Recycling the woonerf

A circular woonerf neighbourhood

Research plan
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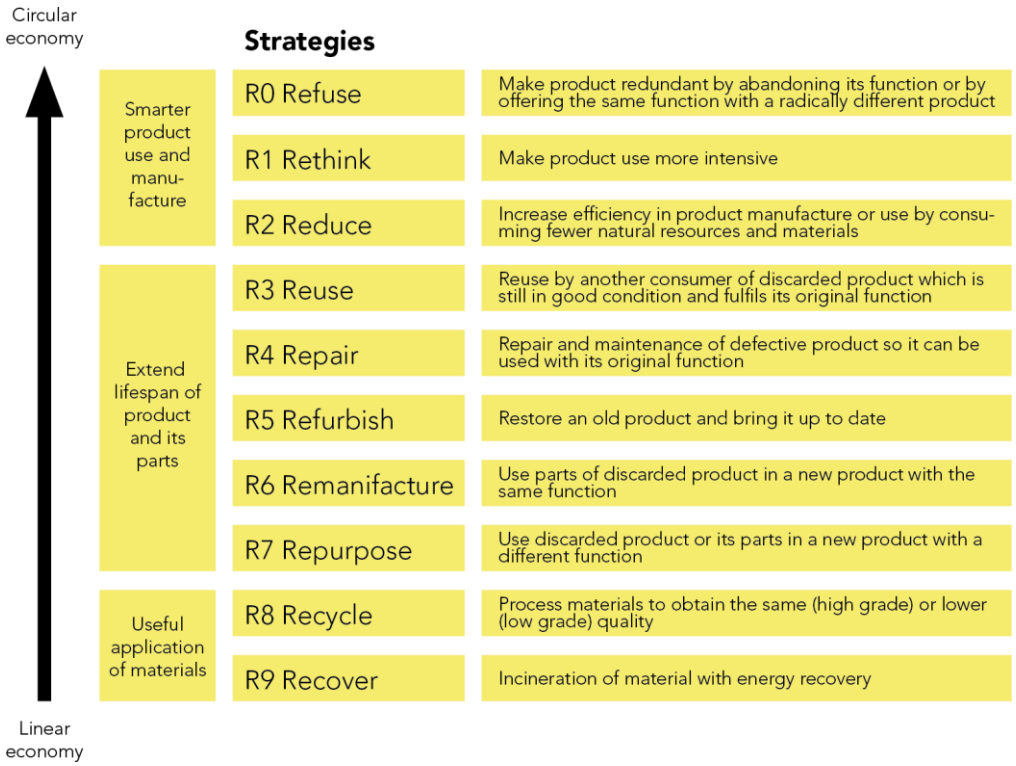
Introduction

The world needs a new revolution, one of the sociotechnical systems. In 1972 it was concluded in the report for the club of Rome that the unlimited growth of the world population, the economy and the associated use of energy and materials would ultimately lead to a catastrophe (Meadows, et al., 1972). The report awakened the world, leading to increased awareness of environmental pollution and sustainable energy consumption. Meanwhile, the resource consumption stayed mostly linear, meaning that it follows a 'take-make-dispose' pattern (Ellen MacArthur Foundation, 2013). This pattern not only further depletes natural resources, but also leads to emissions of pollutants and disposal of waste into water, air and soil. To address these issues, the concept of circular economy (CE) has gained increasing attention in business models as well as in political agenda's (Ellen MacArthur Foundation, 2013; European Commission, 2020; UNEP, 2016). While certainly not a new concept, there are various understandings of the concept of the circular economy. In their analysis of 114 circular economy definitions, Kirchherr, Reike, and Hekkert conceptualized their findings in a single definition:

"A circular economy describes an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro-level (products, companies, consumers), meso-level (eco-industrial parks) and macro-level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations" (Kirchherr et al., 2017, p. 224-225). This definition is based on core principles and aims found throughout the examined definitions. The core principle contains the R framework, which is essentially the how-to of the CE. Furthermore, the framework has a waste hierarchy, that indicates the order of ranking of the mentioned Rs, and it operates on three different scales. Although many varieties of the R framework exist, the research and design will hold on to the 4R framework mentioned in the definition by Kirchherr et al.

Figure 1 *9R Framework. Source: adapted from Potting et al. (2017, p.5)*



On the Dutch political agenda, the government aspires to make the Dutch economy completely circular by 2050, meaning that only renewable resources are used and the waste sum is brought back to zero (Rijksoverheid, 2016). Especially the construction industry plays a big role in resource consumption and waste. The sector is responsible for 50% of raw material consumption, 40% of the total energy consumption and 30% of the total water consumption in the Netherlands. In addition, 40% of all waste in the Netherlands comes from construction and demolition, and the sector is responsible for approximately 35% of CO2 emissions (PBL, 2021; Rijksoverheid, 2016). Construction and the built environment would, therefore, be a great chance to apply circularity. Within the Dutch housing stock, the category of the woonerf is, with 20%, in abundance (Mooij & Quaedflieg, 2013). Most importantly, this category is in great need to be updated to sustainable standards. While sustainable awareness increased during the '70s after the oil crisis, and the building standards became more energy-efficient, the quality is still inadequate to modern standards. For example, insulation was added to the cavities of external walls reaching an average Rc-value of around 2,5 m^2.K/W, and single glazing was replaced by double glazing (Regionaal energie loket, n.d.).

The woonerf neighbourhoods, however, stand far from the energy-neutral buildings the Dutch government is striving for.

The woonerf is a neighbourhood part of the so-called cauliflower districts that were built in the '70s and '80s. The term cauliflower district refers to the structure of these neighbourhoods, which were linked through a branching infrastructure system (Mooij & Quaedflieg, 2013). The majority of these neighbourhoods within the cauliflower districts are designed as a woonerf, which translates to a living street. These types of neighbourhoods signify a turning point in urban planning and architecture in the Netherlands. It was a countermovement of post-war modernist urban planning. The social failure of the modernist movement was to be replaced by a planning policy that aimed to restore social cohesion and collectivity. Accordingly, the woonerf was introduced to bring back the street as a meeting place. Furthermore, the woonerf suppressed the dominance of the car by making all traffic flows equal and increased identification with the living environment (Abrahamse, 2019).

Figure 2 *Neighboors talking in Overbos, Hoofddorp. Source: photo by Theo Baart, 1986. Rijksmuseum Amsterdam.*

It can be stated that the woonerf is a well-exposed theme in written research. There is a plural of sources that write about the origin of the woonerf and the historical context in which it was created. The most elaborate one is the report published by Jaap Evert Abrahamse, commissioned by the Rijksdienst voor het Cultureel Erfgoed (2019). The report *Opkomst en ontwikkeling van de bloemkoolwijk: Het ontwerp van woonwijken in Nederland en de zoektocht naar identiteit* covers the historical and political context of the woonerf, but also goes into depth about the form and function of the woonerf. The report concludes with a challenge, stating that the woonerf neighbourhoods require a different approach from older post-war neighbourhoods which is yet to be found.

A spatial-typological and sociological research into the woonerf is done by Ivan Nio, Nynke Jutten, and Willemijn Lofvers. The focus of this research is laid on the transition zone between the dwelling and the outdoor space. The first phase of the research was published in *Lay-Out 08* (2009), and *Het Woonerf Leeft* (2010). In the second phase of the research, spatial and sociological research was done into the qualities of woonerf neighbourhoods, using case studies in Lunetten. The results were published in *Studie Woonerven Lunetten* (2011).

Further research into the appreciation of the woonerf neighbourhood and its spatial characteristics was done by Joris Quaedflieg and Harald Mooij in *Bloemkoolwijken: een uitgekookt concept. Een onderzoek onder bewoners naar de waardering van ruimtelijke kenmerken voor toepassing in toekomstige woningbouwopgaven* (2013). The research is based on surveys among professionals and residents of ten cauliflower districts, and an analysis on the spatial structure.

The future task that lies ahead of the woonerf neighbourhoods is defined by Martijn Ubink and Thijs van der Steeg in their publication *Bloemkoolwijken: Analyse en perspectief* (2011). They provide spatial and socio-economic insights into the gradual downward dynamics of bloemkoolwijken, by analysing 35 neighbourhoods. These insights could potentially help with the challenge of revitalising woonerf neighbourhoods.

Figure 3 *'Wij willen woonerf!' affiche. Source: Afficheproject. Nederlandse Affiches, Internationaal Instituut voor Sociale Geschiedenis, 1979.*

To summarize, a lot has been written about the woonerf. The history of the woonerf was elaborately described by Abrahamse (2019), the social aspects and spacio-typological research was done by Nio et al. (2011), and the values of the woonerf were published by Mooij and Quaedflieg (2013). An insight into the developments of the woonerf was given by Ubink and Van der Steeg (2011), which provides stepping stones to the redevelopment of the woonerf. Lastly, in *Layout-08* Van der Leun and Oskam give somewhat of a future perspective, with what they call a 'toolbox of the bloemkoolwijk'. Though the toolbox is rather limited and the research itself is already dated. The theme of sustainability in the woonerf stays seemingly unexplored and therefore needs to be addressed in this research. There is a specific gap in research about circularity in the woonerf neighbourhoods. This design project takes this opportunity to explore and investigate the possibilities of a circular woonerf neighbourhood.

Problem statement

The problem of the woonerf neighbourhoods is that the problem does not appear as urgent. The residents are generally satisfied with their residency in these neighbourhoods (Mooij & Quaedflieg, 2013). Nonetheless, the residential areas and real estate in these neighbourhoods are degrading in quality, and the design of the collective spaces does not meet the needs of the current residents (Van der Steeg & Ubink, 2008). On top of that, the energy performance of the neighbourhoods is lacking and is most of all, not future proof. Not unimportant, are also the social problems in the neighbourhoods. Social changes are taking place in the woonerf neighbourhoods. The current residents are ageing, which means that the number of family households with children is decreasing and one- and two-person households and elderly are increasing (Nio, 2010; Van der Leun & Oskam, 2008). Loneliness is a consequence of this social change. Furthermore, social cohesion and sense of security score lower than other types of neighbourhoods in the Netherlands (Van der Steeg & Ubink, 2008). In short, the neighbourhood and its image are deteriorating. Although the problems are not alarming, there are many problems and the woonerf neighbourhoods take up a large portion of the housing stock, action is therefore needed. A circular redesign of the neighbourhood could tackle the sustainability challenges of the woonerf. However, there is no existing approach to redevelop a woonerf neighbourhood into a circular neighbourhood. With its unique spatial and social structure, the opportunities and challenges of a conversion into a circular neighbourhood are therefore yet to be explored.

Research aim

With its abundance of collective space, the woonerf could potentially lend itself as a breeding ground for circularity. Moreover, the collective space is pre-eminently the domain where the social dimension of a circular neighbourhood can be tested. Therefore, this research aims to investigate the possibilities of the woonerf as a circular neighbourhood. As a typical woonerf neighbourhood in Almere-Haven, Goedewerf will be the subject of the research and design project. Taking into account the history Almere has with water, the research and design on circularity take a specific focus on the green-blue structures of Almere to enhance the identity of the neighbourhood. Other resource flows to examine the possibilities in the CE of the neighbourhood include energy, building materials, and biota.

An additional challenge within this research is the question of heritage. Because the woonerf is still relatively new, its value as future heritage is yet undetermined. Its potential value will be investigated and taken into account with the design of the project.

Supporting the graduation project the research question is formulated as a design question, and reads as follows:

How can the woonerf be redesigned to create a circular neighbourhood, while still maintaining potential heritage?

The corresponding sub-questions are as follows:

1. *What was the original intent of the woonerf?*
2. *What are the values of the woonerf?*
3. *Which circular methods can be implemented in the woonerf?*
4. *What are the circular opportunities in the green-blue structure of Almere?*

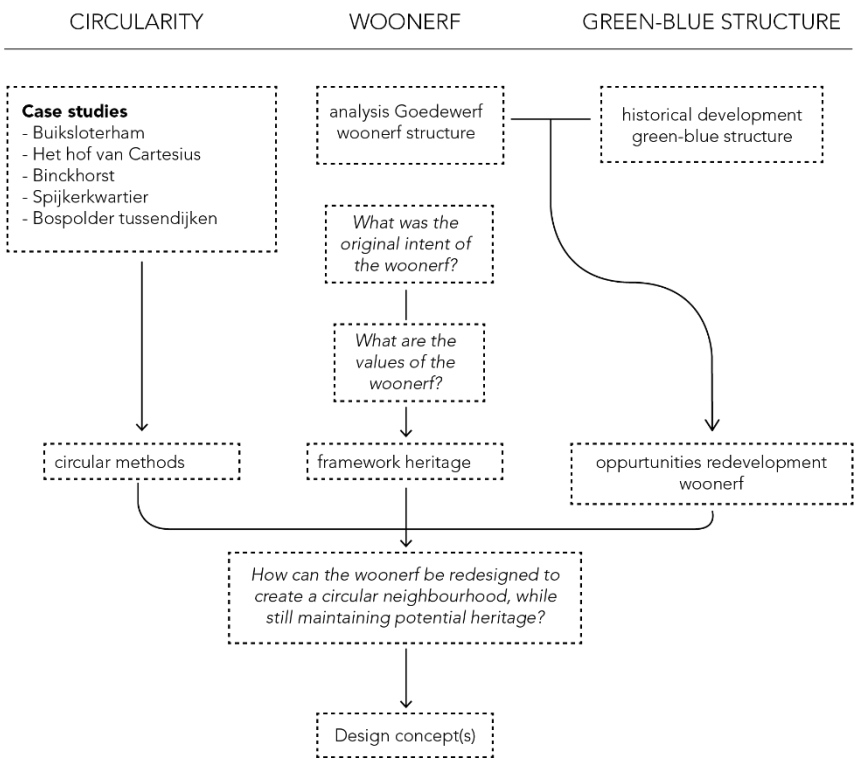
Methodology

To determine the original intent of the woonerf, research will be conducted through literature readings on the historical development of woonerf neighbourhoods (Abrahamse, 2019; ANWB, 1980; Van der Leun et al., 2009; Ubink & Steeg, 2011). Following, the values of the woonerf will be investigated through the sum of the analysis done by the studio group, the outcome of the 'speurtocht' conducted by Renoveren met Respect, and the supplement of literature readings on the concerned topic (Van der Leun & Oskam, 2008; Nio et al., 2011; Uyterlinde & Oude Ophuis, 2012; Mooij & Quaedflieg, 2013; Leclerc & Smit, 2021). The outcome of these sub-questions pertains to the second part of the main question: the potential heritage of the woonerf. By knowing the values and the intention of the woonerf design, potential heritage can be guarded with the redevelopment of the woonerf into a circular neighbourhood.

The third part of the research consists of the analysis of various case studies that feature a circular economy. Unfortunately, most of the case studies exist of new-build circular neighbourhoods, leaving the redevelopment of existing neighbourhoods yet to be researched. From this analysis, a distillation needs to be made of circularity methods.

Finally, the opportunities of the redevelopment of woonerf Goedewerf are explored, by taking the existing analysis of Goedewerf and the examination of the historical green-blue structure of Almere (Horlings & Blom, 2018). Further development consists of research by design, meaning that the circular methods and the opportunities of the woonerf are to be combined and experimented with. Whether the woonerf proves to be a suitable candidate for a circular neighbourhood, will show in the result.

Figure 4 *Diagram research structure*



Frame of reference

The definition by Kirchherr et al. (2017) will be used for the understanding of the concept of circularity. The R framework, with its hierarchy, will provide a guideline for the decision making process during the design stage of the project. The different scales mentioned in the definition (micro, meso, and macro), will encourage the integration of circularity in all building scales. Lastly, the definition also touches upon the subject of the three p's: people planet, prosperity, involving all aspects of sustainability.

The case studies that will be examined in the research, derive from the report *Waardevolle wijken: Het creëren van waarde in wijken door het gezamenlijk sluiten van grondstofkringlopen,* published by Leclerc and Smit in 2021. The report mainly focuses on the social aspects of circular neighbourhoods, by analysing six case studies of circular neighbourhoods.

The reports *Circular economy*: *Measuring innovation in the production chain* by Potting et al. (2017), and *The greenest Building: Quantifying the Environmental Value of Building Reuse* by the Preservation Green Lab (2011), will provide a more technical background for the research on circularity.

Potting et al. introduce a way to measure the progress of the process and effects of a circular transition with diagnostic questions, while the Preservation Green Lab research the life cycle environmental impacts of building reuse.

The material on the historical background of the woonerf will be mostly based on the research done by Abrahamse (2019) in *Opkomst en ontwikkeling van de bloemkoolwijk: Het Ontwerp van Woonwijken in Nederland en de Zoektocht naar Identiteit.* The values of the woonerf are will partially be subtracted from the publication of Mooij and Quaedflieg (2013), but will also be based on the analysis done by the studio and the speurtocht of *Renoveren met respect*. Regarding the green-blue structure of Almere, the base will be formed by the publication *De groene horizon: Vijftig jaar bouwen aan het landschap van de Flevopolder* published by Horlings and Blom (2018).

Relevance

Whether the outcome of the research shows that circularity is an applicable method for the woonerf neighbourhood or other sustainable methods need to be researched, the research into circular woonerf neighbourhoods is relevant to the redevelopment of the woonerf. Because the redevelopment of these neighbourhoods is inevitable, every sustainable method needs to be explored to apply the most efficient and future proof method. In terms of academic relevance, the research also has a focus on the heritage value of the woonerf, which up to recent years hasn't had a lot of attention. With the redevelopment of the woonerf, the potential heritage value needs to be taken into consideration, which is why this sub-question is relevant.

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