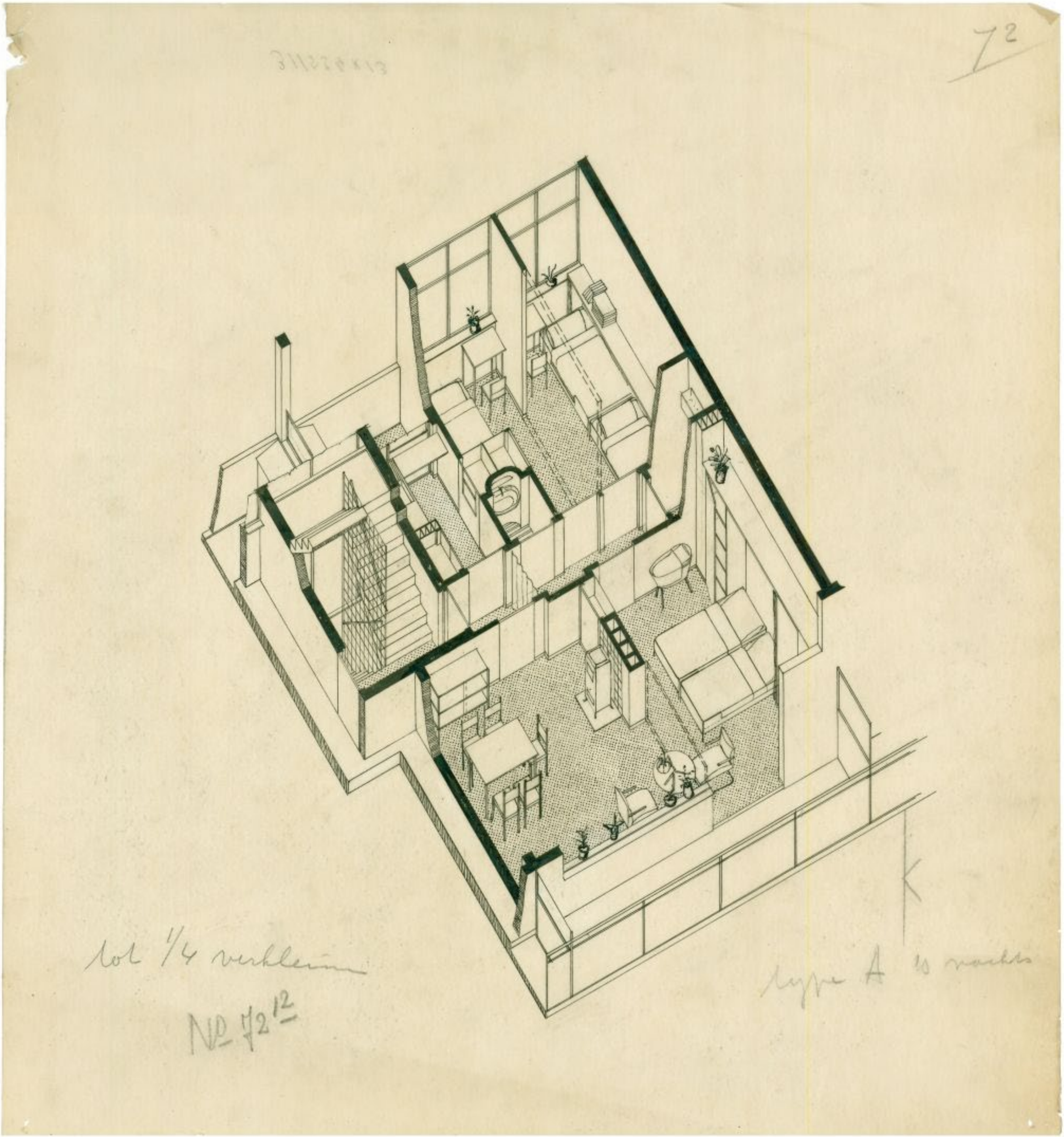
A New Minimum

The potential for existenzminimum housing concepts in renovation projects.



J.H. van den Broek, Prijsvraag goedkope woningen / Ontwerp Optimum, Amsterdam, 1934. Collectie Het Nieuwe Instituut, archief J.H. van den Broek.

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Introduction

'The need for housing in the Netherlands has not been this high since the Second World War.' (NOS, 2021), that's the statement the Woonprotest movement gave to the press before their march in Amsterdam on September 12th 2021. Simply building more homes seems like the obvious solution. Reality is, of course, not that simple and there are multiple solutions that can lead to an improvement. For example, we could build 1.000.000 new homes or make better use of the existing housing stock. Or we could repurpose empty office buildings, change the interest rate on mortgages, more subsidies for construction of homes through the government or even reject the system altogether and seek new models for housing in the Netherlands. But which these solutions are correct?

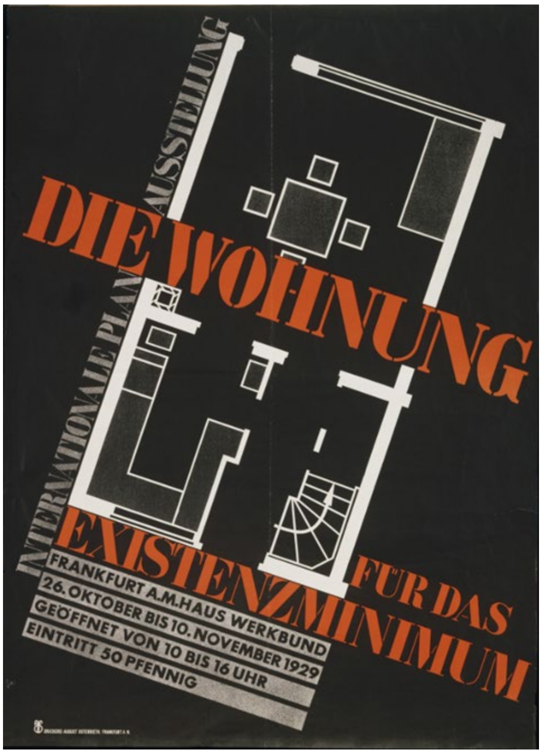

Figure 1: Poster advertising the 2nd CIAM congress. (Leistikow, 1929)

In the past, the housing crisis of the Interbellum inspired the *Existenzminimum* movement of architects, cumulating in the 2nd CIAM congress in 1929 titled: "Die Wohning für das Existenzminimum" (see figure 1). These architects and planners aspired to uplift the working class from the poor conditions of their existing homes in the slums by designing new, efficient models for housing. They designed homes that provided an adequate amount of daylight, access to green space, fresh air, access to transit and other such aspects while attempting to limit the required floorspace as much as possible.

The optimization of living towards maximum efficiency leads to an inevitable struggle. How much are we willing to sacrifice in the name of efficiency? In terms of the 3 P's of sustainable development as defined by the European Commission, there is a struggle between People and Prosperity that is inherent to the idea of a minimum dwelling. Adapting dwelling concepts from the *Existenzminimum* (or other historic examples of efficient housing) so they fall on the acceptable side of this conflict should be a logical solution to the housing crisis of 2022 in the Netherlands. However, this overlooks the third P of sustainable development: the Planet. Humanity's impact on the global climate is undeniable and any solution for the housing crisis that does not regard the global climate should be discarded. This process is described in the diagram in figure 2.

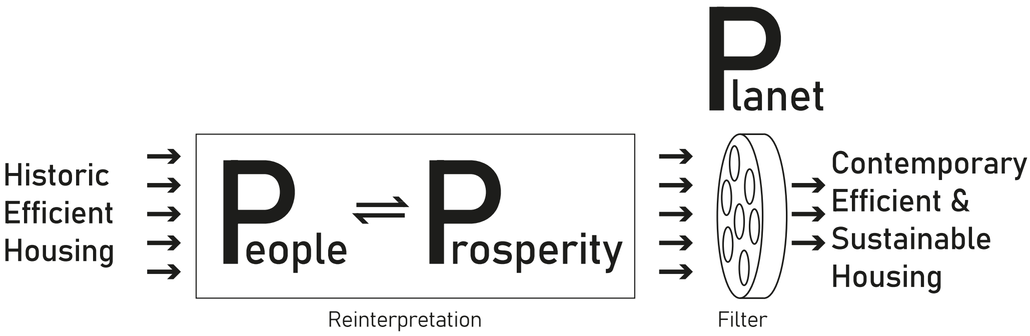

Figure 2. Diagram of the development of housing concepts in the project.

This graduation report describes a feasibility study of recontextualized historical efficient housing models within the graduation studio Revitalising Heritage at the TU Delft, as part of the Master track Architecture at the Faculty of the Built Environment. In this studio, relatively young buildings that are not yet defined as heritage are the objects of interest. The studio poses the following question: “How could renovation and densification strengthen qualities and solve current problems, without compromising heritage values and identities?”

Method

The feasibility study is conducted as follows: Firstly a baseline assessment is done of the case study buildings as part of the group work preceding the individual graduation studio project. This is done in the form of architectural, historical and technical research that is then condensed into SWOT analyses and finally into a comprehensive model for sustainability focused decision making in renovation projects as defined by Kamari et al. (2017). The assessment using the Kamari model will serve as the baseline.

Second, historical examples of efficient housing models will be selected to be implemented in the case study provided by the graduation studio. These efficient housing concepts are not exclusive to the *Existenzminimum* movement. In the selection process of these concepts the case study serves as the canvas, providing external factors in the way of spatial or ecologic limitations and existing qualities that can strengthen or jeopardize selected concepts.

Thirdly, concepts that are incompatible with the necessary ecological design interventions in the case study to achieve sustainable development are disqualified, visible in figure 2. Ecological interventions will be designed in a way to strengthen existing qualities of the case study and to support the chosen efficient housing concepts.

Case study

Figure 3: Google Maps cutout of the case study

The chosen case study to be renovated is Bijlmerplein Clusters 2&3, designed by Atelier Pro, completed in 1986. It consists of 137 dwellings and is part of the Amsterdamse Poort shopping area at the center of the Bijlmermeer expansion area of Amsterdam. The ground floor consists primarily of commercial and storage space, with the floors above consisting of housing. A significant area on the 1st floor was designed as a library that has since moved out and been replaced by more commercial space. The commercial spaces get significant foot traffic from the nearby public transit hub station. The structure is built up of concrete columns and beams on the ground floor with concrete load bearing walls above. The facades are constructed out of aerated concrete and finished with a light colored brick that is consistent with most other buildings that make up the shopping area. Perhaps the most important quality of the buildings is the decks on the backside of the buildings. Covering either the parking lot or expedition streets, the decks form the primary entrance to the dwellings.

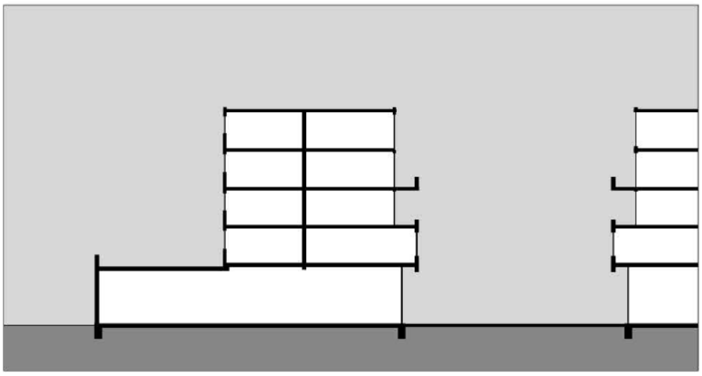
Figure 4: Schematic section of the case study

Group work analysis into the architectural, historical and technical aspects in the 1st semester resulted in the following SWOT analyses as seen in figure 6. Additionally, a wheel-shaped model for sustainability focused decision-making in renovation projects, as defined by Kamari et al. (2017), was used to serve as a baseline assessment of the building. The model defines 18 categories of building quality, to be graded 1-5, in which a grade of 1 means sub-standard quality, 2 means minimum standard, 3 means good practice, 4 means best practice and a grade of 5 means exemplary quality. The baseline grading of Bijlmerplein Clusters 2&3 can be seen below in figure 5. This same model for assessment is used to evaluate the feasibility of the design solutions that are found by recontextualizing historical housing models.

Figure 5: The Kamari wheel baseline evaluation of the case study

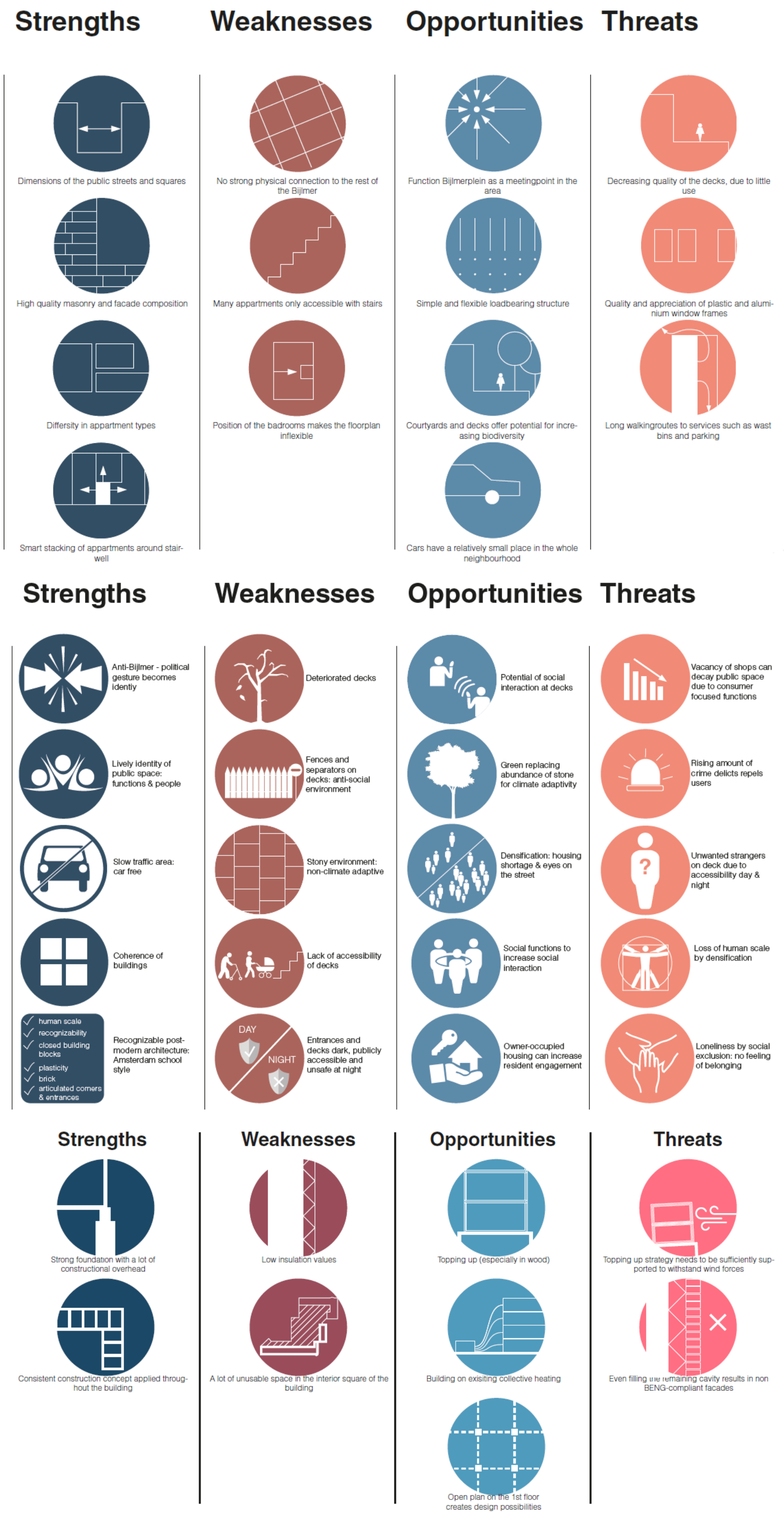

Figure 6: SWOT analyses of case study (will be unified in layout)

Formulating a design brief

The three pillars that inform the renovation design process of Bijlmerplein Clusters 2&3 are the housing crisis, climate crisis and the potential heritage aspect of the building. Solutions are posed for each pillar: historic housing models for the housing crisis, Kate Raworth's Dougnut Economic model for the climate crisis and an informed conservation strategy to address potential heritage values.

The "Existenzminimum" or minimum dwelling moniker is dangerous. If left unaddressed it can be interpreted as designing a home that consists of as little as possible. As little floorspace as possible, as little function as possible, a sort of 'race to the bottom'. To avert this issue, the concept of minimum dwelling is inverted to strive for maximizing housing quality within a certain envelope that is to be defined. In this way, the design requirements are flipped as well, defining a goal to maximize aspects rather than minimize them.

In addition to these concepts, the design also utilizes the Doughnut Economic model. This model, as seen in figure 7, defines an ecologically safe ceiling and a socially just floor in between which humanity can thrive. Fully incorporating the Doughnut model in the design means ensuring all design solutions are fitting to this definition of a safe and just space for humanity. This translates to setting certain minimum requirements for the ecological and social quality of design solutions.

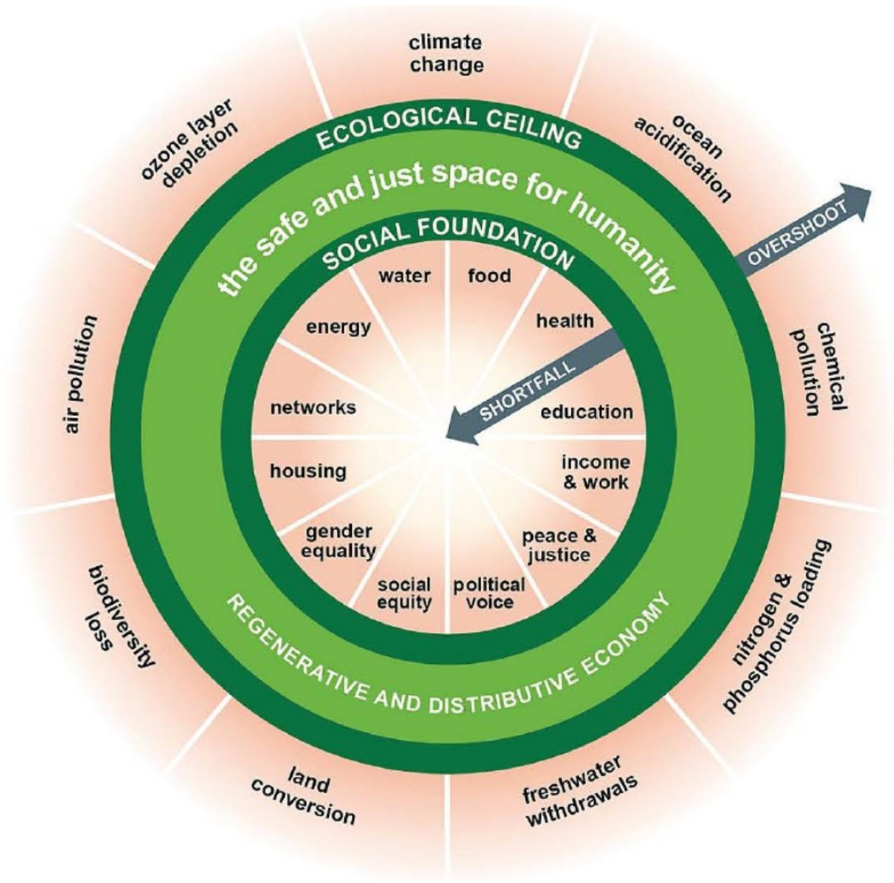

Figure 7: Kate Raworth's Doughnut economic model (Wikipedia.com)

Finally, although not yet certified as heritage, the building still has qualities to be strengthened and identities to be preserved. These were researched in the group work in the 1st semester. The conservation of these values is also reflected in the design requirements. A basic overview of the design requirements and goals is visible in figure 8. In the figure, the H represents requirements and goals for the housing, The E represents requirements and goals for the ecological aspects of the renovation. The S represents requirements and goals for the social qualities of the building and the HA represent goals and requirements in regards to the potential heritage values.

- **H** **Full compliance with housing quality standard**
- **H** **Maximal efficiency in space usage**
- **E** **Maximal efficiency in material usage**
- **E** **Full CO2 compensation & self-sufficient energy generation**
- **E** **Maximal exploitation of biodiversity improvement opportunities**
- **S** **Maximal engagement with public spaces**
- **S** **Maximal exploitation of opportunites for shared functions & spaces**
- **S** **Maximal opportunity to remain on location**
- **HA** **Maximal strengthening of values & identities**

Figure 8: Design Requirements

The Design

The starting point for the design was the implementation of historical housing concepts. But which housing concepts and where? In the process many historic examples of efficient housing were considered. Perhaps the oldest example, even predating the 2nd CIAM congress in 1929 is the *hofje,* which literally translates to small courtyard, first established in the 13th century. A typical *hofje* consists of small houses surrounding a central ornamental garden and was meant to house poor members of society, normally widows or unmarried women. As the communal well, water pump and toilet were located in the garden, it also functioned as the meeting point for inhabitants of the complex. The *hofje* was typically very secluded, separated from the outside with a high wall or fence (Zuiderwijk, 2013). This dwelling concept was rejected as the secluded character was difficult to realize with the inner courtyards not being fully closed off and the density of the existing buildings. Another example of a rejected housing concept is the *vertical city* as utilized by Le Corbusier in the Unité d'Habitation. In this concept, spatially efficient housing is realized in unison with a large amount of additional functions, all within the same building. In this concept the roof of the building is used as a large communal space, with a running track, kindergarten, gym and even a pool. Additionally, shops, medical facilities and a hotel are distributed throughout the building (Kroll, 2020). This concept was rejected because the location of the case study within a commercial center means the extra functions realized are already available in close proximity.

Three concepts were found to be compliant to the case study renovation design, supported by a combination of either contemporary experts, societal factors or existing implementations of the concept. These were established in the design in three different ways. As the SWOT analysis from the 1st semester showed, the Bijlmerplein buildings are fit for densification, especially topping up. Therefore the first concept will be implemented as a topping up. The second concept will be implemented in the existing dwellings. The third will be implemented as a strategy for the empty commercial space on the ground floor.

Efficiency through sharing

The first concept to be added is a concept that was defined by Karel Teige after the 2nd CIAM congress in 1929 (Korbi & Migotto, 2019). In the original concept the home is reduced to a living compartment that is to be used almost exclusively for sleeping. Other required functions are situated outside of the home to be shared with other inhabitants. The concept is supported by the societal trend of shared services like sharing cars (Jongeneel, 2018), the fact that the average person in the Netherlands uses more floorspace than surrounding countries (Van Bockxmeer, 2021) and contemporary projects that utilize a similar concept, like the Domus concept seen in figure 9. The location of the case study within a commercial center also provides a lot of functionality to the inhabitants of these dwellings.

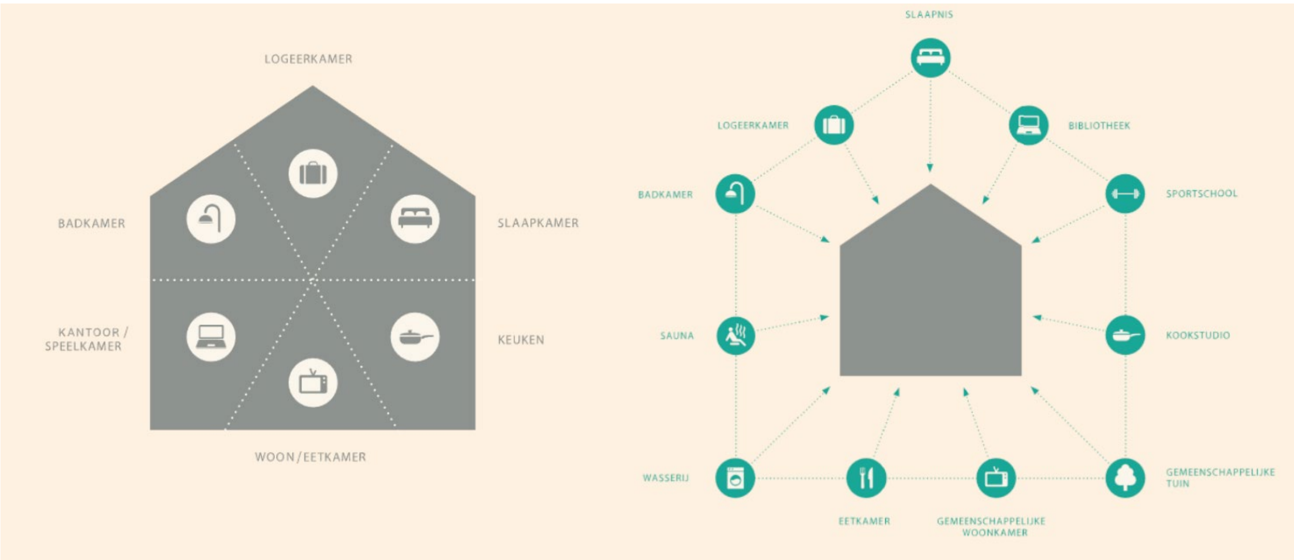

Figure 9: The Domus living concept. (Domusliving.nl)

This concept is recontextualized to a studio apartment, in which the floorspace requirement is flipped around to fit certain functions instead of fitting functions within a set floorspace. The apartments fit the following: a queen size bed, a kitchen, a bathroom equipped with a shower and toilet, a wardrobe, a desk and a dining table with 4 chairs or a lounge set. All other functions, like laundry or space for cleaning supplies are to be shared with other residents. By halving the existing grid dimension of 5400 millimeters along the length of the building and extending its depth, a new grid of 2700x3000 mm is formed. The functions mentioned before fit within the envelope of 3 grid elements or 24,3 square meters. These apartments are intended as social housing aimed at young independents: people who are moving out for the first time, students or expats.

Efficiency through flexibility

The second concept was also fully developed following the 2nd CIAM congress. The *frictionless living concept* designed by Alexander Klein sought to make floor plans more efficient by analyzing living patterns (Korbi & Migotto, 2019). This concept is visible in figure 10.

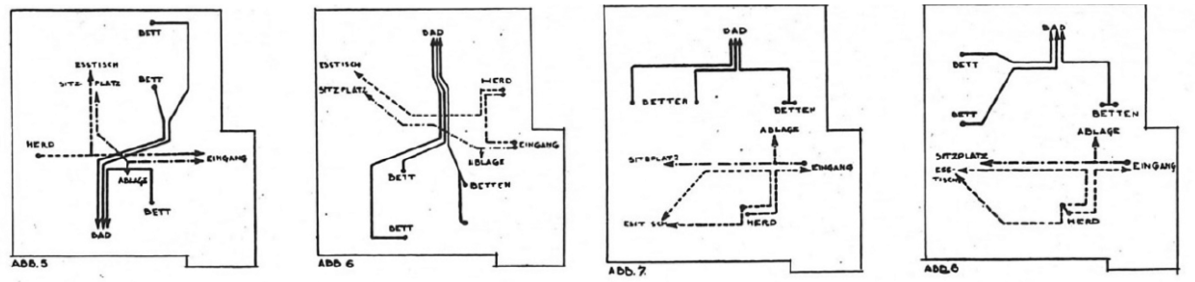

Figure 10: Graphic method of optimizing dwelling plans. (Korbi & Migotto, 2019)

This concept seemed to have inspired the dwellings designed by J.H. van den Broek in “de Eendracht” in Rotterdam. Designed as part of a contest for cheap housing, these dwellings strive to maximize a home’s functionality by changing its rooms’ functions throughout the day. Normally, a bedroom is only needed at night and a study is only needed during the day. By combining these, less floorspace is required. This concept is supported by the popularity of the tiny house movement, as seen in the NeverTooSmall Youtube channel, which relies on the same principles of flexible furniture. In the case study contemporary day/night homes are to be implemented in the place of the existing dwellings. In the process, these homes are rearranged into 30% homes of 50 square meters, 45% homes of 76 square meters and 25% homes of 108 square meters. The most desired sizes as found in market research (Onderzoek en Statistiek, gemeente Amsterdam, 2022). The formerly social homes are sold on the market, with the current inhabitants given the opportunity to buy them for market price beforehand.

Efficiency through communal living

The final concept will be implemented in the commercial space on the ground floor. Supported by the trend of ever increasing vacant commercial space (NOS, 2020) and the call for conservation of cultural sanctuaries present in squatted buildings directly following the criminalization of squatting in the Netherlands in 2010 (Kleijn, 2012). While squatting was not necessarily efficient living in terms of floorspace, it is an efficient way of realizing social and cultural functionality in both public and private space without getting caught up bureaucracy (Pruijt, 2009). The case study is located in the area of Amsterdam with the highest percentage of vacant commercial space, reaching 10% in 2021 (Economische Zaken gemeente Amsterdam, 2021). To get ahead of this, the commercial space in the project could be repurposed to create a communal living concept. Inhabitants will have small private room to sleep in, while sharing a living room, kitchen and sanitary facilities. Additionally there is space for these inhabitants to appropriate into other functions as desired. This will be part of the renters’ contract as well: each inhabitant is required by the commune to provide some form of social credit, to be accorded by the rest of the inhabitants. The reward for providing this credit is that the renting price will only consist of utilities and maintenance costs. In the renovation redesign the extra space is designed as a collective atelier with exposition space and shop, other examples of social functions realized in squatted buildings are community centers, cafes, band practice areas, bike repair workshops, restaurants, printing works, theaters, cinemas, nightlife, daycare or even a sauna. The social credit system attempts to utilize the institutionalized ‘squatters’ as place makers, interacting with the foot traffic from the shopping area.

Integral ecologic design

The design interventions that are meant to achieve some form of ecological impact are not the main focus of the design. Instead they are meant to support the dwelling concepts and reinforce existing qualities of the case study Bijlmerplein. As stated in the design requirements, the goal for the renovation design is to achieve carbon neutral operation and realization. To this end, most additions will be designed in a timber construction to serve as a form of carbon capture and storage to compensate all subtractions. A second skin façade is realized on the inside of the block to ensure the apartments are facing towards the interior courtyard space and protect it using Jane Jacobs’ eyes on the street principle. This method also conserves much of the materials and energy embodied therein of the courtyard façade. The streetside façade however carries a lot of embodied cultural energy, as the material is used in most buildings that are a part of the Bijlmerplein commercial center. The façade also has a rhythmic quality that was found to be well appreciated in the group work research. For these reasons the streetside façade was insulated on the interior of the building. By removing the 50 mm screed top layer of the concrete floors of the original building, floor heating can be utilized without compromising the free height. Additionally, the originally gas fired collective heating for the commercial spaces is exchanged for a heat pump on an aquifer to supply both commercial and residential spaces in the building. This aquifer is resupplied in the warmer months by utilizing a hybrid photovoltaic system that is also capable of fully supplying the energy expended in the building. To maximize the potential for biodiversity, the topping up is designed with green facades. Additionally, a comprehensive plan for public green on the decks is developed, to be maintained by inhabitants of the communal living housing concept.

Integral social design

In the group work analyses it was found that the quality of the semipublic space on the decks was simultaneously found lacking and well appreciated. This contradiction can be seen as an indication of the potential of this space, while vulnerable. Adding functions to this space to be used throughout the day double effect. Firstly, it strengthens the already appreciated quality of the space. Secondly, by realizing functionality throughout the day social control of the space can be augmented, as the inhabitants are more incentivized to have eyes on the street, or in this case, deck. Additionally, as the studio apartments are reliant on having high quality shared spaces, the topping up is covered with a greenhouse structure, making the space comfortable year-round, allowing for more social interaction between inhabitants. This structure also increases the available surface for photovoltaic panels.

Design for heritage

From group work analyses several aspects of the building were identified as being highly appreciated. In particular, the brickwork and rhythmic façade connecting the buildings the rest of the shopping area buildings. As result of this, the façade facing the shopping street is mostly preserved, insulating on the inside and exchanging the glass for more insulating glass. As mentioned before, the decks are seen for their qualities, but the downside of such a vulnerable space is also clearly identified. The redesign of the public space and giving ownership of the space to inhabitants aims to protect the space and strengthen the existing quality. It also provides a space where the strong social cohesion that is present can manifest itself.

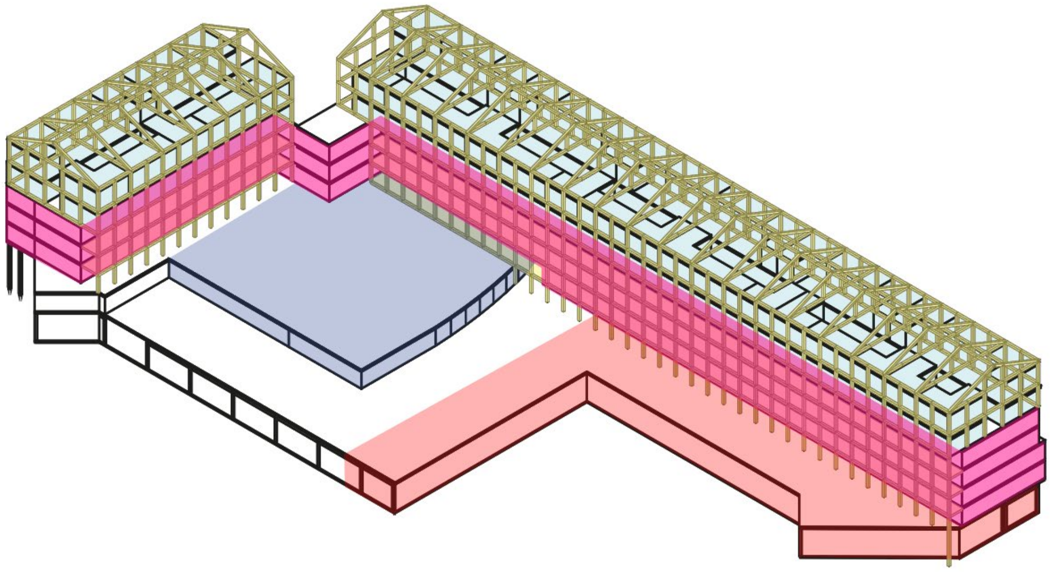

Figure 11: Schematic overview of interventions

Evaluation

With the completion of the final design an assessment using the model for Sustainability focused decision-making in building renovation as defined by Kamari et al. (2017) can follow. The final assessment can be seen in figure 12, with the darker marks denoting the baseline assessment. The grade system works with grades from 1-5, with 1 meaning sub-standard, 2 minimum standard, 3 good practice, 4 best practice and a score of 5 meaning exemplary. The model is divided into three categories, accountability, functionality and feasibility.

The accountability portion features the following criteria: spatial, sociality, security, identity, integrity and aesthetic. This category has seen marginal increases in three criteria and an identical assessment of the other three. The security, identity and integrity criteria achieve a high score through implementing an eyes on the street principle, providing space for social interaction and enhanced ecology of the site, respectively.

The functionality category features these criteria: indoor comfort, energy efficiency, material and waste, water efficiency, pollution and quality of services. This category saw the greatest overall increase in assessment scores. Every single one of the six criteria saw a higher assessment, with pollution even reaching a score of 5, as the project achieved net-zero carbon operation and realization. Only the quality of services is scored below 3, as the highly collective nature of the installations mean the controllability of the system is slightly compromised.

The feasibility category features the following criteria: investment cost, maintenance cost, financial structure, management, innovation and engagement. The maintenance cost criterium retained its score of 2, as the priority for timber material (while greatly benefitting ecological impact) mean maintenance costs will not be lowered greatly. All other categories achieved a grade of 4. Even the investment costs were suppressed through the selling of existing social housing in the project and returning more social homes in their stead.

Overall the project improved most in the way of functionality and the least in accountability. This seems contradictory to the design process, as the ecological aspect (which informs most of the functionality category) of the design was explicitly secondary to the housing concepts and their implementation. One could expect the accountability category to see the highest increases in overall score with such a division of priority in the design process. However the housing concepts were chosen to increase the efficiency of the project, leading to increased scores in the feasibility category of the model. Assumedly, if housing concepts meant to increase housing quality were implemented in the project the scores in the feasibility category would be lower, while scores in the accountability category would be increased. The increase in ecological criteria despite explicitly not prioritizing these criteria can be interpreted as meaning that the utilized historic efficient housing concepts are very compliant to implementing design interventions that benefit these ecological criteria.

Figure 12: Kamari model evaluation after renovation.

Discussion

The most important flaw of the chosen method of exploring feasibility is my personal limitations as a designer. Implementing a historic housing model in a contemporary context can be done in numerous ways and there is no guarantee that the chosen implementation is the correct or optimal one. Furthermore, the chosen housing models are also not guaranteed to be the optimal ones to implement in this particular project, even with numerous societal factors or other conditions supporting them. Another limitation could be the chosen evaluation method that, while comprehensive, could be biased towards certain aspects of a renovation design.

The renovation planned to keep the project affordable by returning the existing social housing to market and using the funds to realized new dwellings, but fully exploring the affordability of building the project was not within the scope of this research.

The design process that was utilized focused on finding integral design interventions that address multiple design requirements and opportunities simultaneously. This caused the final design to be highly specific to the case study, even the different housing concepts are closely linked or even reliant on one another. Therefore directly transferring the recontextualized concepts into another context, however similar, seems very difficult. Nevertheless, further research can be done into implementing the same concepts in other case study renovation designs without the context specific adaptations utilized in this project. Furthermore the acceptance of certain space-saving measures and the potential for squatting-esque housing as a tool for place making could be investigated. The potential for other housing concepts that were rejected, like the *hofje* or *vertical city* concepts could also be explored in cases that support them better.

Conclusion

As seen in the final assessment, implementing recontextualized historic housing concepts in a renovation design of the case study Bijlmerplein resulted in increased scores in almost all criteria denoted in the model for sustainability based decision making in renovation projects as defined by Kamari et al. (2017). This means recontextualized historical efficient housing concepts are feasible in renovation projects.

The proposed final design has mostly impacted the functionality category of the evaluation model, which features criteria focused on ecological impact, despite explicitly not prioritizing ecological benefits in the design process. This implies that the chosen housing concepts to recontextualize were very compliant to design interventions that improve ecological aspects of the design. The assessment found the least increase in the accountability category, which houses criteria related to spatial and architectural quality. This is seemingly due to the housing concepts, which prioritize efficiency over these criteria, benefitting criteria in the feasibility category of the Kamari model.

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