakeholders to pursue adaptive reuse instead.

3.2 What is social sustainability and how it is affected by adaptive reuse

The term social sustainability does not know one, internationally accepted definition. It is often used without a specific clarification. However, social sustainability emerges in a plethora of scientific papers and its importance is often stressed, further displayed by the abundant presence. In order to understand the term, one could look more closely at the definition of the two components: social and sustainable.

Firstly, social. According to the Cambridge dictionary, social relates to society and living together in an organised way (Cambridge Dictionary, 2023). When researching the meaning of the term social in scientific literature, definitions of the word often refer to community and voluntary. For example, Lockwood (1999) refers to it as kinship at communal level. He also refers to the term as a willingness to help others beyond one's primary network. Chan et al. (2006) state that the term social is often related to themes of inclusion and tolerance. In this paper a duality is mentioned. On one hand social covers the relationship between individuals and groups within society. On the other hand, it covers the relationship between the state and its citizens.

Secondly, sustainability. The term sustainability knows many descriptions, varying per field of research. The concept of sustainability in the architectural world often offers descriptions of the term relating to the provision of development for current generations without undermining resources and opportunities for the next (Chiu, 2003). Furthermore, in the field of the built environment, sustainability is often split into multiple categories. This is when the term social is introduced in accordance with the term of sustainability. According to Durukan et al. (2021), architecture knows four dimensions of sustainability: environmental sustainability; economic sustainability, cultural sustainability and social sustainability. Kohler (1999) categorises sustainable buildings into three dimensions: ecological sustainability, economic sustainability and sociocultural sustainability. Rather similar to the three categories of sustainable development benefits of adaptive reuse by Dyson et al (2016).

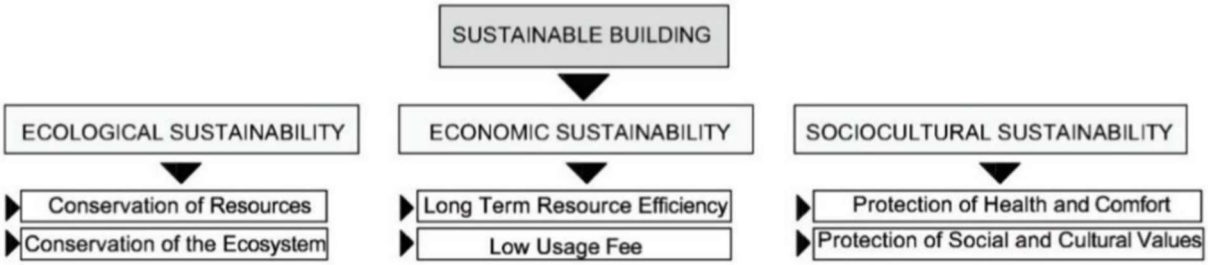


Figure 7. Dimensions of sustainable building (Kohler, 1999)

Remarkable about Kohler's categorisation is the fact that, what in more recent research emerges separately, social and cultural are mentioned as one. However, it is clear that these four components keep re-emerging in many theories about sustainability and therefore social sustainability is in fact, considered as one of the three to four categories of sustainable buildings.

Compared to the other two categories the social aspect is rather intangible. Measures can be made in the fields of environmental sustainability and economic sustainability in order to assess the feasibility or the success of a project. Social sustainability is not as tangible nor measurable, which in turn makes it complex to scope and implement.

As mentioned before, social sustainability emerges in a plethora of scientific research about the built environment. Until now it is clear that the term is written about as one out of three elements of sustainability in the built environment as a whole. However, it emerges on many more occasions. The term is often used as an umbrella term when relating the aspects of the built environment to societal needs. Many societal needs are described as factors of social sustainability.

An infinite number of researchers attach different meanings to the word. According to various

studies, the word encapsulates different concepts. The following statements have been made about social sustainability, each addressing different characteristics of the term. For example, Vallance et al. (2011) state that respecting values, habits and norms are a form of social sustainability in buildings. When denying people these, public support decreases. Furthermore, Vallance et al. (2011) mention housing affordability, accessibility, governmental protection, liveability and social relations as factors of social sustainability. Other writings emphasize that social sustainability stands for a certain level of quality of the built environment, saying a place should provide shelter and protection, while also creating a sense of belonging and identity, which is influenced by social constructs like community, integration and cohesion, forged by interaction (Hoogland, 2000; Foth & Sanders, 2005). Moreover, in addition to protecting and providing sociocultural value as mentioned by Kohler (1999), social sustainability entails the bridging of the conflicting goals regarding the three individual components of Kohler's dimensions of sustainable development (Vallance et al., 2011).

3.2.1 Why is social sustainability important

That governments and businesses are challenged to pursue sustainable development throughout has already been stressed importunately and the previous paragraphs explained that social sustainability is an unpartable element of the three sustainability components. This reflects the importance of social sustainability to society, however it does not give any further explanation of its effects. These are in fact not as well-known as those from their environmental or economic counterparts despite their inevitable presence in actual sustainable development.

Hence, it is required to make these effects more explicit, especially since the three components often conflict (Vallance et al., 2011). However, the issue here is the complexity of the term and its intangibility. The effects of social sustainability are much less explicit than the effects of environmental and economic sustainability. Therefore, it is relevant to answer why social sustainability is important in urban development, before investigating how it can be implemented in urban development. To do this, one must look into the effects of factors mentioned in literature which belong to social sustainability.

For example, it was mentioned before that a sense of safety and identity are factors related to social sustainability. Why are safety and a sense of identity so important? According to a fragment by Alaie et al (2022), feeling safe and having a strong sense of identity and belonging positively benefits mental health. Mental health is certainly crucial to a happy life, which in turn positively affects economic efficiency, less costs to society and reduced health care demand. Social sustainability also coincides with residential satisfaction. Residents whose sociocultural values are protected are more satisfied with their homes, leading to higher cohesion and a more sustainable relationship with their residential environment (Emami & Sadeghlou, 2020).

Moreover, in a time where urban densification is a common goal in regard to environmental sustainability, communities are at risk of collapsing under the pressure of the increasing population. Densification has many advantages. Relative costs of many amenities go down, commuting with its innate pollution decreases and less nature needs to be sacrificed for the cities surface area. However, it is crucial to include the social side in the scope of densification. If not, projects are at risk of failure by losing public support, creating a "dragging legacy" and negate the intended benefits to society (Janssens & Verbeeck, 2017).

Lastly, social sustainability serves as a precursor to environmental benefits (Vallance et al., 2011). Few will prioritise, even with the best intentions, green energy or biodiversity when their basic human needs are not met. Neither are green investments likely to happen to households without a sustainable relation with their residences as many options require a long-term commitment before generating returns. On that account, social concerns act as a driver for bottom-up sustainable development.

All in all, this series of examples shows that positive effects related to social sustainability factors, positively contribute to society. This positive contribution to society is of importance as a healthier

society in turn positively influences a better environment and economy. This underlines the statement by Vallance at the end of the previous paragraph. Which answers the question about the importance of social sustainability.

3.2.2 What is the relation between social sustainability and the built environment

The built environment is a term which covers all that is built around us. In this paragraph the relation between social sustainability and the built environment is investigated. The concept of the built environment is divided into two separate scales: the urban scale, and the housing scale. This paragraph focuses on the findings in literature about social sustainability at both scales. Throughout this paragraph examples of implementations are discussed as well.

Sustainable housing is an established element of urban development, but in discussion and theory, the environmental and economic components prevail over the social, which lacks an unambiguous definition (Severson & de Vos, 2021). The physical implications of social sustainability are equally neglected (Ghahramanpouri et al, 2015). Therefore, it is essential to establish a definition for this research from the literature that does exist and distil the physical implication on design of this definition to create insight in its practical application.

Before discussing the findings of the literature regarding this subject, it is of importance to address the tangibility of the built environment and the intangibility of social sustainability. In the previous paragraph the intangibility of social sustainability is discussed. Meaning that the way in which social sustainability occurs is mostly in forms of interaction, actions or even the feeling of certain emotions. The built environment, however, is rather tangible as it consists of solid objects and the space in between. Social sustainability is an intangible form which takes place in tangible, contexts of the built environment. Figure 8 attempts to depict the intangibility of social sustainability as opposed to the tangibility of the environment in which it occurs.

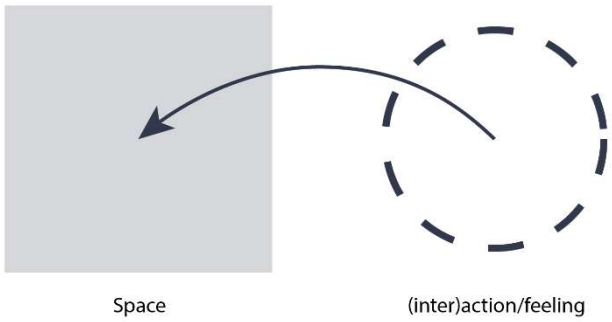


Figure 8: The implementation of something intangible within a tangible environment (Own illustration)

When implementing social sustainability, something intangible is aimed for through the composition of the built environment. One could even debate the term implementing, it is rather about the aim to evoke certain behaviours which lead to the development or presence of social sustainability. As is known from literature, humans react emotionally and behaviourally to their environments (Campbell et al., 2017). This means that the built environment can be designed in specific ways to evoke certain behaviour or feelings. From the literature conclusions are drawn from several fragments of scientific research which discuss the elements necessary to establish a form of social sustainability. These conclusions lead to specific factors related to social sustainability which are subsequently used in further analyses.

Social sustainability is manifested throughout many layers of the built environment, but the housing layer is one of the most prominent and complex (Alaie et al, 2022). Many social relations are engaged in and around the house, but the house itself is a part of someone's identity as well as their social-economic status and a gateway to fundamental amenities. Yet, growing individualism decreased social relations with neighbours. Consequently, this led to a loss of sense of belonging, safety and identity, but also to loneliness, mental disorders and various other problems (Alaie et al, 2022). In this work of literature the relationship between

social relations and the forming of a sense of belonging, safety and identity is mentioned. It can be concluded that positive relations and encounters, in and around one's house, contribute to a sense of belonging, safety and identity.

Alaie et al. (2022) reviewed 28 papers that covered the topic of social sustainability in housing. After dividing the topic into 37 concepts they created a table that showed the frequency of each of these concepts discussed in these works of literature. Half the studies mention safety and security, followed by the proximity of amenities as second most discussed concept. A third place is shared by: community spaces; routes and movement; identity; social interaction and social participation. The repetition of these terms regarding social sustainability poses the importance of their presence in housing.

Figure 9. Dimensions of social sustainability in housing based on Ancell & Thompson-Fawcett (2008) and Severson & de Vos (2021), from Alaie et al. (2022). [sic]

Figure 9 shows the Maslow pyramid used in their work, which distinguishes primary needs and higher order needs. It demonstrates that, when basic existential needs are met, the most important housing values are community integration and social inclusion (Alaie et al., 2022) Out of the main concepts in their research only the proximity of amenities is something that cannot be influenced by architectural design. Safety, however, is also an issue of perception. Whenever a community is tightly knit with friendly social connections and amiable relationships one would consider their place of residence much safer and be more at ease there. This research shows that housing values such as community integration and social inclusion are categorised as higher order needs.

Social sustainable design in housing should include flexibility, comfort and inclusivity along with climate change resilience indoors (Alaie et al., 2022). Residents should be able to both change the indoor climate and the physical composition of their homes. The quality of the interior design is also important, especially the way it accords the private with the public space in a way that safeguards privacy but also enables communication through spatial circulation. Thus, quality and adaptability of interior are factors which can enable interactions. Circulation spaces being mentioned as environments where these interactions take place as these are the transitional spaces between the private and the public.

In a study about residential satisfaction, Emami and Sadeghlou (2020) found three indicators regarding social milieu. These were social context, social network and sense of identity. The social context pertains to everything that make a social network possible, e.g., communal spaces

where one can meet their neighbours, whereas the social network is your relationship with your neighbours. The sense of identity reflects the recognisability of the building and how a resident relates to its appearance. Both the first and the last indicator can be directly influenced by design. Coinciding with the previous paragraphs, encounters need to be stimulated by quality design to result in a better social context, but increases the chance of a sense of identity as well, especially when in an authentic or typical style (Barentsen, 2015).

Foth and Sanders (2005) conclude in their study of social networks in apartment buildings that circulation space yields the highest potential in this regard. They make a case for the value of serendipitous interaction in residential buildings. By thinking beyond the functional minimum, this can be orchestrated with simple elements like seating on stairway landings or extended galleries with room for appropriation, subsequently providing a conversation starter. Their findings stress the importance of circulation space and suggest the placing of simple elements to elevate the potential these spaces.

In a turn towards more humanising architecture, The Pritzker Architecture Prize recently lauded Balkrishna Doshi and Alejandro Aravena, in 2018 and 2016 respectively, for exceptional integration of local identity and choice in their architecture. The late Doshi braided the rigid modernism and the vernacular into a new form as a living organism, accommodating choice. (Scriver & Srivastava, 2022). Richard Sennett (2018, pp 141) makes a case against rigid urbanism as well: "A too-tight fit between form and function is a recipe for technological obsolescence.". Not only does this tight fit deny personalisation, it also arrogantly assumes human needs to be static or unchanging. Sennett (2018) describes additional collateral complications of prescriptive urbanism. Prescription both results in a less qualitative urban environment and hinders people to experience qualities that do exist by decreasing accidental discovery. These expressions indicate a need for environments which offer possibilities for adaptation and appropriation in order to reflect local identity and personal desires.

Semi-public open spaces have the highest chance of causing social interaction according to Huang (2006). She even writes that a lack of open space is ranked first among nine factors of dissatisfaction regarding the living environment of these residents. The most valued open spaces, however, are not the most prominent or large, but actually just those that are nearby. Urban open spaces positively influence sense of place and neighbourliness, but their impact is exponentially related to proximity. Semi-public open spaces have the highest chance of causing social interaction (Huang, 2006).

Van Kempen et al. (2015) underline that spatial design helps social cohesion and peaceful coexistence. However, the aim in area development should not be a close-knit community, but the stimulation of so-called light interactions: short, fleeting encounters, short conversations or even simple nods or gestures through which people recognize each other, become more familiar with each other and the feeling of safety and connection with the neighbourhood is strengthened. In line with the work of Jane Jacobs (1961), they conclude that neighbourly familiarness is more important than close friendships. This means that these encounters need to be stimulated and facilitated by design.

As early as 1961, Jane Jacobs elaborated in *'The death and life of great American cities'* on social life in cities as being individualist in nature. People live in cities to escape the communal life of rural areas. Highly cherishing their privacy, to these inhabitants, social sustainability in urban areas becomes not a matter of having close friends as neighbours, but more so having meaningful and friendly encounters with neighbours. City dwellers do not seek interaction with strangers. Still, research shows random interaction with strangers has a positive influence on happiness (Epley & Schroeder, 2014). The relevance of this fragment lies in the necessity of people to create and sustain friendly connections with the people in their daily environment.

In Life Between Buildings, Jan Gehl (1987) concludes that optional activities and social interaction in the physical environment are exceptionally more likely to occur in high quality public spaces. Figure 10 shows the quality criteria he found in his research. Interestingly, just one criterium has anything to do with aesthetics whereas most revolve around protection, enjoying yourself and others, while emphasising the provision of opportunity, of choice. In reference to sitting facilities in public space William H. Whyte (1980, pp. 28) agrees: "Ideally, sitting should be physically comfortable... It's more important, however that it is socially comfortable. This means choice... Choice should be built into the basic design". Through his research Gehl accentuates public space as environments where quality contributes to the occurrence of social interactions and quality is mostly found in the existence of opportunity and choice.

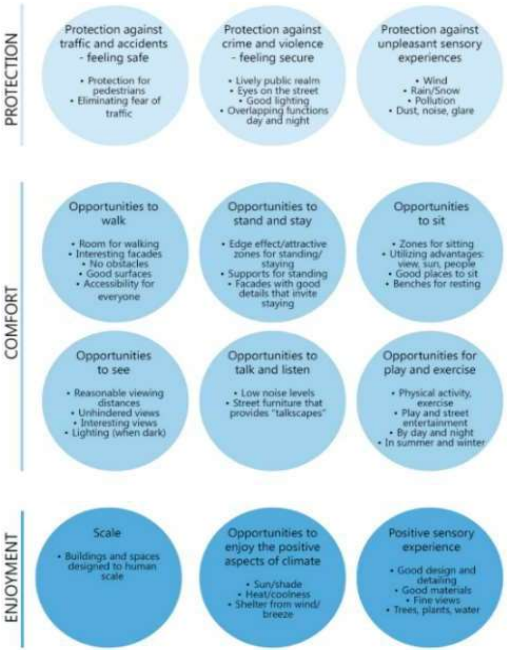


Figure 10. Twelve quality criteria (Gehl,

Naturally, caution is required when transferring such specific ideas to other fields like housing. Yet, these ideas possess a universal wisdom that appeals to our common sense. To start, people display a wide range of behavioural eccentricities that would be impossible to capture in a single design. Besides, not every human finds satisfaction in making choices. Whether at a restaurant, barbershop or using public space, people want to be in control of their situation, to reflect their personal preferences. Therefore, social sustainable housing includes both adjustable features as optional social facilities, i.e., a flexible design.

Furthermore, it proves to be hard to dictate social values. Just as a room without adjustable temperature, a prearranged house is uncomfortable (Alexander, 1979). In urbanism, this applies as well. The research by Stoiljković (2022) shows that designated social areas in residential buildings were little used, though that does not mean that these spaces are unimportant or unfunctional. Preferably social interaction should be facilitated as an optional activity and an urban planner or architect can only facilitate it through the addition of quality to public space. Rather than implementing monofunctional social areas, quality should be added to spaces and areas that are used in everyday life, routing or access, for example (Botta, 2005). So, as the literature illustrates, addition of quality to public space enhances social cohesion.

High cohesion also leads to better maintenance, as concluded by Tostões and Ferreira (2021) in their research on the success of the Barbican Estate in London. This means that the operator of the building reaps the benefits of developers who choose to implement the right measures, however developers generally have little incentive to support this when they do not operate the building themselves. One can argue that the success of the Barbican Estate can be attributed to the resident's awareness of its architectural significance and the pride that it generates among them (Tostões & Ferreira, 2021). This research describes the benefits of social cohesion to its environment. It further explains that awareness of architectural significance could influence people's behaviour towards the building.

Other than all of the above, but equally as interesting, literature explains the positive health effects of nature and urban greenery are near endless. Ulrich (1983; et al., 1991) most prolifically proves how plants are a source of stress relief but also provide additional health benefits. This means that architecture and urbanism can positively influence the 'protection of health and comfort' by including natural elements.

Essentially, social sustainability is a multi-faceted phenomenon influenced by many factors of the built environment. It can be summarised as the protection of sociocultural values of a

community and providing them with a high-quality living environment. This means healthy, comfortable and diverse housing that people can personalise and identify with, but also the provision of ample opportunities for optional activities, social interaction and accessible amenities.

From this literature review, several concepts and ideas overlap and re-emerge in different pieces of literature. Their recurrence implies their important presence in social sustainable developments. These are therefore considered important elements to include in sustainable design of the built environment. Figure 11 shows an overview of the factors that need to be considered when creating social sustainable environment. These factors are derived from the persisting elements in this chapter's literature and are used throughout the thesis in order to assess social sustainability in adaptive reuse projects.

To conclude, the relation between social sustainability and the built environment is that the built environment forms a context in which social sustainability can emerge when one or more of these factors retrieved from the literature is present. The context can in turn influence and shape social sustainability. An absence of these factors can lead to a lack of social sustainability.

As previously stated, these factors are derived from the literature, scientific research conducted by other authors. The following overview indicates the authors related to each factor.

Figure 11. Twelve factors to include in socially sustainable developments, derived from literature..

Architectural significance - *(Barentsen, 2015; Tostões & Ferreira, 2021)*

Local characteristics - *(Ghahramanpouri et al., 2015)*

Semi-private zones - *(Gehl, 1971; Hoogland, 2000; Foth & Sanders, 2005; Huang, 2006)*

Identity - *(Emami & Sadeghlou, 2020; Alaie et al, 2021)*

Cohesion - (Van Kempen et al., 2015; Alaie et al., 2022)

Liveliness - *(Jabobs, 1961; Gehl, 1971)*

Health - *(Ghahramanpouri et al., 2015; Alaie et al., 2022)*

Safety - *(Ghahramanpouri et al., 2015; Alaie et al., 2022)*

Comfort - *(Ghahramanpouri et al., 2015; Alaie et al., 2022)*

Diversity - *(Ghahramanpouri et al., 2015)*

Flexibility - *(Alexander, 1979; Alaie et al., 2022)*

Choice - *(Gehl, 1971; Sennett, 2018; Scriver & Srivastava, 2022)*

Considering these 12 factors of social sustainability the result of this chapter, in an architectural space, circulation design significantly affects social sustainability as a main facilitator of serendipitous interaction. As described above, this contributes to social cohesion and a lively atmosphere. It further strengthens a sense of identity, safety and comfort while the right design also encourages healthy habits through stair use. Architectural significance, local characteristics and semi-private zones in circulation space, in turn, are stimulants of interaction. Therefore, circulation space design has major potential to fortify social sustainability.

3.2.3 Relationship between social sustainability and adaptive reuse

We have seen that social sustainability and adaptive reuse are related through various scales and levels. A comprehensible distinction can be made that separates the different ties into categories. Adaptive reuse has intrinsic values and characteristics which relate to social sustainability on both a tangible and intangible level without any design intervention. Then some values exist as a result of adaptive reuse design that are less apparent or absent in new construction.

For example, on many occasions housing is built with the smallest dimensions. Budgeting and the optimisation of floor plans is already discussed as one of its reasons, though the most straightforward explanation is the fact that housing simply serves fewer people. As elaborated in chapter 4.2, especially subsidiary spaces like circulation fall victim to optimisation as developers cannot 'sell' these square meters. Other typologies offices or public buildings are generally characterised by much larger dimensions. Subsequently, when adapted to housing these features remain as high ceilings, grand entry portals, spacious corridors and large windows, all of which have added quality to housing as well, but of course to higher costs. Moreover, after adaptive reuse a building profits quality wise from emphasised authentic conceptual characteristics and age diversity (Plevoets & Van Cleempoel, 2019).

Along with the end result, the process can equally connect with social sustainability. Egyptian architect May al-Ibrashy works from the conviction that heritage ultimately revolves around people. In practice she found that involving local residents in conservation decision-making automatically leads to a more social sustainable end result as it connects the work to their sense of ownership and control. Locals subsequently profit from this connection in an economic, social and spiritual way (Al-Ibrashy, 2021). In her academic work, García (2018) equivalently concluded community participation can act as a tool in planning and preservation of heritage.

The serious pollutant emissions for which the construction industry is responsible not only

negatively impact climate change, but also severely damages surrounding biodiversity and public health (Brunone et al. 2021). Reducing pollution is thus to the benefit of social sustainability. As concluded earlier, adaptive reuse contributes to this reduction in a mayor way by preventing the demolition of buildings with their embedded resources and subsequent transportation.

Some parameters of social sustainability are inherently at odds with adaptive reuse, however. For example, with an existing structure it is more difficult to achieve a high degree of flexibility whereas flexible dwellings prevent residents from moving out as their needs change. Flexibility means that buildings can be adapted to other functions more easily in the future too, think of open floor plans or modular construction elements, significant negatives. Considering the construction process, flexibility entails coping with unexpected problems inevitable when working with existing buildings. This means that flexibility is not only a source of discord but a mutual success factor as well.

Furthermore, as established in chapter 3.1, the unpredictable nature of adaptive reuse and highly specialised demands, potentially cause high realisation costs. Dyson et al. (2016) warn for gentrification. If house prices surge to compensate for these costs as developers prioritise financial gains over social value, the project provokes the same displacement it had sought to avoid. Therefore, adaptive reuse projects are better able to provide social sustainability with explicit costs and financial benefits of social value.

3.2.4 Conclusion

In order to answer the second research question, social sustainability has been discussed from several angles in literature and practice. Conclusively, social sustainability entails the protection of sociocultural values, increasing residential satisfaction and strengthening communities to eventually establish a more durable connection with the direct urban environment. It is furthermore important because it relates to health, safety and comfort. Lastly, sustainable development as necessary as it is, has no guarantee of public support. Therefore, social sustainability is paramount in aligning all sustainability goals and realise them successfully.

In urban design, social sustainability can be summarised as the orchestration of fleeting unintentional encounters of recognition with spaces of quality, leaving room for serendipity and choice. In architectural design these concepts can be translated into the composition of collective spaces like circulation with a gradual transition from private to public. A condition for orchestrating interaction in these spaces is sufficient margins in surface area to converse without blocking the way. Additional aspects that relate to social sustainable housing are: local characteristics, architectural significance, identity, liveliness, diversity and flexibility.

Concerning adaptive reuse, several inherent aspects have a certain premium quality over new construction, leading to more distinct and meaningful forms that enhance residential satisfaction. It benefits social sustainability by being a healthier and less disruptive alternative as well. On the other hand, high costs and financial priorities can still generate community disruption, which means adaptive reuse has significant social sustainable approach potential with regard to subverting building obsolescence, provided that costs and financial gains are explicit.

3.3 Social sustainability in practice of adaptive reuse

3.3.1 Which tangible architectural elements affect social sustainability?

In the 'ubiquitous' smart city of Songdo in South Korea places for social activity were meticulously designed and integrated into a larger urban plan as well. The places turned out to be a failure. Koreans favoured informally grown places, without a logical relation to the urban plan as they are more familiar and frivolous (Sennett, 2018). In *'Building and Dwelling: Ethics for the City'* Richard Sennett (2018) makes a case for serendipity as well. He praises the residential work of Alejandro Aravena in Chile that supplied people with a shell to individualise and adapt to their personal needs. Monotonous and ubiquitous architecture without the flexibility to adapt to different cultural backgrounds is not likely to foster a cohesive community (Tostões & Ferreira, 2021).

In an attempt to systematically chart distinct architectural archetypes used in design Bernard Leupen and Harald Mooij created a visual lexicon with descriptions of these different design types. The types range from the various compositions of building blocks to housing lay-outs. Regarding circulation space, Leupen and Mooij (2012) have identified five different overarching typologies. Figure 12 illustrates the five principles simplified. Naturally, all have a significantly different effect on the way people experience their house and how they interact with their neighbours.

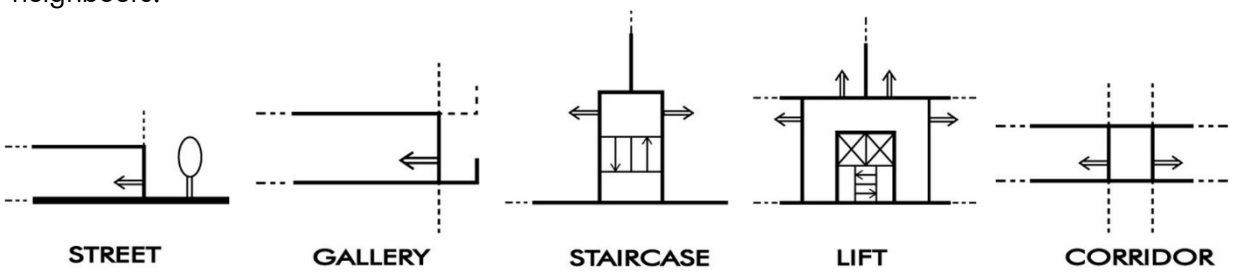


Figure 12. Self-made representation of the five circulation typologies as defined by Leupen and Mooij (2012), (Own image).

The 5 typologies each have different characteristics in reference to social sustainability. Many front doors are beneficial to a lively and pleasurable street scape (Karssenberg et al., 2016). They create a more legible city scape compared to multi-family buildings with a single entrance and are more easily identifiable as well as appropriated for residents. Galleries can have similar qualities. Gehl (1987) and Jacobs (1961) both argue that they, if generously proportioned create additional street life that brings safety and liveliness. Galleries are equally capable in optimising floor space as they are not counted in the gross floor area.

Staircases are fundamental in healthy buildings as apparent in WELL certification assessment by stimulating walking. However, they are not equitable when not combined with lifts. Botta (2005) explains, as described before, how they make buildings future proof. They also inefficiently take much interior space. Still, authentic elements and monumental features in interior collective space stimulate interaction, which improves cohesion (Barentsen, 2015). Removing them, is therefore not necessarily a just decision.

The city of Rotterdam introduced a social update on its high-rise vision in 2019. It was conceived as a measure to prevent people from going from their subterranean parking garage to their homes anonymously by lift. Residents should pass through a public lobby first (Gemeente Rotterdam, 2019). In this vision the stimulation of random encounters with neighbours also entails the introduction of common spaces like gardens amongst others and an active plinth to reduce anonymity at the street level. The eventual goal is a more cohesive, lively and liveable city, as the presence of other people not only encourages interaction, it equally fortifies one's sense of security. Therefore, the composition of circulation space and routing in buildings has a significant social impact that needs to be investigated more thoroughly.

3.3.2 How are social concepts assessed?

According to Botta (2005), sustainability assessment of renovation projects is a very complex process that requires objectively measurable parameters in combination with value judgements. However, not only the result of the renovation should be assessed. The effects on the past and future are equally important to assess as the present as well as the effects on the larger urban context. This implies a need for a holistic approach.

Regarding adaptive reuse, cultural values are embedded in regulations and judged by an aesthetics committee or 'welstandscommissie' in The Netherlands. Social values do not have this privilege, which prevents easy retention in case of possible demolition. For example, the Woningwaarderingsstelsel (WWS), a Dutch tool to calculate maximum rental prices, includes many aspects like surface area of individual rooms, storage space, private outdoor space and even a monumental premium, but it does not incorporate social amenities like collective space or semi-private areas.

Categories	Priority	Rank
Participation & control	20.1%	1
Environmental education	19.5%	2
Social equity	19.5%	2
Health and safety	13.7%	4
Accessibility & satisfaction	12.0%	5
Social cohesion	8.7%	6
Cultural values	3.7%	7
Physical resilience	2.8%	8
Total	100%	

Table 1. Resulting weights of the categories based on pairwise comparison (Atanda, 2019).

Jubril Atanda (2019) recognised this absence in social sustainability assessment. By means of a Delphi study, he defined social sustainability indicators, before presenting them to a panel of 150 building users and subsequently integrated the results in an existing 'green building assessment tool'. The results are shown in table 1. The indicators participation & control, environmental education and social equity show significant priority. It indicates the importance of including people in design and conveying environmental considerations, without losing sight of a fair process.

3.4 Costs of adaptive reuse and social sustainability

Although numerous works of research indicate the potential value of adaptive reuse over demolition and new construction for developers and users, many decision-making processes grind to a halt due to financial problems (Bullen & Love, 2011). Economic considerations are in essence the main driver of decision-making regarding reuse or demolition. Most developers focus on short-term profits rather than environmental or social considerations despite their acknowledgement of the negative impact demolition could have on their corporate image (Bullen & Love, 2011). Even economically, reuse might prove to be more profitable when a long-term vision, including an operation and maintenance strategy, is adapted, as is apparent in the project by SUM for the 2022 Solar Decathlon (SUM, 2021).

Since developers calculate construction costs by GFA and revenues by UA, in the Netherlands, unfortunately, construction development is confined by the optimisation of ratios between gross floor (GFA) area and use area (UA). UA only involves the available space inside individual houses, excluding surface are covered by wall and subsidiary spaces like circulation. Decreasing the ratio of GFA to UA thus increases profits, resulting in the neglection of circulation areas as places of quality. In adaptive reuse this cause additional trouble for the simple reason that the buildings form is already set.

Nygaard (2022) detects a severe disconnection between sociology and housing economics, despite housing being a substantial factor in the social realm. He notices the effect of social norms and institutions on housing markets, but also their neglect. He therefore pleads for a better incorporation of social norms in economics towards more "pragmatic socioeconomics".

3.4.1 Making costs explicit

As previously stated, vacancy is an intrinsic feature of the office market (Mackay, 2008). Premium rent office space is, however, hard to achieve with renovation or transformation (Bullen & Love, 2011). This level of pricing can only be achieved when the energy performance is optimal and the operationally required technical installations are of the highest grade possible. This doesn't mean that there are no other viable destinations for an adaptive reuse project. Housing, for example, is less affected by technical specifications as opposed to aesthetical considerations and authenticity (Barentsen, 2015). Housing might even see positive financial benefits (Langston et al., 2007; Persoon, 2019).

People's choices are conditioned by social norms and habits. This is also apparent on the housing market where it differentiates actual market value from what would theoretically be its economic value. Different societies have different demands on this topic. Somewhere, communal space might be especially valued, while elsewhere a particular emphasis could lie on a kitchen separate from the living room, but it could also mean that house ownership is irrationally overvalued in relation to a rental tenure (Nygaard, 2022).

Existing buildings have value in a wide range of disciplines. They have social, historic and cultural value (Remøy in Wilkinson et al., 2014), emotional, experience and aesthetic value but few values are clear-cut and easy to pin down. Most buildings are therefore solely defined by their market value and cultural value.

The economic value of a building is defined by several aspects. The first value is related to use. This means the functionality and utility of the buildings with which it is able to host activities that have an economic nature, be it housing, retail or another service. Secondly, a building represents non-use economic values. This pertains to values of the past functionality that persist in existence of materials and the options to use it (Spoormans & Pereira Roders, 2020). Shipley et al. (2006) describe the marketing potential of familiar buildings as a non-use economic value. The final value is bequest value for future generations. This value refers to the option of saving present knowledge and principles from disappearing (Persoon, 2019). Besides, how could one

predict which values future generations hold.

A building, however, also represents an environmental value. It inherently relates to its environment by defining public space and housing animals, plants and quite often people, but the materials that the building is made of, in addition to their economic value, embody environmental value as well. Each brick contains embedded energy and has been responsible for a generous amount of pollutant emissions. Moreover, previously mentioned concepts like familiar ugliness, high ceilings, authentic elements and other social values still exist as well. This means that a building cannot be freely discarded when other values, like the economic or cultural, fail to meet a certain standard.

The largest cost component in adaptive reuse projects of offices to housing is firstly the façade, followed by general execution costs and thirdly, inner walls (Mackay, 2008). He further concluded that case studies are not well suited for studying specifics of costs in adaptive reuse as projects vary too much from case to case. Nevertheless, case studies can be very effective in analysing related phenomena, he writes. For example, case studies have the possibility to illustrate patterns as a result of certain choices regarding these cost components.

3.4.2 Financial benefits

Adaptive reuse projects have several financial benefits. They usually see few objections of neighbours strengthening the financial feasibility of the projects as objection cases can take serious time and resources that can't be put in the project itself. Sales can also be boosted with visitable display apartments rather than drawings or renders. Additionally, adaptive reuse projects not only require, generally, fewer construction materials and less demolition, but afford shorter realisation time as well, meaning shorter financing periods and reduced risk (Geraedts et al., in Wilkinson & Remøy, 2018). Lastly, as stated, adaptive reuse projects have a larger potential for supplementary use in marketing strategies (Shipley et al., 2006).

Adaptive reuse is equally capable of providing indirect economic benefits. Upgrading dilapidated buildings has a positive effect on the surrounding area by bringing more economical activity and improving investor confidence (Aigwi et al. 2019). The limited realisation time of adaptive reuse projects does not just trigger this process sooner, but also bolster its effects. Whereas new construction would emphasise the contrast between dilapidation and success, adaptive reuse reveals hidden quality.

Social sustainability brings economic benefits on various levels of economy through several mechanisms both qualitatively and quantitatively. If wellbeing is promoted in office buildings with plants and healthy materials productivity rises significantly (Johnson, 2000). It also leads to less high participation with less absence (Abdullah et al., 2012). With respect to healthcare, these investments significantly reduce costs too. For every dollar $3.27 can be saved according to Baicker et al. (2010) or an average of 24.5% less costs as stated by Chapman (2012). Healthy and green offices furthermore show higher real estate returns. For example, offices in New York City with a high degree of plants and other natural features have a 5.6% to 7.8% rent premium opposed to those without (Yang et al., 2020).

To be fair, these works did research to offices, not housing. Nevertheless, they do show how health affects the economy. Perhaps developers or real estate investors won't personally see the return after investing their money as the difficulty lies in the fact that the stakeholders who invest in social sustainability often struggle to see the financial returns. To some extent, this can be attributed to the returns being obscure or qualitative. More importantly however, the benefits simply don't return to the stakeholder that invested in its favour when the benefits entail higher economic efficiency or reduced maintenance, especially in projects where the investors are not the operators. However, it seriously substantiates regulations or subsidies in support of healthy construction as well as future research to other factors that influence both physical and mental health in the built environment.

Interlude

Having consulted literature to formulate an understanding of social sustainability and adaptive reuse, several ideas emerged that informed the case selection. This intermission explains the choice to study circulation space in dwellings of modernist architecture, before commencing the empirical part of this thesis.

Dwelling

Social sustainability is influenced by many urban elements. Unintentional social encounters can happen anywhere. However, houses provide the clearest insight in social life related to the spatial interaction of landscape and buildings as the most numerous architectural typologies and the place one spends most time (Rapoport, 1969). Therefore, this research focusses on housing or the dwelling in specification of the architectural as opposed to the urban. Especially since this is the less researched one (Ghahramanpouri et al, 2015).

Rapoport (1969) defines the dwelling as a 'social unit of space' and part of a greater configuration of socio-cultural structures. In many primitive societies single family houses are distributed around communal public space. The small communities use these for rituals, dance or other social activities with a higher priority than functional ones like trade or craft. Present day urbanites however, dwell in multi-family buildings where these social activities with neighbours occur only in the space that connect the individual units or disconnected entirely from the dwellings.

In *House Form and Culture* (1969), Amos Rapoport distinguishes two architectural traditions; The grand design and the folk tradition. It describes the place of the traditional dwelling in architectural and archaeological history. He points out that, in contrast to monuments, the house hasn't been as extensively documented, researched or valued by architectural historians, even though the bulk of the built environment consists of dwellings. Additionally, the design of monuments merely reflects either the ambition of its patron to impress the populace or his peers. Dwellings on the other hand are both conscious and subconscious physical manifestations of a culture, an expression of needs and traditions.

While Rapoport (1969) focusses his study mainly on primitive or vernacular dwellings and contemporary housing would be categorised as part of the grand design tradition, still, it remains relevant to study the way dwellings are used and personalised. Not only vernacular huts embody needs and traditions. They have been transferred to and projected on the urban context consisting of multi-dwelling units like apartment buildings in addition to newly developed ones.

Working from home during the COVID-19 pandemic, for example, has also changed our needs and the relationship we have with a dwelling (Doling & Arundel, 2022). The house has again become, as in the Middle Ages, a place of work. In our time this means a private room with a desk that is free of sound nuisance during working hours. Additionally, it changed the way the different residents relate to each other both in individual dwellings as with neighbouring dwellers. Spouses may turn out to have different work rituals and neighbours are more often met during the day. Especially this aspect influences the impact that certain design choices regarding social cohesion and interaction have on the residents of the neighbourhood or building.

"These differing housing environments were built at different times, according to different notions about the needs of residents and the organization of activities in the city – and sometimes without any specific notions at all. Ultimately, however, what all of these housing environments share is an interaction between the world their residents create for themselves and activities elsewhere in the city. Indeed, the quality of a housing environment, to a significant degree, lies in the access it provides to the facilities its residents require" (Leupen & Mooij, 2012, pp. 23). Additionally, though, studying housing exposes the interaction between "the world their residents

create for themselves" and the housing that has been provided to them, which can be used to inform future design.

The point is that the goal of architecture, especially in a residential capacity, is first and foremost a social one, not an economic one. Dwellings provide basic human needs like shelter and interaction. Architecture as a cultural expression came only second when there was room for individual design of decoration and the need arose for space to host rituals and other collective events in a community. The latter still a social goal. Economic goals of architecture are, on the contrary, a fairly new phenomenon that only just really took flight in the last centuries (De Graaf, 2020).

Heritage and modernity have an inherently paradoxical relationship. Modernity strives towards the new, innovative and progressive while heritage is marked by history, memory and tradition, which have a strong connection with the way in which Bernard Leupen and Harold Mooij describe 'dwelling' (2012). Dwelling is the highly personal interpretation of comfort that stems from tradition. It is no secret that architects of the modern movement tried to change the dwelling paradigm by imposing their vision on society (Leupen & Mooij, 2012).

We should look to our architectural history in the philosophy of Michel Foucault. History is a source of knowledge that should be used to inform new thinking, but never with scientific rigidity. We have been led to believe that the scientific modernity has improved the lives of the people in general. However, science regularly omits or disregards the unpredictability of the intrinsically playful human, who more often than not makes irrational choices.

Modern Heritage

Remøy states that "Heritage has been defined as the expression or representation of the cultural identity of a society in a particular period, as well as the contribution to the community's cultural capital." (Wilkinson et al., 2014, pp. 160). This statement though, goes beyond heritage. Apart from the discussion about aesthetical quality, restoration era architecture undeniably defines a particular period in Dutch and European history. A huge percentage of the Dutch housing stock is built in this time period. Therefore, it plays a big part in the Dutch urban morphology and its phenomenological expression.

Perhaps this means that those buildings are more expendable as well but that's not the point. The point is that they propagate cultural history. Their value lies, aside from the embedded energy, in the way they are nested in public memory, how they have been culturally appropriated and their significant conceptual qualities. We may feel great fondness where more historical architecture is involved, even though before modernism, many people lived in dire circumstances, without daylight, sanitation or other comforts we cannot imagine lacking today. Mere awareness of these historical values of our homes is able to improve residential satisfaction (Barentsen, 2015).

As previously argued, meticulous conservation is not what our society needs. These modern, reconstruction era, buildings and neighbourhoods were built from a ubiquitous design whereas social sustainability requires them to be a living organism with the capacity to grow haphazardly. We should not remain stuck in the designs of modernist theorists like Le Corbusier, but strive for the interpretation of his protégé, Balkrishna Doshi and his spiritual successors like Alejandro Arivenna.

Regarding quality of living, the symbiosis between contemporary convenience and historical atmosphere in dwellings appears to outweigh authenticity in importance to the surveyed residents in the thesis of Barentsen (2015). This means that modern heritage purveys an opportunity as it mostly lacks a protected monumental status. She does however conclude that authentic elements enhance the quality of living when people can experience them in the access of their building e.g., staircases, hallways and doors. In turn, this quality stimulates unnecessary and unplanned encounters and activity (Gehl, 1987).

Reconstruction era buildings, however, also suffer from a lot of problems ranging from poor aesthetics and energy performance to overall low quality. This is often paired with overdue maintenance or general building decay (Riccardo et al., 2013). As a consequence, for many, these buildings have little appeal overall, leading to a downwards spiral of neglect. Yet, unfortunately, one can easily overlook the fact that these buildings are often situated in neighbourhoods that have been rife with several social issues too begin with or were part of a dysfunctional urban plan instead. The city centre of Rotterdam for example, did not suffer from a negative image for the sake of its modernist buildings, but because the modernist buildings were accompanied with a monofunctional modernist urban design.

Circulation space

The International WELL Building institute has initiated WELL certification to promote a "people-first" approach in architecture (*International WELL Building Institute*, n.d.). They created a scientific framework that assesses impact on health, happiness, productivity and various others social factors to ultimately increase economic effectivity of built assets. Other sustainability certifications, like LEED and BREEAM, focus more on environmental aspects. Surface area, social relations and interaction, however, are not included in any.

Regarding circulation space WELL have interesting criteria divided in three equal parts to increase social value: "Design Aesthetic Staircases; Integrate Point-Of-Decision Signage; Promote Visible Stairs." Design Aesthetic Staircases involves at least two of the following six attributes: music, art, over 215 lux of lighting, outside view and daylight, plants and gamification. Part 2 entails evident signage to the stairs and the last aspect demands one staircase to be at least as prominent as the lift or escalator in order to stimulate walking. BREEAM and LEED certifications' only criterium for circulation space is daylight, which is the most important aspect of circulation space as it caters to both sense of safety and aesthetics.

Yet Lifts are equitable measures, nonetheless. Marina Botta (2005) explains how lifts promote social sustainability as they provide accessibility to a higher variety of social groups like the elderly and disabled. Coincidingly, people are able to remain in their residence through old age or physical misfortune.

4. Empirical study case analysis

This chapter elaborates on the case studies that are performed as part of this thesis. Four adaptive reuse projects have been studied to investigate how practitioners approach these kinds of projects and how they incorporate social sustainability. They are as mentioned in the methodology: de Binck; de Raedt; de Rotterdamse School; Noordsingel. The individual case studies are discussed respectively with, firstly, a general case description, informed by documentation followed by introduction of the related interviewees and their further relevant insights and concepts that have come up.

4.1 De Binck

Case description

'De Binck' by Kraaijvanger architects is a project in the Hague wherein the former state printing press building (SDU) with offices and production halls is transformed to an apartment building of 72 dwellings with a variety of typologies and a partly commercial plinth. The office building stood vacant in spite of its relatively recent construction in 2005, but fitted neatly in the plans the municipality had for the area. According to the architecture firm's website (De Binck | Kraaijvanger. (n.d.)), playing a pioneering role in the large area development of the Binckhorst was the core purpose of the transformation. The Binckhorst in itself is a key project in the 'big city policy' by the four largest Dutch municipalities to improve life in the cities by intensification, renewal and transformation of existing urban areas.

Figure 14. Left: De Binck, 2020 (Kraaijvanger, n.d.); Upper right: SDU-office (Kraaijvanger, n.d. -b); Lower right: Concept 'De Binck' (Kraaijvanger, n.d. -a).

The Binckhorst is a former industrial area that currently houses mainly commercial activity and offices. The municipality of the Hague, however, planned to transform the Binckhorst to a mixed-used urban area through development of housing and other urban typologies. It should become a lively and vivid part of the city centre to which 'De Binck' is playing a pioneering part as the first large scale residential project in the area. Nevertheless, demand for the dwellings was high.

The transformation of the former SDU office was combined with the replacement of the production halls. These halls formerly housing printing presses have been deconstructed and are currently being stored in order to use it for the construction of a new museum in the municipality of Barneveld in the future. At the original location, adjacent to 'De Binck', single family terraced houses have been newly constructed instead. The new and the adaptive reuse houses are all connected. In correspondence with the footprint of the production halls a parking garage was built whose roof synchronously serves as an inner courtyard. Not only have private gardens for the terraced housing been made, but the majority also functions as a collective park for the entire block. Additionally, this project features two separate tower blocks with apartments. For the sake of diversity however the target group are people who would not like the high-urban buzz from the roadside Binck or the semi-urban collectivity that the terraced houses suggest (Mol, 2023. interview).

Speaking of diversity, the adaptive reuse part has a high variety of dwellings in itself as well. Not only do the floor areas range from 60m^2 to 170m^2, but the typologies are also distinct with apartments, penthouses, maisonettes with patios and townhouses with rooftop gardens. These last two are realised thanks to creative use of the existing structure. To hide installations, a faux wall is placed on the roof in extension of the facade which resulted in multi-story houses with patios, while the lower wing is expanded with the characteristic 'springboard' and gardens on top.

One key aspect of the project is the preservation of the industrial character of the Binckhorst in line with previous transformations like the Caballero Fabriek and Binck36. According to developer Local, it is crucial to cherish the collective memory of the city, partly composed of its buildings, in order to keep it liveable (De Binck | Kraaijvanger. (n.d.)). Thus, the expansion with additional floors is realised without harming the original exterior design. This was possible due to the locational knowledge of the developer Local and the extensive structural and material knowledge of Kraaijvanger as they also designed the original, fifteen years prior.

Significant qualities of the residential building are defined by its root in adaptive reuse. Thanks to the original function as office and printing press hall the edifice is characterised by high ceilings with concrete flutings, flexibility in floors and facades and a spacious entrance. Embracing these features led to a unique result. The dwelling typologies and plinth are also designed to honour the original building and enhance the visibility of structural elements.

Figure 15. Binck Eiland (VORM, n.d.)

In addition to the celebration of the industrial character and its subsequent qualities, the architecture contains several other important design elements. As the building is situated at an entry road to the Binckhorst, the large, street- side, glass plinth is retained but given a commercial function to give it a more vibrant image during working hours when housing would not. Additionally, with a mix of housing typologies a diverse resident composition is created. Circularity and social interaction were goals as well, which have been realised by reusing materials that had no use in the new function elsewhere and the inclusion of a spacious lobby where residents can meet each other.

According to the architecture firm's website the ambitions for this project can be summarised as follows: "The realisation of De Binck is exemplary for the way in which existing

buildings can be given a new lease of life by combining a programme and a design with a sustainability concept in line with social and economic ambitions to create value from existing materials and structures of quality, rather than produce waste." – (De Binck | Kraaijvanger. (n.d.)).

Circulation and entry

Figure 16 represents the floor plans of the ground and first floors of 'De Binck'. It makes clear the spacious dimensions of entrance and circulation plans more associated with large office buildings than residential architecture. The lofty entrance hall's height crosses multiple storeys, made possible by two main factors. Firstly, thanks to regulatory lenience and general appreciation, the facade is kept intact, avoiding a need for rigorous space optimisation. Secondly, by creative configuration of floor plans and typologies like maisonettes the first floor does not need circulation space, an uninterrupted space is provided as well.

Furthermore, 'De Binck' encourages stair use as it the stairs are very prominently situated in a hallway with natural light, preceding the lifts. The other two newly built towers have artwork in the hall. It is therefore qualifiable for a WELL certification.

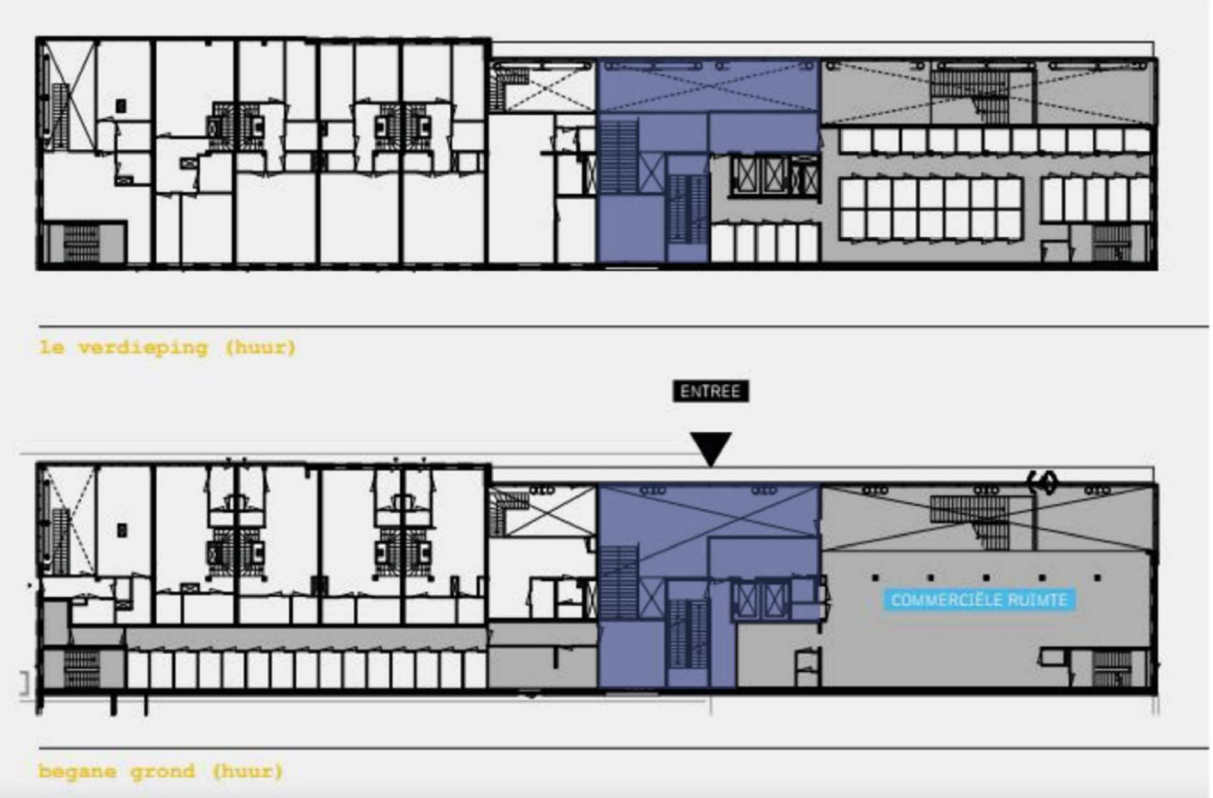


Figure 16. Analysis entrance areas De Binck, plans by Kraaijvanger. (VORM, 2017).

Architect interview

Hans Goverde – Kraaijvanger

Hans Goverde is partner and architect at Kraaijvanger. As an alumnus of Delft University of Technology, he worked for various architecture firms for several years before joining Kraaijvanger in 1995. As such he worked on numerous notable projects of which the most recent are the renovation of the provincial government building of South-Holland, the municipal office of Venlo, built with the Cradle-to-Cradle principle and the adaption of the SDU offices that was originally designed by him as well (Goverde, 2022. interview).

Kraaijvanger is a renowned architecture firm based in Rotterdam. As an active participant of the city's post-war reconstruction, they played a pivotal part in creating the city scape of today with more than 300 realised projects. Particularly interesting is the fact that their longevity resulted in them transforming their own projects. As Dyson et al. (2016) pointed out, research and knowledge about a building are crucial and led to several successful adaptive reuse projects of reconstruction era architecture.

Figure 17. Hallway with stairs to courtyard (Kraaijvanger, n.d.)

Also in other projects, the firm has striven to have a social impact. For office building 'De Rotterdam' a more gradual transition from public urban life to the intimate office realm is proposed and the municipal office in Venlo was designed with human health at the core. Research has even proven that this office building enjoys a significantly better work environment. Users are healthier and more productive thanks to the use of solely healthy materials, maximisation of natural light and greenery and stimulation of movement by designing smart routes (Goverde, 2022. interview).

For 'De Binck', important design features are the courtyard, the open plinth with commercial function, the grandeur and industrial elements as a courtesy of its former function and its diversity of dwelling types (Goverde, 2022. interviews). According to Hans (2022. interview), each time he visits, the courtyard is a lively place where neighbours interact. It can be entered through the collective hallway as depicted in figure 17, but also from the surrounding house's gardens and the parking garage underneath. On account of this garage, however Hans is unsatisfied with the car park in front of the building as he thinks it unnecessarily prevents additional quality.

Developer interview

Wicher Mol – BPD

Wicher Mol is an alumnus of the TU Delft as well. He works as a development manager for BPD, a firm with headquarters in Amsterdam and Frankfurt that specialises in urban area development but is also active in housing. As such they have been a mayor stakeholder in Dutch urban development with the construction of 375.000 homes since 1946. BPD is a construction fund that strives for affordable housing in liveable and inclusive cities by means of an integral approach that aligns societal challenges. Wicher Mol manages the urban area development of the entire Binckhorst, which involves new construction and transformation and over 1.500 houses.

He himself, however, is not particularly keen on transformation or adaptive reuse (Mol, 2023. interview). "With so many unknowns and uncertainties, transformation just costs too much time and energy". He is of the opinion that, financially, keeping the building in an office function would have been better as he recounted how the project was much more difficult than anticipated even though the original building was only 16 years old at the start. The building did not offer sufficient insulation to meet contemporary standards, for instance but the project team was fortunate enough to receive an exemption by the city council. This was crucial for project to be feasible. However, he did say that if it works the results are great. An intrinsic value of adaptive reuse, diversity, is one of his main social values in urban development.

Wicher Mol (2023, interview) claimed little assessment methods are known regarding social concept and even less are used. Contrary to the technical or 'hard' environmental sustainability,

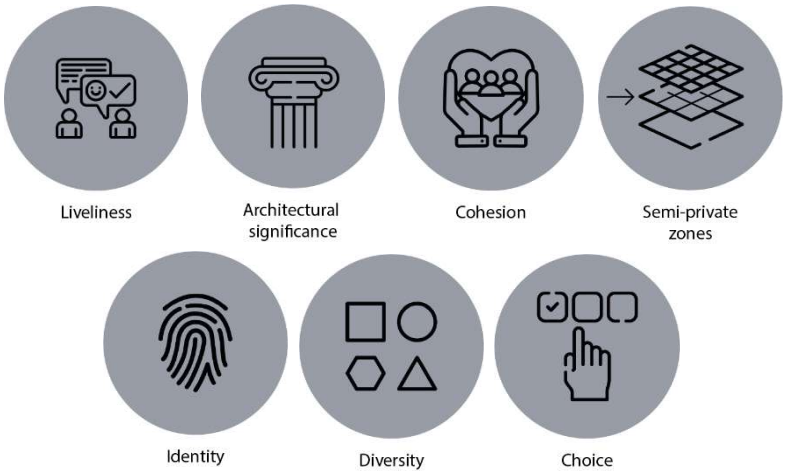
social sustainability is much more soft, harder to pin down. He said: "In the end you just want to do a great project, whether those things have to do with social sustainability or not." It perfectly illustrates how many choices in construction projects are based on gut feeling, trends and familiar solutions. It implies a need for more exposure of explicit social values and their subsequent benefit in order to be integrated in the practitioner's paradigm of a "great project".

Conclusion

According to the available data, the project is successful. Both the architect and the developer expressed their satisfaction with the result, though not these are the most reliable sources. The inner courtyard, however, is commonly used and functions as planned, providing interaction between residents. The extend to which people from the apartment buildings use the courtyard however is not known. Apart from a random visit, no monitoring is performed to check the effectivity of such an expensive feature. The entry is spacious, with a high ceiling, broad stairs and ample daylight, unchanged from the original building. This makes it a pleasant space to linger, have a casual conversation. Dwellings also benefit from high ceilings in addition to other industrial characteristics and unique floor plans, living up to the promise.

The idea to start the transformation of the entire Binckhorst area into a more residential neighbourhood with a project like this one makes sense. Through the adaption of existing buildings, the developers show us that the Binckhorst is able to be a residential place as it is, whereas full demolition and new construction would only emphasise the opposite and increase habituation time. Most design choices support the establishment of a residential neighbourhood as well. The plinths are lively through the large glass facade with commercial function and the entry hall at the front while the terraced housing creates a residential feeling with individual front doors and gardens. Yet, as Hans Goverde agrees, the car park in front makes it look like an office area which negates these effects.

All in all, the social quality has been made possible by lenient regulators that agreed to lower energy performance preserving the original facade and keep budget available elsewhere. Moreover, this project shows the difficulty of adaptive reuse and illustrates that even young buildings face unforeseen problems that lead to high costs.



4.2 De Raedt

Case description

At the corner of the stately Mathenesserlaan and Heemraadssingel, De Architektenkombinatie transformed a sixties former office building turned school into a modern apartment complex as commissioned by VORM. Across the 8 levels, 51 apartments were realised:

6 urban apartments on the ground floor. 50 – 110 m²

24 city apartments. Approximately 100 m²

18 avenue apartments. Approximately 130 m²

3 penthouses at the top, the seventh floor. 149 – 204 m²

The original building from 1972 served as an office to the Overseas Gas- and Electricity Cooperation before being turned into an Albeda College. The building is characterised by its construction in two separate phases. In 1967, the first commenced adjacent to the old office which was subsequently demolished, and the second phase was constructed thereafter, resulting in two conjoined structures. The new office was 30 meters high with 7 floors and a basement with vaults. It was designed by renowned Rotterdam based architects, the Kraaijvanger brothers.

Both the Mathenesserlaan and the Heemraadssingel are characterised by fin de siècle

Figure 18. Left: De Raedt, 2020 (Funda, n.d.); Right: OGEC office (top010, n.d.).

architecture like Jugendstil and Art Nouveau and are part of a protected city scape. The preservation of this city scape was one of the main ideas imposed by the city council. This resulted in the replacement of the horizontally oriented sixties façade with a new brick façade that has a classic vertical order. The architect, Dennis Hofman, on one hand likes the facts that in contrast to the initiation of this project, lately more appreciation exists regarding reconstruction era architecture as part of Rotterdam's history, but on the other agrees with the council in this case as he felt the architecture did not comply with a residential function. However, they still wanted to keep a certain tough or bold exterior in accordance with the original architecture. With central stairs and balconies at the singel side, the architecture is also in line with previous modern residential developments in the area from more recent decades (Hofman, 2022. interview).

Social design in other projects by ArchitektenKombinatie revolve around open plinths, improving street life and circulation space. Their social-ecological residential project '*Groene Mient*' is designed with a vision of a sustainable community with an autarkic fossil-free energy network, individual identity, diversity and communal spaces like gardens. Remarkably little of this social awareness is apparent in 'De Raedt's' design. Social principles are more focussed on individual

than collective space like the balconies, as Dennis Hofman (2022. interview) explains. Even though the gallery is designed with a semi-public transition platform between the front doors and the walkway, the main reasoning behind it was the optimisation of floor space. Nevertheless, when visiting the building it was clear that this space is used by residents to make it more distinct by adding plants, chairs and benches, stimulating interaction.

Circulation and entry

Marketing material claims that modernism is being embraced in reflection of Rotterdam's heritage, even though little remains of the original modernist design. Grandeur was a key conceptual element as well, the interior does not reflect this. The entrance is quite minimally dimensioned. Figure 19 demonstrates the open entrance space of the original building opposed to the compartmentalised current layout. Therefore, this and the words of the contributors should be critically assessed before drawing any conclusions.

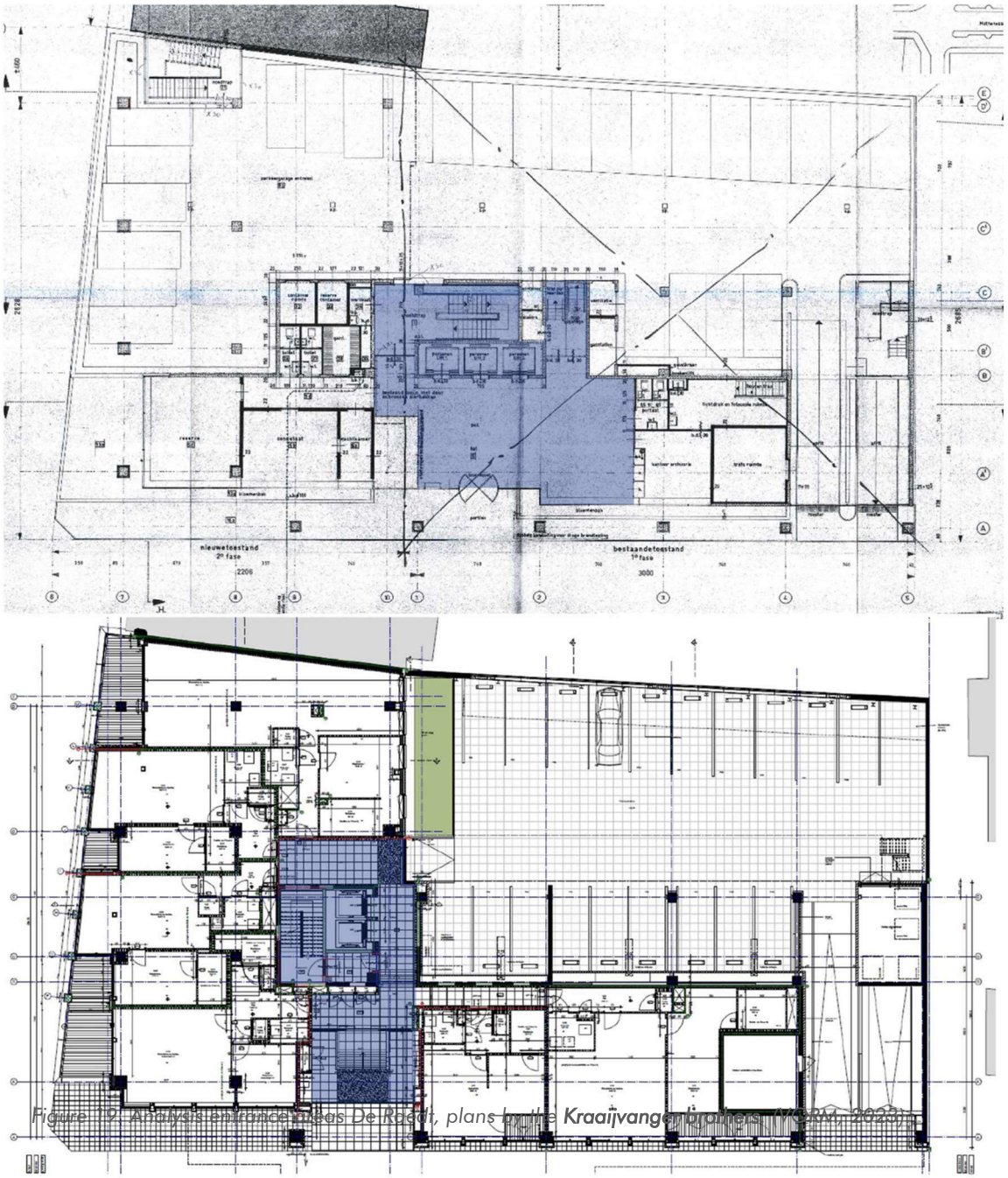


Figure 19: Analysis entrance Blaas De Raadt, plans by the Kraaijvanger Urbanists (MVRDV, 2022).

The new central stairs have no access to natural light, no music, art or natural design elements, while the lift precedes stairway in the general route. These two facts mean that the building fails to encourage stair use according to WELL certification. The gallery however does include more aspects of the well rating. Naturally, there is plenty of natural light and depending the apartment its stairs precede the elevator, while greenery is growing on the railings.

Costs

GFA total:	10.660 m²
GFA general areas:	3.285 m²
GFA apartments:	7.375 m²
UA apartments:	5.774 m²
NFA total:	9.403 m²
NFA general areas:	2.901 m²
NFA apartments:	6.502 m²

Figure 20. De Raedt, rearview, gallery entrances (Architectenweb, n.d.).

Total costs estimate:	€12.246.451
Costs/m²:	€1149
Lifts:	€113.423
Gallery:	€108.00
House price/m² ±:	€4.750

Gallery cost/ house price/m² = 108/4,75 = 22.74m²

This means the gallery is already profitable when 22.74m² net floor area can be won by it. Since the gallery services 6 floors, the gains are considerable.

Architect interview

Dennis Hofman - ArchitektenKombinatie

Dennis Hofman is one of the two lead architects of Bos Hofman ArchitektenKombinatie. With this firm, he has worked on many adaptive reuse projects, both monumental and not. He was also involved in sustainable collective developments such as 'De Groene Mient'. This 'social ecological' green city village, realised with high participation, was based on social diversity, individual expression, flexibility and collectivity.

Dennis Hofman (2022. interview) stated social sustainability is the most important architectural imperative. More than aesthetic or economic reasons, architecture is about providing people with a durable place they can live the way they want to live, including people they connect with. he also thinks adaptive reuse is a very important tool in sustainable development. In the interview he recounts of his experience of adapted or refurbished buildings that take less time integrating into the urban fabric and as such be accepted by neighbouring residents. It is in line with the 'familiar ugliness' by Remøy (Wilkinson et al., 2014). Adaptive reuse is also characterised by a high variety of housing typologies.

Furthermore, the value of the transformation lies in its scale, according to Dennis Hofman (2022. interview). The building has high ceilings, big free floor areas and a significant height advantage over the neighbouring buildings. This accentuated one of the core design principles, matching the grandeur of the location. These larger than usual dimensions of the structure were then supplemented with large floor to ceiling windows, high grade finishings, expensive materials like natural stone and a similar colour scheme.

Social sustainable design involves equitability, participation, the use of greenery and gradual transitioning from public to private, according to Dennis Hofman (2022. interview). He further states how social sustainability is vaguely assessed and often neglected for there is no market demand. But what is done is checking which concept is most in line with peoples wishes. How often includes collective spaces in his design as they are relatively easy to keep from budget cuts.

Developer interview

Harald Clabbers – VORM

Harold Clabbers is a senior project developer at VORM, one of the largest Dutch companies in housing construction. As head of the transformation department, he has worked on many adaptive reuse projects since he started there in 2010. He explains how he, with VORM, deducted that the latter produces twice as many emissions than adaptive reuse, even when accounting for lower energy efficiency. Moreover, literature supports this claim as already described on page 20 of this thesis.

New construction is more explicit. Calculating construction costs of adaptive reuse projects can be a capricious exercise, but regarding social sustainability in adaptive reuse over new construction, this is not the case. In the interview, it is suggested that economies of scale can be beneficial to the feasibility of adaptive reuse. The challenge in costs calculation is related to estimating the amount of refurbishment needed to bring existing buildings up to contemporary standards. Therefore, adapting similar buildings at the same time, or back-to-back, can simplify resource allocation and reduce the impact of estimation errors, while also providing transferrable insight in mitigating problems (Clabbers, 2022. Interview).

Structural consultants need to be more involved in the process for higher chances of adaptive reuse project success. Structural cuts are not only expensive, they also take a lot of time. Construction on hold for example. Hence, with early advice on structures these problems could be mitigated. Digitalisation is also important to chart potential causes for trouble as there are always unforeseen problems. The risk is high in adaptive reuse. The balance between creativity

and commercial value is extremely difficult. Lastly, the largest challenge in adaptive reuse lies in optimising the ratio between gross and net floor area (Clabbers, 2022. interview).

Adaptive reuse projects have several benefits as well. As the building is already embedded in the surrounding atmosphere and infrastructure, while recognisability is maintained, local residents sooner acclimate to it, in addition to a reduced chance of appeals to the plans. Other advantageous results of adaptive reuse mentioned in the interview are more unique houses. Projects show a higher diversity of floor plans and dwelling typologies with higher quality over new construction, which also increases potential for personal identification. Furthermore, compared to housing, most non-residential buildings have dimension premiums. Ceilings are generally higher, windows bigger, hallways grander while the structure is often stronger and more open. This makes a building more flexible and future proof too (Clabbers, 2022. Interview).

Conclusion

The evidence implies 'De Raedt' has not been financially successful. Promises made by marketing material are not fully accomplished. It spoke of grandeur and representing Rotterdam heritage, of which little is apparent in the end result. The original building was clad in expensive natural stone, in contrast to the new ordinary bricks, which might relate to the surrounding buildings, but do not correspond with the city's modernist architectural history. The fact that significant effort was put in the optimisation of sellable floor space, illustrated by the smaller entry area and the gallery, in addition to crumbling cladding materials within a year after completion, also indicates a financial struggle. Neither do the small entry and the gallery reinforce the ambition of grandeur, although as stated in the interviews, the gallery still expresses social value in other forms.

Two design choices seem the most plausible causes. In general, replacing the facade is the most expensive part of adaptive reuse projects, and structural changes are not only expensive but are also highly unpredictable It is surprising that an architect who claims holding social values in higher regard than aesthetics, literally championing it over facade materialisation to have made these choices as refraining from these options could have been a way of realising more of the initial promises within the project budget and a more social result. Perhaps the developers pressured him in fear of unsellable apartments.

4.3 Rotterdamse School

Case description

As the name already implies, the 'Rotterdamse School' originally functioned as a school, more specifically a Roman Catholic girls lyceum and is situated just adjacent to the Rotterdam city centre. However, the building conjointly housed a nunnery. Therefore, it also features, besides the distinctive high ceilings and large open spaces of schools, a chapel with an eye-catching bell tower. Designed by Jos Margry, the 'Rotterdamse School' was built in the New Objectivity style in 1933, thus making the building one of the earlier examples of modernist architecture in Rotterdam, although it still bears some anachronous elements like the sculpted architrave of the main entrance. Moreover, the listed monument is constructed with yellowish bricks and characteristic steel window frames.

Figure 21. Rotterdamse School, prior to construction of the front doors in the chapel. (EGM architecten, n.d.).

In 2018, EGM architects transformed the school building into 43 high-end residential units. The project focussed on the retention of monumental qualities like the leaded windows in the stairwells and procured to maintain its wooden floors in deliberation with the fire department. They even managed to restore original elements that have since disappeared. They further most notably restored the vestibule, but also uncovered authentic wooden ceilings and traced original paint colours from long gone window frames by searching for splatters on the adjacent bricks.

Figure 22.Renovated vestibule of the main entrance with transparent lift (left) and main entrance exterior with front doors on both sides (right) (EGM architecten, n.d.).

Contemporary additions were subsequently designed to minimally affect the authenticity of the

building. For example, a lift was installed to bring it to contemporary standards, but the developer invested in a glass cabin that automatically travelled to the first floor by default, which enables experiencing sightlines as originally intended (Van Schaik, 2022. interview).

The monumental building is actually an amalgam of different building typologies. The lyceum with classrooms makes up the largest chunk which is connected to a chapel with a tower as well as accommodation for the nuns and a gymnasium for the students. Moreover, as with most construction projects, the developers asked the architects to optimise the net to gross floor area. This situation led to a high variety in housing types and sizes that had been tailor made for their specific location, ranging from relatively small, under 80 m², apartments to quite vast maisonettes up to 155 m².

With creative use of different typologies and a detailed overview by the Pointcloud, floor space was optimised in 'De Rotterdamse School' without robbing apartments from having outdoor space. Overlapping maisonettes enabled the realisation of both street side front doors and balconies at the back while minimising circulation space. The apartments without a street connection are accessed by the renovated monumental stair wells. Lastly, all apartments came with the privilege of choice regarding the layout, without regulatory restrictions on account of monumental status. As Barentsen (2015) concluded in her thesis, this is the perfect combination of authentic elements in the collective space and freedom in the personal.

Thus, some measures to support of social sustainability can be identified in the 'Rotterdamse School'. To the design team it was important to establish a better connection with the street in front and with that the city. They felt that the long monotonous wall with its high classroom

Figure 23. Analysis entrance areas Rotterdamse School, plans by EGM. (VORM, 2016).

windows, starting approximately two meters from the ground, did little to attach this new residential building to the surrounding neighbourhood. Therefore, it was decided to give as many apartments as possible, a street side door, even though the floors did not match the street level. The significant costs caused by necessary structural alteration is justified by the quality of individual front doors and a livelier street. Lastly, a notable feature of the design was the free interior composition for the future residents. With this, they are able to take ownership of their homes and furnish it the way they want (Van Schaik, 2022. interview).

Circulation and entry

The circulation typology of the original building is maintained in in its current residential function. The four separate entry halls of each building component are maintained as common access and restored to their original state with leaded glass, wooden construction details and hardwood floors (Figure, 25). One measure to keep the project feasible despite these large unsellable common spaces has been the inclusion of maisonettes. By means of providing street entry to some of the dwellings, less space is occupied by corridors in addition to establishing a connection with the surrounding neighbourhood.

The Rotterdamse School has some elements that make it eligible for a WELL certification. Alongside the introduction of streetside front doors, the project had several different original staircases leading to apartments renovated, which included hardwood stairs and leaded windows. We have seen that these authentic elements are to the benefit of social sustainability (Barentsen, 2015). Leaded windows additionally cover two WELL criteria, namely artwork and natural light in the circulation space, which is very spacious as well. The monumental quality of the stairs lastly makes them more prominent than the lifts.

Architect interview

Arno van Schaik - EGM architecten

Arno van Schaik is architect and partner at EGM architecten. After graduating in Delft, he started working as an architect for Dam & Partners, before joining EGM in 2007. He names human experience as a core value in his architecture. Arno has made several designs for existing buildings, but the 'Rotterdamse School' was the first adaptive reuse project. However, with two prominent recently realised designs, the new main building for Radboud UMC and an extensive penitentiary near Brussels, Arno did pursue social impact with EGM through encouraging social interaction, health and building with the human scale. The Radboud hospital even features a flexible design that supports future modifications (*EGM.*, n.d.).

For 'De Rotterdamse School', the entire edifice was digitally modelled to Pointcloud, in an effort to subvert future problems from uncertainty and the predefined shell. This method had additional benefits. It made possible to more precisely chart how the school, nunnery, gymnasium and chapel were connected. Without this model it would have been harder and, most importantly, expensive to design the routing because the floors turned out to have significant unexpected height discrepancies. Likewise, it facilitated better optimisation of the floor plans in order to increase profit (Van Schaik, 2022. interview).

Arno further shared the compelling thought that the design of circulation typology could have serious repercussions on the facade. If the aim is to preserve the frontal facade, a designer needs to think how outdoor space is provided without attaching balconies to it. Hence, each apartment needs a connection to the rear facade for its balcony, which a corridor might render impossible or rethink the provision of outdoor space altogether. He also stated that function should follow the form in adaptive reuse in order to contain unnecessary costs.

Developer interview

Harold Clabbers – VORM

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Structural consultants need to be more involved in the process for higher chances of adaptive reuse project success. Structural cuts are not only expensive, but they also take a lot of time. Construction on hold for example. Hence, with early advice on structures these problems could be mitigated. Digitalisation is also important to chart potential causes for trouble as there are always unforeseen problems. The risk is high in adaptive reuse. The balance between creativity and commercial value is extremely difficult. Lastly, the largest challenge in adaptive reuse lies in optimising the ratio between gross and net floor area (Clabbers, 2022. interview).

Adaptive reuse projects have several benefits as well. As the building is already embedded in the surrounding atmosphere and infrastructure, while recognisability is maintained, local residents sooner acclimate to it, in addition to a reduced chance of appeals to the plans. Other advantageous results of adaptive reuse mentioned in the interview are more unique houses. Projects show a higher diversity of floor plans and dwelling typologies with higher quality over new construction, which also increases potential for personal identification. Furthermore, compared to housing, most non-residential buildings have dimension premiums. Ceilings are usually higher, windows bigger, hallways grander while the structure is often stronger and more open. This makes the building more flexible and future proof too (Clabbers, 2022. Interview).

Conclusion

This project resulted in the successful conservation of a rare Rotterdam inner-city monument. It appears the initial ambitions have been achieved. Sufficient financial capacity is indicated as well by substantial unnecessary reconstruction efforts, the special glass lift to preserve sightlines and the expensive structural alterations in favour of the new front doors. The latter equally captions the advantages of lenient regulations. The project furthermore teaches the importance of digital tools in reducing risks, improving collaboration and providing relevant early design input.

4.4 Noordsingel 185

Case description

This project features the adaption of a severely dilapidated former office building on the picturesque Noordsingel in Rotterdam. The 1970 building housed architecture firm H.D. Bakker and is designed by its eponymous architect, a prominent figure in Rotterdam's post-war reconstruction. After some years of vacancy, TOBA architects made a design for 12 houses as commissioned by developer Woonlofts. The concept development and construction, executed by adaptive-reuse and renovation experts De Nieuwe Norm, has been completed in 2019 (De Nieuwe Norm, n.d.).

Figure 24. Noordsingel after adaptive reuse (left) and before (right). (TOBA, n.d.).

The resulting dwellings are large and high-end, ranging from 127 to 177m². In order to house these with contemporary provisions, the building was stripped down until little more than the constructive shell remained. In return a white plastered façade was built with a more vertical orientation, while, though dimly, the original design still shines through. Moreover, part of the initially dead plinth now holds an apartment that establishes a connection with the street and a semi-public transitional alcove provides a more gradual progression into the building.

Architect interview

Martijn Tromp – TOBA architecten

Martijn Tromp is owner and architect at TOBA architecten, a firm he founded in 1998, even before his graduation in Delft. His varied portfolio features several renovation and adaptive reuse projects of whom several with monumental status. With his firm Martijn propagates the use of BIM in favour of pragmatic designs for modern and flexible buildings (TOBA, n.d.).

Martijn recounted how De Nieuwe Norm approached him for his digitisation expertise when development of Noordsingel 185 stagnated on account of structural problems amongst others. Subsequently, he made a digital scan of the building that resulted in a Pointcloud dataset. Afterwards several BIM models were produced in Revit as shown in figure 25 that enabled detailed insight to the problems and a feasible outcome after all (Tromp, 2022. interview).

One of the most severe difficulties was rooted in his wish to change the original corridor circulation typology. Due to the fact that the circulation core was not centrally located and the existing corridors were not thought to be preferable in a residential building for their lack of daylight, a new core was planned in the middle that efficiently provides access to each apartment without a need for corridors. However, the ensuing necessary structural alteration proved to be costly (Tromp, 2022. interview).

In Martijn's opinion, the original horizontal orientation of the façade was not ideal for housing as well. He therefore designed vertical pilasters to break up the characteristic horizontal bands of glass, but not completely eliminate them. As a result, the new building references the old, but mildly (Tromp, 2022). He does think that adaptive reuse has several benefits. The common dimension premium holds potential quality and adapted buildings need less time to find their place in the urban tissue than new construction. Working with existing buildings bring surprising results as well. Yet the reusage of existing constructions forms a major threat along with regulations difficulties.

Figure 25. From left to right: Pointcloud model, BIM model existing building, BIM model stripped down structure and BIM model new design (TOBA, n.d.).

Circulation and entry

The circulation core of this project was relocated to the centre of the building with great costs. This resulted in a lift typology combined with stairs. Figure 26 illustrates the changes made in this project, revealing an entrance area reduced in size in the new design. The entrance is now a corridor in spite of the original hall, the stairs take less space just as the elevator. Moreover, the resulting stairwell has significant daylight, but does not precede the lift or tick boxes of other WELL criteria and is thus not certifiable.

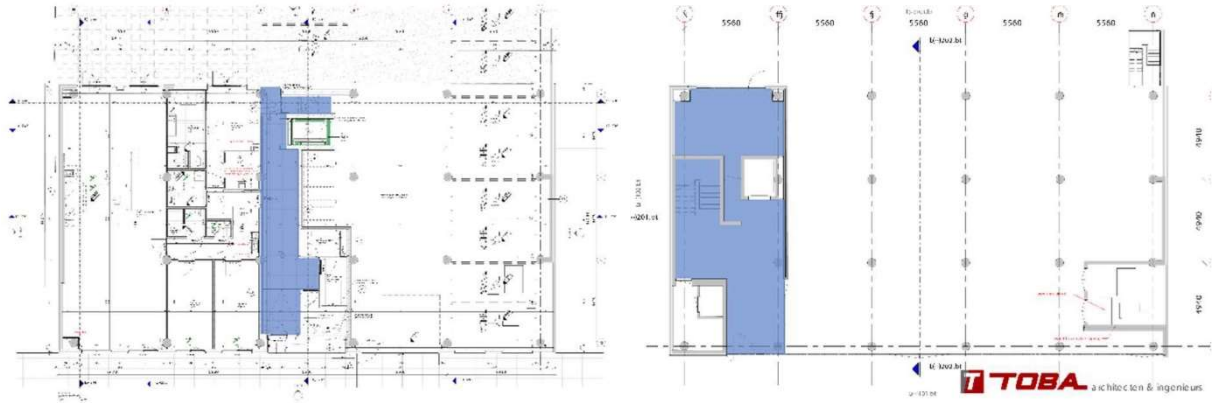


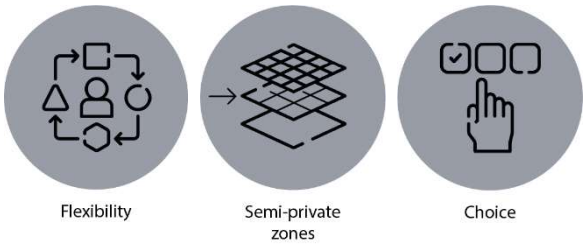
Figure 26. Ground floors with common entry space in blue, new (left) and old (right). (TOBA, 2017).

For actual social measures in circulation, the 12-unit complex was too small in the eyes of the architect. Only a small alcove for the main entrance is added to establish a gradual transition between public and private. In other projects, he did incorporate collective spaces to stimulate interaction and further recounted how left-over space in adaptive reuse projects sometimes ends up as collective social space. However, he mentioned social sustainability is a condition for these spaces to be functional, not the other way around. Additionally, with respect to social sustainability, he thinks people have to be defended from themselves. With ubiquitous design, you can prevent them from adding their own DIY projects (Tromp, 2022. Interview).

Conclusion

'Noordsingel' teaches few lessons of which the impact of digitalisation is the most important. With 3D modelling many uncertainty-related problems can be prevented. Furthermore, the change of the facade is a highly expensive measure, which has significant implications on the rest of the project. In combination with the pricey relocation of the circulation core, it puts pressure on other design options, such as social measures. The architect blames the limited scale of the project for its lack of social space, but abstaining from these expensive could have enabled a more inviting, spacious and lively entry than the present situation (figure 21).

Figure 27. Noordsingel collective entrance. (TOBA, n.d.).



Separate consultant interviews

Financial advisor interview

John Koks – IGG

As a specialist in building economics, John Koks works as a consultant in cost calculations for advisory firm IGG. He has been active in this field for over 25 years and holds an MBA in construction industry entrepreneurship in addition to his grade in architectural engineering. As such he has advised in numerous big construction projects throughout the Netherlands.

Naturally, John had much to say regarding construction costs. First of all, he think there is a too narrow focus on costs. Practitioners only look at the obvious options. Choices like facade materialisation are made too soon for instance. Social housing generally see steel window frames and rebated doors opposed to the private sector with more expensive wooden frames and flush doors. He doesn't think many people really care. Rebated doors are even better insulators as they are more airtight, but still budget cuts rarely involve them over social investments. He thinks people might prefer extra social space like an extended gallery instead (Kok, 2022. interview).

On adaptive reuse, he said that the problem regarding costs is not related to calculating costs of specific elements, but rather estimating how much has to be done. Even though adaptive reuse requires a whole different approach, especially regarding circulation, calculating remains quite straightforward. The end result of adaptive reuse however are more interesting housing typologies than with new construction.

This is also true for social measures. Their problem lies in their soft and inexplicit nature which often causes neglection. The measures that are realised most usually involve collective space like rooftop gardens or courtyards, but with widely varying characteristics and costs. As an important sidenote, John mentioned that the more expensive choices not only have a better result, but also have higher future value. For example, if a rooftop garden involves actual trees, a stronger structure is needed which parallelly provides the building with the option to expand or adapt in the future (Koks, 2022. interview).

Social return consultant interview

Gert-Jan Fernhout – REBEL GROUP

Gert-Jan Fernhout is consultant and founder at Rebel Group, where he works on social return on investment, amongst others. He specialises in urban development, real estate and consumer behaviour. In order to create support for social investment he searches for benefits and returns in places not directly obvious or related and makes them more quantifiable. He thus shows clients like governments that a more holistic approach is needed to ensure that investors have enough incentive to chase social value.

On that regard, Gert-Jan had several remarks regarding financial benefits of social sustainability in architecture although he did not acknowledge a strong connection to adaptive-reuse, apart from monumentality. Gert-Jan stated that high cohesion may lead to higher house prices and less health care costs by reduced loneliness. Furthermore, he explained how societies can be more efficient or productive when cohesion is high since people sooner go out to see a movie when, for example, babysitters are readily available. Furthermore, he talked about collective spaces like gardens that function as a social cohesive and explained that they most likely work if a common goal or mission is transferred clearly. However, he stressed that these measures are strongly dependent on the people you build them for (Fernhout, 2022).

Social design interview

Thysia Kleijwegt – Twynstra Gudde

Thysia Kleijwegt has been working for Twynstra Gudde as a consultant since she finished her Master of Science Management in the Built environment in 2017. As such she works on sustainable innovation of housing processes in pursuit of an improved built environment with more affordable housing. On that account, she expressly voiced her delight in succeeding to bring together sceptical neighbours and a group of immigrants in a flex housing project.

Social design entails an emphatic approach of your target group. When done right and social sustainability is improved, housing projects become more controllable which means there is less need for maintenance. Creative ideas that are compatible with your target groups help in bridging differences and finding common ground between them. A great example is the 'one day store' in which residents can set up shop for just one day to try out business ideas and see how the neighbourhoods responds (Kleijwegt, 2023).

Interaction can be used as a means to achieve cohesion, like she did in her flex housing project, but it should always come from solid initial research. Many architects just introduce a collective space like a community garden in their projects, but this only works when it is both well designed and organised and the target groups have been truly understood to profit from this. Whenever someone is tasked with its management, professionally or not, benefits increase, while the chances of dilapidation of the facility diminishes (Kleijwegt, 2023).

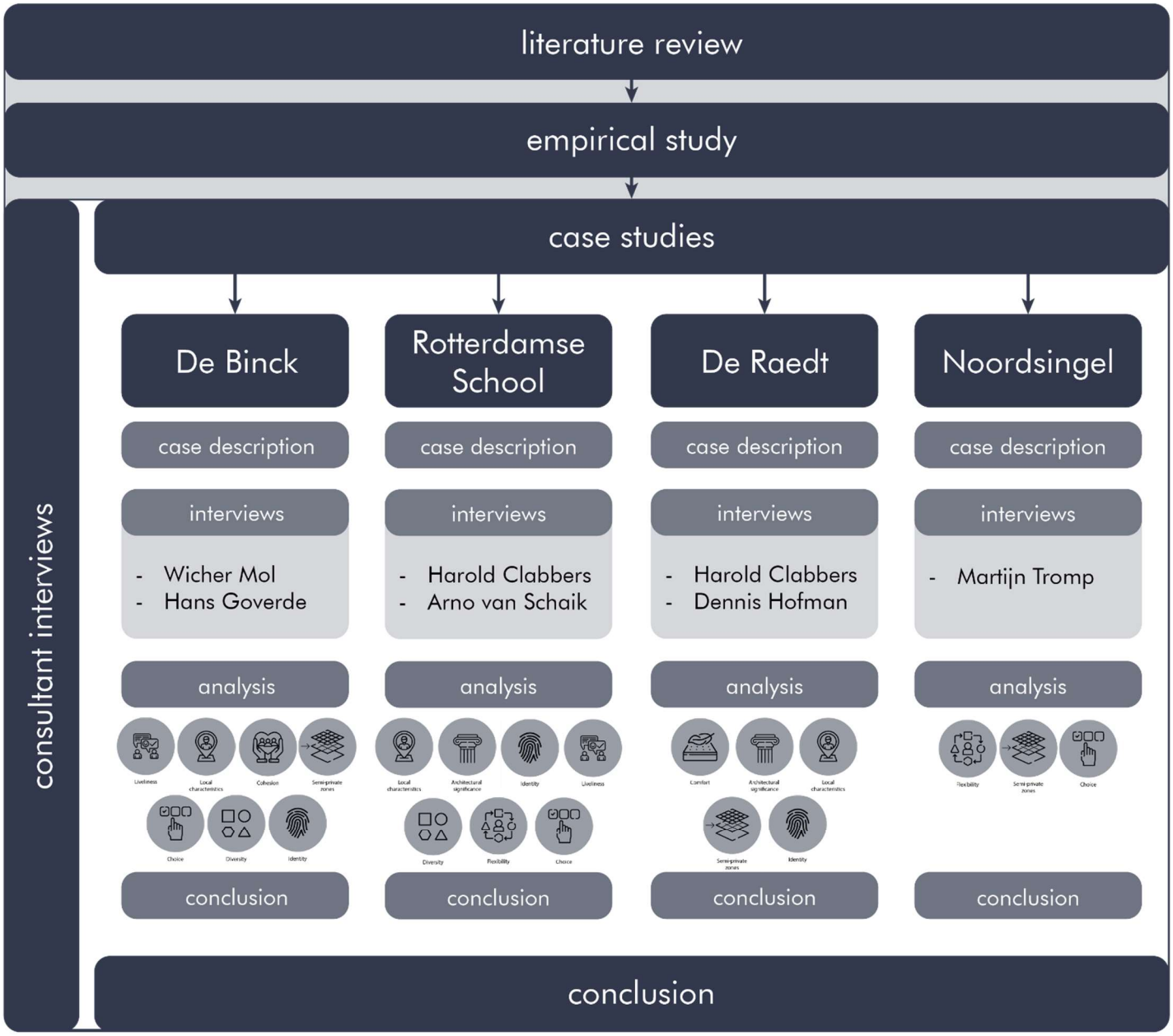
When asked about the housing crisis she said we need to think further then the classic pattern of simply increasing the housing stock to really tackle the problem. Not quite unlike the unnecessary expansion of road networks to solve congestion, it is a vicious circle, that needs to be diverted with alternative ideas instead, like new housing concepts, better cooperation between public and private parties and regulations that can react to unfamiliar circumstances (Kleijwegt, 2023).

Conclusion

From each of the three consultant interviews, one main idea stands out. John Koks most striking story relates to the obstinate attitude in regard to the definition of quality he observes amongst developers and construction companies in spite of more social investments. They have a set picture of what differentiates houses for renting and buying. The process of both 'De Raedt' and 'Noordsingel' implies a similar stubbornness with the need for a facade remodelling opposed to other design options. Similarly, the observation that architects often include measures just for the sake of trends and gut feeling, without proper initial research, is Thysia Kleijwegt's most important interview take away. Thirdly, Gert-Jan Fernhout proffered a method to quantify the economic value of cohesive communities by investigating collateral effects. His suggestions support potential subsidies in favour of social sustainability. In conclusion, these ideas suggest a reconsideration of building values in order to have a more inclusive future where budgets are well spent.

5. Empirical study research questions

This empirical research examines deliberate efforts of practitioners to improve social sustainability in adaptive reuse, but also latent effects of design choices. To this extent interviews are held with relevant stakeholders like architects and developers of the selected cases. Additionally, three neutral experts are interviewed to scrutinise the findings. The questions are derived from prior literature research, as it is crucial to define the theoretical framework of the studied subject beforehand (Yazan, 2015). The individual case studies are further informed by document analysis such as the comparison of old and new floor plans. Afterwards, the individual cases are compared in order to find both commonalities and disparities.



5.1 Adaptive reuse

Much more than architects are the developers aware of the challenges involving adaptive reuse. Where architects especially stated its relevance and potential qualities, developers stressed the difficulty of regulations and uncertainty in terms management, although without disregarding its value. All interviewees agree that adaptive reuse leads to more meaningful forms. Inherent qualities like spaciousness and potential authentic elements bring extra character to future residents in addition to better integration with the urban tissue. Furthermore, several interviewees discussed the positive effect on housing typologies that follow adaptive reuse.

In adaptive reuse function should follow form (Van Schaik, 2022). Finding the right match is to the benefit of the final costs as it results in fewer unforeseen problems and less need for demolition. Detailed analysis of the context is essential to this extent. The case studies show digitalisation technologies are helpful in this effort.

Despite monumental status, for 'De Rotterdamse School' it was allowed to add doors and enlarge windows in the frontal facade as the social result was deemed more important. 'De Binck' did not have substantial insulation, although built in 2005. However, it was deemed sufficient by the municipality , exempting the developers from improving the situation for the sake of project feasibility. This shows how a lenient attitude regarding regulations can be crucial in realising adaptive reuse projects. As a matter of fact, adapting buildings affords a huge environmental premium compared to demolition and new construction regardless. Interviewee Harald Clabbers (2022) explains how he, with VORM, deducted that the latter produces twice as many emissions than adaptive reuse, even when accounting for lower energy efficiency.

Other result of interest are the answers of Arno van Schaik (2022), Dennis Hofman (2022) and Thysia Kleijwegt (2023) on collaboration. Both van Schaik and Hofman describe how collaboration between different stakeholders is more difficult in adaptive reuse projects due to the need for flexibility in response to unexpected situations and actors refusing to take responsibility. Many problems eventually end up on the plate of the contractor. Better integration of the project team is opted to counteract this.

5.2 What is social sustainability and how it is affected adaptive reuse

Gert-Jan Fernhout (2022. interview) defines it as the desire to remain in your current dwelling and, not less important, being able to. This means that housing foremost is affordable. Additionally social sustainable housing provides flexible future proof measures such as divisibility and adaptability to cater to life changes, but numerous other reasons that stimulate attachment exist as well.

A noteworthy result from the interviews on this topic is the difference between architects and developers. Architects were aware of social sustainability the most and elaborated on its importance while developers were more practical as Wicher Mol's (2023. interview) quote about just wanting to do great projects implies (pp. 45). Harold Clabbers (2022. interview) for instance talked about avoiding dead ends in hallways and galleries for the sake of safety. The consultants were more in between. They expressed awareness but also included practical implications like economy and criticised architects for sometimes getting stuck in concepts, while those need proper analyses before being effective.

5.2.1 Why is social sustainability important

From the interviews can be concluded that its importance lies in having strong and satisfied, durable communities (Goverde, 2022; Hofman, 2022; Mol, 2023; Kleijwegt, 2023. interviews). This is present in the cases as neighbourhood connection (Rotterdamse School and Binck: front doors, open plinths and the latter also with common areas). Other answers on the importance of social sustainability involve the concepts liveability, decreasing loneliness, equity, health, circularity awareness, future proofing, and economic efficiency.

5.2.2 What is the relation between social sustainability and the built environment

Dennis Hofman (2022. interview) said social sustainability is the most important architectural imperative. More than aesthetic or economic reasons, architecture is about providing people with a durable place they can live the way they want to live, including people they connect with. This was also how Gert-Jan Fernhout (2022. interview) described the phenomenon. Additionally, according to the interviewees social sustainability entails diversity, liveliness or active plinths, a connection between buildings and the street, collectivity and a sense of pride, amazement and place attachment. Hans Goverde (2022. interview) describes this sense of place as having a feeling of ownership, being able to have a say in the composition of our environment. He mentioned as well that academic proof was found, regarding his design of the Venlo municipal office that suggests a focus on healthy building methods are a substantial contributor in decreasing sick leave for its employees. This means that architecture and urbanism are able to improve public health by using healthy materials and including natural elements like plants.

5.2.3 Relationship between social sustainability and adaptive reuse

Most interviewees (8 out of 9) noted the diversity of dwellings in transformation projects as one of its core qualities. As designers have to work with an existing structure it is more difficult to multiply or mirror typologies like often happens in new construction to simplify systems and optimise floor space. This results in more unique dwellings that are each specifically designed to fit its contexts. The dwellings are thus more distinct from one another in a single transformation project and more recognisable for their residents, with more meaningful forms. The by default higher diversity of typologies brings different people together as well while left over space is sometimes transformed to a social area (Tromp, 2022. interview). Moreover, the empirical study shows that practitioners recognise the social value of adaptive reuse. The larger dimensions of non-residential buildings provide additional quality, like high ceilings, to adaptive reuse projects opposed to new construction, according to both literature and the interviewees. The reduction of social disruption is underscored by the interviewees as well. Several interviewees have observed adaptive reuse projects to be accepted by local residents and integrate into the urban tissue much faster than new construction would (Clabbers, 2022; Hofman, 2022. interviews).

5.3 Social sustainability in practice of adaptive reuse

To start things of, team SUM, who participated in the 2022 Solar Decathlon Europe (SDE), worked from the ambition to contribute to a symbiotic urban future by bringing environmental, economic and social sustainability together. Figure 13 shows the design SUM made for the SDE as a result. With a top-up of two stories that equally serves as a battery and an energy generator, the original tenement flat, accounting for 11% of the Dutch housing stock, is both extended and powered. With addition of significant insulation, the transformed building is able to reach climate positivity as such (SUM, n.d.).

Figure 13. Tenement flat transformation design for the 2022 Solar Decathlon Europe (SUM, 2022).

The design presents several initiatives in respect to social sustainability, which mostly originate in public participation meetings. Firstly, the interiors are fitted with flexible furniture to increase space where needed, proving that flexibility is not impossible in transformation. The circulation is changed to feature a gallery that supports interaction and greenery while also providing future proof accessibility with an elevator. The previously dark plinth is activated too. With public functions like a restaurant with a community or a makers space for the residents to work in, it now promotes a livelier neighbourhood while stimulating interaction and a sense of ownership as well (SUM, n.d.).

Because the most effective solution for applying insulation to existing buildings is exterior cladding, the original façade is completely covered. Therefore, lightweight strips of brick are used to mimic the building's authentic identity and Dutch brick building tradition. A perfect solution. They are not only made from recycled bricks and less pollutive then actual bricks, but also take less space and their slender, lightweight composition enables the structure to bear the added top-up mass. Most importantly though, the strips enable prefabrication of wall elements. Resultingly, the full transformation process can be achieved in a month's time, which diminishes the disrupting effect it has on the residents (SUM, n.d.).

5.3.1 Which tangible architectural elements affect social sustainability?

The interviewees unanimously discussed the use of comparable measures to the benefit of social sustainability in their projects. They spoke of interaction through circulation typologies and collectivity concepts like community gardens and courtyards after discussing social sustainability. According to Dennis Hofman (2022. interview) this is because they are relatively easy to keep from budget cuts. He further named equitability as an important driver behind his circulation

design as well. Thysia Kleijwegt (2023. interview) and Gert Jan Fernhout (2022. interview) emphasised engaging residents in collective activities with a common goal to improve its effectiveness.

Both additionally stated that interaction can be used as a means to achieve cohesion, but it should always come from solid initial research regarding the intended target groups . Many architects just introduce a collective space like a community garden in their projects, but this only works when it is both well designed and organised and the target groups have been truly understood to profit from this. Whenever someone is tasked with its management, professionally or not, benefits increase, while the chances of dilapidation of the facility diminishes.

Several interviewees noted the diversity of dwellings in transformation projects as one of its core qualities. As designers have to work with an existing structure it is more difficult to multiply or mirror typologies like often happens in new construction to simplify systems and optimise floor space. This results in more unique dwellings that are each specifically designed to fit its contexts. The dwellings are thus more distinct from one another in a single transformation project and more recognisable for their residents.

In the 'Rotterdamse School' they renovated leaded windows in stairways and brought the school's main entrance back to its original state. 'De Binck' saw little changes to its main entrance and circulation as well, thanks to the architect's appreciation for the grandeur that the original office entrance provides. Despite this, one significant intervention has been done. A wide stairway now connects the lobby with the inner collective courtyard that establishes a relation between the adaptive reuse apartments and the single-family homes behind.

The other two cases, 'De Raedt' and 'Noordsingel' do feature serious alterations to the routing and the original entry space. The former had two stairs replaced with a more centrally situated one in combination with a gallery to optimise net floor space while for the latter, the original corridor was changed to a lift typology because the architect deemed corridors unfit. Unfortunately, both choices led to high construction costs. Moving the location of a staircase causes the need to cut through mayor structural elements where a new one must arise and additional load bearing elements where it is removed. Especially cutting through structure is expensive, even more so where concrete is involved. Nevertheless, with 'De Raedt' significant profit was gained by attaching the building with an external gallery as a means of circulation.

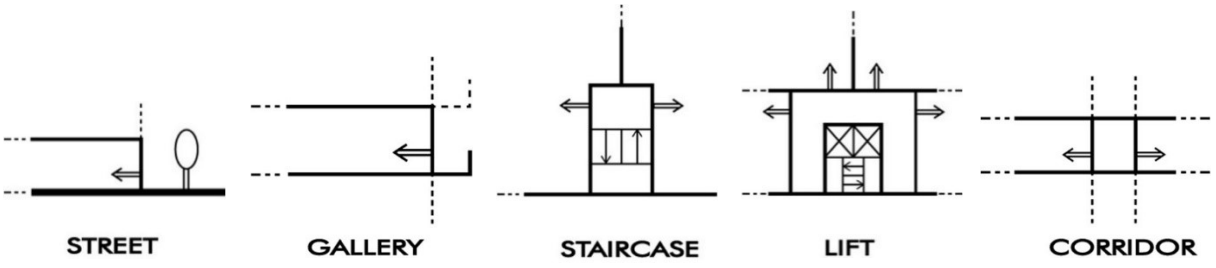


Figure 12. The five circulation typologies as defined by Leupen and Mooij (2012) (Own image).

Other elements found in the case studies and mentioned in interviews are greenery, avoiding dead ends, active plinths, street-side front doors or likewise gradual transitions from public and private, authentic elements, adaptability or individualisability. 'De Binck' features a collective garden at the rear, surrounded by private back gardens belonging to adjacent terraced housing that form a perimeter city block. The project also contains commercial space in the plinth and authentic elements preserved from its industrial origin. Residents of 'De Raedt' makes use of a gallery with planting, offset from the facade by a meter. This allows them to claim the connective platform between their front doors and the gallery as a semi-private personal space. By means of adding front doors to the closed plinth 'De Rotterdamse School' achieved a connection with street life.

'De Binck', 'De Raedt' and 'Noordsingel' case studies show that practitioners recognise this value. The first creates this with a front garden as a personal space in between the collective area and the house. The latter two use a gallery extension and a transitional alcove for the front door respectively. Yet, the meagre result of 'Noordsingel' suggests that, in spite of this recognition, funds were insufficient for an adequate result.

Arno van Schaik (2022. interview) also shared the compelling thought that the design of circulation typology could have serious repercussions on the facade. If the aim is to preserve the frontal facade, a designer needs to think how outdoor space is provided without attaching balconies to it. Hence, each apartment needs a connection to the rear facade for its balcony, which a corridor might render impossible or rethink the provision of outdoor space altogether. The front doors solved this in the case of 'De Rotterdamse School'.

5.3.2 How are social concepts assessed?

In his interview Hans Goverde (2022. interview) expressed his concern regarding a lack of quantification or assessment methods with respect to social sustainability, as he thinks it would be helpful in realising it. Other interviews indicate this absence as well. Neither does any interviewee practice a form of effectivity monitoring concerning social sustainability more formal than a random site visit when in the neighbourhood.

According to the interviewees, decision making with regard to social sustainability is largely based on intuition. When initiating a project, through a tender application or otherwise, actors work on an overarching concept or metaphor, based on the client's brief, to give the ensuing design a direction that informs future decision. Some elements from the brief are mandatory and need to be included, but many goals can be discarded over other ambitions with a clearer backing by regulations. Dennis Hofman (2022. interview) therefore suggests that the desired balance of the three sustainability components of figure 6 should be achieved with policies and subsidies.

Regarding adaptive reuse, cultural values are embedded in regulations and judged by an aesthetics committee or 'welstandscommissie' in The Netherlands. Social values do not have this privilege, which prevents easy retention in case of possible demolition. For example, the Woningwaarderingsstelsel (WWS), a Dutch tool to calculate maximum rental prices, includes many aspects like surface area of individual rooms, storage space, private outdoor space and even a monumental premium, but it does not incorporate social amenities like collective space or semi-private areas.

Gert-Jan Fernhout (2022. interview) actually works on the quantification by searching for economic effects caused by these phenomena, usually commissioned by governmental bodies. With this quantification he provides grounds for possible subsidies amongst others. He mentioned a boost in economic efficiency as a possible outcome of social cohesion. Whenever a good relationship with neighbours exists, the chance rise people find a babysitter and have the opportunity to go out and see a movie for example. Cohesion can also lower the pressure on the healthcare system with informal care. He further expects house prices to be relatively higher in cohesive neighbourhoods as people are less willing to move and maintenance costs drop too. Thysia Kleijwegt (2022. interview) also noted a relationship between cohesion and controllability, which decreases maintenance needs thanks to more proactive and careful residents. Consequently, these benefits present a basis for the quantification of social sustainability.

5.3.3 Conclusion

As hypothesised, the case studies present the use of comparable measures to the benefit of social sustainability in their projects. Many spoke of interaction through circulation typologies and collectivity concepts like community gardens and courtyards after discussing social sustainability. Equitability is further named as an important driver behind circulation design. Other social

sustainability principles are greenery, avoiding dead ends, open plinths, street-side front doors, authentic elements, flexibility, local identity, adaptability or individualisability, front doors or likewise gradual transitions from public to private.

Corridors are disadvantageous in residential architecture. Galleries and street access typologies however have the capacity to increase liveability and interaction in residential buildings, also increasing safety with social control, while streetside front doors are equally useful in transitioning to a more residential atmosphere. Especially when given additional quality like in 'De Raedt' and SUM, galleries can shed its negative connotation and increase interaction, in addition to providing equitable accessibility and financial benefits. To finish, elevators make dwellings more equitable and future proof, but only exist in combination with the others, barring 'street'.

Furthermore, social sustainable design is most effective when stimulating optional activities, by encouraging a common mission, but always stemming from proper target group research. Lastly, actual assessment methods of social sustainable design concepts are lacking. Their implementation largely follows trends in line with the overall preconceived building concept and is mostly based on gut feeling, which strains potential realisation. However, economic efficiency, higher house prices, less health care and maintenance costs as benefits of cohesion can be used order to quantify social sustainability.

5.4 Costs of adaptive reuse and social sustainability

5.4.1 Making costs explicit

Costs are also less easily calculated in adaptive reuse projects than new construction. This is mainly caused by uncertainty, which both developers indicate as the reason why they are harder to realise. In order to minimise this, demolition should be minimised according to John Koks (2022. interview). Yet, he also explains how calculating specific costs related to adaptive reuse is straight forward as long as the building is well charted. Making costs explicit in adaptive reuse thus relies on holistic knowledge which is most easily achieved by digitalisation.

In the end the biggest issue for working with an existing building is floor plan optimisation. Although every project faces this, with adaptive reuse it is especially urgent as the floor plan needs to be tailored to an existing one, built for another purpose. This needs creativity and extra man hours to work. Hence it is relevant to make the distinction between development costs and construction costs as the two are wholly different things. Construction costs could be lower in transformation, but development costs are generally much higher. Both architects, consultants and developers themselves need more time to conform to regulations, tailor floor plans and mitigate unforeseen circumstances (Koks, 2022. interview). Especially the latter causes strife between stakeholders and cracks in their cooperation, which ultimately lead to even more costs (Van Schaik, 2022. interview).

When comparing the two cases with remodelled facades with the two without, it is immediately that in the latter two cases ('De Binck' and 'De Rotterdamse School') the common entrance was kept in its original state, whereas the others ('De Raedt' and 'Noordsingel') dramatically changed the entry to smaller dimensions. This diminishes opportunities for staying over merely passing through. Even though, naturally, other explanations can be found, it suggests that the costly facade transformations increased the need for thorough floor space optimisation.

In respect of social sustainability, the interviewees were clear. Costs are explicit. The challenge rather lies in determining what the output and effectivity of adding social value is (Koks, 2022; Kleijwegt, 2023. interviews). As stated in chapter 4.1.2, it can be made more explicit by quantifying economic benefits. John Koks (2022. interview) tells developers usually make the more obvious and standard choices when distributing budget, while he thinks that they are not necessarily the best. For example, social housing generally sees steel window frames and rebated doors opposed to the private sector with more expensive wooden frames and flush doors. He doesn't think many people really care and might prefer extra social space like an extended gallery. Rebated doors are even better insulators as they are more airtight, but still budget cuts rarely involve them over social investments. Choices like facade materialisation are made too soon as well, to which Dennis Hofman (2022. interview) agrees. Social sustainability is more important than high-end materialisation.

5.4.2 Financial benefits

Thanks to limited emissions, adaptive reuse yields additional financial benefits. Along with the potential to be part of the solution to the nitrogen question described earlier, adaptive reuse can find advantage in carbon reduction programs. Harald Clabbers (2022. interview) explains how new construction is twice as pollutive. This increases project feasibility in addition to potential governmental subsidies.

Gert-Jan Fernhout (2022. interview) and Hans Goverde (2022. interview) explain how social sustainability brings economic benefits on various levels of economy. Simple residential satisfaction impacts house prices (Fernhout, 2022. interview). Health is related to economic efficiency and, of course, health care demand. Cohesion equally enhances efficiency. Whenever more friendly relations with neighbours are present, it is more likely that people, for example, babysit. In turn, this accommodates higher economic activity as a visit to the cinema becomes

easier (Fernhout, 2022. interview). Likewise, cohesion increases the chance people are cared for by neighbours instead of nurses and take pressure off the economy.

Moreover, social sustainability decreases maintenance costs. Communities with higher cohesion are more likely to help each other in individual maintenance work and satisfied, proud residents sooner maintain their environment themselves. Thysia Kleijwegt (2023. interview) stated that cohesion makes projects more controllable, which reduces costs associated with nuisance and maintenance. Lastly, social sustainable values have the capacity to be used in marketing strategies (Koks, 2022. interview).

Financial interest play a big part in considering circulation typologies. As stated before, optimising the net to gross floor area ratio is essential in any construction project, but in adaptive reuse its more difficult, being confined to an existing structure. The case study of 'De Raedt' as well as SUM's SDE design show how galleries can play a major part in this effort. Galleries do not add to the gross floor area, which is to the benefit of gross to net area and to the absolute area maximum, providing extra space for living in combination with circulation. However, construction costs and, in particular, the potential negative impact on building valuation cannot be neglected. In 'De Raedt' a lightweight gallery sufficed, whereas other buildings might need extra structural measures in order to support its weight, causing the costs to surge (Koks, 2022). Still, 'De Raedt' proves that galleries work in high-end residential projects contrary to its general association with social housing.

5.4.3 Conclusion

Transformations apparently include to many unknown variables to make a valid generalisation. Therefore, case studies shouldn't be used to study cost calculation for elements of future projects but rather function to shed light on cost mechanisms in a broader sense and indicate a relationship with the construction process as a whole. In that sense, the cases studies indicate that a costly facade remodelling can induce a need for rigorous space optimisation to increase profits but reduce collective space that might host interaction. Additionally, the interviews imply that choices are too often informed by mere habit, which means, in the end, a better means of making decisions is required to spend budgets more wisely.

Furthermore, the interviewees unveil numerable examples of economic benefits. Unfortunately, a discrepancy exists between the in- and output of these benefits, which leads to limited investment that make it happen. Therefore, a more holistic approach is needed that takes all benefits in consideration in order to enable fair distribution of eventual benefits such as subsidies or tax allowance.

6. Empirical results

This chapter relates the empirical findings of chapter 4 to the literature of chapter 3 according to the 4 research questions.

6.1 What is adaptive reuse?

The literature suggests unwillingness amongst practitioners in regard to engaging in adaptive reuse projects. Apparently, too many obstacles exist as opposed to new construction. The interviewees concur. Adaptive reuse poses more risk thanks to greater difficulty and high levels of uncertainty concerning the state of material degradation, lead bearing capacities and inflexibility, amongst others, in contrast to more controllable new construction.

Still, the interviewees recognised its potential qualities over demolition and new construction such as reducing social disruption and resource use in accordance to work of Bullen and Love (2011). It needs less time to integrate in the urban context. This is also captured in the term 'familiar ugliness' by Remøy that explains how even widely considered ugly buildings have the potential to be successfully refurbished (in Wilkinson et al., 2014). Consequently, surrounding buildings benefit as well.

Additionally, building appreciation can see significant benefits of adaptive reuse. Both literature (Langston et al., 2007; Plevoets & Van Cleempoel, 2019; Brunone et al., 2021) and the interviewees agree on the cause. The premium qualities of existing buildings and the required design expertise lead to unique architecture in a more meaningful urban form. The observed reluctance is therefore curious, especially since the developers express their desire to just do great projects. Apparently, financial motives still prevail, but could equally mean that not enough benefits are explicit.

6.2 What is social sustainability and how is it affected by adaptive reuse?

The literature and empirical study both show social sustainability entails interaction, diversity, liveliness or active plinths, a connection between buildings and the street, collectivity and a sense of pride, amazement and place attachment. Hans Goverde (2022. interview) describes this sense of place as having a feeling of ownership, being able to have a say in the composition of our environment, which affirms Atanda's Delphi study (2019).

The list of literature that explains the positive health effects of nature and urban greenery is near endless. Ulrich (1983; et al., 1991) most prolifically proves how plants are a source of stress relief and other health benefits. Hans Goverde (2022. interview) mentioned as well that academic proof was found, regarding his design of the Venlo municipal office that suggests a focus on healthy building methods are a substantial contributor in decreasing sick leave for its employees. This means that urbanism and architecture are able to improve public health by including natural elements like plants.

The literature brought forth the notion that individuality, identification and recognisability are all essential parts of social sustainability. Several interviewees noted the diversity of dwellings in transformation projects as one of its core qualities. As designers have to work with an existing structure it is more difficult to multiply or mirror typologies like often happens in new construction to simplify systems and optimise floor space. This results in more unique dwellings that are each specifically designed to fit its contexts. The dwellings are thus more distinct from one another in a single transformation project and more recognisable for their residents.

Furthermore, the empirical study shows that practitioners recognise the social value of adaptive reuse. The larger dimensions of non-residential buildings provide additional quality to adaptive reuse projects opposed to new construction, that leads to residential satisfaction, according to both literature and the interviewees. The reduction of social disruption mentioned by Bullen and Love (2011) is underscored by the interviewees as well. Several interviewees have observed

adaptive reuse projects to be accepted by local residents and integrate into the urban tissue much faster than new construction would.

6.3 How do practitioners incorporate social sustainability?

The way in which the interviewed practitioners include social sustainability in their projects touches the conclusion on social sustainability in the literature study. In addition to the passive effects of adaptive reuse, with collective spaces they actively aim to stimulate interaction by provoking random encounters, in order to fortify cohesion. This is most pursued with collective courtyards or gardens.

Especially in collective spaces, foremost entrances, are authentic elements beneficial to home satisfaction according to Barentsen (2015). In the 'Rotterdamse School' they recognised this quality. Without altering circulation routes, they renovated leaded windows in stairways and brought the school's main entrance back to its original state. 'De Binck' saw little changes to its main entrance and circulation as well, thanks to the architect's appreciation of the grandeur that the original office entrance provides. Despite this, one significant intervention has been done. A wide stairway now connects the lobby with the inner collective courtyard that establishes a relation between the adaptive reuse apartments and the single-family homes behind.

The other two cases, 'De Raedt' and 'Noordsingel' do feature serious alterations to the routing and the original entry space. The former had two stairs replaced with a more centrally situated one in combination with a gallery to optimise net floor space while for the latter, the original corridor was changed to a lift typology because the architect deemed corridors unfit. Unfortunately, both choices led to high construction costs. Moving the location of a staircase causes the need to cut through mayor structural elements where a new one must arise and additional load bearing elements where it is removed. Especially cutting through structure is expensive, even more so where concrete is involved. Nevertheless, with 'De Raedt' significant profit was gained by attaching the building with an external gallery as a means of circulation.

Combining these paragraphs, it can be concluded that honouring the original state of entry and circulation is beneficial to an adaptive reuse project, in spite of the demand for floor plan optimisation. The oversize of circulation is beneficial to both certainty and social sustainability. A large lobby creates a more active plinth, beneficial to sense of security, excess space is needed for residents to linger, strengthened by authenticity, and increases a buildings flexibility. When remembering the work of Dyson et al. (2016), but also the interview with Koks (2022) this conclusion is particularly relevant. They already argued to minimise change in adaptive reuse design to tackle costs and uncertainty issues as described above.

Coincidentally, these two projects that changed the circulation, 'De Binck' and 'Noordsingel' saw its facades remodelled completely. As stated in chapter 3.4, Mackay (2008) concluded that facade renovation or reconstruction is the largest cost component of adaptive reuse projects. It is therefore of particular interest to note that these two cases with remodelled facades dramatically reduced the dimensions of the entrance as well. Even though, naturally, other explanations can be found, it suggests that the costly facade transformations increased the need for thorough floor space optimisation, which resulted in smaller circulation space.

Hoogland (2000), Foth and Sanders (2005) and Huang (2006) each conclude gradual transition spaces from public to private ease social interaction. When using these spaces, people are comfortable and more open to conversation. 'De Binck', 'De Raedt' and 'Noordsingel' case studies show that practitioners recognise this value. The first creates this with a front garden as a personal space in between the collective area and the house. The latter two use a gallery extension and a transitional alcove for the front door respectively. Yet, the meagre result of 'Noordsingel' suggests that, in spite of this recognition, funds insufficient for an adequate result.

Arno van Schaik (2022. interview) also shared that the design of circulation typology could have serious repercussions on the facade. If the aim is to preserve the frontal facade, a designer needs to think how outdoor space is provided without attaching balconies to it. Hence, each

apartment needs a connection to the rear facade for its balcony, which a corridor might render impossible or rethink the provision of outdoor space altogether. The front doors, as part of a maisonette typology solved this in the case of 'De Rotterdamse School'.

Similarly, Huang (2006) found that common access and circulation routes increase opportunities for casual conversation, further enhanced by visually pleasing elements like plants and water as well as street furniture. Especially where the routes cross, at nodes, is social interaction apparent. She also mentions that social interaction in circulation routes is more likely when people have enough space to have a conversation without blocking the way. Both 'De Binck' and 'De Rotterdamse School' enjoy spacious entrance halls inherited from their non-residential ancestor. The latter is serviced by broad school stairwells too. In combination with the authentic elements, this means adaptive reuse brings notable quality over new construction.

Semi-public, urban, open spaces positively influence interaction, sense of place and neighbourliness, but their impact increases exponentially with proximity (Huang, 2006). They should be close not grand. Conversely, Martijn Tromp (2022. interview) states that adaptive reuse projects are often too small to incorporate collective gardens or courtyards as he does in other projects. This argument is in reality not relevant. First of all, a smaller scale suggests a need for collective space of a smaller scale instead of none at all. Additionally, 'De Binck' shows how a 'small scale', single building transformation can be expanded with new construction as well to generate more sustenance for such goals.

The 5 typologies of figure 12 each have different characteristics in reference to social sustainability. Both 'De Binck' and 'De Rotterdamse School' embody the notion that many front doors lead to better urban space. They incorporate them in order to advance the transition from an industrial to a residential area and to integrate a previously non-residential building in a residential neighbourhood through a street connection respectively. Karssenberg et al. (2016) elaborate on this principle as a key ingredient in liveable, human-scale cities, in addition to the previously mentioned work of Gehl (2010), Hoogland (2000) and Jacobs (1961).

'De Binck', thus, is perceived as a catalyst for urban development. It aims to transform the Binckhorst from a commercial and industrial area to a more residential and mixed-use neighbourhood. Adaptive reuse was essential in this regard. Otherwise, the impossibility of a Binckhorst residency would be nothing but emphasised. By explaining how adaptive reuse is better suited to revitalise urban areas than demolition and new construction, similar conclusion are drawn in the work of Dyson et al. (2016) and Aigwi et al. (2019).

The case studies also showed how direct street access is used to increase liveliness in urban environments, and muster a sense of identification to the residents themselves, especially when combined with front garden, which additionally provide semi-private space to the benefit of social interaction.

Galleries can have similar qualities. Gehl (1987) and Jacobs (1961) both argue that they, if generously proportioned create additional street life that brings safety and liveliness. Galleries are equally capable in optimising floor space. 'De Binck' brings both together with its gallery by including a semi-private transitional space between the front doors and the gallery that functions as a small front garden or balcony.

Staircases are fundamental in healthy buildings as apparent in WELL certification assessment by stimulating walking. However, they are not equitable when not combined with lifts. Botta (2005) explains, as described before, how they make buildings future proof like done by SUM. They also inefficiently take much interior space. 'De Rotterdamse School' ignores this inefficiency in reverence of the authentic qualities found in the circulation space. As the thesis by Barentsen (2015) concludes, authentic or monumental qualities support residential satisfaction and social cohesion.

The last typology, corridors, is not suitable for residential architecture in the eyes of Martijn Tromp (2022. interview). Even though corridors function comparably to galleries, their lack of

natural lights prevents them from being a place to linger, i.e., interact. The three discussed certificates, WELL, BREEAM, LEED, all stress the importance of natural light in circulation space. Moreover, corridors are not likely to be generously proportioned. On that account, galleries have the advantage of not being included in gross floor area counts, increasing the possibility of extra semi-private space like 'De Binck' and, according to Huang (2006), subsequent interaction.

It furthermore appears that among architects the impression exists that people wreck their designs when given the chance. Both Hans Goverde (2022. interview) and Martijn Tromp (2022. interview) use the 'Gamma fence' analogy to illustrate how residents mark their territory by building fences that cause catastrophic style clashes whenever no preventive measures have been established. To the contrary, many architects would nevertheless disagree that architecture is an artform, wherein form alone is the purpose. Rather, architecture distinguishes itself by giving form to the functionality of human needs. Adolf Loos (1910, pp.10) describes this beautifully in his essay 'Architektur': "The work of art is responsible to none; the house is responsible to everyone."

Comparably, when Gehl (2010) makes a case for quality urban space in his book, quality is less about aesthetics than choice, protection and opportunity. Ubiquitous design is also unlikely to foster cohesive communities (Tostões & Fereira, 2021) or create cosy places (Sennett, 2018). Architect Dennis Hofman (2022. interview) underlines this statement. He criticises colleagues who prioritise aesthetics over social value as he thinks social sustainability is the most important architectural imperative. More than aesthetic or economic reasons, architecture is about providing people with a durable place they can live the way they want to live, including people they connect with. Gert-Jan Fernhout (2022. interview) described the phenomenon similarly. Even Hans Goverde (2022. interview), in contradiction with himself explains how the gardens bordering the collective garden supports individual identity in 'De Binck'. Choice and opportunity, however, are not mentioned by any interviewee.

In the social sustainability prioritisation model of Atanda (2019) participation & control, environmental education and social equity came out as the indicators with the highest priority. It shows the importance of including people in design and conveying environmental considerations, without losing sight of a fair process. These notions, however, are barely present in the case studies and not mentioned in interviews.

Sennett (2018) and Scriver & Srivastava (2022), but also SUM do stress the importance of including participation and control, as apparent in the work of Alejandro Aravena and BV Doshi, in a development strategy. With it, premature obsolescence is less likely and a built environment of a higher quality ensues. Lastly, when considering their approach to cities as living organisms and the choice of demolition becomes even more ridiculous. A quote from Danielle Barentsen's thesis phrases it perfectly: "identity is not malleable, it grows" (2015, pp. 19).

6.4 How are costs related to social sustainability in adaptive reuse

As implied by Gert-Jan Fernhout (2022. interview) and Hans Goverde (2022. interview), social sustainability brings economic benefits on various levels of economy and through several previously discussed elements (ch. 4.1.2). Literature substantiates this both qualitatively and quantitatively. If wellbeing is promoted in office buildings with plants and healthy materials productivity rises significantly (Johnson, 2000). It also leads to higher participation with less absence (Abdullah et al., 2012). With respect to healthcare, these investments significantly reduce costs too. For every dollar $3.27 can be saved according to Baicker et al. (2010) or an average of 24.5% less costs as stated by Chapman (2012). Healthy and green offices furthermore show higher real estate returns. For example, offices in New York City with a high degree of plants and other natural features have a 5.6% to 7.8% rent premium opposed to those without (Yang et al., 2020).

To be fair, these works did research to offices, not housing. Nevertheless, they do show how health affects the economy. Perhaps developers or real estate investors won't personally see the

return after investing their money as the difficulty lies in the fact that the stakeholders who invest in social sustainability often struggle to see the financial returns. To some extent, this can be attributed to the returns being obscure or qualitative. More importantly however, the benefits simply don't return to the stakeholder that invested in its favour when the benefits entail higher economic efficiency or reduced maintenance, especially in projects where the investors are not the operators. However, it seriously substantiates regulations or subsidies in support of healthy construction as well as future research to other factors that influence both physical and mental health in the built environment.

The interviews present more financial benefit. Simple residential satisfaction impacts on house prices as well (Fernhout, 2022. interview). The relationship between social sustainability and residential satisfaction has already been ascertained as well. Moreover, feeling safe and having a strong sense of identity and belonging positively benefits mental health for example (Alaie et al, 2022). Mental health is certainly crucial to a happy life, which results in more economic efficiency, less costs to society and reduced health care demand. Cohesion equally enhances efficiency. Whenever more friendly relations with neighbours are present, it is more likely that people, for example, babysit. In turn accommodates higher economic activity as a visit to the cinema becomes easier (Fernhout, 2022. interview).

Likewise, cohesion increases the chance people are cared for by neighbours instead of nurses and take pressure off the economy. Lastly, social sustainability decreases maintenance costs. Communities with higher cohesion are more likely to help each other in individual maintenance work and satisfied, proud residents sooner maintain their environment themselves. Thysia Kleijwegt (2023. interview) underlined the notion by Tostões and Ferreira (2021) that cohesion makes projects more controllable, which reduces costs associated with nuisance and maintenance. Lastly, Koks (2022) indicate social sustainable values have the capacity to be used in marketing strategies, whereas Shipley et al. (2006) stress the marketing potential of adaptive reuse.

Thanks to limited emissions, adaptive reuse yields additional financial benefits. Along with the potential to be part of the solution to the nitrogen question described earlier, adaptive reuse can find advantage in carbon reduction programs. Harald Clabbers (2022. interview) explains how new construction is twice as pollutive, which is fortified by literature such as the Life Cycle Analysis of Hasik et al. (2019). The Dutch government already instituted extra tax liability for industrial facilities as EU levies were deemed insufficient (Ministerie van Algemene Zaken, 2022). It therefore wouldn't be a large step towards implementation of such regulations in the construction business.

Adaptive reuse projects have several financial benefits. They usually see few objections of neighbours strengthening the financial feasibility of the projects as objection cases can take serious time and resources that can't be put in the project itself. Sales can also be boosted with visitable display apartments rather than drawings or renders. Additionally, adaptive reuse projects not only require, generally, fewer construction materials and less demolition, but afford shorter realisation time as well, meaning shorter financing periods and reduced risk (Geraedts et al., in Wilkinson & Remøy, 2018).

Adaptive reuse is equally capable of providing indirect economic benefits. Upgrading dilapidated buildings has a positive effect on the surrounding area by bringing more economical activity and improving investor confidence (Aigwi et al. 2019). The limited realisation time of adaptive reuse projects does not just trigger this process sooner, but also bolster its effects. Whereas new construction would emphasise the contrast between dilapidation and success, adaptive reuse reveals hidden quality. The initiators of 'De Binck' recognised this capacity and used it to further development of the Binckhorst area in its entirety to the benefit of their adjacent other construction plans.

Nevertheless, the interviewees, especially the developers (also of 'De Binck'), expressed the difficulty of executing financially successful adaptive reuse projects. Although cost calculation is

explicit, it remains an unpredictable process. Unforeseen problems keep resulting in costly construction process stagnation and other additional expenses, while stakeholder collaboration is strenuous. This implies the 'De Binck' can thank it current form largely to economies of scale as developers VORM and BPD have a significant stake in other Binckhorst plans. It also implies that adaptive reuse is stimulated through large scale urban development by one party or a joint venture to reap the indirect area benefits.

Financial interest play a big part in considering circulation typologies. As stated before, optimising the net to gross floor area ratio is essential in any construction project, but in adaptive reuse its more difficult, being confined to an existing structure. The case study of 'De Raedt' as well as SUM's SDE design show how galleries can play a major part in this effort. Galleries do not add to the gross floor area, which is to the benefit of gross to net area and to the absolute area maximum, providing extra space for living in combination with circulation. However, their construction costs cannot be underestimated. In 'De Raedt' a lightweight gallery sufficed, whereas other buildings might need extra structural measures in order to support its weight (Koks, 2022). 'De Raedt' additionally proves that galleries work in high-end residential projects contrary to its general association with social housing.

As stated in chapter 3.4, Mackay (2008) concluded that facade renovation or reconstruction is the largest cost component of adaptive reuse projects. It is therefore of particular interest to compare the two cases with remodelled facades with the two without. Immediately apparent is the fact that in the latter two cases ('De Binck' and 'De Rotterdamse School') the common entrance was kept in its original state, whereas the others ('De Raedt' and 'Noordsingel') dramatically changed the entry to smaller dimensions. The abstractions of figures 14 and 15 illustrate the difference between the old and new entry halls of the buildings. Even though, naturally, other explanations can be found, it suggests that the costly facade transformations increased the need for thorough floor space optimisation to make ends meet. The subsequent structural changes to accommodate the new stairwells further amplify uncertainty and costs as well, straining project success (Dyson et al., 2016. See page 19).

Oddly enough, the architect of 'De Raedt' deems architecture first and foremost a social endeavour, literally championing social sustainability over facade aesthetics. Still, he completely destroys the original facade, arguing its aesthetics unfit for residential architecture. This expensive measure exhaust funds for other potential design options, for example those that benefit social sustainability.

Just as John Koks (2022. Interview) said, practitioners make choices for eventual residents without knowing their preference, just because it's how things are always done or its their own preference. Enough people would rather live in a cheaper house with that original facade and entrance than spend so much on a new look. In the end, it's all about making the right choice as every euro can be spent once. Therefore, minimal change and public participation decrease the chance of unnecessary spending, for the good of social sustainability.

7. Conclusion

This chapter commences with sub question conclusions, before addressing the final conclusion.

What is adaptive reuse?

In conclusion, adaptive reuse is a means of subverting vacancy or obsolescence of buildings without demolition. By finding a suitable new function with creativity, the absolute life cycle of buildings is fully exploited and the continuity of significant embedded value like history, identity and energy safeguarded. Even when performance is not at the same level as new construction it can be compensated with higher social value. Moreover, relative to demolition and new construction, adaptive reuse is less disruptive to communities, less pollutive and increases the profitability of a building while contributing to a more diverse and meaningful urban form. As such it can play a crucial role in sustainable urban development with its potential of balancing the benefits in each category as illustrated by figure 6. However, many challenges remain. The highly specific act of adaptive reuse is characterised by unpredictable realisation costs as it requires extra attention, cooperation and skill of practitioners while the process is fraught with many uncertainties. Potential high costs push stakeholder preference towards demolition, in addition to threatening social sustainability. It is therefore of importance that both the costs and the potential benefits are more explicit in order for these stakeholders to pursue adaptive reuse instead.

What is social sustainability and how is it affected by adaptive reuse?

In its most basic definition, social sustainability, in respect to urban development, refers to strong communities with a durable relationship to their immediate surroundings. Social sustainable building entails the protection of health, comfort and sociocultural values. It is manifested throughout many layers of the built environment and paramount in successful sustainable development by order of public support. Pertaining to adaptive reuse, social sustainability appears through, more unique, identifiable and meaningful forms in addition to limited social disruption, but only if the costs and financial benefits are explicit.

How do practitioners incorporate social sustainability?

In practice, interaction through circulation typologies and collectivity concepts like community gardens and courtyards is commonly used. Equitability is further named as an important driver behind circulation design. Other social sustainability principles are greenery, avoiding dead ends, open plinths, street-side front doors, authentic elements, flexibility, local identity, adaptability or individualisability, front doors or likewise gradual transitions from public to private. Furthermore, social sustainable design refrains from prescription. It is most effective when stimulating optional activities by encouraging a common mission, but always stemming from proper target group research. Lastly, actual assessment methods of social sustainable design concepts are lacking, and so is monitoring. Their implementation largely follows trends in line with the overall preconceived building concept and is mostly based on gut feeling, which strains potential realisation. However, economic efficiency, higher house prices, less health care and maintenance costs as benefits of cohesion can be used in order to quantify social sustainability.

How are costs related to social sustainability in adaptive reuse

Adaptive reuse projects include to many unknown variables to make a proper costs estimation, which leads to unwillingness of practitioners even though several examples of economic benefit exist. Moreover, with better informed decisions, minimal change and public participation the chance of unnecessary spending decreases, for the good of social sustainability. Subsequently, social sustainability offers numerous economic benefits as well. Unfortunately, a discrepancy exists between the in- and output of these benefits, which leads to limited investment that make it happen. Therefore, a more holistic approach is needed that takes all benefits in

consideration in order to enable fair distribution of eventual benefits such as subsidies or tax allowance.

"How is social sustainability included in the practice of adaptive reuse architecture and how does it impact the costs?"

This research identified a gap in the knowledge regarding the social tranche of sustainable development and limited research to its relationship of with heritage conservation. Subsequently, it made apparent how social sustainability cannot be neglected in the pursuit of sustainable development. In this, adaptive reuse is can play a significant goal with benefits throughout all three sides of sustainability compared with demolition and new construction as many existing buildings possess intrinsic values worth saving. Environmentally, adaptive reuse preserves embedded energy. Economically, adaptive reuse acts as a catalyst to its surroundings and is less disruptive to the local economy, but also to local communities which relates to the social side of sustainable development. Furthermore, transforming existing buildings with adaptive reuse results in a recognisable, more meaningful form, a palimpsest of historical layers, due to the preservation of local characteristics and historic value.

However, this research found adaptive reuse projects to include too many unknown variables to make a proper costs estimation, which leads to unwillingness of practitioners. Yet, with better informed decisions, minimal change and public participation the chance of unnecessary spending decreases, for the good of social sustainability, especially since the quality of circulation space increases. Subsequently, social sustainability offers numerous economic benefits as well. Unfortunately, a discrepancy exists between the in- and output of these benefits, which leads to limited investment that make it happen. Therefore, a more holistic approach is needed that takes all benefits in consideration in order to enable fair distribution of eventual benefits.

8. Discussion

With respect to the adaptive reuse process, it would have been interesting to interview experienced contractors. The part of this research covering the topic solely involved a literature review, but their input could have been relevant nonetheless, with their knowledge on mitigation of unforeseen problems in particular but to the empirical part as well. Luckily, VORM also acted as the contractor in all but 'Noordsingel' which means I had some information, even though those involved in construction were not employed at VORM anymore.

Martijn Tromp (2022. interview) states that adaptive reuse projects are often too small to incorporate collective gardens or courtyards as he does in other projects. This argument however is in reality not directly related. First of all, a smaller scale suggests a need for collective space of a smaller scale instead of none at all. Additionally, 'de Binck' shows how a 'small scale', single building transformation can be expanded with new construction as well to generate more sustenance for such goals.

Social sustainability is on many fronts a highly personal matter. It differs not only from country to country or city to city, but everyone has alternate sociocultural values that require specific housing solutions. It is wrong to generalise too much. Perhaps it is usually best to guide people through collective spaces, stimulate encounters and build cohesion, but some will always want to live sheltered from their neighbours, park their cars in a basement before anonymously taking the lift to their front doors. Therefore, behaviour of the target groups should always be studied with their according housing preferences. As Hans Goverde (2022. interview) stated however it is impossible to do research in detail every time and have faith in previous, generalised findings.

Both literature and interviews further showed that human behaviour is usually erratic. People need to be given the space to choose randomly and adapt their environment to their personal preferences to feel at ease, of which the designing could be interpretated as impossible or hopeless. Yet Becker (1962) stresses that it remains relevant to model the *'expected outcome of random choice',* even when accounting for the idea that consumers choose fully randomly.

One means to stimulate people to engage in favoured behaviour is 'gamification'. Gamification alludes to strategies that incorporate game elements in a non-gaming environment such as awarding points after completing tasks. WELL certification has already incorporated the concepts into assessments of healthy building design, while VORM is investigating its use in public participation. Incorporating gamification in social design, promoting use of stairs for example, could be a viable basis of future research.

The interviewees and literature also named diversity as a factor of social sustainability and a substantial trait of adaptive reuse. Adaptive reuse can be used to revitalise neighbourhoods as well (Langston et al., 2007). However, past desegregation policies did not lead to social mixing and it potentially causes disruptive gentrification as well (Van Kempen et al., 2015). Yet, these policies, again, focussed on the neighbourhood level instead of the building level. It is unknown if that would remain so, though it seems unlikely when looking at real life and the sheer number of forced encounters direct neighbours have. Few people have never spoken to their direct neighbours, whereas residents of the next block are equally unfamiliar as those at the other side of town. Besides, revitalising 'bad' neighbourhoods decreases the negative connotations surrounding them. This fortifies the sense of security of residents and could be a renewed source of pride, which as discussed is beneficial to mental health.

The assessment method regarding social value that is used by Gert-Jan Fernhout (2022. interview) utilises economy wide benefits to calculate 'social return of investment'. However, this method still revolves around economic and monetary value. Even though this is a clear and helpful means of making value explicit, it cannot wholly express the extent of social sustainability. Basic human needs like health and happiness reach further than the economy. Besides, it can be a dangerous game to quantify human nature as it is dynamic and whimsically variform.

Dutch philosopher Maxim Februari explains how the rise in statistic research has hugely impacted the definition of normality and ideal human standards, paving the way for excluding those who did not conform.

Several interviewees in this report, in addition to various works of literature, discussed the necessity of involving the target groups and local residents before trying to implement social spaces. The right choice is highly situational so generalising them should be avoided. Therefore, instead of focussing on the tangible side of social sustainability, a future researcher could try to increase understanding with respect to the process of social sustainability and involve residents of relevant case studies. Nevertheless, generalisation is always helpful, granted that its reasoning is sound and only carefully projected on a different context. As Thysia Kleijwegt (2023. interview) noted in the interview, most actors must rely on generalised concepts as do not have the time or the resources to thoroughly investigate all their ideas themselves. It would simply be too expensive.

A relevant option for future research on adaptive reuse challenges that appears in this thesis is investigating the role technology can play in predicting risks and working with uncertainty. The interviews showed how digitalisation efforts were highly productive in nipping potential problems in the bud. Dyson et al. (2016) equally stress the importance of prior research in adaptive reuse. It is therefore a wiser topic than studying costs as these are mainly too unpredictable to chart.

Future research on social sustainability could focus on a detailed examination of the economic effect that certain factors collected in this thesis have. Buildings with facilities to improve cohesion can be compared to buildings without to investigate if an economic premium exist for house prices, healthcare or maintenance costs. For example, this could be done with a hedonic pricing method, preceded by a survey on satisfaction and interaction.

As I have been ranting about the human side of scientific research and the principally social essence of this work in particular, the natural question that arises is, why no regular people were involved in this thesis. It mainly relies on data from literature, documents and expert experience. Despite this absence, there are several arguments to be made in favour of the chosen methodology. For one, thesis research is limited in itself due to its educational nature and a lack of resources to interviews masses in order to get an appropriate population sample. Therefore, I judged interviewing experts a more purposeful method.

It is, however, important to note that most interviewees were heavily involved in the cases, which suggests biased answers to the interview questions, though not necessarily deliberate. With the presumption that they act from a desire to create something good, these people still act according to personal views and would present these as the right angle to approach a project no matter what, as would we all. Nevertheless, by interviewing different actors from different companies and some neutral ones, a generalisation is still possible.

In this regard, it is a shame no sociologists were involved as experts in this research even though the cooperation between sociologists and architects, according to Emami & Sadeghlou (2020) is essential in research to residential satisfaction, which is related to social sustainability and cohesion. Two interviewees can be regarded as experts in social design as consultants, but that is not the same as a sociologist. Sociology has a certain distance from the construction industry which enables them to evaluate the described phenomena from an angle unaffected by their experience and education is architecture or urbanism. Unfortunately, the contacted sociologists were unresponsive to my advances until it was too late. Hence, it is recommended for future researchers to avoid this significant omission in the interviewee group by sending invitations to a considerable number of sociologists early on.

Furthermore, based on “expanded readings”, Vallance et al. (2011) argue social scientists are essential in aligning sustainability goals with human behaviour. They think researchers are better

equipped to explore the societal concern on change with a holistic and interdisciplinary approach less embedded in scientific data. Scientific abstractions have the tendency to construct theory, rather than discover them (De Boer, 2019). So, consider, not with data but empathy why people might resist change and we get a smoother and more equitable transition to a sustainable future.

Experts can shed light on topics and illustrate potential research gaps in a much more concentrated fashion than interviews with regular people drawn from a random population sample ever could (Bogner et al., 2009). When investigated people in social studies, still, experts are more efficient contributors since they are able to share their large-scale professional observations of individual people, particularly relevant to a thesis of this scale without the resources for huge surveys. Nevertheless, the fewer people involved, the higher the chance of biased interpretation and unobjective results.

The empirical part of this research is therefore comprised of four case studies informed by six expert interviews, which were asked general question about adaptive reuse and social sustainability as well. Additionally, three independent built environment consultants with varying fields of expertise have been interviewed in order to validate the results in triangulation with the preceding literature review. However, the chance of biased results could have been slimmer if the research had incorporated neutral experts in the same field to critique the others. Considering the limited clues that discredit the conclusion which is also in line with initial casual expert conversation and literature, biased results don't seem very likely.

The fact that several interviewed experts base their social sustainability assessments mostly on gut feeling suggests limited expertise. However, research shows that experienced people have a strongly developed intuition, that actually helps them in making the right decision often. Additionally, this thesis has investigated how practitioners work with social concepts, not scientists. Besides, it might also be very useful to conclude that many practitioners in the construction industry are dilettantes who don't know what they are doing and are the real cause of unsuccessful adaptive reuse.

The findings in the empirical part of this thesis is quite in line with what was already drawn from literature before. On one hand it implies some kind of veracity to the conclusion regarding social sustainability in adaptive reuse and its workings in practice. On the other however, thoughts from two consultants regarding the topic suggest that the commonalities between the case study results and literature are nothing more than proof of the fact that practitioners apply trendy elements of academic work as marketing strategies. This does not have to be a bad thing though. As Shipley et al. (2006) remark, adaptive reuse has serious potential to be included in marketing strategies thanks to their local familiarity, presenting additional commercial capacity.

In his interview, Arno van Schaik (2022. interview) pointed out that cooperation in new construction projects is easier than projects involving renovation or adaptive reuse, largely thanks to uncertainty and unexpected problems. On that account future research regarding stakeholder management or alternative integrated procurement methods in adaptive reuse can hold scientific relevance. Perhaps reinforcing cooperation and trust mitigates some uncertainty related problems already.

The successes of BV Doshi and Alejandro Aravena in their native countries are inspirational but of course not necessarily repeated with equal success in The Netherlands. The Dutch, as also discussed already, are different people with different preferences, more individualist in nature and very keen on a neat urban environment. Still inspiration can be drawn from these designs, without one-on-one adaption. Already many projects in The Netherlands generated highly diverse and qualitative neighbourhoods by allowing separate allotments to have separate designs, but then mostly within the confines of preordained architectural rules. These examples, such as the 'Coendersbuurt' in Delft or 'Centrumeiland' in Amsterdam have been successful new construction projects that resonate the traditional urban landscape of their respective cities.

Concerning adaptive reuse, the recent 'kluswoningen', or DIY-dwellings, of Junoblok, also in the Binckhorst, show how granting individuals the freedom to construct their own homes inside a former office building can result in quality housing in support of a more inviting atmosphere towards future development. All, interesting topics for future research.

As affordability is a big part of social sustainability, it is relevant to study the feasibility of social housing in adaptive reuse projects given the conclusion that the studied cases mainly feature high-end housing. Future research could therefore involve a study to compare house prices of adaptive-reuse projects to new construction in order to scrutinise whether adaptive-reuse projects result in more expensive housing and if so, why. This can entail analysis of adaptive-reuse projects that did manage to incorporate more affordable housing as well. None of the case study projects, however, were executed by housing corporations. The SUM project shows how transforming social housing buildings does have the potential to be feasible.

With better cooperation and uncertainty mitigation adaptive reuse projects can become more feasible for private parties too. The implied economic benefits are potentially grounds for subsidies or other incentives in order to stimulate affordable housing in adaptive reuse projects as well. More rough finishing or 'DIY-dwellings' can lower development costs too, while enabling residents to individualise their homes and take ownership of their environment.

The social sustainability indicator prioritisation of table 2 as made by Atanda (2019) highlights three important indicators in particular; participation and control; social equity; and environmental education. The first indicator coincides with the notion Sennett makes against prescriptive design and the interview answers by Hofman (2022. interview) and Fernhout (2022. interview). They think social sustainability entails providing people with a place they can live the way they want to, which, quite frankly, summons less conjecture when involved themselves. Therefore, in extension of the critical success factor "understanding client needs" by Dyson et al. (2016), 'understanding user (or resident) needs' should be included as a factor of adaptive reuse success.

Additionally, participation and control relate to the instructions on successful collectivity by Fernhout (2022. interview) and Kleijwegt (2023. interview). They see detailed target group analysis and the initiation of a common management mission to evoke a sense of responsibility as fundamental conditions for these principles to work. Kleijwegt (2022. interview) also doubts this ensures their performance no matter what.

The third notable social sustainability indicator, environmental education, fortifies the interconnected relation of social and environmental sustainability described by Vallance et al. (2011). Sustainable development goals require public support. Atanda's (2019) research shows the possibility of stimulating support by increasing awareness of environmental considerations. This coincides with the primary indicator, participation and control. These considerations can be included in participation programs, to give the public a sense of ownership regarding the results and increase effectivity. A top-down process may lead to sustainable design, a bottom-up approach leads to sustainable development.

Lastly, it is of interest to future research to combine the framework of Atanda (2019) with the existing 'Green building appraisal tools' he based his work on. The case studies brought to light how social sustainable investments are sometimes revoked in favour of other (sustainability) goals. Although not necessarily a bad thing, it appears that social goals are neglected over more explicit alternatives. Thus, research that identifies and offsets the priority of these alternatives against social goals would be helpful.

9. Reflection

- if your approach worked

Although it was not perfect, I think my approach largely worked. The choice to use experts rather than a random population sample gave a much deeper understanding of the source material. However, regarding the costs I did not ask all the right questions. I did not have enough understanding of the full extent of the topic which meant I somewhat misjudged the answers I needed. My first idea was to make a calculation model, but it was too hard for me to figure out how. When finalising this thesis eventually drew near, and I reread Atanda (2019), I realised what I had in my mind initially, weighing social indicators. Yet, his method of a Delphi study, followed by surveys would have been too extensive for me to wrap my head around.

- your understanding on the "how and why"

The reciprocal nature of a Delphi study is very useful in setting up indicators to assess a certain topic. I only included three neutral consultants to weigh the previously found results, but as I did not end up creating an assessment method, I think they have provided sufficient scrutiny.

- your reflection upon the feedback that was given by your mentors

It was hard for me to ask the right questions during meetings as I struggled to oversee the full picture. As a result, for a long time I worked in parallel with my method instead of coextensively. I got carried away a lot in rabbit holes unrelated to my research questions as I sometimes forgot this simple truth: just answer the research questions.

I'm therefore especially grateful for the considerable patience my mentors awarded me, taking away pre-meeting anxiety when I thought I again hadn't done enough. Moreover, did my mentors compel me to write while thinking, keep me from drifting too far off course and helped me settle in my method.

Perhaps the most valuable feedback was the idea that this thesis is an exercise in learning to do academic research rather than actual academic work. It relieved me of the insecurities evolved out of the wish to emulate the studies I read. This doesn't mean I haven't taken my work seriously, it's just a way to cope.

- how you have translated the feedback into your work

With this in mind I started doing my own thing more. Maybe I discarded some initially included methods that would have fortified my thesis, but I would have never gotten this far if I didn't. Thereby, while just writing, finally the thoughts came along to further my research.

- how you've learned from your own work.

Over the past year, through my thesis work but also other reading, I have come to see the value of nuance in progress. Before, I had a quite rigid view of wright and wrong. For example, in sustainable development and heritage conservation. Now I know the disruptive effect change can have on communities and the resistance it might provoke. The thought provoked reminiscence of Kader Abdolah's novel *"The House of the Mosque",* which beautifully encapsulates this counteractive force of relentless progress. Hence, sustainable development benefits from a more human approach that aligns cultural values, social values and economic.

The nuance is also relevant in this human approach. In "The Dawn of Everything", Graeber and Wengrow explain how people have always misjudged people. Be it by a contemporary, Western or male gaze, anthropology has historically drawn many conclusions that overlooked the most

fundamental aspects of human values and behaviour. The civilizations that rendered the most magnificent monuments are not necessarily the ones with the most equitably thriving populations and numerous so called 'golden ages' only resulted in great wealth for a happy few, while taking from the many. Compared to other countries, the relative absence of megalomaniac cathedrals like Saint Peter's, palaces like Versailles or towers like Burj Khalifa in the Netherlands, is something to cherish. We cannot forget that architecture is first and foremost a social venture.

I learned many things about myself as well. First of all, I found out that I am more a novelist than an academic. I took more joy from the literature review than the empirical study, probably because reading literature is more straightforward an act, but also more controllable. I further learned a more reflective work ethic, which was lacking in the beginning and detached the study from the method, I get carried away. Lastly, working on this thesis taught me the value of vulnerability and how issues are much sooner solved with help, but then you have to open up.

1. What is the relation between your graduation project topic, your master track (Ar, Ur, BT, LA, MBE), and your master programme (MSc AUBS)?

The master track MBE involves courses regarding real estate management and development as well as building law and construction economics. The four have connection with this thesis as tried to understand development mechanics like with respect to social sustainability and adaptive reuse. Adaptive reuse is one of the options developers and real estate managers have in dealing with existing buildings. Furthermore, economic principles are covered in search of possible overseen benefits as a result of both social sustainability and adaptive reuse in order to find grounds for subsidies amongst others. Laws are lightly touched but the result do indicate need for flexible regulations to the benefit of social sustainability and adaptive reuse.

2. How did your research influence your design/recommendations and how did the design/recommendations influence your research?

The conclusion of serendipitous, organic and participatory design was not something I initially expected to draw and come relatively late in my research. Consequently, I delved deeper in the subject, reread some previously read material and realised it can't be omitted from a thesis about social sustainability. Unfortunately, it was not anymore possible to build the thesis around it.

3. How do you assess the value of your way of working (your approach, your used methods, used methodology)?

In my opinion, expert interviews were the right choice as they can shed light on topics and illustrate potential research gaps in a much more concentrated fashion than interviews with regular people drawn from a random population sample ever could (Bogner et al., 2009). When investigated people in social studies, still, experts are more efficient contributors since they are able to share their large-scale professional observations of individual people, particularly relevant to a thesis of this scale without the resources for huge surveys. Nevertheless, the fewer people involved, the higher the chance of biased interpretation and unobjective results.

However, some disappointing omissions exist in the panel of experts consulted. For example, no sociologists were involved as experts in this research even though the cooperation between sociologists and architects, according to Emami & Sadeghlou (2020) is essential in research to residential satisfaction, which is related to social sustainability and cohesion. Two interviewees can be regarded as experts in social design as consultants, but that is not the same as a sociologist. Sociology has a certain distance from the construction industry which enables them to evaluate the described phenomena from an angle unaffected by their experience and

education is architecture or urbanism. Unfortunately, the contacted sociologists were unresponsive to my advances until it was too late. Hence, it is recommended for future researchers to avoid this significant omission in the interviewee group by sending invitations to a considerable number of sociologists early on.

Furthermore, based on "expanded readings", Vallance et al. (2011) argue social scientists are essential in aligning sustainability goals with human behaviour. They think researchers are better equipped to explore the societal concern on change with an interdisciplinary approach less embedded in scientific data. Consider why people might resist change and we get a smoother and more equitable transition to a sustainable future.

With respect to the adaptive reuse process, it would have been interesting to interview experienced contractors. The part of this research covering the topic solely involved a literature review, but their input could have been relevant nonetheless, with their knowledge on mitigation of unforeseen problems in particular but to the empirical part as well. Luckily, VORM also acted as the contractor in all, but 'Noordsingel' which means I had some information, even though those involved in construction were not employed at VORM anymore.

4. How do you assess the academic and societal value, scope and implication of your graduation project, including ethical aspects?

Committees that grant funds and judge the research ethics of applications appear to mostly focus on participant wellbeing and ethical data management (National Centre for Research Methods [NCRMUK], 2017). However, this disregards deontological or consequential ethics. Respectively, these terms mean either the ethics of actions regardless of their consequences or the ethics of predicted consequences of research. Nevertheless, consequences are hard to foresee. Therefore, it is important to assess the ethics of the intentions of this research, which is improving social sustainability performance of the built environment through adaptive reuse.

Although the consequence of a focus on social sustainability might be the neglect of some other sustainability goals, the aim of this research is to aid in diminishing destruction of existing architecture with significant social value and embedded resources. This in turn results in fewer emissions and higher urban quality. Additionally, by incorporating social sustainability and participation in the urban development paradigm, public support for these other goals rises. Besides, Garcia (2018. pp 16) describes community engagement as "the very foundation of city planning ethics."

5. How do you assess the value of the transferability of your project results?

The principles of social sustainability are relevant in all construction projects, also new construction. Participation, individualisability, collectivity etc. are not exclusively valued in adaptive reuse projects and have a part play in the full extent of sustainable development.

6. How can you transfer this thesis to your life after graduation?

The nuanced and emphatic approach is something I want to take with me when finding a job in the construction industry. Furthermore, heritage and history are a personal interest, but I have learned that a rigid approach to historic preservation hampers the creation of societal quality.

7. To what extent does the writing of a thesis relate to your personal skills and ambitions?

I have always loved literature. Even though writing, and especially reading, are hobbies, I can't say I looked forward to writing this thesis. Knowing myself, I feared this assignment as both its branching scope and the bodice of academics neither fits my skillset nor my ambitions as previous papers or articles or essays, during my studies, I only completed after a taxing struggle. Even a thousand words daunted me. Yet, I finished, quite successfully too and even with retroactive pleasure. I enjoyed bringing different works of literature together by forging words

into a sentence, as did my teachers the result.

Still, I knew a thesis would be different. With roughly a factor of 20, my largest academic work would grow, a rather big jump. Where earlier work had not, I knew here demand for structure, planning and diligence would be severe. Weaknesses all.

Nevertheless, I can even say, apart from the empirical, I came to enjoy writing this thesis at last. Sometime prior to the first P4, I could finally picture an end product, maybe not the right one eventually, but a picture that pushed me to a work ethic I'd never experienced before.

Regardless of academics, architecture or management, this project with its demanding extent taught me patience and perseverance. It taught me how to work for myself, what I can do to help me and, most importantly, it taught me the kind of guidance I need and how others can help me, for that is my biggest flaw.

10. References

Abdullah, D. N., & Lee, O. Y. (2012). Effects of wellness programs on job satisfaction, stress and absenteeism between two groups of employees (attended and not attended). *Procedia - Social and Behavioral Sciences, 65*, 479-484. https://doi.org/10.1016/j.sbspro.2012.11.152

Aigwi, I. E., Egbelakin, T., Ingham, J., Phipps, R., Rotimi, J., & Filippova, O. (2019). A performance-based framework to prioritise underutilised historical buildings for adaptive reuse interventions in New Zealand. *Sustainable Cities and Society*, *48*, 101547. https://doi.org/10.1016/j.scs.2019.101547

Alaie, A., Yazdanfar, S. A., Norouzian-Maleki, S., & Hosseini, S. B. (2022). Evaluation of studies in the field of social sustainability in housing: a systematic review. *Journal of Housing and the Built Environment*, *37*(4), 2179–2214. https://doi.org/10.1007/s10901-022-09946-0

Alexander, P. D. A. C. (1979). *The Timeless Way of Building*. Oxford University Press.
ArchDaily. (2021, October 10). *Office Building Conversion- Spain* (By Foster + Partners). https://www.archdaily.com/969860/exploring-the-principles-of-reurbanism-adaptive-reuse-at-the-city-scale/615fe3c4f91c81078a0000a6-exploring-the-principles-of-reurbanism-adaptive-reuse-at-the-city-scale-image

Atanda, J.O. (2019). Developing a social sustainability assessment framework. *Sustainable Cities and Society*, *44*, 237–252. https://doi.org/10.1016/j.scs.2018.09.023

Baicker, K., Cutler, D., & Song, Z. (2010). Workplace wellness programs can generate savings. Health Affairs, 29(2), 304-311. https://doi. org/10.1377/hlthaff.2009.0626

Balocco, C., & Marmonti, E. (2013). Optimal and Sustainable Plant Refurbishment in Historical Buildings: A Study of an Ancient Monastery Converted into a Showroom in Florence. *Sustainability*, 5(4), 1700–1724. https://doi.org/10.3390/su5041700

Barentsen, D. J. (2015). *Waardebepaling van wonen in erfgoed (Thesis)*. TU Delft. https://repository.tudelft.nl/islandora/object/uuid%3A3a45233c-8ae4-4a7d-ae4eb2faf097561b

Becker, G.S. (1962), Irrational Behavior and Economic Theory. *Journal of Political Economy,*

70, 1–13. https://www.journals.uchicago.edu/doi/abs/10.1086/258584

Behbehani, L. J., & Prokopy, L. S. (2017). The Appropriation of Built Heritage and Pro-Environmental Behaviors: A Case Study of Leed-Certified Low-Income Multifamily Housing. *International Journal of Architectural Research*: ArchNet-IJAR, 11(1), 67–82. https://www.archnet.org/publications/12027

Bodewes, R. (2019). *Improve the future, renovate the past: A research on improving the balance between cultural value, sustainability, and costs in industrial heritage renovation projects*. (Thesis). TU Delft repository

Bogner, A., Littig, B., & Menz, W. (2009). *Interviewing Experts*. Palgrave Macmillan.

Botta, M. (2005). Towards sustainable renovation : three research projects (PhD dissertation, KTH). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-599

BPD. (n.d.-a). *BPD | Bouwfonds Gebiedsontwikkeling | BPD.nl*. App. https://www.bpd.nl/

Brunone, F., Cucuzza, M., Imperadori, M., & Vanossi, A. (2021). Existing Building Transformation: Current Drivers, Issues, and Possibilities. *Wood Additive Technologies, Springer*

Tracts in Civil Engineering. Springer, Cham. 1–13. https://doi.org/10.1007/978-3- 030-78136-1_1

Bryman, A. (2016). *Social Research Methods*. Oxford University Press.

Bullen, P. A. & Love, P. E. (2010). The rhetoric of adaptive reuse or reality of demolition: Views from the field. *Cities*, *27*(4), 215–224. https://doi.org/10.1016/j.cities.2009.12.005

Bullen, P.A. & Love, P.E.D. (2011), Adaptive reuse of heritage buildings, *Structural Survey,* Vol. 29 No. 5, pp. 411-421. https://doi.org/10.1108/02630801111182439

Buonincontri, P., Marasco, A., & Ramkissoon, H. (2017). Visitors' Experience, Place Attachment and Sustainable Behaviour at Cultural Heritage Sites: A Conceptual Framework. *Sustainability*, 9(7), 1112. https://doi.org/10.3390/su9071112

Burnham, B. (1998). Architectural heritage: the paradox of its current state of risk. *International Journal of Cultural Property*, *7*(1), 149–165. https://doi.org/10.1017/s0940739198770146

Cambridge Dictionary. (2023). Cambridge Dictionary. Retrieved May 10, 2023, from https://dictionary.cambridge.org/dictionary/english/social

Campbell, D. E., Kurvers, S., & Bluyssen, P. M. (2017). A review of comfort, health, and energy use: Understanding daily energy use and wellbeing for the development of a new approach to study comfort. Energy and Buildings, 152, 323–335. https://doi.org/10.1016/j.enbuild.2017.07.060

CBS. (2022). *Landelijke monitor leegstand*. dashboards.cbs.nl. Retrieved March 2, 2023, from https://dashboards.cbs.nl/v3/landelijke_monitor_leegstand/

Chapman, L. S. (2012). Meta-evaluation of worksite health promotion economic return studies: 2012 update. American Journal of Health Promotion, 26(4), 1-12. https://doi.org/10.4278/ajhp.26.4.tahp

Chan, J., To, HP. & Chan, E. (2006). Reconsidering Social Cohesion: Developing a Definition and Analytical Framework for Empirical Research. Soc Indic Res 75, 273–302. https://doi.org/10.1007/s11205-005-2118-1

Chiu, R., (2003). Social sustainability and sustainable housing. In: Forrest, R., Lee, J. (Eds.), *Housing and Social Change: East, West Perspectives*. Routledge, London, New York, pp. 221–239.

Cousin, C. (2005). Case Study Research. *Journal of Geography in Higher Education*, 29(3), 421–427. DOI: 10.1080/03098260500290967

De Boer, B. (2019). Gaston Bachelard's Philosophy of Science: Between Project and Practice. *Parrhesia Journal of Critical Philosophy*. 31. 154-173. Retrieved from https://www.researchgate.net/publication/331223785_Gaston_Bachelard's_Philosophy_of_Science_Between_Project_and_Practice

De Graaf, R. (2020, July 21). 'Architecture is now a tool of capital, complicit in a purpose antithetical to its social mission.' *Architectural Review*. https://www.architectural-review.com/essays/architecture-is-now-a-tool-of-capital-complicit-in-a-purpose-antithetical-to-its-social-mission

De Nieuwe Norm. (n.d.). *Transformatie kantoor Noordsingel Rotterdam*. Denieuwenorm.nl. Retrieved February 23, 2023, from: https://www.denieuwenorm.nl/projecten/transformatie-kantoor-noordsingel-tot-lofts-en-penthouses/

Doling, J. & Arundel, R. (2022) The Home as Workplace: A Challenge for Housing Research, *Housing, Theory and Society,* 39:1, 1-20, DOI: 10.1080/14036096.2020.1846611

Durukan, A., Ertaş Beşir, E., Koç Altuntaş, S., & Açıkel, M. (2021). Evaluation of Sustainability Principles in Adaptable Re-Functioning: Traditional Residences in Demirel Complex.

Sustainability, *13*(5), 2514. https://doi.org/10.3390/su13052514

Dyson, K., Matthews, J. & Love, P. (2016). Critical success factors of adapting heritage buildings: An exploratory study. *Built Environment Project Asset Management. 6(1)*, 44–57. EGM architecten. *(n.d.-b). EGM | team | Team – Arno Van Schaik. EGM.nl. https://www.egm.nl/team/arno-van-schaik/152*

EGM architecten. (n.d.). *De Rotterdamsche School*. EGM.nl. https://egm.nl/architecten/projecten/de-rotterdamsche-school-/377

Emami, A. & Sadeghlou, S. (2020). Residential Satisfaction: A Narrative Literature Review Towards Identification of Core Determinants and Indicators. *Housing, Theory and Society*, *38*(4), 512–540. https://doi.org/10.1080/14036096.2020.1844795

Epley, N., & Schroeder, J. (2014). Mistakenly seeking solitude. *Journal of Experimental Psychology: General, 143*(5), 1980–1999. https://doi.org/10.1037/a0037323

Foth, M., & Sanders, P. W. (2005). Social Networks in Inner-City Apartment Complexes and the Implications for the Residential Architecture of Public Space. *Faculty of Built Environment and Engineering; Creative Industries Faculty*.

García, I. (2018). Community participation as a tool for conservation planning and historic preservation: the case of "Community As A Campus" (CAAC). *Journal of Housing and the Built Environment*. 33, 519–537. https://doi.org/10.1007/s10901-018-9615-4

Gehl, J. (1987). *Life between buildings*. Washington: Island Press Gehl, J. (2010). *Cities for People*. Washington: Island Press Gehl, J. (2015). In Search of the Human Scale. In *TEDx Talks*.

https://www.youtube.com/watch?v=Cgw9oHDfJ4k&ab_channel=TEDxTalks

Gemeente Rotterdam. (2019). Hoogbouwvisie 2019. In *Rotterdam.nl*. Geraadpleegd op 7 december 2022, van https://repository.officiele-overheidspublicaties.nl/externebijlagen/exb-2020-2360/1/bijlage/exb-2020-2360.pdf

Geraedts, R. P., van der Voordt, T., & Remøy, H. (2018). Conversion Potential Assessment Tools. In S. J. Wilkinson, & H. Remøy (Eds.), *Building Resilience in Urban Settlements through sustainable change of use* (pp. 1-22). Blackwell. https://doi.org/10.1002/9781119231455.ch7

Ghahramanpouri, A., Abdullah, A. S., Sedaghatnia, S., & Lamit, H. (2015). Urban Social Sustainability Contributing Factors in Kuala Lumpur Streets. *Procedia - Social and Behavioral Sciences*, 201, 368–376. https://doi.org/10.1016/j.sbspro.2015.08.188

Gillott, C., Davison, B., & Tingley, D. D. (2022). Drivers, barriers and enablers: construction sector views on vertical extensions. *Building Research and Information*, *50*(8), 909–923. https://doi.org/10.1080/09613218.2022.2087173

Hasik, V., Escott, E., Bates, R., Carlisle, S., Faircloth, B., & Bilec, M. M. (2019). Comparative whole-building life cycle assessment of renovation and new construction. *Building and Environment*, *161*, 106218. https://doi.org/10.1016/j.buildenv.2019.106218

Hoogland, C. (2000, Juli). *Semi-private Zones as a Facilitator of Social Cohesion* (Thesis).

Katholieke Universiteit Nijmegen.
https://www.researchgate.net/profile/CarolienHoogland/publication/228548216_Semi-private_Zones_as_a_Facilitator_of_Social_Cohesion/links/58107c5008aef2ef97b200fe/Semi private-Zones-as-a-Facilitator-of-Social-Cohesion.pdf

Huang, S. (2006). A study of outdoor interactional spaces in high-rise housing. *Landscape and Urban Planning*, *78*(3), 193–204. https://doi.org/10.1016/j.landurbplan.2005.07.008

Al-Ibrashy, M., (2021) "Closing Keynote Speech-May al-Ibrashy-Heritage as a driver for development: Athar Lina Initiative in Historic Cairo" *Research and Creativity Convention. 1.* *https://fount.aucegypt.edu/research_convention/2021/closing/1*

International WELL Building Institute. (n.d.). https://www.wellcertified.com/

Jacob, S. A., & Furgerson, S. P. (2012). Writing interview protocols and conducting interviews: Tips for students new to the field of qualitative research. *The Qualitative Report*, *17*(T&L Art, 6), 1-10. Retrieved from http://www.nova.edu/ssss/QR/QR17/jacob.pdf

Jacobs, J. (1961). *The Death and Life of Great American Cities*. New York: Random House

Jäger, F. P. (2010). Old & New: Design Manual for Revitalizing Existing Buildings. Birkhauser.

Janssens, B., & Verbeeck, G. (2017). *Towards a Framework for Architectural Design Enhancing Social Sustainability in Dense Housing Projects*. European Network For Housing Research.

Tirana, Albania.
https://www.researchgate.net/publication/320474824_Towards_a_Framework_for_Architectural_Design_Enhancing_Social_Sustainability_in_Dense_Housing_Projects/citations

Johnson, S.D. (2000). The economic case for "High performance buildings". *Corporate Environmental Strategy*, *7*(4), 350–361. https://doi.org/10.1016/s1066-7938(00)90006-x

Karssenberg, H., Laven, J., Glaser, M., Van, M., Clos, J., & Van 't Hoff, M. (2016). *The City at Eye Level*. Macmillan Publishers.

Kraaijvanger. (n.d.). *De Binck | Kraaijvanger*. Kraaijvanger.nl.
https://www.kraaijvanger.nl/nl/projecten/de-binck-van-werken-naar-wonen/

Van Kempen, R., Zwiers, M., Bolt, G. & van Ham, M. (2015). *Lessen over buurtontwikkeling en buurtverval*. Den Haag: Platform31. Retrieved from: KKS_Essay_Lessen_over_buurtontwikkeling_en_buurtverval.pdf (verdus.nl)

Kohler, N. 1999: The relevance of Green Building Challenge: an observer's perspective.

Building Research & Information, 27(4/5), pp 309-320

Langston, C., Wong, F.K.W., Hui, E.C.M, & Shen, L. (2007). Strategic assessment of building adaptive reuse opportunities in Hong Kong. *Building and Environment,* 43(2008), 1709-1718. doi:10.1016/j.buildenv.2007.10.017

Leupen, B., & Mooij, H. (2012). *Housing Design - A Manual* (2de editie). Macmillan Publishers.

Li, J., Krishnamurthy, S., Pereira Roders, A., & van Wesemael, P. (2021). Imagine the Old Town of Lijiang: Contextualising community participation for urban heritage management in China. *Habitat International*, *108*, 102321.
https://doi.org/10.1016/j.habitatint.2021.102321

Liu, J., Bengtsson, B., Bohman, H., & Staffansson Pauli, K. (2020). A System Model and An Innovation Approach toward Sustainable Housing Renovation. *Sustainability*, *12*(3), 1130.

https://doi.org/10.3390/su12031130

Lockwood, D.: 1999, 'Civic integration and social cohesion', in Gough and Olofsson (eds.), Capitalism and Social Cohesion, ch.4.

Loos, A. (1910). *Architecure*. (Essay) retrieved from: http://www.mom.arq.ufmg.br/mom/02_arq_interface/2a_aula/loos_architecture.pdf

Lupacchini, R. (2019). *CULTURAL HERITAGE ADAPTIVE REUSE: LEARNING FROM SUCCESS AND FAILURE STORIES IN THE CITY OF SALERNO, ITALY* | BDC. Bollettino Del Centro Calza Bini. Retrieved 20 September 2022, from http://www.serena.unina.it/index.php/bdc/article/view/7273

Mackay, R. (2008). *Bouwkosten van transformatieprojecten* (Thesis). TU Delft.

Meurs, P., & Steenhuis, M. (2017). *Reuse, Redevelop and Design: How the Dutch Deal with Heritage*. Macmillan Publishers.

Nygaard, C.A., (2022) On "Pragmatic Socioeconomics" and the Architecture of the Rational Decision Making Framework. *Housing, Theory and Society*, 39:2, 168-174, DOI: 10.1080/14036096.2021.2022752

Persoon, T. (2019). *The Value of Cultural Heritage (*Thesis). TU Delft.

Planbureau voor de leefomgeving. (2021, december). *PILOT PLANMONITOR NOVI 2021*. Uitgeverij PBL. https://www.pbl.nl/sites/default/files/downloads/pbl-2021-pilot-planmonitor-novi-4712_1.pdf

Plevoets, B., & Van Cleempoel, K. (2019). *Adaptive Reuse of the Built Heritage: Concepts and Cases of an Emerging Discipline*. London: Routledge

Provoost, M. (1995). *Re-arch: nieuwe ontwerpen voor oude gebouwen*. NAI: Rotterdam Rapoport,

A. (1969). *House Form and Culture*. Pren tice-Hall. *Inc: New Jersey.*

Riccardo, F., Van Oel, C., & De Jong, P. (2013). Neighbourhood Regeneration by Facade Redesign: A Visual Experiment on Energy Efficiency and Aesthetics. *The International Journal of Architectonic, Spatial, and Environmental Design*, *6*(2), 57–80. https://doi.org/10.18848/2325-1662/cgp/v06i02/38328

Schoch, K. (2016). Case study research. The scholar-practitioner's guide to research design. *The Scholar-Practitioner's Guide to Research Design,* 227–241. https://us.sagepub.com/sites/default/files/upm-assets/105275_book_item_105275.pdf

Schoenmaker, D. (2020) 'The impact economy: balancing profit and impact', Working Paper 2020/04, Bruegel.

Schuiling, D. (2007). Stadsvernieuwing door de jaren heen. *Rooilijn*, *40*(3), 159-165. https://www.canonsociaalwerk.eu/1977_Stadsvernieuwing/Schuiling%20RL%2003-07.pdf

Scriver, P., & Srivastava, A. (2022). Review: *Balkrishna Doshi: Writings on Architecture and Identity* and *One Continuous Line: Art, Architecture and Urbanism of Aditya Prakash*. *Journal of the Society of Architectural Historians*, *81*(2), 250–252. https://doi.org/10.1525/jsah.2022.81.2.250

Sennett, R. (2018). *Building and Dwelling: Ethics for the City* (First American Edition). Farrar, Straus and Giroux.

Severson, M. & de Vos, E. (2021). Social sustainability in social and affordable housing. In: S. Tsenkova (Eds) *Cities and affordable housing: planning, design and policy nexus.* (Ch. 19).

Routledge.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects.

Education for Information, *22*(2), 63–75. https://doi.org/10.3233/efi-2004-22201

Shipley, R., Utz, S., & Parsons, M. (2006). Does adaptive reuse pay? A study of the business of building renovation in Ontario, Canada. *International Journal of Heritage Studies, 12*(6), 505-

520. DOI: 10.1080/13527250600940181

Stoiljković, B. (2022). Social Cohesion and Neighbor Interactions within Multifamily Apartment Buildings: Challenges of COVID-19 and Directions of Action. *Sustainability,* 14(2), 738. https://doi.org/10.3390/su14020738

Spoormans, L., & Pereira Roders, A. (2020). Methods in assessing the values of architecture in residential neighbourhoods. *International Journal of Building Pathology and Adaptation,* 39(3), 490–506. https://doi.org/10.1108/ijbpa-10-2019-0095

SUM. (n.d.). *SUM - TU Delft - Solar Decathlon Europe Competition*. Retrieved February 24, 2023, from https://www.delftsolardecathlon.com/

Sundling, R., & Szentes, H. (2021). Why are we not renovating more? An elaboration of the wicked problem of renovating apartment buildings. *Civil Engineering and Environmental Systems*, *38*(3), 197–221. https://doi.org/10.1080/10286608.2021.1969371

Teller, J. (2021). Regulating urban densification: what factors should be used? *Buildings and Cities*, *2*(1), 302–317. https://doi.org/10.5334/bc.123

Tostões, A. & Ferreira, Z. (2021). Social endurance at the Barbican Estate (1968–2020), *The Journal of Architecture,* 26:7, 1082-1106, DOI: 10.1080/13602365.2021.1978523

TOBA architecten. *(n.d.). Over ons | Toba Architecten. Toba.nl. https://toba.nl/over-ons-architecten-en-bouwkundigen-team/*

TOBA architecten. *(n.d.). Transformatie kantoorpand Noordsingel Rotterdam*. Toba.nl. https://toba.nl/project/transformatie-kantoorpand-noordsingel-rotterdam/

Tweed, C., & Sutherland, M. (2007). Built cultural heritage and sustainable urban development. *Landscape and Urban Planning*, *83*(1), 62–69. https://doi.org/10.1016/j.landurbplan.2007.05.008

Ulrich, R. S. (1983). Aesthetic and affective response to natural environment. *Behavior and the natural environment*, 85-125.

Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of environmental psychology*, *11*(3), 201-230.

United Nations (2015) 'UN Sustainable Development Goals (UN SDGs) - Transforming our world: the 2030 Agenda for Sustainable Development', A/RES/70/1, New York

Vafaie, F., Hou, C., & Remoy, H. (2021). The Criteria Towards the Success of Adaptive Reuse of Heritage Buildings: a Systematic Literature Review. 27th Annual European Real Estate Society Conference. Published. https://doi.org/10.15396/eres2021_149

Vallance, S., Perkins, H. C., & Dixon, J. E. (2011). What is social sustainability? A clarification of concepts. *Geoforum*, *42*(3), 342–348. https://doi.org/10.1016/j.geoforum.2011.01.002

Whyte, W. H. (1980). *The Social Life of Small Urban Spaces*. Conservation Foundation.

Wilkinson, S., Remøy, H. T., Langston, C. A. (2014). *Sustainable building adaptation: Innovations in decision-making*. Chichester, West Sussex, United Kingdom: Wiley/Blackwell.

Yang, J., Rong, H., Kang, Y., Zhang, F., & Chegut, A. (2020). The financial impact of street-level greenery on New York commercial buildings. MIT Center for Real Estate Research. https://doi.org/10.2139/ ssrn.3714858

Yazan, B. (2015). Three Approaches to Case Study Methods in Education: Yin, Merriam, and Stake. *The Qualitative Report*, 20(2), 134-152. https://doi.org/10.46743/2160-3715/2015.2102

Yigitcanlar, T., & Teriman, S. (2015). Rethinking sustainable urban development: towards an integrated planning and development process. *International Journal of Environmental Science and Technology*, *12*(1), 341–352. https://doi.org/10.1007/s13762-013-0491-x

Yin, R.K. (1994) *Case study research: design and methods*. 2nd edition. Thousand Oaks, CA: Sage.

Overige {foto's/websites/artikelen}References (2.0):

Architectenweb. (n.d.). *Renovation De Raedt* (By FiCor). https://architectenweb.nl/projecten/project.aspx?ID=43277

CBS (2023, 23 maart). Transformaties in de woningvoorraad 2021. CBS.nl. Retrieved May 5, 2023, from https://www.cbs.nl/nl-nl/longread/aanvullende-statistische-diensten/2023/transformaties-in-de-woningvoorraad-2021?onepage=true#c-3--Kenmerken-van-woning--en-pandtransformaties

De Binck | Kraaijvanger. (n.d.). Retrieved November 27, 2022, from https://www.kraaijvanger.nl/nl/projecten/de-binck-van-werken-naar-wonen/

De Raedt. (n.d.). Retrieved November 14, 2022, from https://architectenweb.nl/projecten/project.aspx?ID=43277

De Rotterdamsche School. (n.d.). Retrieved January 10, 2023, from https://egm.nl/architecten/projecten/de-rotterdamsche-school-/377

EGM Architecten. (n.d.). *De Rotterdamse School*. https://egm.nl/architecten/projecten/de-rotterdamsche-school-/377

Funda. (n.d.). *De Raedt*. Funda.nl. https://www.funda.nl/koop/verkocht/rotterdam/appartement-42847015- mathenesserlaan-321-p/

Kraaijvanger. (n.d.-a). *Concept "De Binck."* Kraaijvanger.nl. https://www.kraaijvanger.nl/nl/projecten/de-binck-van-werken-naar-wonen/

Kraaijvanger. (n.d.-b). *De Binck*. Kraaijvanger.nl. https://www.kraaijvanger.nl/nl/projecten/de-binck-van-werken-naar-wonen/

Kraaijvanger. (n.d.-c). *SDU, Binckhorstlaan, 2001* (By J. Musch). schie.nl. https://shie.nl/bedrijven/sdu-1577-heden/

Kraaijvanger. (ca. 2019). De Binck - *Hallway with stairs to courtyard*. https://daf9627eib4jq.cloudfront.net/app/uploads/2019/09/ARC19-Kraaijvanger-Architects_De-Binck2.pdf

Ossip van Duivenbode. (n.d.). *17 Karel Doorman Ossip van Duivenbode 2T8C4217-1*.

Galleo.co. https://www.galleo.co/project/karel-doorman

TOBA. (n.d.). *transformatie-kantoorpand-noordsingel-rotterdam*. TOBA.nl. https://toba.nl/project/transformatie-kantoorpand-noordsingel-rotterdam/

top010. (n.d.). *Voormalig OCEM gebouw*. nieuws.top010.nl. https://nieuws.top010.nl/transformatie-schoolgebouw-mathenesserlaan.htm

VORM. (n.d.). *Binck Eiland*. vorm.nl. https://vorm.nl/projecten/binck-plaats

Appendices

Appendix A: Interview protocol

Case study protocol

Whenever a case study is performed in academic research it is important to write a case study protocol. The protocol is made to ensure that the case analysis is done systematically and that its process is traceable by peer reviewers. A protocol should define the way relevant research questions will be answered, address how data is collected and subsequently its credibility procured (Breretone, 2022).

Case study selection criteria

For research of this extent, where multiple case studies are performed, it is advised to use three to four cases (Schoch, 2016).

Selection criteria

- Adaptive reuse projects
- Modern architecture
- New function is housing
- South Holland
- Instrumental case

Cases

- De Raedt
- De Rotterdamse School
- Noordsingel
- De Binck

Document analysis

As far as access to case specific documents go. Case

specific questions

Data analysis

- Partly open coding, summarising each sentence.
- Listing codes
- Reduction to smaller number
- Constant comparison
- 5 – 7 overarching themes that reflect the purpose of the research
- Examining and reflecting on ideas that compose the themes.
    - How do they interact with each other?
- Writing down the narrative with supporting quotes and discussion of interrelationship

Interview protocol

- Predefining concepts
- Collecting examples of these concepts

- Analysing these concepts in order to find the commonalities

What, why, how.

Required case information.

- Developer
- Architect
- Original function
- Year of construction
- Year of transformation
- Location
- Project size
- Access type
- Case description
    - Architecture
    - Goal/vision of transformation
    - Social sustainability measures – overview according to the framework
- Conclusion

	De Raedt	De Rotterdamse School	Delft Hoog	De Binck	Noordsingel
Developer	Vorm	Vorm	De Nieuwe Norm	Vorm	De Nieuwe Norm
Architect	Architekten Combinatie	EGM	Klunder	Kraaijvanger	TOBA
Original function	Offices	School	Offices	Offices	Offices
Year of construction	1968	1933	1975	2005	1970
Year of transformation	2020	2018	2020	2019	2017
Location	Rotterdam	Rotterdam	Delft	The Hague	Rotterdam
Project size	51	43	208	73	12
Access type	Lift/gallery	Corridor/Lift	Lift	Corridor/Lift	Corridor
Construction costs					
Costs per dwelling					

Script

Begin

Hoi … ik ben Max Mellink en ik doe onderzoek naar sociale duurzaamheid in transformatiebouw. Ik ben op zoek naar ontwerp en ontwikkelkeuzes die hiertoe gemaakt worden om vervolgens te kijken naar de bouwkosten die deze met zich meebrengen.

Ik doe dit onderzoek voor mijn scriptie om de master MBE aan de TU Delft af te ronden. Zou je bij deze het consent formulier willen invullen? Het is voor het onderzoek belangrijk dat ik vertrouwelijk omga met de informatie die mij gegeven wordt en dit formulier is daar onderdeel van. Daarnaast zou ik het interview graag willen opnemen om het optimaal te kunnen verwerken.

The hypothesis

Buildings need to stimulate fleeting encounters with quality and spacious circulation space.

though no definitive theorie on how

Vragen

Wat is uw achtergrond? Heeft u veel ervaring met transformatieprojecten?

Vindt u het belangrijk om gebouwen te transformeren in plaats van sloop en nieuwbouw?

Waarom?

Heeft het andere implicaties/complicaties?

Ben u bekend met de term sociale duurzaamheid?

Op welke manier probeert u bij uw projecten de SD te bevorderen?

Waarom deze manier?

Waaruit blijkt dat dat werkt?

Wordt dat gemonitord?

Heeft u daarvoor andere ontwerpkeuzen moeten schrappen?

Hoe heeft u het binnenklimaat proberen te verbeteren?

Hoe is er gekeken naar de aansluiting tussen het private en publieke?

Hoe is de veiligheid van bewoners gewaarborgd?

Heeft u geprobeerd ontmoetingen te stimuleren?

Is authenticiteit van het oorspronkelijke gebouw een uitgangspunt geweest?

Is identiteit een uitganspunt geweest? Individuele identiteit.

Hoe heeft u dit bij de … aangepakt? Wat waren de ontwerp uitgangspunten?

Wat is de impact van deze ingrepen op de bouwkosten geweest?

is het mogelijk om een schatting te maken van het percentage van de kosten dat voor gemeenschappelijke of sociale doeleinden wordt gebruikt?

Hoe wordt bepaald Wat kwaliteit is en wat niet?

Hoe denkt u dat sociale duurzaamheid makkelijker toegepast kan worden?

Heeft u wensen achterwege moeten laten? Waarom?

Einde

Bedankt voor je medewerking. Dit zijn mijn contact gegevens als je nog vragen hebt. Verder hoop ik dat ik op mijn beurt nog contact kan opnemen als iets verder opgehelderd dient te worden.

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Appendix B: Interview results

Qs	Hans Goverde	Dennis Hofman	Arno van Schaik
2. What is social sustainability and how is it affected by adaptive reuse?	Reuring/ gezonde omgeving/ balans/ generating public support/ participation	outdoor space more important than original facade. Technically only futile architectural discussion if its a nice facade or not. /social control	Contact met maaiveld/ontsluiting met eigen identeit, diversiteit/ verhoogde begane grond
2A. - Why is social sustainability important?	Safety/liveability/increases support for circularity/battling loneliness/ health	Creating quality for society/ amenities/ equity/future proofing	Connection/ liveability
2B. - What is its relation with the built environment?	Sense of amazement/ spaciousness/ ownership/city image	It is all interconnected. You always have to think about the impact on the surroundings. Collective spaces/ amenities	Liveliness/ connection with the street and city.
2C. - How is social sustainability related to adaptive reuse?	authentic elements/ more positive urban image	higher varietye/quality like high ceilings	Brede gangen, hoge ruimtes, gekke gangen, gekke ruimtes. verhoogde begane grond. Glas in lood etc. All met al ruimtelijke verassingen die een uniek resultaat leveren. Diversiteit.
3. How do practitioners incorporate social sustainability?	open plinth/ communal space and activity, organising it together, but also some private space as a buffer, borders they can individualise/ restoration of industrial look	gradually from public to private/greenery/ equitability/participation	making extraverted buildings
3A. - Which tangible architectural elements affect social sustainability?	courtyard/ authentic elements/ front doors at street level/greenery	Equitable entries/ you should sooners take a more ugly facade stone than cutting elemental elements from your initial concept	circulation space, but is usually minimised. Authentic elements. Visual Connection between apartments at the back. Street connection. Interaction/collective court/roof garden
3B. - How are social measures assessed?	discussion in line with initially formulated goals, no quantitaive way. Might help though	Vaguely/often neglected for there is no market demand/ But what we do is checking which concept is most in line with peoples wishes. Collective spaces are relatively easy to keep from budget cuts	Project afhankelijk, maar ramingen worden gemaakt en er wordt gekeken of het binnen het ontwerp past
4. How are costs related to social sustainability in adaptive reuse	Difficult to assess/ especially a better qualification of social measures is needed		Expensive structural changes
4A. - How can the costs be made explicit?	Determining social return of investment		Ramingen
4B. - What financial benefits exist?	higher market value		Building value
miscelleaneous			The function should follow the form. Arno further shared the compelling thought that the design of circulation typology could have serious reperaussions on the facade. If the aim is to preserve the frontal facade, a designer needs to think how outdoor space is provided without attaching balconies to it. Hence, each apartment needs a connection to the rear facade for its balcony, which a corridor might render impossibel or rethink the provision of outdoor space alltogether.
1. What is adaptive reuse?			Carte blanche binnen stedelijk weefsel en je kan voor een ontwikkelaar ideaal maatwerk leveren. Makkelijker samenwerken. Optimising floor space.
1A. - What are current challenges of adaptive reuse?		Confined. Different scale/less easy to creating an urban/risky/Holistic approach, dont lay everything on the contractors plate. Cooperation	Floor space optimisation/ bestaande context/ shouldnt be holy grail/ pointcloud
1B. - What is its relevance?		Very important! More quality	Duurzamer/ better buildings/ dont impose a design on a building
1C. - How does it differ from new construction?		Neighbourhood is already used to its volume/ diversity of houses/ Very special housing types	Less waste/ better cooperation/higher difficulty/more interesting result

Qs	Martijn Tromp	Harald Clabbers	Wicher Mol
2. What is social sustainability and how is it affected by adaptive reuse?	liveliness/culture/daylight	Sees no direct connection.	Diversity. Contrary to the technical and 'hard' environmental sustainability, social sustainanability is much more soft. Harder too pin down/cohesion
2A. - Why is social sustainability important?			Important that people have a sustainable connection with their residence
2B. - What is its relation with the built environment?	Active functions	Recogniseability, place attachment,	diversity of dwellings, diversity of residents, target groups.
2C. - How is social sustainability related to adaptive reuse?	Not a huge connection on design level. You do see larger spaces when adapting offices for example, which is nice/ sometimes you see spaces that cant be transformed to a resifential function so it becomes a common social space, residual space	A building is already embedded in the surrounding atmosphere and infrastructure. Unique floor plans. Each house is unique. The extra floor height makes the building more flexible and future proof	Surprise(serendipity)/Diversity in housing types, but really depends (Binck actually very much so)/ neighbourhoods immediately have history
3. How do practitioners incorporate social sustainability?	Defending people from themselves	Providing choice/ collective garden/ left over space eventually furnished as collective space	Providing diverse households with collective spaces/ healthy environment
3A. - Which tangible architectural elements affect social sustainability?	collective outdoor space/ However, social sustainability is a condition for successfulcollective space	gallery/diversity of transformation/ Regarding circulation: no dead corners etc. to divert safety issues. Light. Fancy materials	Collective amenities like washing space/guest bedrooms/gardens
3B. - How are social measures assessed?		Gut feeling. Balconies were deemed more important than the facade.	gut feeling/ no real monitoring/ You see these collective spaces a lot recently but nobody realy checks if it works/ you just discuss what is more in line with your concept
4. How are costs related to social sustainability in adaptive reuse	Costs are often high in adaptive reuse	In adaptive reuse, the costs are calculated very differently, the other way around. Economies of scale need to secure enough profit.	not about costs, just care and attention. Costs for an artwork for example is relatively negligible. Financially not really great to transform
4A. - How can the costs be made explicit?		New construction is more explicit. Calculating construction costs of adaptive reuse projects can be a capricious exercise, but social sustainability in adptive reuse is not more capricous than in new construction	
4B. - What financial benefits exist?			Not sure, possibly but just societal benefit is also ok
miscelleaneous	Corridors are not suited for residential architecture but often found in offices	Social side of the gallery is a nice extra, since the gallery was mainly supposed to increase commercial floor area	"With so many unknowns and uncertainties, transformation just cost to much time and energy".
1. What is adaptive reuse?	Take more time to chart everything (pointcloud)		When it works its great though. History remains in neighbourhoods. Layering brings character
1A. - What are current challenges of adaptive reuse?	Fire hazards/confining shell/regulations/installations/maximisation of floor space	Structural engineers need to be more involved. Structural cuts are not only expensive, they take a lot of time. Construction on hold for example. Digitalisation/Difficult balance between creativity and commercial value. GO/bvo verhouding. Always unforseen problems.	Very high risk. Very restricted
1B. - What is its relevance?	Easier for the neighbourhood/ less time to grow	In research he did for VORM he found out that for adaptive reuse both environmental and societal benefits are significantly higher compared to its alternitive, demolition and new construction. Positive impact on society	Most suitable office buildings have already been transformed.
1C. - How does it differ from new construction?	some qualities like floor height etc/ floor space maximisation more difficult/suprises	Higher variety in dwellings	More time and energy to develop and design. Judicial negatives

Qs	Gert-Jan Fernhout	John Koks	Thysia Kleijwegt
2. What is social sustainability and how is it affeded by adaptive reuse?	How people prefer to live/ not for everyone the same/ Neighbourliness	More interesting typologies. Inner courtyard /rooftop gardens (very expensive). Increasingly applied	Strong community with a sustainable connection to their immediate environment, both built and social
2A. - Why is social sustainability important?	Less loneliness/better health/economic efficiency		cohesion/equity
2B. - What is its relation with the built environment?	A durable relation with your dwelling and your neighbours		
2C. - How is social sustainability related to adaptive reuse?	Sees no direct connection with adaptive reuse	Adaptive reuse requires a whole different approach regarding the circulation space and creates more interesting forms	
3. How do practitioners incorporate social sustainability?	Collective space/ common goals or mision	Too much focus on obvious costs. Choices like facade materialisation are made too soon. Social housing generally see steel window frames and rebated doors opposed to the private sector with more expensive wooden frames and flush doors. I don't think many people really care. Rebated doors are even better insulators as they are more air tight, but still budget cuts rarely involve them over social investments. I think people might prefer extra social space like an extended gallery.	Interaction as a means to achieve cohesion. Many architects just introduce a collective space like a community garden in their projects, but this only works when it is both well designed as organised and the target groups have been truly understood to profit from this. Whenever someone is tasked with its management, profesionally or not, benefits will increase, while the chances of delapidation of the facility deminish.
3A. - Which tangible architectural elements affect social sustainability?	Future proofing/adaptability/flexibility//front gardens/open plinths	Expensive high-end material are chosen when extra quality is an option, even though social measure might actually make a better mark on your life.	Eendagswinkel, community gardens > bridging different groups by finding common ground.
3B. - How are social measures assessed?	Social return of investment/ target groups need to be thoroughly examined	Not really	Social design entails an emphatic approach of your target group
4. How are costs related to social sustainability in adaptive reuse	economic efficiency/higher house prizes probably/	Optimising floor plans. Calculating if the facade justifies circulation plan. Depends on the phase. You cant earn money with circulation space. When developers decide where to invest in value creation, too often they make the obvious choice. Demolition costs of course, demolish as little as possible. Repeated little changes often eventually lead to too high costs and too much change. Just dont. Very expensive to make structural changes	Not the costs are the problem, but the benefits or value. However, high costs are often where ambitions fall apart
4A. - How can the costs be made explicit?	Social return of investment	Calculating costs is essentially very simple. The costs of concstruction elements are set, just count how much you need. With adaptive reuse however, the problem lies in prediciting the count rather than calculating the costs.	Not the right question
4B. - What financial benefits exist?	Cohesion can be beneficial in several economic levels. Efficiency, operation costs/maintenance/ health costs/mantelzorg. It is furthermore selfexplanatory that satisfaction impacts prices.	benefits are not necessarily directly financial as it is difficult to express them in a monetary value. Developers rather use them as marketing to sell their project	Housing projects become more controllable, less maintenance
miscelleaneous		Galleries for example dont count for your gross floor area, which means that it increases the net to gross ratio compared to indoor circulation space. Developers, however, often forget that they still have significant costs that negate its positive initial look	To tackle the housing crisis we need to think further then the classic pattern of simply increasing the housing stock. Not quite unlike the unecessary expansion of road networks to solve congestion, it is a vicous circle, that needs to be diverted with alternative ideas intstead, like new housing concepts, better cooperation between public and private parties and regulations that can react to unfamiliar circumstances.
1. What is adaptive reuse?		More interesting	adaptation does create a certain positive atmosphere, but should not be pursued no matter what. It is wholly dependendant on the situation.
1A. - What are current challenges of adaptive reuse?		many unknowns	
1B. - What is its relevance?			
1C. - How does it differ from new construction?			