Resourceful Affordability

Evaluating Case Studies to Determine the Most Affordable Resource Implementation Principle

Research Plan

Advanced Housing Design

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Introduction

In The Netherlands, there is currently a housing crisis whereby access to housing is in short supply. This is not a new issue in the Netherlands, where housing supply fluctuates. Historically, there have been times when housing had to be erected quickly and affordably, however, little attention was paid to the resources and environmental impact of the resource usage. An instance of this is the post-war dwellings erected over the country. Typically these dwellings are made from prefabricated concrete elements such as facades (Weriel, 2015), which is a resource approach that prioritises speed over quality and sustainability.

Supply of housing is not the only problem the housing market faces, but also the affordability of the housing available. This is most specifically a problem for the large number of people who fall into the gap where they earn too much to qualify for social housing, but earn too little to rent in the free sector (Boztas, 2023). The average price per square metre per month in the private sector is €17.10 (Pararius, 2023), whereas, in the social sector, it's €6.24 per square metre per month (van Deursen, 2023; Vijverberg & Jones, 2005), which demonstrates the vastness in the gap between the ability to rent in the free sector. There are also other expenses that these people have to incur in the long term. Renting in the free sector means rent increases are allowed to be higher than in the social sector. In 2023, the legal maximum rent increase in the free sector was 4.1% (Government of the Netherlands, 2023), while it was only 3.1% (Lieven de Key, 2023) in the social sector. Free sector renters have less legal help than people renting in the social sector; they only have access to the Rent Tribunal ("Huurcommissie") in the first six months of occupation, while social renters have permanent access (I Am Expat, 2023). The free rental sector also has only 14% of the housing stock, whereas the social sector has 28.7% of the housing stock, increasing competition for housing in this sector. The combination of these factors ultimately makes it very difficult for people who fall into this gap to rent any kind of housing.

The topic of resource usage lends itself to providing affordable housing, however, this is a topic that has very limited research, specifically in combination with sustainability principles. Since certain resource principles are under-used (circularity, bio-based) there is very little researched in combination with affordability, perhaps because there is very little researched on the topic of providing a framework to assess the affordability of dwellings.

The problems the country is facing with affordable private sector housing as well as the research gap, lends itself to making the main focus of this study to determine whether there is a more resource-central

aproach to designing dwellings - specifically for people who are in the gap between social housing and being able to rent in the free sector - that makes a dwelling more affordable to this target group. This leads to the research question: “Which resource implementation principle is the most successful in the creation of housing that is considered to be affordable in the free market rental sector?”

Theoretical Framework

The main theories governing this research are principles that focus on architecture from a material perspective, as well as its response to this from an economic perspective. This lends itself to themes centred around the management of resources, including industrial ecology, resource implementation principles and examples of this. To consider architecture from an economic perspective, the principle of housing economics is introduced, as well as the principle of affordability implied in this report.

Industrial ecology is a principle based on means by which sustainability can be rationally approached; it is a system's view focused on the cycle of materials (Kapur & Thomas, 2004), whereby the entire system is evaluated, rather than in isolation (Mitra, Elhaj, & Rahman, 2023). This principle is important in the evaluation of the sustainable use of materials, as well as in designing with materials in a systems approach.

The concept of a resource implementation principle forms the backbone of this study. This new term is used since no single overarching term groups these resource principles together in this way. It refers to an overarching theme of approaching sustainability regarding materials. In this instance, it concerns different approaches in material execution, such as cradle-to-cradle, open buildings and modularity. On the other hand, it also focuses on the choice of materials, such as bio-based, and locally sourced materials. The main objective of each principle differs, as is outlined below.

The Cradle to Cradle approach is based on a literature study of the book of the same name, Cradle to Cradle: Rethinking the Way We Make Things (McDonough, W.; Braungart, M, 2002). The basic principles of this approach are that when resources reach the end of their use, they are re-used, regenerated or remanufactured; it deviates from the typical linear economy, whereby resources are used and discarded.

Open buildings focus on the ideology that different materials have different lifetimes. Because of this, in these projects, the structure (with the longest lifetime) is provided, and the infill (with a shorter lifetime) is built by the individual (openbuilding.co, 2023). In a resource sense, the individual is required to buy and bring their own resources to build their home.

Modular housing is based on assembling as much of the dwelling as possible off-site, to limit the amount of time spent assembling on-site. It lends itself to quicker construction (Cameron, 2007), as well as

demountability ease (Cameron, 2007), whereby modules of the building are mechanically fixed and easily removed as a whole.

Bio-based materials are materials derived from organisms, such as wood, sheep wool, etc. These materials are thus renewable, and therefore more sustainable to use than traditional, non-renewable building materials such as concrete, steel and bricks.

The locally sourced resource approach is centred around the concept that materials, and ultimately design, are focused on what is available locally. This has a positive environmental impact due to fewer emissions from transportation to the site, as well as the possibility to reuse local resources.

To relate these resource implementation principles to affordability, a comprehensive definition of housing in an economic sense is provided, thereafter affordability in the context of the article is defined.

Housing economics as a principle, concerns itself with the quantitative value of a house in the market, which thereby allows for ratios and trends to be applied to its value (Kingsbury, 1941). This principle becomes of use when assessing the affordability of a dwelling qualitatively, as it allows for comparison. This principle bases itself on the evaluation of housing from a consumer's perspective, whereby "lumber, labor [sic] and land" (Kingsbury, 1941, p. 356) are not considered.

Affordability, as briefly mentioned above, is variable according to consumer perspective. In the context of this research, it is related to people who are above the maximum income required for social housing, but typically earn less than the average required to obtain a rental house in the free market. In quantitative terms, this is considered anywhere between the highest rental amount in social housing, €808.06 per month, and the average rental price in the free market, €1255.00 (Veul, 2023).

The combination of the entire framework provides a foundation to which the research question can be applied, in this case, a comparison between resource implementation principles and affordability.

Methodology

To conduct this research and ultimately answer the research question, certain methods will be used, which includes a literature review, case studies, quantitative analysis, as well as qualitative analyses if data is insufficient, ending with a comparative analysis.

A literature review is used to gain a greater understanding of certain topics. Initially, it is used to define the context of the research question by providing data-based evidence for the problem statement, as well as identifying a research gap. This method is also used in combination with the case study, whereby resource implementation principles are researched in greater depth to understand and extract the main principles around which they revolve. The case studies also rely greatly on this method to research and ultimately, understand the main principles of each project.

Simultaneously, a case study will be used to gain a greater understanding of the projects that represent each resource principle. This will involve many steps, including, but not limited to, an analysis of the architect and their design approach, site analysis, and a building analysis in many scales comprising elements such as access, circulation, structure, construction technologies, and building services.

A qualitative analysis will be used as a method to gain more insight into the case studies in the case that there is insufficient public data available. This includes methods like interviewing architects, as well as fieldwork where applicable.

Once the case studies and qualitative analyses have sufficient data, a quantitative analysis will be executed, whereby Indicator Based Sustainability Assessment Tool for Affordable Housing Construction Technologies (Wallbaum, 2011) is used as a tool to analyse the affordability of each case study. This tool entails giving a score to each case study in respective topics - such as initial construction costs, labour intensity, and durability - and calculating the total average for each case study.

Once the quantitative analysis is completed, a comparative analysis will be executed to determine the reasoning for the scores, as well as ensure the resource ideology with the highest score, is relevant to the site of the project.

Using all these methods, design principles will emerge, creating the foundation of a project. The design

of this will be based on principles further established using the literature review methodology. Once the case studies are analysed, and comparative analysis is completed, an affordable option for the resource ideology will become apparent, which the design will utilise as its main focus.

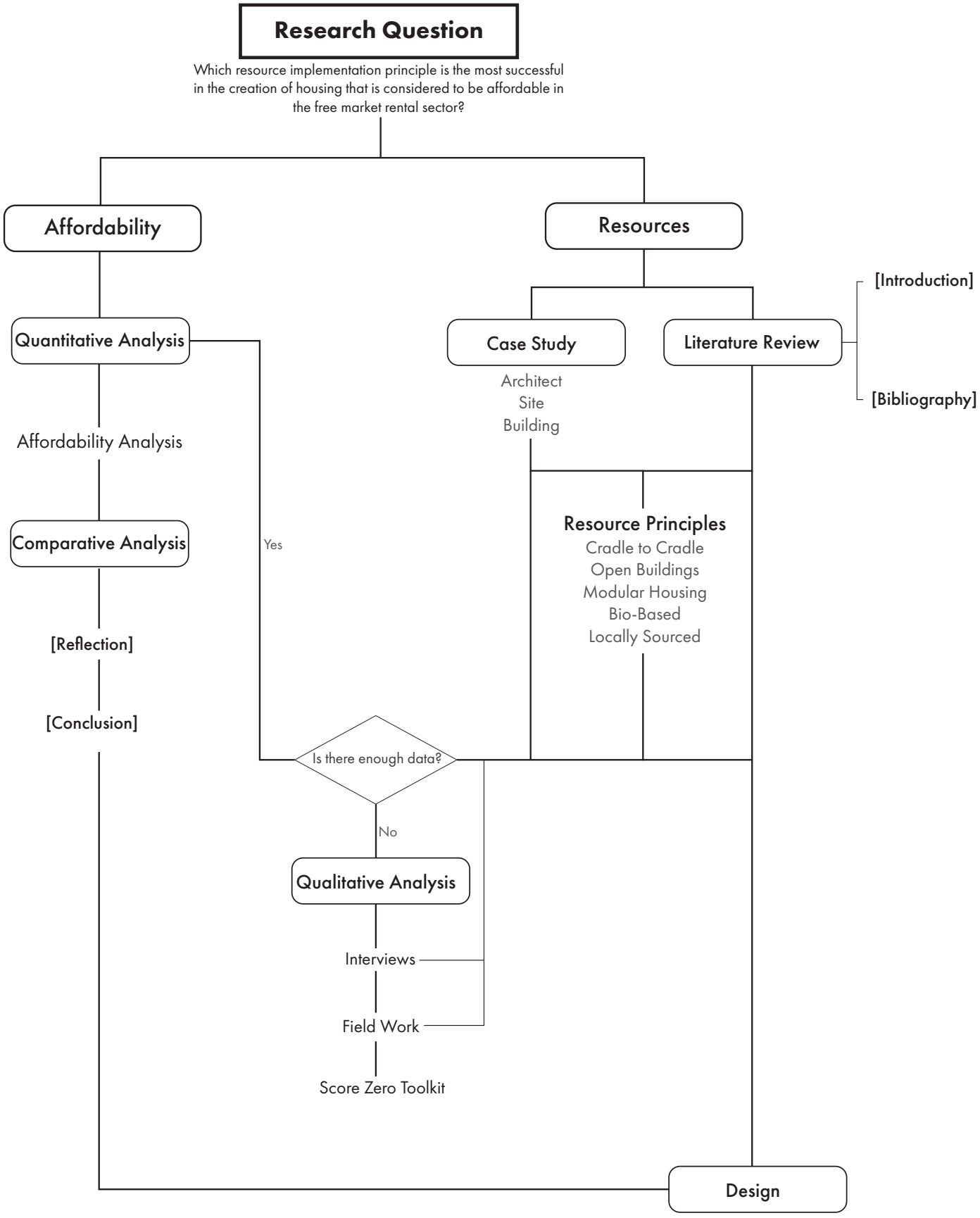

Figure 1. Diagram of Methodology

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