MASTER OF ENVIRONMENTAL AND ENERGY MANAGEMENT PROGRAMME

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GOVERNANCE ASSESSMENT OF CIRCULAR BUILDING POLICIES AND PRACTICES IN THE NETHERLANDS

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Abstract

The construction sector and buildings in general are responsible for a significant amount of global energy demand and energy-related CO_2 emissions. Overcoming this problem calls for new types of work and construction methods whereby emissions that occur during the total life-cycle of buildings are also regarded. One such method that applied total life-cycle thinking is circular building. This relatively new concept is difficult to operationalize since it encompasses several tools and techniques such as life cycle assessments and cradle-to-cradle products.

The Dutch government has taken the first steps towards achieving a circular building economy in 2050. Although, circular building has been on the political agenda since 2016, it is not yet a mainstream practice. This implies that there are barriers obstructing the implementation of circular building in the Netherlands.

This research had the objective of providing empirical insights on the implementation of circular building in the Netherlands by assessing the current policies and practices. The Governance Assessment Tool (GAT) was used to assess whether the governance context is supportive or restrictive towards the implementation of policies and projects, based on the criteria of extent, coherence, flexibility and intensity.

The GAT showed that most of the criteria were assessed as being moderately supportive for the implementation of new policies and projects regarding circular building. The 'actors and networks' dimension emerged as the most supportive dimension since most actors are involved in the policy processes. It is also easy for actors to join networks and coalitions on circular building whereby they work in institutionalised and stable structures. The 'strategies and instruments' dimension is the most restrictive, since the strategies and instruments of the building sector collide with those in other sectors, such as the energy transition and the building decree.

The assessment results indicate that the goal of a circular building economy in 2050 can be achieved. However, actions should be taken to accelerate the implementation of circular building in the Netherlands. The main recommendations are to accelerate the step of raising the MPG-requirement as well as making it mandatory for other building types such as industrial buildings. Additionally, municipalities may need to be more lenient with issuing permits for circular building projects since re-using materials can lead to conflict with the existing building decree. Lastly, it could be beneficial to identify the best available techniques (BAT) that help to overcome the differences among provinces or municipalities in the way circular building is implemented.

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List of Abbreviations and Acronyms

BREEAM	Building Research Established Environmental Assessment Method
BZK	Binnenlandse Zaken en Koninkrijksrelaties
C2C	Cradle to Cradle
CB'23	Circulair Bouwen 2023
GAT	Governance Assessment Tool
LCA	Life Cycle Assessment
MIA	Milieu Investeringsaftrek (environmental investment deduction)
NMD	Nationale Milieu Database
MPG	Milieu Prestatie Gebouwen (Environmental performance of buildings)
RVO	Rijksdienst voor Ondernemend Nederland
TCB	Transition Team Circular Building Economy
TPAC	Timber Procurement Assessment Committee
UNEP	United Nations Environmental Programme

1 Introduction

This chapter provides background information on the subject of the thesis, the problem statement and the research objective. The chapter ends by stating the research questions.

1.1 Background

The construction sector and buildings in general are responsible for a significant amount of global energy demand and energy-related CO_2 emissions. In 2020 these emissions were lower than usual due to the Covid-19 pandemic, however buildings still accounted for 36% of global energy demand and 37% of energy related CO_2 emissions (United Nations Environment Programme, 2021). There is a need for change in the building sector, although, some strategies are increasing the energy-efficiency of buildings and lowering the carbon impact of the power supply. Another problem that needs to be addressed are the emissions that occur due to the construction process of buildings and materials itself. To achieve a sustainable building sector, a more comprehensive view is essential considering the emissions that occur throughout the total life-cycle of buildings. This also includes the end-of-life stage, where circular thinking or circularity comes in. Recently, efforts have been made in the European Union (EU) towards achieving circular approaches, and an EU policy on circularity is and total-life-cycle thinking is likely to be developed. Though with a focus on the construction sector, the Netherlands is several years ahead with more tailored approaches.

The Dutch government introduced the nationwide program “Netherlands Circular in 2050”. This program gives an outline how the Dutch government aims to achieve the transition towards a circular economy and the construction sector was mentioned as one of five priorities (TCB, 2018). The construction sector in the Netherlands is prioritized, because it is responsible for 50% of the total raw materials consumption, 40% of the total energy usage, 30% of the total water usage and circa 35% of the total CO_2 emissions (TCB, 2018). The construction sector is also responsible for a large part of the waste production in the Netherlands as well (TCB, 2018).

The Dutch government has set up three steps to achieve a completely circular economy by 2050:

1) setting up a so called “basecamp” in 2018-2021, 2) achieve 50% of the complete circularity goal in 2021-2030 and 3) achieve a completely circular building sector during the period 2030-2050 (TCB, 2018). However, the first step, the basecamp, is yet to be completed in 2023 (RVO, 2021). Based on this delayed implementation, the deadline has already been postponed. The first step of the transition, setting up the base camp, which is now scheduled to be finished in 2023 consists out of four key topics. The first key topic is market development, the second is measurement, the third is policy, legislation and regulations and the fourth is knowledge and awareness (RVO, 2021). These four key points are the fundament for achieving a circular economy in 2050.

Governance of circular building has been the subject of previous studious. Christensen (2021) analysed how cities and municipalities can support and facilitate the circular economy through multiple modes of governance. Heurkens & Dąbrowski (2021) identified barriers for the transition towards a circular economy on a regional scale.

This thesis aims to analyse the governance of circular building by applying the Governance Assessment Tool (GAT). The GAT has been applied in various cases, such as low energy green building innovation in the building sector (Jain et al., 2020), the adoption of energy efficient appliances in households (Gana & Hoppe, 2017) and blue-green infrastructure projects (Casiano Flores et al., 2021).

1.2 Problem Statement

The Dutch Government has high ambitions to achieve a circular building sector in 2050 and they have set up three steps to achieve this as mentioned above. However, the building sector cannot become circular overnight, the route is described as a transition. There is no clear line for achieving a circular building economy, but instead it is more of a search (RVO, 2021). This means that the government and the transition team have no detailed plan for the further development and implementation circular building in the Netherlands, they aim to achieve further development by exploring.

Organizations have been able to deduct a part of investments in circular buildings from their profits for some years now in the Netherlands, which is called the Milieu-Investerings Aftrek (MIA) subsidy (RVO, 2022b). To obtain this subsidy buildings have to meet certain conditions and several documents have to be handed it, this can be seen as one of the first circular building policies. The government also tries to promote circular building in other ways.

Even tough circular building has been on the political agenda since 2016 in the Netherlands, it is not applied that often yet. So far there have been 126 building projects that involve some form of circular building and construction (RVO, 2022c). This low number of circular building projects may indicate that there are still barriers in place that obstruct the implementation of circular building in the Netherlands.

Based on the above, it can be concluded that the implementation of circular building in the Netherlands faces multiple challenges. The building sector is responsible for a large amount of the total raw materials, energy and water consumption. This means that there is a need to overcome these challenges so that the overall consumption and environmental impact of the building sector can be reduced. The Dutch Government aims to achieve a circular building economy that relies on all types of knowledge for developing not only the technology and expertise, but also social, political and economic systems. This calls for research to create empirical knowledge on circular building practices

1.3 Research Objective

The research objective of this thesis is to provide empirical insights on the implementation of circular building practices in the Netherlands. This objective will be achieved by assessing the current policies and practices for circular building in the Netherlands, based on two case studies of circular building projects. The Governance Assessment Tool (GAT) will be used to assess the current policies and practices. The GAT can be used to assess whether the governance context, in this case of circular building is supportive, restrictive or moderate towards the implementation of policies and projects (Bressers et al., 2016). The dimensions and assessment criteria of the GAT are further specified in section 2.5.

This research does not aim to solve the broader problem that the implementation of circular building practices is insufficient in the Netherlands. Nevertheless, it will offer insights as to why it is not implemented as a widespread practice. These insights may result in better policies for circular building in the future.

1.4 Research Questions

The main research question of the thesis is as follows:

How can the implementation of policies and practices regarding circular building in the Netherlands be improved?

Three sub-research questions are formulated to be able to answer the main question:

1. How is the governance context of circular building in the Netherlands characterised, based on the five dimensions of the GAT?

2. How supportive is the governance context of circular building in the Netherlands, based on an assessment using the four GAT criteria?

3. What actions can be taken to improve circular building governance in the Netherlands?

The first sub-question is a descriptive question whereby the governance context of circular building in the Netherlands is described. For the second sub-question the governance context of circular building is assessed based on the GAT criteria, this is an evaluative research question. The third sub-question translates into answering the main research question and is exploratory by nature, since it aims to seek new approaches to improve the implementation of circular building in the Netherlands. The three sub questions are structured to build on each other to answer the main research question. The description of the governance context is needed for the assessment based on the GAT criteria, while the assessment is needed to provide recommendations for a better implementation.

1.5 Thesis Outline

The remainder of the thesis is structured as follows: The second chapter describes important concepts and theories which are used for this research. Chapter 3 outlines the research design, explaining data collection methods, and the data analysis and validation processes. Chapter 4 describes the governance context of circular building in The Netherlands. In chapter 5, the five government dimensions are assessed to find out how supportive the governance context of circular building is. Lastly in chapter 6 the research questions are answered, policy recommendations are provided, and future research directions are presented.

2 Literature Review

In this chapter relevant concepts and theories are explained. Firstly, the concept circularity is described since it is used throughout different section in this thesis. Secondly the concept circular economy is explained since this forms the base of circular economy in the building sector. The third concept that is described is circular building and construction. After that a closer look is taken at circular building and construction in the Netherlands. Lastly the concept of governance is described.

2.1 Circular Economy

Kirchherr et al. (2017) analyzed 114 different definitions of circular economy and proposed the following the definition: "an economic system that replaces the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes". Circular economy has the end goal of achieving economic prosperity and social equity while improving the environmental quality, additionally it can be applied on macro-, meso-, and microlevel scales (Kirchherr et al., 2017). The circular economy transition has only just begun, and the way it is applied differs for each country, additionally the focus currently lies on recycling instead of reusing products (Ghisellini et al., 2016). According to Ghisellini et al. (2016) circular economy has the goal of increasing resource efficiency by promoting the adoption of closing-the-loop production patterns. The Ellen MacArthur Foundation (2015) describe it as an economy that is restorative and regenerative, that focuses on keeping products, components and materials at the highest quality or value. The United Nations Environment Programme (UNEP), describes the concept of circularity as a way to challenge the current economic model, whereby the entire value chain is more important than individual stages and where materials are kept at the highest possible value (UNEP, n.d.). According to UNEP, all stakeholders should be engaged, lifecycle thinking should be applied and activity should be disconnected from natural resource use and environmental impacts (UNEP, n.d.). Overall circular economy and circularity are broad concepts that can be applied on different levels and scales, and use different tools and techniques.

2.2 Circular Building and Construction

Circular economy concepts can also be applied in the building and construction sector, which is called circular building or construction. Circular building is a relatively new concept which has gained more interest over the past couple of years. Çimen (2021) found out that ninety percent of the literature on circular building and construction was published between 2017 and 2020 and that it diversified by integrating new kinds of subjects over the years. This shows that circular building is a concept which has become increasingly more difficult to operationalize.

Adams et al. (2017) argue that a lack of awareness on circular building exists in the construction sector due to the fact that there is no consensus on what it should look like. Another aspect that makes Circular Building a more difficult concept is that it does not only take place in the different design stages of buildings from the feasibility and planning stage until the end-of-life stage, but also on different scales such as material level, building level, area level and city level (Çimen, 2021). The different design stages and scales are shown in Figure 1.

Several tools and techniques can be applied to design and construct circular buildings. Pomponi & Moncaster (2016) give life cycle assessments (LCA) and cradle to cradle (C2C) products as examples of such techniques. With LCA the total environmental impact of buildings during its total life cycle is calculated, which also includes the environmental impact from electricity usage during the usage phase and environmental impact during the demolishing stage. C2C is about using items and materials for as long as possible and reusing them without a loss of value (Pomponi & Moncaster, 2016). However circular building and construction is not limited to these two techniques and tools, as shown in Figure 1. Çimen (2021) also gives flexible and modular building, decoupling and waste

recycling as techniques. So, circular building and construction consists of different subjects, is applied on different scales, and encompasses different techniques and tools.

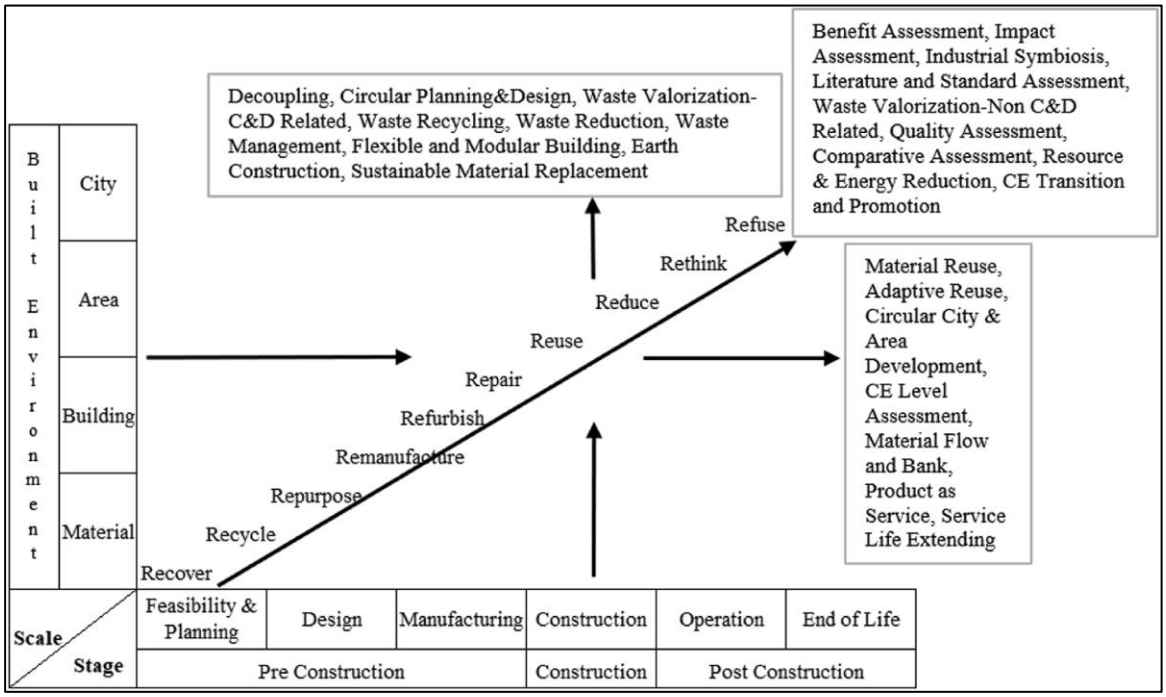

FIGURE 1 - CIRCULAR BUILDING SUBJECT DEVELOPMENT

Source: (Çimen, 2021)

2.3 Circular Building and Construction in the Netherlands

In the Netherlands, circular building has been given the following definition: "Circular building means the development, usage and reuse of buildings, areas and infrastructure, without unnecessarily depleting natural resources, polluting the environment and damaging ecosystems. Building in a way that is economically responsible and contributes to the well-being of humans and animals." (TCB, 2018).

In 2050 all construction in the Netherlands is supposed to be circular. To achieve this goal, the Dutch governments wants to have set up a base camp by 2023, which consists of four key aspects.

1. Market development: by 2023 the governments want to make a plan on how they can develop the supply side of circular building (RVO, 2021). This means that they want to improve the connection of second-hand building materials with new construction and renovation plans. They also want to make plan on the demand side (RVO, 2021). This involves creating demand for circular buildings and including it in tenders from the government. For this key aspect they also want to gain insight into the use of "materials passport" [1]. Lastly, the government wants to understand how producers and suppliers of building materials can be made responsible for their waste management (RVO, 2021).

2. Measurement: by 2023 the government wants to have elaborated a measuring instrument together with a set definition for circular building and clear legal requirements for the measuring instrument (RVO, 2021).

[1] The Materials Passport is an application that tracks which materials have been used in buildings and in what way they are used.

3. Policy, legislation and regulations: by 2023 the government wants to have additional insight in the policy instruments that they will be using, this includes upgrading the MPG, which stands for Milieu Prestatie Gebouwen (Environmental Performance of Buildings) so that different building types and renovation projects can also be valued for circularity (RVO, 2021). Additionally, the government seeks insights into relevant developments on a European level and if the Dutch progress is in line with this (RVO, 2021).

4. Knowledge and awareness: The last key aspect is to further improve knowledge and awareness on circular building in the Netherlands, to achieve this the government wants it to be an integral part of all building related educations (RVO, 2021).
To improve investments in circular buildings the Dutch government has made circular commercial and residence buildings, as well as several circular building materials available for MIA, translates into environmental investment deduction (RVO, 2022b). This means that organizations can take a part of the investment in circular buildings and deduct it from their organizations profits for the year, allowing them to pay less taxes. To obtain this form of subsidy and building has to meet several criteria.

2.4 Governance of Circularity

Circularity is a concept that has been around for some years now and it many organizations see the need to transition towards a circular economy. However just like sustainability transitions, the transition towards a circular economy is a large challenge.

Christensen (2021) found out that local governments such as municipalities can function as an important driver for change, by organizing capacities for stakeholders and facilitate a transition towards a circular economy. In the same study Christensen (2021) gives four examples of modes of governance such as self-governance, governance by provision, governing by authority and governing through enabling . These governance modes can be combined to support a transition towards a circular economy (Christensen, 2021). Thus, the governance of circularity can take place on different governance levels, and it can be applied by different modes of governance.

Heurkens & Dąbrowski (2021) argue that the transition towards a circular economy is challenge due to the fact that the circular economy transition requires cutting across sectoral, scalar and administrative boundaries. Heurkens & Dąbrowski (2021) also give as an example that circular building experiments are being restricted by the existing building legislations, and that to overcome this there is a need for simultaneous action at all transition levels.

The governance of certain fields such as low-carbon (Wang & Chang, 2014), but also circularity can be supported by applying policy instruments. There is a wide range of different policy instruments. Vedung classified policy instruments in to three simple typologies: regulatory (sticks), economic (carrots) and information based (sermons) instruments (Vedung, 2017). Pacheco-Vega (2020) argues that this typology is often applied since it simplifies a complex discussion on instrument choice. Serbruyns & Luyssaert (2006) apply Vedungs typology as well to evaluate the application of policy instruments on private forest management in Flanders. This simple way of categorizing policy instruments is useful for this research since it allows to make a distinction between the various policy instruments that are applied for circular building in the Netherlands

2.5 Governance Assessment Tool

The governance assessment tool (GAT) can first of all be used to describe the five dimensions of the governance context. The five dimensions consist out of: 1) levels and scales, 2) actors and networks, 3) problem perspectives and goal ambitions, 4) strategies and instruments and 5) responsibilities and resources. The GAT can also be used to assess the status of these five dimensions to see whether these lead to a supportive or restrictive governance context (Bressers et al., 2016).
This assessment takes place based on four quality criteria: extent, coherence, flexibility and intensity. These criteria are further specified with specific questions by Bressers et al., (2016) for all five governance dimensions. The GAT can be summarised in a matrix as shown in Figure 2.

The GAT is not a relevant tool for assessing a single actor or plan but instead it can be useful to assess the entire governance context and whether this context helps or restricts the implementation of policies (Bressers et al., 2016). It is not possible to fill in the matrix with hard measurement, instead one has to rely on qualitative data and "informed judgement" (Bressers et al., 2016).

Governance dimension	Quality of the governance regime			
	Extent	Coherence	Flexibility	Intensity
Levels and scales	How many levels are involved and dealing with an issue? Are there any important gaps or missing levels?	Do these levels work together and do they trust each other between levels? To what degree is the mutual dependence among levels recognised?	Is it possible to move up and down levels (upscaling and downscaling) given the issue at stake?	Is there a strong impact from a certain level towards behavioural change or management reform?
Actors and networks	Are all relevant stakeholders involved? Are there any stakeholders not involved or even excluded?	What is the strength of interactions between stakeholders? In what ways are these interactions institutionalised in stable structures? Do the stakeholders have experience in working together? Do they trust and respect each other?	Is it possible that new actors are included or even that the lead shifts from one actor to another when there are pragmatic reasons for this? Do the actors share in 'social capital' allowing them to support each other's tasks?	Is there a strong pressure from an actor or actor coalition towards behavioural change or management reform?
Problem perspectives and goal ambitions	To what extent are the various problem perspectives taken into account?	To what extent do the various perspectives and goals support each other, or are they in competition or conflict?	Are there opportunities to re-assess goals? Can multiple goals be optimized in package deals?	How different are the goal ambitions from the status quo or business as usual?
Strategies and instruments	What types of instruments are included in the policy strategy? Are there any excluded types? Are monitoring and enforcement instruments included?	To what extent is the incentive system based on synergy? Are trade-offs in cost benefits and distributional effects considered? Are there any overlaps or conflicts of incentives created by the included policy instruments?	Are there opportunities to combine or make use of different types of instruments? Is there a choice?	What is the implied behavioural deviation from current practice and how strongly do the instruments require and enforce this?
Responsi-bilities and resources	Are all responsibilities clearly assigned and facilitated with resources?	To what extent do the assigned responsibilities create competence struggles or cooperation within or across institutions? Are they considered legitimate by the main stakeholders?	To what extent is it possible to pool the assigned responsibilities and resources as long as accountability and transparency are not compromised?	Is the amount of allocated resources sufficient to implement the measures needed for the intended change?

FIGURE 2 - GOVERNANCE ASSESSMENT TOOL MATRIX

Source: (Bressers et al., 2016)

The GAT has been applied by various researchers to assess the governance of different subjects related to sustainability. Jain et al. (2020) use it to assess the governance of low energy green building innovation in the building sector in Singapore and Delhi, by using the GAT they found out that the governance conditions in Singapore were strong while governance quality was found to be lacking in Delhi. In another study Gana & Hoppe (2017) apply GAT to assess the governance system regarding the adoption of energy efficient appliances in households in Nigeria. Gana & Hoppe (2017) found out that the governance system of Nigeria was weakly developed and that the policies had little effect in helping reach the pre-set goals. Lastly Casiano Flores et al. (2021) apply the GAT to assess the governance of a blue-green infrastructure project in a small city in Belgium. Casiano Flores et al. (2021) found out that influence from regional and provincial governments helped to achieve a moderate governance context and that this support helped the city to speed up its transition in urban water management. This leads to the conclusion that the GAT is a relevant tool for assessing the governance context of different sectors and in different contexts such as developed or developing countries. Therefore it is chosen for this research to assess the governance on circular building in the Netherlands.

To assess the qualities of the governance regime as specified by the GAT, Casiano Flores et al. (2017) have created an assessment matrix and rubric specified for wastewater governance. That assessment matrix and rubric are used as a guideline during the application of the GAT in this research. The assessment rubric was altered to match circular building better and then used to assess the governance of circular building in the Netherlands, the new assessment rubric is shown in Table 1.

TABLE 1 - CIRCULAR BUILDING GOVERNANCE ASSESSMENT RUBRIC

Governance Dimension	Qualities of governance context			
	Extent	Coherence	Flexibility	Intensity
Levels & Scales	**Supportive**: All levels are involved in the implementation **Moderate**: Most of the levels are involved **Restrictive**: The minority of levels are involved	**Supportive**: The levels consider they all work together, trust each other and recognise its dependence **Moderate**: The levels consider few multi-level issues exist, they report some trust issues and recognise their dependence **Restrictive**: Most levels are missing, but recognise their dependence	**Supportive**: It is possible to move up and down levels, depending on the issue in a freely manner. **Moderate**: It is possible to move up and down levels, depending on the issue, only through the implementation of agreements **Restrictive**: It is not possible to move up and down levels even when there are agreements to do so	**Supportive**: All levels are working to bring behavioural change or management reform **Moderate**: Most levels are working to bring behavioural change or management reform **Restrictive**: The minority of levels are working to bring behavioural change or management reform
Actors & Networks	**Supportive**: All the stakeholders feel involved **Moderate**: Most of stakeholders feel involved **Restrictive**: Few stakeholders feel involved	**Supportive**: Actors report that their interactions are institutionalised, stable (time working together), and there is trust **Moderate**: Most interactions among actors are Institutionalised. Actors report stability and/or trust issues **Restrictive**: Institutions that promote interactions among actors are not operating. Actors report stability and/ or trust issues	**Supportive**: The institutional arrangement facilitates the inclusion of new actors, shift leadership and social capital creation **Moderate**: The institutional arrangement facilitates only some of the follows: inclusion of new actors, shift leadership and social capital creation **Restrictive**: The institutional arrangement restricts the inclusion of new actors, shift leadership and social capital creation	**Supportive**: There is a collision of different actors to create a strong impact in behavioural change or management reform **Moderate**: There is a fragmentation of the intensity. There is a minor collision of actors trying to create an impact in behavioural change or management reform **Restrictive**: There is only one actor or one collision trying to create an impact in behavioural change or management reform
Problem perspectives & Goal ambitions	**Supportive**: The actors consider that all perspectives are involved **Moderate**: The actors consider that most of the perspectives are involved **Restrictive**: The actors consider that a minority of the perspectives are involved	**Supportive**: All of the involved actors goals support each other **Moderate**: Most of the involved actors support each other **Restrictive**: There is competition among the goals of the actors	**Supportive**: It is possible to reassess goals during the implementation process **Moderate**: It is possible that some aspects of the goals can be reassessed during the implementation process **Restrictive**: It is possible to reassess the goals only, after the implementation process or there is not reassessment	**Supportive**: The actors consider that the established goals can be achieved with the current policy implementation **Moderate**: The actors consider that the policy implementation requires some minor changes to achieve the intended goal **Restrictive**: The actors consider that major changes are required to achieve the intended goals
Strategies & Instruments	**Supportive**: According to the actors and the law no instruments or strategies are missing **Moderate**: According to the actors and the law some instruments or strategies are missing **Restrictive**: According to the actors and the law an important number of instruments or strategies are missing	**Supportive**: The system allows the creation of synergy among the policy instruments and there are not overlaps or conflicts among the instruments **Moderate**: The system allows the creation of synergy among the policy instruments but some overlaps or conflicts among the instruments are found **Restrictive**: The system does not allow the creation of synergy among the policy instruments and there are overlaps or conflicts among the instruments	**Supportive**: The institutional arrangement provides the opportunity to combine and use different instruments and actors can make choices in a pragmatic manner **Moderate**: The institutional arrangement provides the opportunity to combine and use different instruments as long as it is stated in the law **Restrictive**: The institutional arrangement provides the opportunity to combine and use different instruments but the actors do not do it or they do not have those choices	**Supportive**: The actors report that there is no need of behavioural deviation from current practice and the instruments are being enforced properly **Moderate**: The actors report that there is a minor need of behavioural deviation from current practice and the instruments are facing small issues during enforcement **Restrictive**: The actors report that there is a major need of behavioural deviation from current practice and the instruments are facing important challenges during their implementation
Responsibilities & Resources	**Supportive**: Responsibilities are clearly assigned with sufficient resources **Moderate**: Responsibilities are clearly assigned but some have resources **Restrictive**: Responsibilities are clearly assigned but there are insufficient resources	**Supportive**: The institutional arrangement and the actors promote cooperation within and across institutions **Moderate**: The institutional arrangement promotes cooperation within and across institutions. However, actors report some issues **Restrictive**: The institutional arrangements promote cooperation within and across institutions. However, actors report relevant issues	**Supportive**: It is possible to pool the assigned responsibilities with effective accountability mechanisms in a pragmatic manner **Moderate**: It is possible to pool partially some of the assigned responsibilities with effective accountability mechanisms in a pragmatic manner **Restrictive**: It is not possible to pool the assigned responsibilities with effective accountability mechanisms in a pragmatic manner	**Supportive**: The actors consider there are the enough resources needed for the intended changes **Moderate**: The actors consider there are resources to comply most of the responsibilities to achieve the intended changes **Restrictive**: The actors consider there is a lack of resources to comply the responsibilities to achieve the intended changes

3 Research Design

This chapter explains how the research was designed, by describing the different steps that were taken during this research namely: research framework, -strategy, data collection and data analysis.

3.1 Research Framework

According to Verschuren & Doorewaard (2010) constructing a research framework helps gain a clear understanding of how to achieve the research objective. To help construct this framework they have proposed a step-by-step approach. The seven steps of this approach, as applied to this research, are summarised below.

Step 1: Characterizing the objective of the research
The research objective of this thesis is to provide empirical insights on the implementation of circular building practices in the Netherlands by assessing the current policies and practices (governance) that the Dutch government is using to promote circular building in the Netherlands.

Step 2: Determining the research object
The research object are the current policies and practices that are implemented to promote circular building in the Netherlands. The object was analysed by using case studies of actual circular building projects.

Step 3: Establishing the nature of research perspective
This research assessed the current policies that the Dutch government is using by using case studies and stakeholder's views. This means that this research is a practice-oriented evaluation research.

Step 4: Determining the sources of the research perspective
The conceptual model of this research was developed by studying the current policies and practices and scientific literature on circular buildings.

Step 5: Making a schematic presentation of the research framework
The research framework is illustrated in Figure 3 and described below.

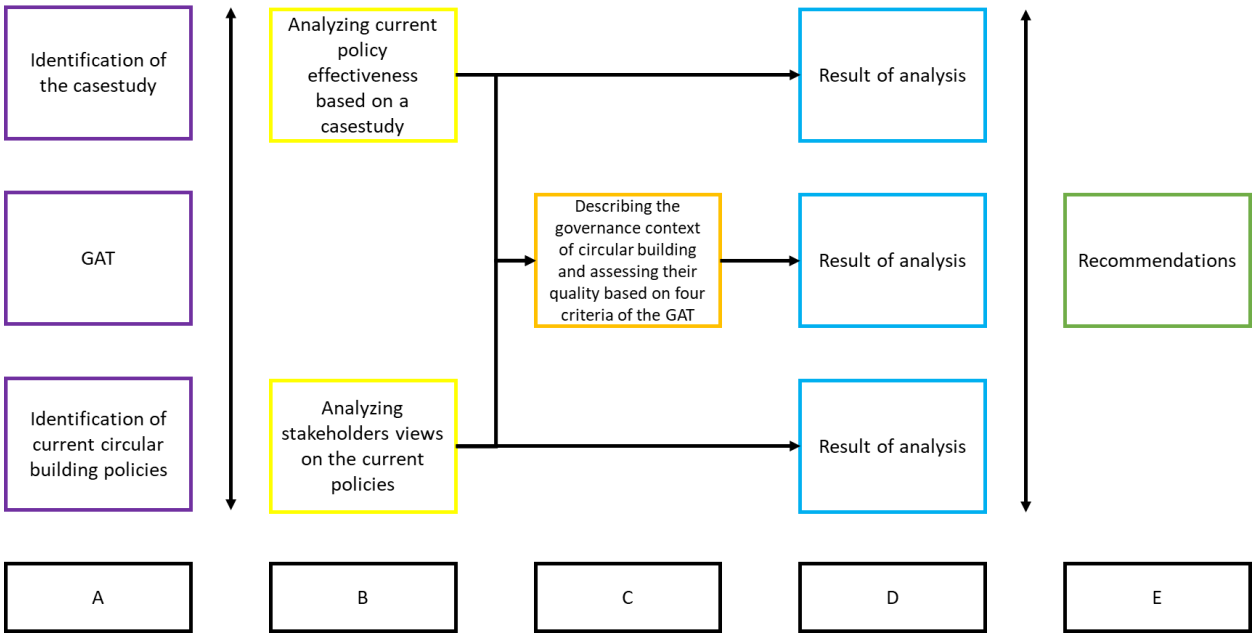

FIGURE 3 - RESEARCH FRAMEWORK

Step 6: Formulating the research framework in the form of arguments
As shown in Figure 3, the research can be summarized in the following phases:

A. Literature review on circular building policies, the GAT and a description of the case studies.
B. Collecting data by analysing a case and the stakeholders views on the current policies.
C. Application of the GAT, to describe the governance context and their qualities.
D. Comparison of results of the case studies, interviews and the application of the GAT
E. Recommendations for policy makers on circular building in the Netherlands

Step 7: Checking whether the framework requires any change
This framework may be subject to change, since research is an iterative process. New insights that are gained during the data gathering phase can lead to an alteration of the research framework.

3.2 Research Strategy

The research strategy that is applied during this research is a case study approach, which is looking at a circular building case in depth using several methods of data collection.

3.2.1 Research Unit

The initial research unit of this research was identified as a circular building project in the Netherlands and the stakeholders that are involved with this project. During the data collection phase it was observed that this research unit did not lead to sufficient data. Additionally I was able to join two project meetings for a new project with the goal of complying to a municipality's circular quality plan for a building area. Furthermore, other stakeholders that are not directly involved with the circular building cases but that are involved with circular building in the Netherlands were interviewed.

3.2.2 Selection of Research Unit

The first circular building case was selected based on a suggestion by an expert on sustainable building. This expert was involved in a circular building project as the assessor, meaning that he had to assess whether the project met the criteria for circular building as specified by the Dutch government. He also has a network in the construction sector which made it easier to contact relevant stakeholders. The project took place in Zwolle, where the developer of the building wanted to obtain subsidy for circular building. The Rijksdienst voor Ondernemend Nederland (RVO), came to Zwolle to inspect the building site to see what circular building materials and practices were applied.

Furthermore, the commissioning party and other stakeholders from the building team had the aim to obtain the circular building MIA subsidy.

The second circular building case had completely different circumstances. The commissioning party did not have the goal of obtaining subsidy but instead they wanted to develop a building project that meets the municipality's circular quality plan. The same expert on sustainable building was connected to this project to advise on sustainability issues. This building case took place in Heesch and was in the early feasibility stage.

Both cases were appropriate for this research. The expert on sustainability was the direct contact for this research on circular building governance. He could provide data on the case such as reports, LCA and MPG calculations and contact with stakeholders. Additionally, through participatory observation I was able to gain insights on how the policies are implemented in practice. Overall, the cases offered sufficient availability and accessibility on that data that was required for answering the research questions.

3.2.3 Research Boundary

The Dutch government has an implementation plan for circular buildings that takes place up and until 2050. This research, however, focuses on the current circular building policies and practices in the Netherlands. Since the goal is to assess the current policies and practices, the preference was to review the scientific and grey literature and policy documents that were published in or after 2016.

The research scope was extended to two building projects that want to meet certain circularity guidelines in combination with interviews with stakeholders that are involved in the policy making process. The research assessed the qualities of the governance context of circular building in the Netherlands, as specified within the GAT.

3.2.4 Data Sources and Collection Methods

The data that was needed to answer the research questions was collected by using several methods, namely stakeholder interviews, desk research and participatory observations. The data collection for this research is summarized in Table 2.

TABLE 2 - DATA SOURCES AND COLLECTION METHODS

Research Question	Data Required to Answer the Question	Sources of Data		Data Collection Methods
How can the governance context of circular building in the Netherlands be described based on the five GAT dimensions?	Description of the actors of circular building, their problems, goals and ambitions, policy strategies and instruments, responsibilities and resources.	Policy documents		Desk research
		Circular building case	▪ Meetings ▪ Reports ▪ LCA/MPG calculations	Observation Desk research
		Stakeholders from the building sector		Semi-structured Interview
How supportive is the governance context of circular building in the Netherlands, based on an assessment using the four GAT criteria?	Insights in the quality of all five dimensions of the governance context of circular building in the Netherlands	Policy documents		Desk research
		Circular building case	▪ Meetings ▪ Reports ▪ LCA/MPG calculations	Observation Desk research
		Stakeholders from the building sector		Semi-structured Interview
What can be done to improve circular building governance in the Netherlands?	▪ Insight into current barriers. ▪ Insight into possible improvements for current circular building policies.	Results from application of the GAT		Desk research
		Circular building case	▪ Meetings ▪ Reports ▪ LCA/MPG calculations	Observation Desk research
		Stakeholders from the building sector		Semi-structured Interview

3.2.5 Stakeholder Interviews

The main data collection of this research took place by holding semi-structured interviews with stakeholders that are involved with circular building in the Netherlands. The interview questions were specified based on the dimensions and criteria of the GAT. The assessment matrix was used to formulate relevant interview questions, which are specified in Appendix A. Six interviews were conducted with different stakeholders in circular building. The interviews are displayed in Table 3 underneath.

TABLE 3 - OVERVIEW OF ORGANIZATIONS PARTICIPATED IN THE INTERVIEWS

Organisation	Description of organisation	Interviewee	Description of interviewee	Date
Dura Vermeer	Large developer and contractor in the Netherlands.	Nilgün Kinzis	Concept developer and tender manager.	26-09-2022
Madaster	Developer of software used for circular building	Sander Beeks	Partnership manager.	05-07-2022
ALBA concepts	Consultant on circularity and circular building	Marie Sophie Res	Housing advisor.	30-06-2022
Linneman Bouw en Advies	Consultant on sustainable building.	Tom Linneman	BREEAM and circular building assessor.	16-09-2022
Provincie Overijssel	Middle layer of government in Overijssel.	Nico de Boer	Project leader of the regional transition agenda construction	13-09-2022
RVO	Government agency for the implementation of policies regarding businesses	Anonymous	Advisor for the MIA subsidy	27-09-2022

The aim was to interview different stakeholders from the building sector so that a broad understanding could be gained. Most of these interviewees had no relation to the circular building cases which were used for data collection as well. The exception for this is the interview with RVO, this interviewee was also present at the circular building case for which they wanted to obtain subsidy.

The organisations such as Madaster, Alba Concepts and Linneman Bouw en Advies were selected because they are prominent actors in the area of sustainable and circular building. Dura Vermeer is one of the largest contractors in the Netherlands and was selected because of this aspect. The Province of Overijssel was selected to gain insights from a government point of view. Lastly the RVO was selected because they grant subsidy for circular building projects.

Five of the interviews took place via Microsoft Teams, while the interview with the representative from Linneman Bouw en Advies took place in person, since their location was in the nearby area. It made no difference that this interview was in-person instead of online. The interviews lasted 30 to 50 minutes. The interviews were recorded and completely transcribed afterwards. The records and transcripts were saved confidentially.

3.2.6 Desk Research

During this research several documents have been used to obtain data. Examples of these include policy documents, scientific articles on circular building and international reports on circular building. In Table 4 some main documents are listed that so far have been used during this research.

TABLE 4 - MAIN DOCUMENTS USED FOR DESK RESEARCH

Document	Author
Circulaire economie: wat we willen weten en kunnen meten. Systeem en nulmeting voor monitoring van de voortgang van de circulaire economie in Nederland	Potting et al. (2018).
De inrichting van het basiskamp in 2023 De circulaire bouweconomie (in uitvoering).	Rijksdienst voor Ondernemend Nederland (2021)
Transitie Agenda Circulaire Bouweconomie.	Transitieteam Circulaire Bouweconomie (2018)
Adviesroute naar een circulaire economie voor de bouw	TCB (2022)
Stand Stand van zaken concretisering doelen voor circulaire economie	Heijnen (2022)

3.2.7 Participatory Observation

In addition to the stakeholder interviews, I was able to observe and attend meetings for the two circular building projects. The participants of the research were approached in their own working environment, so that I could get insights into their behaviour and activities. According to Mack et al. (2005) researchers should not disrupt normal activity therefore other than stating the identity and purpose the researcher should interfere as little as possible during the meetings.

For the first case, I joined the inspection of a circular building project as well as the meeting afterwards as an observer. This first case gave insights into how the Dutch government wants to stimulate circular building by using MIA subsidy.

For the second case, I attended the early feasibility and design meetings on how the developer wanted to meet the criteria stated by the municipality as an observer. This second case gave insights into how municipalities want to stimulate circular building by making it a requirement for building developers.

3.3 Data Analysis

This research made use of the analysis of qualitative data. Firstly, I examined current policy documents on circular buildings in the Netherlands to acquire a better understanding of the current policies and instruments that are applied. Secondly, I described the governance context of circular building governance in the Netherlands by examining policy documents, two circular building cases as well as the interviews. Thirdly, I assessed the five dimensions of the governance context based on the four quality criteria from the GAT. This was done by applying an assessment matrix (Table 1) which I developed based on the GAT matrix by Casiano Flores et al. (2017). For the assessment, the data that was obtained from desk research, the interviews and observations was compared, and held against the assessment matrix shown in Table1. The last step was to provide recommendations as to how the circular building governance in the Netherlands can be improved. This was done by using insights from the previous steps.

3.4 Data Validation

A case study has the characteristics that it focuses on qualitative analysis with a focus on depth instead of breadth (Verschuren & Doorewaard, 2010). In order to realize this a triangulation of data sources and collection methods took place. For this research the data collection methods consisted of desk research, semi-structured interviews and participant observation. Using different sources of data together with different methods to investigate the current circular building policies in the Netherlands ensured that a biased point of perspective was avoided, and validity was obtained. There were no notable findings from the desk research, semi-structured interviews or participant observations that contradicted each other.

3.5 Ethical Considerations

During this research, human participants were involved for the data collection. These participants were interviewed in a semi-structured manner. To avoid harm to the participants, several measures were applied during this research. First of all, participants were treated with respect, and it was made sure that no persons with additional vulnerability were interviewed. Participants were asked for their consent to participate in the research, and they had to give consent so that their data could be used for this research. The participants were informed of their right to withdraw this consent at any given time. The participants were also asked if they wanted their responses to be anonymized during the research to avoid future implications, only one participant requested this option. Lastly, the data was stored securely on UT Surfdrive and only used for this research. The only persons that had access to this data were the researcher and supervisor of the research. The data will be deleted after this research is completed.

4 Description of the Governance Context of Circular Building

This chapter describes the governance context of circular building based on the five governance dimensions as specified by Bressers et al. (2016).

4.1 Levels and Scales

The Netherlands is a parliamentary democracy whereby the system is split into three levels of government. Firstly, there is the parliament, which is the highest authority and has the last word. Secondly there are the provinces with their own councils and lastly there are the municipalities also with their own councils (Overheid.nl, n.d.). Circular building is applied differently by each governmental level.

4.1.1 Circular Building on National Level

The Dutch government tries to support circular building at the national level. They have set up a transition agenda which indicates that they want to achieve a completely circular building economy in 2050 (TCB, 2018). To stimulate circular building the government currently have a subsidy available for circular building projects, namely the MIA subsidy which the RVO is responsible for.

Additionally, the Dutch government enforces circular building by securing it in the national building decree. Residential buildings have to meet an MPG score of 0.8 and offices have to meet an MPG score of 1.0. For all other types of buildings there is no requirement yet.

4.1.2 Circular Building on Provincial Level

On a provincial level circular building is applied differently from the national level. The province functions as the linkage between the national agreements and regional agreements with municipalities (Boer, 2022). Another example that provinces have their own take on circular building is that the province of Overijssel has developed its own regional transition agenda circular building together with regional organizations. The province tries to promote circular building by collaborating and facilitating. They co-invest in circular projects and set up meetings on circular building for organizations in the province (Boer, 2022). The province also provided subsidies for circular building in the past. However, the province can also make circular building mandatory by using instruments such as environmental regulation and zoning plans, however they only want to use this as last resort when collaboration doesn't work (Boer, 2022).

4.1.3 Circular Building on Municipal Level

Municipalities can demand circular building or circular aspects in zoning plans for areas. For example near the town of Heesch in Noord-Brabant the surrounding municipalities want to develop a new industrial area next to the highway A59. This land is highly sought after by real estate developers for the construction of distribution centres. The municipalities therefore have set up a circular quality plan in which several demands on circularity, energy usage and climate adaptation are stated (Gemeente Berheze et al., n.d.). Developers that want to make an offer on the land have substantiate how they comply with the demands.

A similar example has been applied by the municipalities of Amsterdam and Haarlemmermeer. Together with the province of Noord-Holland they developed a new business park near Schiphol. Organizations that want to develop on this business park have to meet several criteria based on seven pillars of a circular economy (SADC, 2018).

4.1.4 Collaboration Between Levels

The policies on circular building are mostly based on national agreements, the province uses this as a guide to set up its own policies on circular building (Boer, 2022). The housing advisor from Alba Concepts stated that: *"We do notice that, to stay in terminology for a moment, it is a fairly linear process. There is a national policy, then the province responds to it and only when the province forms something of a policy about it, does the municipality come up with a policy."* (Sophie Res, 2022).

In addition to the different levels, it was noted that provinces and municipalities on the same level give their own interpretation circular building. An example of this was given in section 4.1.3, and the same interviewee also stated: *"You see that there is actually a different focus within circular construction within different provinces and municipalities. For one province that means building with recycled materials, and for the other province it is therefore biobased construction."* (Sophie Res, 2022). She further mentioned that the program manager of the province of Zuid-Holland was motivated to develop biobased building, so personal factors can also influence the policies of certain administrative levels and cause them to differ from each other.

4.2 Actors and Networks

Various actors and networks are involved with the policy processes of circular building. These main actors and networks that are involved with circular building in the Netherlands are described underneath.

4.2.1 Governmental Actors

In section 4.1 the different governance levels were explained. On the highest regulatory level, the Ministerie van Binnenlandse Zaken en Koninkrijksrelaties (BZK), is responsible for building-related policies and regulations in the Netherlands (Rijksoverheid, n.d.). In 2020, they wrote a letter to the parliament with an update on the circular building progress in the Netherlands (Ollongren K.H., 2020). The provinces act as the linkage between national agreements and regional agreements with municipalities (Boer, 2022). While provinces don't have any legislation or authority to set up new regulations on circular building, they can demand it in environmental regulation on zoning plans. However they only use this as a last resort and try to stimulate circular building by stimulating and facilitating (Boer, 2022). Some provinces such as Overijssel, Noord-Holland and Utrecht, have also developed a provincial agenda on circular economy as an extension on the national transition agenda. According to the interviewee from the Province of Overijssel, the collaboration exists between different governance levels, however he also mentions that policies are developed independently of each other (Boer, 2022). Municipalities also try to stimulate circular building by demanding it in zoning plans for areas, this is described in paragraph 5.1.3.

4.2.2 Rijksdienst voor Ondernemend Nederland

The RVO is responsible for the distribution of the MIA subsidy for circular building in the Netherlands. They have direct contact with experts from various ministries on the national level and are in general not involved with provinces or municipalities (RVO, 2022). They are also responsible for the development of the subsidy for circular building, this means altering the requirements for obtaining the subsidy. The RVO also depends on the state support framework, which is a European regulation, stating for which subjects the RVO can grant subsidy (RVO, 2022).

The RVO has to verify whether building projects meet the requirements for obtain the subsidy. These requirements include providing an MPG calculation, setting up a materials passport, using products that are renewable or recyclable, using only sustainable wood and providing information on the detachability of building elements and materials (RVO, 2022a). They have direct contact with the contractor or with the advisor that is responsible for the subsidy application.

4.2.3 Transition Team for Circular Building Economy

The transition team for circular building economy works on behalf of the Dutch cabinet on the implementation program for circular building in the Netherlands (Circulaire Bouweconomie, n.d.). The team consists of representatives from the government and from the construction and infrastructure sector. This team decides the strategy of the Netherlands to achieve a circular building economy in 2050 , making it one of the main actor networks on circular building in the Netherlands. According to the interviewee from Madaster, the transition team is a good representation of the market, however it are organisations and people that are leading in the way on circularity (Beeks, 2022). The transition team also coordinates between other platforms and initiatives on circular building.

4.2.4 Platform CB'23

Another influential actor network is CB'23, which stands for Circular Building in 2023. CB'23 is a platform where organisations from the building and infrastructure sector collaborate on developing solutions for circular building (CB'23, n.d.). Platform CB'23 has made agreements with the transition team circular building economy. The transition team reflects on the activities and results of the platform and provides them with research questions (CB'23, n.d.). Relevant organisations and individuals can join this platform to actively contribute to the development of circular building in the Netherlands.

4.2.5 Practitioners of Circular Building

The actors that are described in this section are less relevant in the governance context of circular building since they do not have direct influence on policy making. However, these actors are needed for the implementation and further development of circular building practices.

Contractors can be considered as a main actor for further development of circular building. They have to apply circular building principles in practice. Large contractors such as Volker Wessels and Dura Vermeer have set their own goals for circular building in their annual reports. Large contractors work on projects from developers, housing associations or the government but they can also develop projects themselves (Kinzis, 2022). The contractor is a central figure in the construction process and therefore has a lot of contact with other involved parties.

The expert from Dura Vermeer stated that: *"You notice that you have an early discussion with the involved parties, about how we are going to do it. The demolition contractor no longer demolishes but he disassembles the building and sees what he can reuse. You deal with your building material connections differently because you want to keep the materials at high-quality in the supply chain. So, if you look at the construction side, we are all talking to each other to come to the best solutions. The market, the suppliers, the subcontractors also help us with this."* (Kinzis, 2022).

The client of building projects is also an important actor due to the fact that circular building is not mandatory in the Netherlands yet. Therefore, most circular projects have been carried out by clients who had the ambition to develop a circular building themselves. the clients ambition is crucial for circular projects because of several reasons. The first one is that circular building is still more expensive at the moment, reused materials are more expensive than new materials at the moment (Beeks, 2022). Or it takes time and additional work to get used building elements such as window frames up to standards (Kinzis, 2022). Additionally, the client has to accept that circular building may be aesthetically less pleasing because re-used materials and elements may have traces of use and the client has to accept this (Kinzis, 2022). The expert from Dura Vermeer also stated: *"it starts and falls with the ambitions of your client, is that intrinsic motivation, how far is he willing to go* (Kinzis, 2022). Lastly, building material suppliers are also an important actor in the circular building processes. According to Linneman (2022), a consultant on sustainable building, suppliers such as Falk and

Circulair Staal are leading the way on circular building materials in the Netherlands. Falk has developed facade panels with a circular insulation core, these panels are delivered with return or buyback guarantee (FALK, n.d.). Circulair Staal has developed a way to design and produce steel structures that can be easily disassembled, they also offer buyback guarantee so that the steel can be reused at the end of the life (Circulair Staal, n.d.). These kinds of innovative building materials are needed for the transition towards a circular building economy.

4.3 Problem Perspectives and Goal Ambitions

Since the development of the transition agenda for a circular economy the government has created several goals. The most important goals are explained in the paragraphs below.

4.3.1 Problem Perspectives

Through the interviews and the review of the circular building cases, two major problems were identified that can be encountered while working on circular building projects.

The first problem is the increasing costs of circular building and the high demand for affordable housing in the Netherlands. Several interviewees mentioned circular building to be more expensive than building a house the traditional way. Reasons for this are that re-used materials may need additional labour to be brought up to standards (Kinzis, 2022) or the price of the circular building materials itself is higher than virgin building materials (Beeks, 2022). During the interview with Province of Overijssel it was stated: "*There are now many social costs involved in traditional building materials, which are not immediately reflected in the price. So there is still a bit of a skewed competitive relationship*." (Boer, 2022). This makes applying circular building materials and principles less interesting for both the business as private market. However according to the expert from Dura Vermeer the necessity for circular building will arise automatically due to rising energy prices which are reflected in the price of building materials and the scarcity of raw materials and resources (Kinzis, 2022).

Stakeholders also encounter problems while trying to re-use building materials. these problems arise due to the fact that re-used building materials do not meet the current requirements stated in the Dutch building decree. For example, window frames might not meet the insulation requirements. Another problem that arises when reusing building materials or elements is that producers and suppliers no longer provide a warranty on a re-used product. The consultant from Linneman gave the following statement regarding this problem: "*For example, what we had with those hollow-core slab floors at a project. Yes, then constructively there is just a point of attention because you remove something that already exists and the supplier no longer supports it. They no longer give a warranty. Then the client must have a lot of drive and motivation to continue with the project."* (Linneman, 2022). Municipalities also need to cooperate with the developers of buildings, for example regarding the aesthetics of a building. For the same project, the consultant mentioned: "*At that time they did not yet know what the facades would look like, but they did get a permit. We did give an indication of probably it will look like this, but we don't know yet which frames will be available for re-use* (Linneman, 2022). Municipalities may need to be more lenient with issuing permits for circular building projects.

The problems stated above can cause resistance for the transition towards a circular building economy. Since it causes circular building developers to face additional costs, risk or bureaucratic actions and thus discouraging them from developing circular buildings in the future.

4.3.2 Transition Towards a Circular Building Economy in 2050

The transition team has published the transition agenda circular building economy in 2018, in this agenda the goal of a completely circular building economy in 2050 was stated. This agenda for the building sector is part of the nationwide program the Netherlands Circular in 2050. In this transition agenda was stated that the goal of a circular building economy was to be reached in three stages: 1) by 2021, the basecamp had to be set up; 2) by 2030, 50% of the end goal has to be realised, and 3) in 2050, the building economy will be completely circular. For setting up of the basecamp, the transition team focused on four main points of interest: 1: Market development, 2: Measurability, 3: Policy, law and regulations, 4: Knowledge and awareness (TCB, 2018).

However, in November 2021 the transition team published the implementation programme, in which they mention that the basecamp has to be set up in 2023 (RVO, 2021). So, the deadline for the setting up the basecamp has been postponed already. In this implementation program the four main points of interests are still the same. The points of interest are described below.

Market Development
The government wants to develop both supply and demand of circular solutions and building materials by gaining insights into success and failure factors of circular solutions (RVO, 2021). Additionally, they want more insights in the usage of material passports and in producer responsibility. The goal is to know how producers, suppliers and importers can be made responsible for the waste management of the building materials they supplied (RVO, 2021).

Measurability
The government wants to develop a measuring instrument for circular building. The first step to achieving this, is by defining the definition of circular building (RVO, 2021). Circular building is a broad concept that reaches from re-using materials to applying biobased products. They want to develop a clear understanding, standardisation and legal requirements for the measuring instrument (RVO, 2021).

Policy, law and regulations
The government tries to translate circular economy into government instruments. For now, the main instrument is the MPG calculation for building which they want to refine and expand so that it can be applied on other building types and for renovation projects (RVO, 2021). Additionally, they want to have developed a roadmap by 2023 in which the circular building goals for 2030 are stated (RVO, 2021). This roadmap has been published in July 2022 and is described in section 5.2.3.

The Dutch government also wants to keep pace with European policies and developments therefore they want to have mapped out relevant developments by 2023 that can help to stimulate a transition towards a circular building economy (RVO, 2021).

Knowledge and awareness
This last point of interest is straightforward. The governments wants to stimulate the development of knowledge, skills and support for circular building therefore they want to have it integrated in building related educations by 2023 (RVO, 2021).

4.3.3 Specific Goals for a Circular Economy

On 15 July 2022 the state secretary for infrastructure and water management had to inform the Second Chamber of the Dutch Parliament about adopting specific goals for achieving a circular economy as well as the interim results. The transition teams were responsible for proposing more specified goals for a circular economy in 2030 (Heijnen, 2022).

The transition team for circular building economy therefore published the report: “The advisory route towards a circular building economy”. In this document the transition team proposes new goals for five product groups with the highest environmental impact within the building sector as well as several overarching goals (TCB, 2022). The document describes both goals that were set for 2023, and new goals for 2030. The goals are formulated in a more specific, measurable, achievable, realistic and timebound manner compared to the previous goals from the transition agenda.

Another difference between earlier agendas and routes is that they have also established a way to measure the overall goal, which is a completely circular building economy in 2050. The end goal is to be measured based on the MKI/MPG indicator. This measurement method combines 19 different environmental impacts. By 2050 the environmental impact of the building sector is to be eliminated and therefore has a theoretical MKI/MPG of zero, which is the end goal (TCB, 2022). The transition team has also set interim targets for 2030, for residential buildings this is a MKI/MPG of 0,3 for example, this is a big step compared to the requirement of a MPG of 0,8 that currently is being set.

The transition team has decided to set goals based on product groups instead of raw materials, which makes it possible to provide guidance on the entire materials chain (TCB, 2022). The product groups with the largest environmental impact were selected because here the biggest reduction can be achieved. In total, five product groups are selected namely: 1) residential buildings, 2) industrial and office buildings, 3) infrastructure bridges and viaducts, 4) roads, 5) building climate systems (TCB, 2022). The product groups and their targets are shown in Table 5, with the exception of building HVAC systems since these targets are still to be developed.

TABLE 5 - CIRCULAR BUILDING GOALS

Product group	MKI contribution in 2030 prognosis (Mln € MKI)	CO_2 equivalent contribution in 2030 prognosis (Kton CO_2 equivalent)	Target 2030 MKI/MPG	Potential reduction MKI in 2030		Potential reduction CO_2 equivalent	
				Mln € MKI	% MKI reduction	Kton CO_2 equivalent	% CO_2-equivalent reduction
Residential buildings (new construction)	334	2.846	MPG 0,3	161	48%	1.347	48%
Infrastructure (concrete bridges)	26	280	50% MKI reduction	13	50%	140	50%
Infrastructure (concrete viaducts)	7	76	50% MKI reduction	3	50%	38	50%
Office buildings (new construction)	13	107	MPG 0,5	4	32%	34	32%
Industrial buildings (new construction)	133	1.170	MPG 0,5	48	36%	424	36%
Road pavement (asphalt and foundation)	192	1.601	50% MKI reduction	96	50%	801	50%
Total of selected product groups	705	6.080	-	326	46%	2.811	46%
Total of the building sector including other product groups such as renovation and sustainability	1800	15.600	-	326	18%	2.811	18%

Source: TCB (2022)

4.4 Strategies and Instruments

The government tries to stimulate circular building in the Netherlands by using several strategies and policy instruments. Underneath the most important policy instruments are described based on the typologies by Vedung (1998).

4.4.1 Command-and-control Measures

There is little command-and-control over circular building, whereas the only way that control is exercised is by the MPG-score of office and residential buildings (RVO, 2017). Office buildings MPG-score of 1,0 or lower while residential buildings need to have a score of 0,8 or lower. These requirements were not perceived as challenging by stakeholders. For all other building types such as industrial buildings there is no requirement for an MPG yet.

An MPG calculation is made by using dedicated calculation software that is linked to the Nationale Milieu Database (NMD). This database contains the environmental information about products that are used in the building and infrastructure sector. The database is classified into three categories:

- Category 1: proprietary data (for a particular brand), verified by an independent, qualified third party according to the NMD Test Protocol.
- Category 2: proprietary data (unbranded), verified by an independent, qualified third party according to the NMD Verification Protocol, stating representativeness (of for example the Dutch market or a group of producers) and a statement of the participating businesses.
- Category 3: unbranded data (generic), owned and managed by the NMD Foundation, not tested according to the NMD Assessment Protocol

The data for the building materials in categories 1 and 2 are based on LCA's which are used to set up environmental product declarations (EPD) for the products. The data for category 3 is owned by the NMD itself and exists only due to a lack of category 1 and 2 products (Stichting Nationale Milieudatabase, 2022). However, the products in category 3 have an additional charge on the environmental impact due to less accurate data, therefore it is more favourable to use products from categories 1 and 2. Underneath in Figure 4 the process of determining the MPG's is shown.

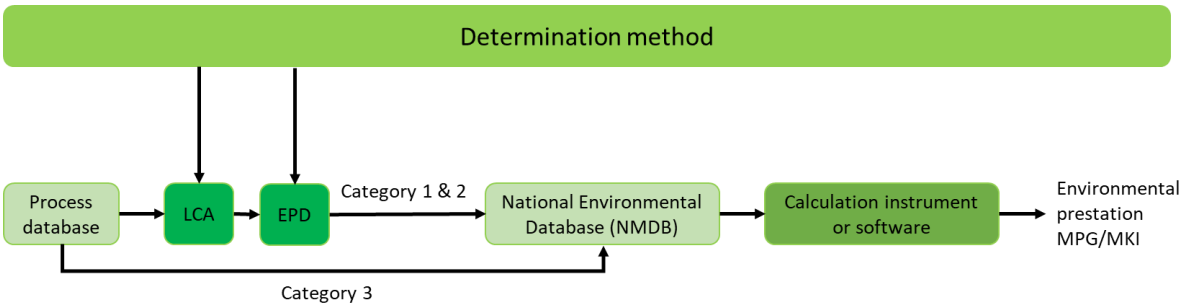

FIGURE 4 - DETERMINING MPG SCORES

Source: Stichting Nationale Milieudatabase (2022)

There are five suppliers of dedicated calculation software that is linked to the NMD. In the software the user specifies the building type, the gross floor area, the lifespan, which building materials are used and their quantity (Bouw Support Oost, 2021). The software then links the applied materials and their quantities to the environmental performance of the products in the NMD. The outcome is the environmental performance (MPG) of the building per square meter. The lower the score the better the environmental performance of the building.

Stakeholders encounter several problems regarding the MPG-calculation which is currently the leading way for measuring circularity. During the interviews with experts Madaster and Dura Vermeer it was mentioned that applying wood is not valued correctly in MPG-calculations, although it is a sustainable product. Another problem is the energy transition, for which a lot of materials such as solar panels and heat pumps are needed, and these materials cause the MPG-score to increase (Sophie Res, 2022).

4.4.2 Financial Incentives

The Dutch government tries to stimulate circular building by providing tax benefits for circular building projects in the form of environmental investment deduction (Milieu investeringsaftrek, MIA). Organizations that develop circular buildings can deduct 45% of the additional investment for circular measures from the profit of their company so that they have to pay less taxes (RVO, 2022a).

The MIA tax benefit exist for commercial buildings such as office and industrial buildings, but also for residential buildings. However, only organizations can make use of the MIA, and not individuals. Therefore, the MIA for residential buildings is only interesting for housing corporations. Building projects have to meet 10 criteria in order to obtain the MIA tax benefit (RVO, 2022a). These criteria focus on contributing to the creation of circular material chains and includes aspects, such as the usage of certified sustainable wood, an MPG score that is lower than regulations, the application of renewable, recycled or re-usable materials and lastly the development of an up-to-date report or dataset of used building materials that is available throughout the entire lifespan of the building. These points are to be verified by an independent assessor.

With these criteria, it is quite challenging to obtain the MIA tax benefit. The first year the MIA subsidy was available, no one has made use of it because the requirements were not feasible. The expert from Madaster stated: "*I don't think it was paid a single time in the first year because it was simply not feasible. This has to do with the fact that the government must also learn. They are also exploring, they don't want to make a request that is too difficult, but not too easy either. And that should come with experience and that is part of it, those kinds of teething problems."* (Beeks, 2022). The RVO revises the criteria every year and the MIA for circular buildings has become obtainable, since several projects are listed on their platform for sustainable buildings.

4.4.3 Persuasive Instruments

Circular building is also promoted and facilitated by sharing information. There are several platforms and initiatives with the goal of spreading information about circular building. Firstly, there is the transition team on circular building economy, they have their own website where they publish data, reports and news about circular building. They also have a podcast for younger audiences (Circulaire Bouweconomie, 2022).

The RVO has their platform for sustainable buildings, which provides information about circular building projects. All projects that want to obtain the MIA tax benefit are listed on this website (RVO, 2022d). The accelerating house "Nederland Circulair" also provides information and facilitates events such as Webinars about circular economy in general. Organizations can also submit questions about circular economy on their website.

The Province of Overijssel tries to stimulate circular building with their platform "the Woonkeuken Overijssel". The interviewee from the Province states that: "*Yes, in networks that we have such as the Woonkeuken, there is a lot of collaboration. So, the parties really know how to find each other there. we also see that in area developments, especially when it comes to future-proof construction that parties then certainly know how to find each other."* (Boer, 2022). These initiatives help to share knowledge and stimulate the transition towards a circular building economy.

4.5 Responsibilities and Resources

In this section, the responsibilities and resources regarding the governance of circular building are described. The most important responsibilities were categorized based on the findings from the desk research, semi-structured interviews and participant observation, and are summarised in Table 6.

TABLE 6 - RESPONSIBILITIES AND ACTORS

Responsibility	Actors
Accountability for progress and results	Ministry of BZK
Implementing programmes, setting and monitoring goals	Transition Team Circular Economy, Platform CB'23
Policy development in circular building	Transition Team Circular Economy, Platform CB'23, Ministry of BZK, Provinces, Municipalities, RVO
Providing funds for circular building projects	RVO, Provinces
Inspecting building projects on circular criteria	Municipalities, RVO

4.5.1 Accountability for Progress and Results

The authority that is accountable for the progress and results about circular building is the ministry of BZK. They have to notify the Second Chamber about the progress on circular building (Ollongren K.H., 2020). The ministry of BZK determines the policy's based on the advice from the transition team. The ministry of BZK has the authority and resources to implement new policies such as the MPG requirement for offices and residential buildings.

4.5.2 Implementing Programmes, Setting and Monitoring Goals

The Transition Team Circular Building is appointed by the ministries of BZK and Infrastructure and Water to be responsible for the transition towards a circular building economy. So, they are on the highest level responsible for putting policies in the transition agendas and in implementation programmes (Circulaire Bouweconomie, n.d.). They are also the actor that is responsible for setting and monitoring goals. The transition team gets assistance from platform CB'23 for providing research and insights from the market. From 2018 up until 2021 the transition team had access to 3.2 million as resources for their own activities (TCB, 2018). Additionally, the transition team estimated budgets for the period of 2018 up until 2021 for each of the goals specified in section 4.3.2. with the total amount leading up to 307 million which was to be provided by both the government and market parties (TCB, 2018).

4.5.3 Policy Development in Circular Building

There are several actors which are and can be responsible for the development of policies on circular building. In documents such as the transition agenda there currently are no responsibilities defined for provinces and municipalities. These government instances have the freedom to design their own policy on circular building. The interviewee from the province of Overijssel stated: *"I think it was mainly the national policy that this has been more decisive for us. and that the step from our transition agenda is actually a bit of translation in the direction of taking steps there with municipalities and supporting them in how we can make that transition together"* (Boer, 2022). The provinces each have their own resources for the advancement of circular building. For example, the

province of Overijssel has funds of 4 million from 2021 up and until 2023 which was, and will be used for research- but also practical projects (Provincie Overijssel, 2022).

Municipalities in the same way try to develop policies on circular building. An example of this are the municipalities of Amsterdam and Haarlemmermeer. Together with the province of Noord-Holland they developed a new business park near Schiphol where developers had to prove that they applied circular building concepts (SADC, 2018). However, the way this is performed can differ by municipality as was seen in the project at Heesch, where building projects were assessed on different criteria then in Amsterdam. Developing new industrial areas requires considerable resources, for the development of industrial area in Heesch costs were estimated of 4.7 million from 2020 up until 2022 (Bernheze, 2021). However, the municipality will eventually also receive funds through the sale of building plots.

Lastly, the RVO, which has the main responsibility of providing subsidies for circular building projects, can also develop policies in some way since they can set the requirements for obtaining this subsidy. During the interview with the RVO it was stated that they develop the subsidy on the basis of European policy (RVO, 2022).

4.5.4 Inspecting Building Projects on Circular Criteria

Some policies that are in place require government agencies to check whether circular building requirements are met. Circular building is included in the building decree in the form of a MPG requirement of 0,8 or 1,0 depending on the building. Municipalities are responsible for checking whether new building projects meet this criteria for the MPG. Building projects need to meet this criteria in order to obtain a permit for the construction. Municipalities charge fees for the provision of services that are in the individual interests of persons, this includes a building permit where the MPG is a part of. These charges provide the municipality with resources to carry out their tasks.

Additionally the RVO is responsible for checking whether the criteria to obtain subsidy in section 4.4.2 are met, these criteria are above normal building legislation. So, it can be concluded that responsibilities for checking and monitoring the requirements are clearly assigned.

5 Assessment of the Governance Context of Circular Building

In this chapter the governance dimensions are assessed using the four criteria to find out how supportive the governance context of circular building is in the Netherlands.

5.1 Extent

5.1.1 Levels and Scales – Moderate to Supportive

Several interviewees stated that the circular building policies mostly originated on a national level and that lower levels such as the provinces and municipalities were less involved (Linneman, 2022) (Boer, 2022) (Sophie Res, 2022). Documents such as the transition agenda from the province of Overijssel and circular quality plans for the area development within municipalities show that all levels are involved with developing circular building in The Netherlands. However, a consensus on this matter is lacking, therefore this is dimension is assessed as being moderate to supportive.

5.1.2 Actors – Moderate to Supportive

During the interviews, different opinions were expressed about whether all relevant stakeholders are involved in the circular building policy making processes. The transition team which is one of the main actors is made up of different actors from the construction sector. This team is a seen as a good reflection of the market and therefore the team can exercise the right influence (Beeks, 2022). It was clearly evident that frontrunners on circular building are mostly involved in the development of circular building and corresponding policies in the Netherlands and that smaller and more traditional organisations are less represented in the policy making processes.

5.1.3 Problem Perspectives and Goal Ambitions – Moderate

Several problems regarding the current circular building policies were described in paragraph 4.3.3. Examples of these problems are that circular building can conflict with existing building regulations such as the building decree and the energy-prestation of buildings (Linneman, 2022). There are also problems that arise due to the use of certain tools and instruments. One example is that the MIA subsidy was unclaimable in the first year (Beeks, 2022). Lastly the affordability of circular building materials currently is a bottleneck.

The transition team and the RVO know that these problems exist and try to address these problems. The MIA subsidy is continuously in development and it is achievable. In the new advisory route for a circular building economy the transition team claims that they want to develop a clear method for measuring circularity whereby the energy-prestation is alto integrated (TCB, 2022). In this document they also claim that they want to improve processes and products throughout the building sector and pay more attention to permits, supervision and enforcement of building projects (TCB, 2022). So, the government and the transition team try to address some of the existing problems.

5.1.4 Strategies and Instruments - Supportive

This dimension is assessed as being supportive even though the transition towards a circular building economy is described as a search that does not follow a straight line by transition team itself (RVO, 2021). Based on this description made by the RVO one would assume that there is no clear strategy for achieving a completely circular building economy in 2050. However, the Dutch government and involved parties apply policy instruments from each category, making it well balanced. The MPG is currently being used as a regulatory tool for circular buildings, whereby offices and residential buildings have a mandatory score that they have to meet. There are also financial incentives for circular buildings in the form of tax reduction. Lastly the government and involved parties try to stimulate circular building by sharing information and knowledge through different platforms.

5.1.5 Responsibilities and Resources - Moderate

The responsibilities and resources for the main actors on the highest governance level such as the Ministry of BZK, the RVO and the transition team are clearly assigned. As well as that municipalities are responsible for checking circularity for projects based on the Dutch building decree. The responsibilities are less extensive for lower governance levels. It was noted that private organisations are pioneering and discovering adjacent to each other (Boer, 2022). Thus, the responsibilities for the private sector are not clarified well. Platforms such as CB'23 where private organisations work together to further develop circular building in the Netherlands change this perception. To conclude, for most actors the responsibilities are assigned, and several actors have freedom and approach circular building in their own way. As for resources, most actors, such as the transition team and the province of Overijssel, have access to a considerable monetary resources that can be used for circular research and projects.

5.2 Coherence

5.2.1 Levels and Scales – Moderate

The circular building policies are mostly designed and implemented on a top-down basis, it's a linear process whereby there is a national policy, then the province responds to it and only if the province forms something of a policy about it, then the municipality will come up with a policy (Sophie Res, 2022). The national policies were for example also decisive for the province of Overijssel for the development of their own transition agenda. and their transition agenda was a translation in the direction of taking steps with municipalities and supporting them in how they can make that transition together (Boer, 2022). However the policies were not developed through cooperation between the different layers (Boer, 2022).

5.2.2 Actors and Networks – Supportive

Several networks work on the development of circular building in the Netherlands. The most important network, the transition team, meets at least five times a year (Circulaire Bouweconomie, n.d.). Another important network, CB'23, hosts knowledge sharing sessions and consultation meetings on circular building, individuals can sign up to take part in these meetings (CB'23, 2022). These examples show that there are sufficient interactions between actors that are institutionalised in stable structures.

5.2.3 Problem Perspectives and Goal Ambitions – Restrictive

Several problems regarding the current circular building policies are described in paragraph 4.3.3. These examples also show that there is conflict between the current policies and goals that the government has set within the building sector. One of the main areas where the goals of circular building clash with other goals is the energy transition, as was mentioned in several interviews (Boer, 2022) (Sophie Res, 2022) (Kinzis, 2022). Another area where circular building currently clashes is the housing shortage in the Netherlands. A lot of houses have to be constructed in short time while also being affordable. In several interviews it was mentioned that circular measures have an adverse effect on affordability (Kinzis, 2022) (Beeks, 2022) (Boer, 2022). It can be concluded the goals for circular building are currently in competition with other goals that exist within the building sector.

5.2.4 Strategies and Instruments – Moderate to Restrictive

A well-rounded set of policy instruments from each typology is applied to stimulate circular building. However, there are gaps within the way these instruments are applied. The regulatory instrument, which is the MPG score, is only mandatory for offices and residential buildings. All other building types are currently excluded from this regulation. At the same time the financial instrument, the MIA tax benefit is only available for companies to take advantage of. Individuals cannot make use of any financial benefit for the development of a circular residential home for their own usage. In section

5.2.3, several examples were given where the current policies for circular building collide with other policies within the building sector.

Another area where synergies are lacking is the NMD, which is described in section 4.4.1. The MPG-score of buildings is based on materials from the NMD, in this database the environmental impact of building materials is listed based on life cycle assessments. This NMD plays a big role, building materials that are not listed in the NMD are appreciated as less sustainable and will not be reflected well in the overall MPG-score of the buildings (RVO, 2022). It is possible for companies to participate in the database, but they will have to disclose sensitive information about the composition, which is also sensitive to competition (Kinzis, 2022). On one hand producers of building materials need their products to be in the NMD, because architects and contractors are reliant on this. On the other hand it is not appealing either since it costs time and money and important information about the composition of products has to be shared, which is mainly relevant for start-ups. So, the current system allows for limited creation of synergy among the policy instruments, but some conflicts exists.

5.2.5 Responsibilities and Resources - Supportive

There are arrangements in place that promote cooperation within and across institutions. Examples are platforms such as CB´23 where individuals can sign up for knowledge and consultation sessions (CB'23, 2022). Several government agencies from different governance levels such as the ministry of BZK, provinces and municipalities also take place in this platform (CB'23, n.d.). During the interview with the province of Overijssel, it was also stated that the province tries to collaborate with both municipalities and organisations active in the building sector, for this they have developed the network the Woonkeuken (Boer, 2022).

5.3 Flexibility

5.3.1 Levels and Scales - Moderate

Each governance level has its approach to stimulating circular building. The lower levels such as the provinces and the municipalities try to translate the national policies and agreements into their own policies, however these lower levels have no legislation or authority to demand things such as a lower MPG-score for building projects (Boer, 2022). This is why the province of Overijssel tries to stimulate through cooperation and municipalities try to make it a part of area development. So it is possible to move up and down levels, depending on the issue, but only through the implementation of agreements.

5.3.2 Actors and Networks - Supportive

There are several networks and platforms where new actors are welcome to join. The goal of these networks is to create social capital and share it with the rest of the building sector. Examples of these are platform CB'23 and the Woonkeuken from the Province of Overijssel. New actors can easily be involved in these processes.

5.3.3 Problem Perspectives and Goal Ambitions - Supportive

The transition team describes the transition towards a circular building economy as a search. The first goals were published in 2018 in the transition agenda circular building economy. Here they state that the first step was to develop a basecamp for circular building by 2021 (TCB, 2018). However in the subsequent document "the set-up of the basecamp", which was published in 2021 the deadline for the completion of the basecamp has been postponed to 2023. The last goals have been published in July 2022, in the document "advisory route towards a circular building economy". In this document new goals are set based on the product groups with the highest environmental impact (TCB, 2022). Based on this it is possible to reassess goals during the implementation process and the transition team is also applying this in practice.

5.3.4 Strategies and Instruments - Restrictive

The current policy instruments are applied in a very targeted approach. Residential buildings and offices have to meet a certain MPG-score while other building types have no requirements. Additionally only organisations can make use of the MIA tax benefit, while there is no financial benefit for individuals. So, the actors do not have the choice to use all instruments or to combine them, this depends on the building project.

5.3.5 Responsibilities and Resources – Moderate to Restrictive

Some of the responsibilities are clearly assigned such as that municipalities have to check MPG-scores of buildings before they can obtain a permit and that the RVO is responsible for granting the tax benefit. Since these responsibilities are clearly assigned it is possible to hold these actors accountable for good compliance. At the same, this makes it difficult to pool the assigned responsibilities. This is substantiated by the fact that the RVO does not work with provinces and municipalities, but only with ministries (RVO, 2022).

5.4 Intensity

5.4.1 Levels and Scales - Supportive

All governance levels are trying to stimulate the transition towards a circular building economy through their own approaches and with the tools that have. On the national level, this is through laws and regulations, and on the provincial level the focus lies on cooperation with actors and facilitating with knowledge or networks (Boer, 2022). Lastly for municipalities it is by demanding circular aspects in zoning plans.

5.4.2 Actors and Networks – Supportive

There are two coalitions that try to facilitate behaviour change namely the transition team and platform CB´23. The Transition Team Circular Building is a coalition of different actors that try to facilitate behaviour change with the end goal of achieving a completely circular building economy in 2050. Platform CB'23 is presented with research questions by the transition team and tries to further develop circular building in the Netherlands. Individuals from all types of organisations can sign up for knowledge and consultation sessions (CB'23, n.d.).

5.4.3 Problem Perspectives and Goal Ambitions – Restrictive

During the interviews it was stated that the required MPG-score is not ambitious (Beeks, 2022). Especially when compared to the requirements that have to be met for obtaining the MIA tax reduction which are more challenging (RVO, 2022). Additionally, there are other obstructive regulations in place such as the building decree which impedes the re-use of second hand materials (Linneman, 2022) (Kinzis, 2022). The interviewed stakeholders were unanimous that major changes are required to achieve a completely circular building economy in 2050.

5.4.4 Strategies and Instruments - Restrictive

The stakeholders that were interviewed were unanimous that there is a need for behaviour change from the current building practices. The sense of urgency for circular building is not always there yet and there are still parties that try to maintain the traditional practices (Boer, 2022). The regulatory instrument the MPG-calculation is being perceived as easy to comply (Beeks, 2022) (Sophie Res, 2022). The MPG requirement is 0,8 for residential homes and 1,0 for offices, and the goal is to achieve buildings with a score of 0,0 (TCB, 2022). So, the instruments for circular building are not facing many obstacles for implementation, but they are not challenging themselves. Overall, the instruments contribute little to triggering behavioural change in the building sector.

5.4.5 Responsibilities and Resources – Moderate

Most stakeholders that were interviewed believed that money was not the solution to achieve the intended changes. It is no solution to just keep investing money, but instead supply and demand for circular building products has to be created (Boer, 2022). This is substantiated by the following statement: "I think it is more a question of whether the resources are spent in the right way" (Beeks, 2022). Behaviour change may arise by itself duo to raw materials getting scarcer (Kinzis, 2022). Based on this finding, a lack of resources is not perceived, but it cannot be concluded that there are sufficient resources to achieve a circular building economy in 2050. Therefore this dimension is assessed as being moderate.

5.5 Assessment Summary

Figure 5 provides an overview of the assessment of the governance context of circular building in the Netherlands. The assessment for each governance criterion is summarised below.

Quality / Dimension	Extent	Coherence	Flexibility	Intensity
Levels and scales	Moderate to supportive	Moderate to supportive	Moderate	Supportive
Actors	Moderate to supportive	Supportive	Supportive	Supportive
Problem perspectives and goal ambitions	Moderate	Restrictive	Supportive	Restrictive
Strategies and instruments	Supportive	Moderate to restrictive	Restrictive	Restrictive
Responsibilities and resources	Moderate	Supportive	Moderate to restrictive	Moderate
Overall assessment	Moderate to supportive	Moderate	Moderate	Moderate

FIGURE 5 - SUMMARY OF THE GOVERNANCE CONTEXT OF CIRCULAR BUILDING

5.5.1 Assessment of Governance Qualities

Extent – moderate supportive

One dimension is supportive, two are moderate to supportive and two dimensions are moderate. All governance levels are involved with the implementation of circular building, however some of the interviewed actors considered that policies are mainly developed at the national level. Most of the stakeholders are involved with circular building as well, however smaller and more traditional organisations are less represented in the policy making processes. Several problems exist regarding the implementation of circular building, however the important actors are aware and try to address them. For some actors the responsibilities are clearly assigned while others have more freedom regarding this matter.

Coherence – moderate

Two dimensions are supportive, one is moderate to supportive, one is moderate to restrictive and one dimension is restrictive. Cooperation between different levels exist however the current policies are designed and implemented on a top down basis. Most of the actors work together based on institutionalised interactions within platforms. There is competition between goals for circular building and other goals within the building sector, such as the energy transition, affordability and supply. The same problem exists within the dimension strategies and instruments. Despite some synergy, conflict also exists between the instruments. Lastly, several arrangements exist that promote cooperation within and across institutions such as platform CB'23.

Flexibility - moderate
Two of the dimensions are supportive, one is moderate, one is moderate to restrictive, and one dimension is restrictive. This dimension therefore tends to steer towards being moderate overall. It is possible to move up and down governance levels, however only through the implementation of agreements. It is easy to include new actors and possible to reassess the goals. The strategies and instruments are applied in a very targeted approach which prevents actors from having choice. Lastly the responsibilities and resources are clearly assigned but it is difficult to pool the assigned responsibilities.

Intensity – moderate
Two dimensions are supportive, two are restrictive and one dimension is moderate. Therefore, this dimension is moderate overall. All levels and scales try to bring forth behaviour change by their own means. A coalition of different actors tries to create impact and behaviour change as well. Most of the actors interviewed argued that major changes are required to achieve a circular building economy additionally the actors argued that the current practices are not challenging and therefore do not bring forth the intended behaviour change. Lastly, a lack of resources is not perceived, but questions are raised whether money is spent effectively.

5.5.2 Most Supportive or Most Restrictive Dimensions

Based on the assessment of the five governance dimensions, it can be said that the dimension "actors and networks" is assessed as the most supportive. It is easy for actors to become involved in the processes by joining platforms and networks that aim to further develop and implement circular building in the Netherlands. The interactions of these actors are institutionalised within the same networks and platforms. Smaller and more traditional organisations, such as small contractors may be less represented in the policy making processes. Compared to the frontrunners on circular building, these smaller and more traditional organisations also have less ambition to bring forth the intended behaviour change towards a circular building economy.

"Strategies and instruments" is assessed as the most restrictive dimension. Although strategies and instruments from all typologies are applied, they are colliding with other policy instruments within the building sector. The strategies and instruments are also applied in a targeted approach which prevents actors from choosing and combining instruments, it is dependent on the building project. Most interviewees agree that there is a major need of behavioural deviation from current practices, but the strategies and instruments do not encourage such behaviour change.

6 Conclusions and Recommendations

In this final chapter, the conclusions and recommendations of the research are described. Answering the sub-questions provide a synthesis of the findings. Then recommendations are provided for policy advisors. Finally, directions for future research are presented.

6.1 Conclusions

The objective of this research was to provide empirical insights on the implementation of circular building practices in the Netherlands by assessing the current policies and practices for circular building in the Netherlands. The assessment was performed by applying the GAT, whereby five governance dimensions were assessed using the four governance criteria. Underneath, the first two research questions are answered in order to conclude this research. The third research question leads towards recommendations, and therefore it is answered in section 6.2.

The main research question: "***How can the implementation of policies and practices regarding circular building in the Netherlands be improved?***" *is* answered by combining the three sub questions. The first two sub-questions provide points of attention on the degree of supportiveness or restrictiveness of the governance context of circular building in the Netherlands. These points of attention can either be further built up on by policy makers or mitigating measures can be taken to reduce the restrictiveness. The third sub-question provides recommendations for policy makers with the goal of improving circular building in the Netherlands.

1. **How is the governance context of circular building in the Netherlands characterised, based on the five dimensions of the GAT?**

Describing the **levels and scales** dimension showed that all governance levels in the Netherlands, namely the ministries, the provinces and the municipalities try to implement circular building policies and practices. Policies are developed in a fairly linear process, there is a national policy on which the provinces respond on which the municipalities reply. The different governance levels have freedom to apply their own view on circular building and develop their own policies.

As for **actors and networks,** several coalitions play a significant role in bringing forth the acceleration towards a completely circular building economy. The transition team is appointed by the ministry of BZK and responsible for setting out the course towards achieving the goal. The transition Team receives assistance from platform CB'23 for which other stakeholders of the building sector can join.

The **problem perceptions and goal ambitions** dimension showed that actors can encounter several problems while working on circular building projects. These problems include facing higher costs for implementation or conflict with other building regulations. The goals from circular building also clash with other goals that the government has set for the building sector such as the energy transition or overcoming the housing shortage.

Regarding **strategies and instruments,** circular building is stimulated by applying a strategies and instruments from each typology: command and control, financial incentives and persuasion. Circular building is enforced by making it mandatory for offices and residential buildings, this is included in the building decree and part of permit applications. Circular building is also stimulated by financial incentives in the form of MIA tax benefit, however only organisations can make use of this subsidy. Circular building is also stimulated by sharing information in networks and information portals.

Lastly, the findings about **responsibilities and resources** revealed that a large part of the responsibilities are clearly assigned. The ministry of BZK is ultimately responsible, they have appointed the transition team for setting out the course and setting goal. Municipalities are

responsible for checking building projects on circularity based on the building decree. Lastly the RVO is responsible for granting tax benefit for circular projects.

2. How supportive is the governance context of circular building in the Netherlands, based on an assessment using the four GAT criteria?

The assessment of the four quality criteria of governance showed that the governance context is moderate to supportive in the quality of extent and moderate in the qualities of coherence, flexibility and intensity.

The actors dimension emerged as the most supportive dimension. Most of the actors are involved with the process due to fact that it is easy for them to join networks and coalitions. This helps to create support for reaching the goal of achieving a completely circular building economy 2050. These networks and coalitions work in institutionalised and stable structures and meet several times a year. New actors can join these networks and make use of the social capital that has been developed over the years.

Strategies and instruments emerged as the most restrictive dimension. The government currently applies strategies and policy instruments from each typology making it well balanced leading towards the quality extent being assessed as supportive. However, there are gaps within the strategies and instruments since not all building types are currently included within the regulations. Additionally the policies collide with other strategies and instruments within the building sector such as the energy transition in some instances. The strategies and instruments are also applied in a targeted approach for a select set of building types, this causes to not have any choice for using all instruments or combining them. The strategies and instruments also do not bring forth the intended behaviour change since the requirements are being experienced as non-challenging.

Overall, the development and implementation of circular building is still at an early stage in the Netherlands. Therefore, it is understandable that gaps exist in the current policies and instruments and that not all responsibilities are clearly assigned. The transition team has set out a detailed route towards the ultimate goal of a completely circular building economy in 2050 in which they have also specified objectives and milestones (TCB, 2022). This is a major step in the right direction, allowing for the progress to be monitored. The government as well as the transition team have made progress since issuing the first plan for a circular building economy in 2018. Within these four years circular building has been included in law and regulations, albeit limited.

During this research most of the GAT criteria were assessed as being moderate. This means that the governance context of circular building in the Netherlands tends to be neutral for the implementation of policies and projects. The way most of the levels and actors work together in open and collaborative networks may help to accelerate this development. Based on this assessment, there is no indication that the ultimate goal of a completely circular building economy in 2050 cannot be achieved, since the GAT criteria are not assessed as being restrictive either. However, actions can be taken to accelerate the implementation if circular building in the Netherlands. And the progress on circular building should be closely monitored, whereby goals are reassessed accordingly.

The findings of this study have to be seen in light of some limitations. This study made use of two circular building cases and six interviews with practitioners. The interviews covered most of the important stakeholder groups. However, since it was difficult to find interview participants, two important groups with valuable insights are missing. No interviews took place with producers of building materials and with Ministry of BZK on the highest governance level. These stakeholders could have provided valuable insights that could have led to a different overall result. The GAT relies on stakeholders perception for the assessment of some criteria, especially for criteria within the

'Intensity' quality. Therefore, the involvement of new stakeholders with potentially different views could influence the results. Additionally, the policies on circular building were subject to change during the execution of this research. This research took longer than scheduled and therefore the most important changes are incorporated, such as the document "The advisory route towards a circular building economy", which was published on 15 August 2022. However, on 23 December a letter to parliament on circular building was published and it is not part of this research since most of the thesis was written at that time.

6.2 Recommendations

The third and last sub-question of the thesis was as follows: "**What actions can be taken to improve circular building governance in the Netherlands?**" This sub-question directly translates into recommendations to improve the implementation of circular building practices in the Netherlands. The recommendations are made based on the description and assessment of the governance context of circular building, which are as follows:

1. **Levels and scales:** All levels have different approaches to implement circular building. To create uniformity, a list of best available techniques (BAT) could be developed. This may help to overcome large differences between provinces or municipalities in the way that circular building is implemented.

2. **Actors**: The transition team aims to stimulate the frontrunners on circularity so that they can continue to guide the others (TCB, 2022). This is a reasonable step for the further development of circular building. More attention can be paid to the late majority and laggards as well. It can be valuable to show this group the benefits of circular building so that they can also get started on this now. This can help to prevent them from lagging behind when it is completely mandatory.

3. **Problem perspectives and goal ambitions**: Municipalities may need to be more lenient with issuing permits for circular building projects since re-using materials can lead to conflict with the existing building decree. An intermediate solution for circular buildings could be developed, where it is acceptable that one building aspect, such as insulation, scores a little lower as long as the overall quality of the building is sufficient.

4. **Strategies and instruments**: The MPG, which currently is the indicator for circularity of projects is only mandatory for offices and residential buildings. The transition team has the ambition to make it mandatory for other building types, such as industrial buildings as well. This is a step that should be taken so that the environmental impact of all building projects can be reduced.

5. **Strategies and instruments**: During the interviews it was stated that the required MPG-score, 0,8 for residential buildings and 1,0 for offices is not ambitious (Boer, 2022) (Linneman, 2022) (Beeks, 2022). The transition team already has the ambition to raise this requirement. Perhaps this step could be accelerated.

6. **Strategies and instruments**: There are no financial incentives in place for individuals when they want to develop a circular building. It currently is only directed at organisations in the form of tax benefit. Making subsidy available for individuals may increase the number of circular building projects.

6.3 Future Research Directions

This research took place during the 'setting up the base camp' phase of the transition agenda, meaning that the implementation of circular building policies is in its early stages. It would be worthwhile to perform a governance assessment again after the policies are in place for several years. The best time for this would be in 2030 when the intermediate goal is to be achieved (TCB, 2018). This can help to assess whether the governance supports the implementation of policies and projects and the goal of a completely circular building economy in 2050 can be achieved.

While this research focused on current circular building policies and practices in the Netherlands, it may also be interesting for researchers, policy makers and practitioners of circular building in other countries as well. They may encounter similar challenges regarding the implementation of policies and practices as described in this thesis. Additionally, this research may be valuable for researchers that want to apply the GAT for other cases. GAT has been previously applied in several sectors. This research now expands the application of the GAT by assessing the governance of circular building. Circularity goes beyond the construction sector as circular principles are applied in other sectors as well. Hopefully this research can offer inspiration and insight for researchers to assess other circular governance cases to accelerate the transition towards a circular economy.

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Appendix A. Interview Questions

Levels and scales

1. In your opinion, how many administrative levels (municipal, provincial, central government) are involved in the design and implementation of circular construction policy?
2. Do you think these levels of government work well together? and do you think they recognize that they need each other?
3. Is there a strong impact from a certain administrative layer towards circular construction or are all administrative layers in the Netherlands working on implementing circular construction?

Actors and networks

4. Are all relevant stakeholders involved in implementing and designing the circular building policies? And which stakeholders do you think these are?
5. Do the different stakeholders work well together?
6. Is it possible to involve new stakeholders in the process? Is that shifting the most important role from one stakeholder to another?
7. Do you think there is strong pressure from a stakeholder or stakeholder coalition to bring about the transition to circular building?

Problem perspectives and goal ambitions

8. To what extent are the different problem perspectives of stakeholders taken into account?
9. To what extent do the goals of stakeholders support each other, or are they in conflict?
10. In your opinion, are the goals and ambitions of circular building too different from standard building regulations?

Strategies and instruments

11. What types of instruments and strategies does the government apply in the circular building policy strategy? Is there anything missing in your opinion?
12. In your opinion, is there also a conflict between the various instruments used for circular building?
13. Are there possibilities to combine different types of instruments?
14. In your opinion, is a strong behavioral change required compared to traditional building? How strongly do the applied instruments require and enforce this?

Responsibilities and resources

15. In your opinion, are the responsibilities for different institutions regarding circular building clearly assigned and facilitated with resources?
16. To what extent do the assigned responsibilities create competency struggles or cooperation within or between institutions?
17. To what extent is it possible to pool assigned responsibilities and resources?
18. Are the amount of resources allocated sufficient to implement the measures required for the transition to a circular building economy