

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.

Personal information	
Name	Suzanne Nathalie Oskam
Student number	4436199

Studio		
Name / Theme	Master of Science Architecture, Urbanism & Building Sciences; Management in the Built Environment	
Main mentor	Dr.ir. E. (Erwin) Mlecnik	REM
Second mentor	Prof.dr.ir. H.J. (Henk) Visscher	DCM
Argumentation of choice of the studio	<p>REM</p> <p>In the beginning of the graduation process, I had contact with Vincent Gruis about my subject and the internship at the Municipality of Rotterdam and he referred me to Erwin Mlecnik, teacher at the Real Estate Management (REM) section. Erwin Mlecnik researches and develops transitions in the construction industry, with regard to market developments of sustainable building concepts (including circularity) and process innovation. Here, the areas of interest are the promotion of collaboration and the development of an innovative supply in the construction sector (including renovation construction), which fits well with my own interests and intended ideas for my graduation topic.</p> <p>DCM</p> <p>After the 'kick off week' of the graduation process, I came into contact with Henk Visscher, Professor of Housing Quality and Process Innovation in the section Design and Construction Management (DCM). His interests are focused on process innovations that contribute to safeguarding and improving the quality of homes.</p> <p>Within construction management, the manager is responsible for the day-to-day management of the construction team, including the supply chain. Because my subject is circular supply chain management and because I want to research collaboration opportunities within the supply chain and the construction team, this ties in well with the field of DCM.</p>	

Graduation project	
Title of the graduation project	Circular supply chain management: The role of the municipality within circular supply chain collaboration to achieve upscaling of circular renovation of Dutch owner-occupied housing
Goal	
Location:	Internship at the Municipality of Rotterdam
The posed problem	<p>However, the fact that there is a significant body of literature about the challenges and drivers of circular economy (CE), there is a lack of clarity about the activities that must be taken within the supply chain of the construction industry, in particular the renovation sector, to become more circular. The main problem is that in the current market the supply of circular renovation principles is still scarce. And the CE principles that are applied in construction are often project-based, which will lead to a lack of wide scale adoption. According to the Municipality of Rotterdam, 'to achieve the upscaling of the supply as quickly as possible, innovative solutions are needed' (O. Oung, personal communication, October 9, 2020). This makes collaboration between the local market parties, active networks and sharing knowledge in the supply chain important. According to SDG17 of the United Nations, shared principles and values, a shared vision and shared goals are needed at the global, regional, national and local levels. The transformation from a linear to a circular economy aimed at the construction industry and the built environment is emphatically about joint tasks, which ultimately leads to different ways of working through awareness and sharing knowledge and experience. So, there is a gap between what the literature advised and what is currently happening in (circular) renovation practices.</p> <p>In this research, the focus is on collaboration opportunities within supply chain management of circular renovation of owner-occupied housing. Based on existing literature, there is a need for further research on how collaboration within supply chains of renovation in the built environment should be reshaped to make it a more circular system. This research will contribute to filling this knowledge gap.</p>
Research questions	<p>Research question: How could CSCC be facilitated by municipalities to achieve upscaling of circular renovation of Dutch owner-occupied housing?</p> <p>Sub-questions:</p> <ul style="list-style-type: none"> - What is the state-of-the-art of circular renovation of Dutch owner-occupied housing? - Which factors are needed to facilitate CSCC according to literature? - How do different actors of CSC networks see and experience the role of the municipality within CSCC to achieve upscaling of circular renovation of owner-occupied homes?

Design assignment in which these result.

This research intends to provide an overview of barriers and opportunities of CSCC within the current circular renovation process of private homes and how these can be better managed. Through innovation within SCM, the circular renovation should be stimulated and upscaled. This research should result in collaboration opportunities that could be applied within CSCM to contribute to the upscaling of circular renovation of owner-occupied housing.

First of all, with this research I want to map the state-of-the-art of circular renovation in a Dutch context, with a special focus on owner-occupied housing. Second, I want to develop a theoretical framework, based on innovation, actor-network theories, supply chain learning concepts, future visions and business models, for researching, reflecting and evaluating the Dutch (circular) renovation process. Third, by means of two interview phases I want to collect different insights about the barriers and opportunities of the current CSCC and what the role of the municipality should be in these processes. Fourth, by discussing the main interview results within a focus group, I will investigate from a management perspective whether the detected opportunities will work or not to solve the barriers and mismatches in terms of concrete strategies. The results of the interviews and focus group discussion will be compared with the theory, examining the importance of obtained solutions for the identified mismatches in more detail. Fifth, because the transition to a CCE is still in the innovation phase, follow-up studies will be necessary to be able to delve deeper into certain aspects of the recommended collaborations. Last, I will end with an advice addressed to the Municipality of Rotterdam on what role they should play in SCC in order to scale up the circular renovation of private homes and on improving local governance within this theme.

This research can be used by municipalities in order to achieve the climate goals and get insight into the main collaborative barriers and opportunities of CSCC of circular renovation of owner-occupied housing. In particular, the Municipality of Rotterdam was interested in this study. However, this report is not only important on this regional level, but also on a larger scale. The transition towards a CE is a global task to which the construction industry can make a major contribution. Based on the outcomes of this study, various collaborative innovations can be made (national and international) which will benefit the production speed and upscaling of the supply of circular renovation principles.

Personal study targets

What I personally want to achieve with my graduation project is first of all learning to write a scientific research. Never before have I had to write such a large research, which makes it a major challenge for me. It is interesting to learn how to design, conduct and analyze research. After the research, I hope to be able to provide a scientific and relevant answer to the main question.

It also appeals to me to gain more knowledge about sustainable developments within construction industry, such as circular renovation. I think it's a very interesting topic and there is always enough room for knowledge expansion. In February I will take the extra course 'Circular Economy', which may also give me extra insights for my thesis. For a job after graduation, I probably also want to orientate myself in this field.

	In addition, I am looking forward to gaining work experience during my graduation internship at the Municipality of Rotterdam. I did not do an internship before during my studies, so I am very curious how I will experience this. Due to the current COVID-19 circumstances, the internship will unfortunately be set up differently; more working from home and more online meetings. I hope this will not have too much (negative) impact on my graduation process. I look forward to entering into a partnership with the Municipality of Rotterdam and working together on the development of a collaboration model within the supply chain of circular component renovation.
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Process

Method description

This research question consists of three parts: circular renovation of Dutch owner-occupied housing, facilitation of CSCC and the role of the municipality. With the support of the following three sub-questions (SQs), an answer will be given to the main research question (covering the three parts). For each sub-question, a brief explanation is given for how the sub-question will be answered in the research.

(1) What is the state-of-the-art of circular renovation of Dutch owner-occupied housing?

Chapter 3 contains an exploratory research, which will look into the current CCE concepts and principles being used in Europe, in the Netherlands and in the city of Rotterdam. Based on this research, a conclusion will be drawn, which will give an answer to SQ1 and what will give the motives for relevant literature research: what is, at this moment in time, urgently needed when looking at the state-of-the-art of circular building and renovation in the Netherlands? From this chapter, the research variables (that are identified as urgent at the moment) will follow, which should be further investigated in the next theoretical chapter.

(2) Which factors are needed to facilitate CSCC according to literature?

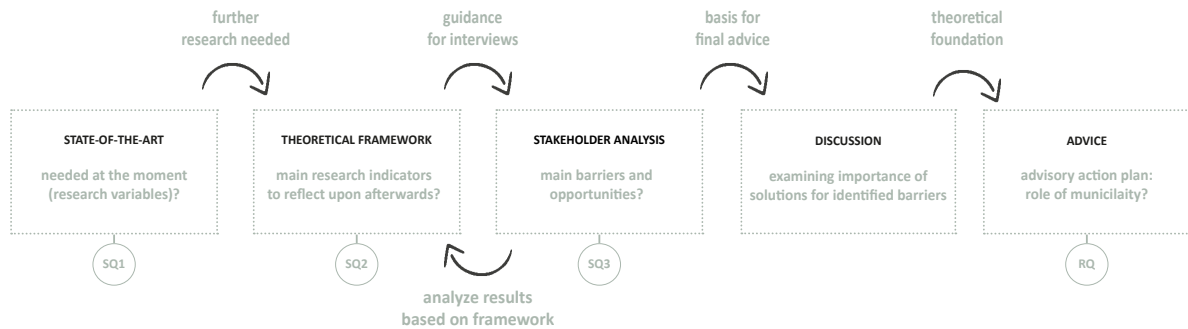
Chapter 4 will give an overview of relevant theories and concepts concerning the identified research variables following from the previous chapter: adoption of innovations, actor networks, supply chain learning, future visions and circular business models. This chapter will identify the main research indicators that I will use to reflect upon after the empirical part of the research. Based on existing literature a conclusion will be made, which will give an answer to SQ2 and in which the theoretical research framework will be developed. This framework will be used as guidance for the empirical part of the research.

(3) How do different actors of CSC networks see and experience the role of the municipality within CSCC to achieve upscaling of circular renovation of owner-occupied homes?

The third sub-question will be answered by means of a stakeholder analysis (Chapter 5), consisting of two phases of semi-structured interviews, an internal survey and a focus group discussion. In the first phase, this sub-question will be discussed by means of interviews with actors from different municipalities, universities and knowledge institutions. This collected data will then be analyzed based on the theoretical framework, linking back to existing literature. In the second phase, the questions will be discussed again, but this time by means of interviews with actors from different (local) market parties, branch organisations within de the building sector and interest groups for homeowners. This analysis will result in four main barriers of CSCC in which the municipality could and should exert influence. To find more clarity with regard to the first main barrier, an internal survey was circulated within the municipality. The remaining three main barriers will be discussed within a focus group, where I will investigate from a management perspective whether the suggested opportunities in terms of (more) concrete strategies mentioned by different stakeholders, will work or not to solve these identified barriers and mismatches in practice. This stakeholder analysis will answer SQ3.

In Chapter 6 (Discussion), the results of Chapters 5 will be compared with the theory, examining the importance of the obtained solutions for the identified mismatches in more detail. Additionally, possible practical recommendations, research limitations and further research will be discussed.

In the conclusion (Chapter 7), advice will be given to the Municipality of Rotterdam on what role they could and should play in stimulating CSCC to scale up the circular renovation of local private homes. This will result in an advisory action plan for the Municipality of Rotterdam, which will give an answer to the main RQ. The Figure below provides a global overview of the research design.



Literature and general practical preference

For the **state-of-the-art** I will research the following aspects:

- Circular definitions, strategies and principles being used in the Netherlands
- European policies and legislation on circular renovation
- Dutch policies and legislation on circular renovation
- Progress towards circular construction industry in the Netherlands
- Circularity in the Rotterdam built environment

For the **theoretical framework** I will search in literature and theories of the following aspects:

- Adoption of innovations in practice
- Actor networks
- Supply chain learning
- Future visions
- (Circular) business models

Reflection

See also 'argumentation of choice of the studio' above.

MBE - In my thesis I look at the research from a management perspective; How can activities within the built environment be better managed to achieve the (inter) national climate and environmental goals? Can the supply chain be managed better? Or can the collaboration be managed better? I look at the organizational aspects of the research and whether any profit can be made there.

REM - In this graduation process, I will research and develop transitions in the construction industry, with regard to market developments of sustainable and circular building concepts and supply chain innovation, whereby the areas of interest are the promotion of collaboration and the development of an innovative supply in the construction sector (including renovation). These topics correspond to what is current within real estate management and what Erwin Mlecnik is working on.

DCM - Within construction management, the manager is responsible for the day-to-day management of the construction team, including the supply chain. Because my subject is collaboration opportunities for circular supply

chain management and because the focus in this thesis will be on renovation of owner-occupied housing, this research fits also into the field of DCM and the working context of Henk Visscher.

Relevance

This research provides new insights on how the supply chain of circular renovation of the private housing stock can be better managed, to achieve the desired upscaling at a rapid pace, by means of organizational innovations within supply chain management. The relevance of this research can be found in a social, scientific and practical context.

Societal relevance

Currently, there is a lack of clarity about the activities that must be taken within the SC of the construction industry, in particular within the renovation sector, to become more circular. The focus of this research is on the gap between what the literature advises and what is currently happening in (circular) construction practices. The development in society, the needed global transition towards a CCE, the rise of circular renovation, the need of collaboration within SCs and the question of the Municipality of Rotterdam which role they should play in the circular renovation process of private homeowners provides an interesting starting point for the formulated research questions. To achieve this upscaling as quickly as possible, it is important that local governments, market parties and knowledge-institutions collaborate, build an active network, share visions and knowledge and create circular business models.

Scientific relevance

For adopting CE principles in the built environment, collaborations and partnerships between supplying parties are of great importance and should be investigated within the development of CSCM (Adamas et al., 2017; Leising et al., 2018). In response to this recommendation, the focus in this study is on collaboration barriers and opportunities in CSCC, especially on the circular renovation for owner-occupied housing, where circular renovation principles are still hardly implemented. The way in which this research is conducted and how the results are interpreted are based on existing literature and theories. On the one hand, the study is influenced and informed by the existing literature. On the other hand, the outcomes of this research can be added to the stock of knowledge within the relevant literature according to circular renovation of private homes.

Practical relevance

The national government sees an increasing need among regions and municipalities to set the transition to a CCE in motion. The results of the conducted research into the barriers and opportunities of CSCC within circular renovation processes are also important to the Municipality of Rotterdam. They are interested in how the supply of circular renovation principles can be scaled up as quickly as possible. And in particular, what the role of the municipality could be in scaling up the circular renovation of owner-occupied housing. I will end with an advice addressed to the Municipality of Rotterdam, which also could be used by other Dutch municipalities, on what role they should play in CSCC in order to scale up the circular renovation of private homes.