Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences

Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

Personal information	
Name	Dylan Besten
Student number	4717317

Studio		
Name / Theme	Circular-Adaptable Real Estate Reuse to React to Societal Changes	
Main mentor	Hilde Remøy	Real estate management
Second mentor	Peter de Jong	Design & construction management
Argumentation of choice of the studio	This thesis will explore multiple personal interests. Throughout the master we have learned about the circular economy and the ways of how it can improve the future. During the course "The Urban Redevelopment Game", I got the change to go even deeper in the subject of the circular economy, while portraying the role of circular economy manager. Even then I only scratched the surface of all the ways circularity can be implemented. This thesis provides the perfect opportunity to explore the subject even more. The subject of heritage is also a big personal interest. The fact that some buildings have stood the test of time has always intrigued me. By researching how these buildings are being repurposed through adaptive reuse is a beautiful way of giving the structures a new and bright future.	

Graduation project	
Title of the graduation project	The Future of Our Past Current implementation of circular economy strategies in the adaptive reuse of heritage buildings and remaining barriers
Goal	
Location:	Adaptive reuse project of heritage buildings throughout the Netherlands
The posed problem,	The construction industry imposes significant pressure on the natural environment, making it essential to transition to the circular economy (CE). A step towards this goal is adaptive reuse of existing buildings, more specifically, heritage buildings. Adaptive reuse (AR) of heritage is a difficult procedure that seeks to maintain the qualities of historic structures while modifying them for usage in the present and the future. The relationship between heritage structures and adaptive reuse has previously been shown in prior research. However, this

	research typically sticks to theory. Even though it provides a clear grasp of the enablers, obstacles, and methods for implementing circularity in the built environment, it frequently fails to convey how it is actually put into practice.
research questions and	What circular economy strategies are currently implemented in the adaptive reuse of heritage buildings and what barriers still require mitigation in order to move towards the circular economy?
design assignment in which these result.	The research will provide a set of circular economy strategies that are currently implemented in practice. It will also provide a series of recommendations about what practical barriers still exists in the implementation of circular economy strategies in the adaptive reuse of heritage projects, and how these can potentially be eliminated. These recommendations can be used speed up the transition towards the circular economy.

Process

Method description

The structure of this thesis will use both an theoretical and an empirical research. Therefore, during the research process, various research methodologies will be applied. Current circular economy strategies and indicators will be studied through literature review. Moreover using the existing knowledge, insights into the enablers and barriers of working with heritage will be discussed, along with ways to asses circularity within projects. The translation of theory to practice will be explored through empirical research, through case studies, which will consist of adaptive reuse projects of heritage buildings. The remaining barriers will be discussed in a focus group, with plan developers, architects and clients.

Literature and general practical preference

The current status, in which circular economy and adaptive reuse are seen as two distinct parts of the built environment will be identified via descriptive literature review. Literature review is used to study previous findings, analyse contributions, explain findings from earlier research, and clarify discrepancies in competing views on the subjects.

The first sub-question reads: How are circularity and adaptive reuse defined within the built environment? This question's answer will be derived from previously published articles. For the concepts to be properly defined, the articles used required to be related to the built environment. The premise for addressing the following sub-questions is established by answering to this question and defining both the concepts of circularity and adaptive reuse.

The second sub-question will delve further into the application of circular economy strategies in adaptive reuse projects and the measurement of a project's circularity. The literature that will be used to address this question will concentrate on frameworks and assessment models that employ indicators to measure circularity within a project. In order to narrow the scope of upcoming research questions, the literature will focus on heritage buildings as much as possible.

The final sub-question to be answered through literature review are the barriers and enablers related to working with heritage buildings. This question will use previous research on the matter, but will also include Dutch policy documents on the renovation of heritage buildings.

Reflection

1. What is the relation between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS)?

The graduation studio topic is Circular-Adaptable Real Estate Reuse to React to Societal Changes. This thesis aims to find out to what extent circular economy strategies are implemented in the process of adaptive reuse. Since the circular economy is not only something that has to be considered during the design phase of a project, but rather the entire life cycle of a building, this thesis will fit well in relation to the master track MBE.

The master programme Architecture, Urbanism, and Building sciences relates to almost every facet of the construction sector. The goal of the Dutch government is to move to a complete circular economy by 2050 (Ministerie van Infrastructuur en Waterstaat, 2022), this also means the construction sector has to make the transition towards circularity. The goal of this thesis is to create better understanding of what barriers still require mitigation to do this, and therefore add to this transition.

2. What is the relevance of your graduation work in the larger social, professional and scientific framework.

Societal relevance

Churches, city landmarks, schools, and industrial structures are just a few examples of the many different types of cultural heritage that have architectural, cultural, or historical importance. Their eligibility for demolition is a moot point given their representative roles. Nevertheless, the vacancy and disrepair issues are astounding despite the emphasis on the significance of the stated societal value. Currently, there are more than a thousand

unoccupied heritage buildings in the Netherlands, totalling 2 million square metres. (Quillettes et al., 2020).

The need for "conservation through transformation", an approach that emphasises managing changes in the historic urban region, is also mentioned in the UNESCO Recommendation on the Historic Urban Landscape (UNESCO, 2011). Cultural heritage is preserved for a longer period of time through adaptive reuse. Similar to this, by reusing materials and components from the original structure, the circular economy will be stimulated.

Moreover the Dutch government had set to have a completely circular economy by 2050 (Ministerie van Infrastructuur en Waterstaat, 2022). One of the measures towards achieving this, is the *"Grondstoffenakkoord"* (raw materials agreement). This agreement contains transition plans for five different sectors, one of which being the construction sector. The plans include steps which are to be taken in order to achieve this full circular economy by 2050. This thesis can contribute to find out where the circular economy currently stands, and show what steps still have to be taken.

Scientific relevance

As mentioned a fair amount of knowledge already exist about how adaptive reuse of heritage buildings can add to the circular economy. Yet a lot of this research is limited to theory.

While this gives a good understanding of enablers, barriers, and ways to implement circularity in the built environment, it often does not make the translation to how is it actually implemented into practice.

According to Hamida et al. (2022) a methodological tool with empirical validation, a workable and fact-based framework for circular construction adaptation is required through future research. Such a framework can be helpful for practitioners to operationalize circular building adaptability either proactively or reactively. This thesis's goal is to find and create that framework and test it, with the focus on heritage buildings. By exploring what circular economy strategies from theory are applied in the adaptive reuse of heritage in practice, a clearer image will be presented about the current state of implementation. This overview will provide information about what is already done but also what still has to be done, in order to accelerate the transition to the circular economy.

References:

Hamida, M. B., Jylhä, T., Remøy, H., & Gruis, V. (2022). Circular building adaptability and its determinants – A literature review. *International Journal of Building Pathology and Adaptation*. https://doi.org/10.1108/ijbpa-11-2021-0150

Ministerie van Infrastructuur en Waterstaat. (2022, January 17). *Nederland circulair in 2050*. Circulaire Economie | Rijksoverheid.nl. Retrieved September 30, 2022, from https://www.rijksoverheid.nl/onderwerpen/circulaire-economie/nederland-circulair-in-2050

Quillettes, J., Gommans, F., & Hitzert, F. (2020). *Leegstand rijksmonumentale nietwoningen, 2019*. Centraal Bureau Statistiek. Retrieved October 24, 2022, from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiGo4XvqPj6AhWWgP0HHZHVA4IQFnoECBkQAQ&url=https%3A%2F%2Fwww.cbs.nl%2F-%2Fmedia%2F_pdf%2F2020%2F05%2Fleegstand-rijksmonumentale-niet-woningen-2019.pdf&usg=AOvVaw3WMTTJUtF677V7fHRawKKw

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