CREATE Embedding advanced urban material stock methods within governance processes to enable circular economy and cities resilience

The decision support used during the tender procedure of the Hezelpoort project in Nijmegen

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Abstract	To implement circularity goals in the built environment, municipalities need to develop and use new tools to support their decision process. Based on the experience of the 3 Living Labs of CREATE, we present the best practices in terms of decision support that enable circularity in urban projects. The first part concerned the results of the case study of the Hezelpoort project in Nijmegen, which aims to develop a high building with almost 400 houses with an ambition of 25% circularity Low environmental impact building with using recycle and biobased material and a design of the construction focusing on detachability and adaptivity/reuse of building purpose) We present how the municipality translated its circular ambitions in the tender process and which decision support the municipality used to secure its ambitions. In the last part, we also present the limitations of using this sort of decision- making support tool to enable circularity in the urban project. Therefore, this case study presents lessons not only for the municipality of Nijmegen, but also for the other Living Lab of CREATE and other municipalities in Europe which are facing the same challenges.
Keywords	decision support, tools, circular economy, built environment, municipality, tender process, public-private partnerships, decision making

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1 INTRODUCTION

1.1 Context of the study in the CREATE project

To understand the initial context of the 3 Living Labs in the CREATE project (Nijmegen, The Netherlands, Rennes, France and Gothenburg, Sweden), joint interviews were conducted, together with partners in WP2 - Identification of circular economy needs and method specification, that led to study the use of materials as part of the case study of the Hezelpoort project in Nijmegen. The main goals of these interviews were to identify the existing data and decision support tools that the cities partners of CREATE already used and what might be their needs in terms of decision support. The first results showed that only Nijmegen already used tools to support the tender procedure of an urban project: The Hezelpoort project, an urban project which aims to build a high tower of 383 apartments, including 211 social housing, and a parking garage of 573 places, with an ambition of 25% circularity (Figure 1).

Figure 1 Modelisation of the double tower in the landscape and the entrance of the building

(source: Architekten Cie Duet - Woontoren Hezelpoort Nijmegen | de Architekten Cie).

The Hezelpoort project experience is interesting to describe as a best practice that enables circularity in the built environment. The Hezelpoort project is a recent example as the tender procedure ended in December 2022. Moreover, the Dutch context is relevant because the Life Cycle Assessment (LCA) of materials are increasingly used in public procurement. Since 2018, the Milieu Prestatie Gebouwd (MPG) is a legal measurement of the environmental impact of a building throughout its lifetime that is mandatory to apply for the development of new buildings. To obtain a construction permit, the developer must demonstrate an MPG lower to 0.8[1]. The case study of the Hezelpoort can be a pioneering example of the use of tools in the decision process of an urban project to enable circularity.

[1] The MPG of a building is the sum of the LCA of all materials, including the one that will be replaced during the life of the building. The more the MPG is low, the less there is a negative environmental impact. The result is expressed in cost/m2year. MilieuPrestatie Gebouwen - MPG (rvo.nl)

The analysis of the case study led us to understand how the municipality of Nijmegen translated and integrated its circular ambition in the tender process, which decision support tools the municipality developed and used exactly, and how these tools were used by people and how people influenced the tools, and the use of tools also influenced the decision-making process. The case study was useful to provide a deep understanding of the Dutch experience and to study the benefits and limitations of such decision-support methods to enable circularity in a building project. Therefore, the results of the case study are not only useful for Nijmegen, but also for the other cities partner, Rennes Metropole, and Goteborg, as well as other European municipalities which are facing the same challenges.

1.2 A brief description of the methodology

The methodology used in this report can be divided in two phases. The first phase took place between July 2022 and February 2023, with the joint interviews and an analysis of documents about the Dutch context related to the assessment of circularity in the built environment. The main goals for this first phase were to identify the existing tools and decision support methods and the potential need in terms of data and tools at the municipality level. The interviews allowed choosing the Hezelpoort project as the case study, which was the focus of the second phase.

The case study was done between March and June 2023. An analysis of the decision documents of the municipality of Nijmegen related to the Hezelpoort project between 2020 and the end of 2022, and all the reports of studies that have been conducted to create decision support was made. Additionally, 11 interviews were conducted including: stakeholders involved in the tender procedure (members of the municipality, clients, consulting companies); the design team of the Hezelpoort and members of the green metropole region (**Error! Not a valid bookmark self-reference.**).

In this document the main results of the study are presented, which include a description of the Hezelpoort project, the decision process and the tools used to support the decision and how the tools and actors using the tools lead to a certain application of circularity in the project. Finally the limitations of theses decision support methods are discussed.

Table 1: List of the interviews conducted by WP4 between July 2002 and July 2023

	Organization	Role	Date
PHASE 1	Economic Board region Arnhem/Nijmegen	civic entrepreneur for sustainability	12/07/2022
	Municipality of Nijmegen	senior advisor in sustainable development	18/07/2022 24/11/2022
	Groen Metropol region Arnhem/Nijmegen	Public Affair Advisor, Region/EU connection	19/07/2022
	Municipality of Nijmegen	strategic advisor urban development/coordinator of the different projects and stakeholders of the station area project	25/11/2022
	Rijk of Nijmegen	program director circular economy and with the program manager RVN@Academy	06/02/2023
	W/E Adviseurs/municipality of Nijmegen	senior advisor, responsible for the measurement of the circularity of the Hezelpoort project	24/02/2023
PHASE 2	Municipality of Nijmegen	Project manager Hezelpoort	10/03/2023
	Architekten Cie	Team member of the circular design team, co-architect of Duet project	04/04/2023
	W/E Adviseurs/municipality of Nijmegen	senior advisor, responsible for the measurement of the circularity of the Hezelpoort project	06/04/2023
	Municipality of Nijmegen	strategic housing policy advisor/Woondeal coordinator	11/04/2023
	SSh& (student social housing company)	Project manager, responsible Hezelpoort project	14/04/2023
	Municipality of Nijmegen	Project developer, responsible of the West area of the station development	18/04/2023
	Municipality of Nijmegen	senior advisor in sustainable development	20/04/2023
	OverMorgen (consulting company)/region Arnhem/Nijmegen	Circular economy advisor and territorial development	21/04/2023
	Municipality of Nijmegen	Procurement officer oft he Hezelpoort project	24/04/2023
	Groen Metropol Region Arnhem/Nijmegen	Manager of circularity and the director of the program of circular and conceptual construction	26/05/2023
	New Horizon Mining	Supplier of materials fort he Hezelpoort project	06/06/2023

2 THE CONTEXT OF THE HEZELPOORT PROJECT

The city of Nijmegen is a growing city of 175 000 inhabitants with strong circular and housing development ambitions. The region of Arnhem-Nijmegen has been identified as one of the territories of the Netherlands with the highest shortages of housing (Klauwen, Gijsberg, 20192). To resolve this shortage of housing, the Woondeal has been signed between the region, the province, the 18 municipalities of the territory and the Ministry of Interior and Kingdom Relation (BZK in Dutch) in March 2020. The Woondeal is an agreement for the construction of 60 000 housing, including 10 000 housing in Nijmegen, with 25% circularity by 2040. During the same period, the municipality formulates (Van Ginkel, Schouten, 20203) an

[2] Klauwen, B., Gijsberg, V., 2019. Woningmarktonderzoek 2019 Regio Arnhem-Nijmegen, Companen 41 p. Regio Arnhem-Nijmegen - Woningmarktonderzoek 2019.pdf

[3] Van Ginkel, M., Schouten, M., 2020. Nijmegen stad in beweging-Omgevingvisie 2020-2040, Nijmegen ` Nijmegen stad in beweging - omgevingsvisie 2020-2040-2.pdf

ambition to reach 25% of circular construction by 2025, 50% by 2030 and 100% circular by 2050 with 0% loss of raw materials as part of its political coalition agreement. These ambitions are aligned with the national one concerning the circularity in the built environment4.

The Hezelpoort project fits these ambitions of housing development with a circular approach and the municipality obtained subsidies from the government to develop it in 2020. The Woondeal allowed the city of Nijmegen to request a grant to the BZK to accelerate the development of housing with attention to social housing (Woningbouwimpulse). In the request, they designated three sites owned by the municipality in the vicinity of the train station area, including Hezelpoort, and promised to develop the train station area with circular ambitions (Figure 2). The project obtained the subsidies in November 2020 which represent 50% of the funding of the project; the remaining is financed by the municipality, the province and two social housing companies as clients of respectively 90 and 40 dwellings.

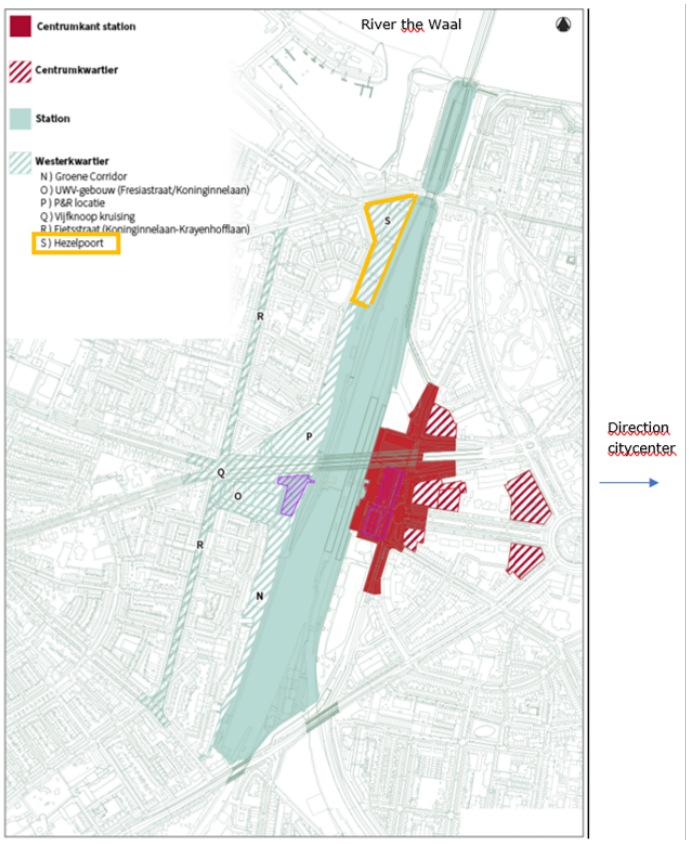

Figure 2: Location of the Hezelpoort project at the North of the train station in Nijmegen

[4] Netherland Circular 2050; Raw material agreement, 2017; Agenda for circularity in the built environment, 2018.

3 THE USE OF DECISION SUPPORT IN THE TENDER PROCESS OF THE HEZELPOORT PROJECT

3.1 The decision process of the Hezelpoort project

The analysis of the decision process of the Hezelpoort project was focused on the timeline from November 2020, when the municipality obtained the funds to develop the project, until the beginning of 2023 when the municipality signed the contract with the chosen developer.

Figure 3**Error! Reference source not found.** shows the timeline of the decision process that can be separated into 3 phases: before, during and after the tender process. The upper section of the timeline represents the classic procedure of the decision-making process and the lower section, in grey, represents the timeline of the development and the use of 5 innovative tools to enable circularity in the process: the ambition session, the cost study, the dashboard, the action plan, and the contract based on scores.

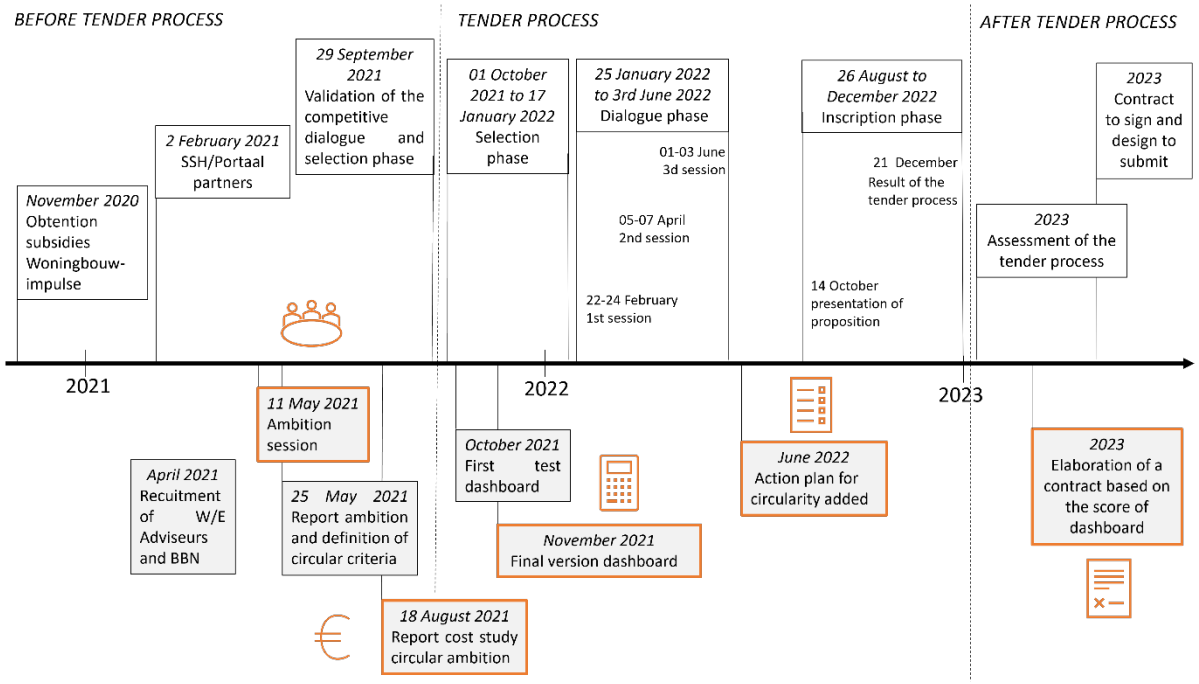

Figure 3 Chronology of the decision-process of the Hezelpoort project

The municipality chose to use a competitive dialogue (CD) process for the tender procedure, considering the complexity of applying circularity in the building project. A CD procedure allows for more dialogue and learning processes with market parties. The tender process took 15 months and was in 3 phases: a selection phase, the dialogue session, and the inscription

phases. The municipality received 10 developers' participants in the first phase, then they chose 3 to participate in the dialogue phases to finally choose between 2 participants at the end of the selection process. The municipality assessed the propositions based on 2 main criteria: the price (40 points) and the quality of the project (60 points). The quality included the spatial and housing quality (40 points), and the circular construction. The spatial and housing quality referred to the quality of the design and how it fits the surrounding area in terms of architecture, culture and history of the area (the Hezelpoort place is also connected to a green corridor that must be integrated into the design). The circular construction was related to the final score of the Dashboard (15 points) and the action plan (5 points). Hence, the circularity represents 20% of the score.

The circular criteria is presented in Table 2 below and indicates the five innovative tools that were developed and used during the different phases of the decision process.

Table 2: The use of tools in the different phases of the decision process of the Hezelpoort project

	BEFORE TENDER PROCESS Urban planning/ Planning	DURING TENDER PROCESS Building pre design			AFTER TENDER PROCESS Building design/ Construction maintenance
Ambition session					
Circularity cost study					
Dashboard					
Action Plan					
Contract on score					

3.2 Before the tender process: ambition session and the cost study

Before the tender process, the municipality used the result of the Ambition session and the cost study to define the selection criteria of the tender process. The Ambition session is a type of brainstorming session, driven by two external companies, experts in circularity in the built environment: W/E Adviseurs and BBN, hired by the municipality. The main goal was to define the circular ambition for the stakeholders involved in the project: SShn, Portaal, Municipality (Project manager of the Hezelpoort, Sustainable advisor, procurement officer). W/E Adviseurs and BBN presented five existing5 strategies to reach the circularity in a construction project, and each stakeholder chose their favourite approach to apply to the project. The results of the ambition session were useful to define a common approach towards circularity for the project and therefore, to define the criteria of circularity in the tender process (Figure 4).

[5] The 5 strategies defined by WE Adviseurs are: Use of available materials, use of renewable materials, mitigation of the environmental impact, preference towards longer lifetime, and possibility to reuse in the future. Circulair bouwen - W/E Adviseurs (w-e.nl)

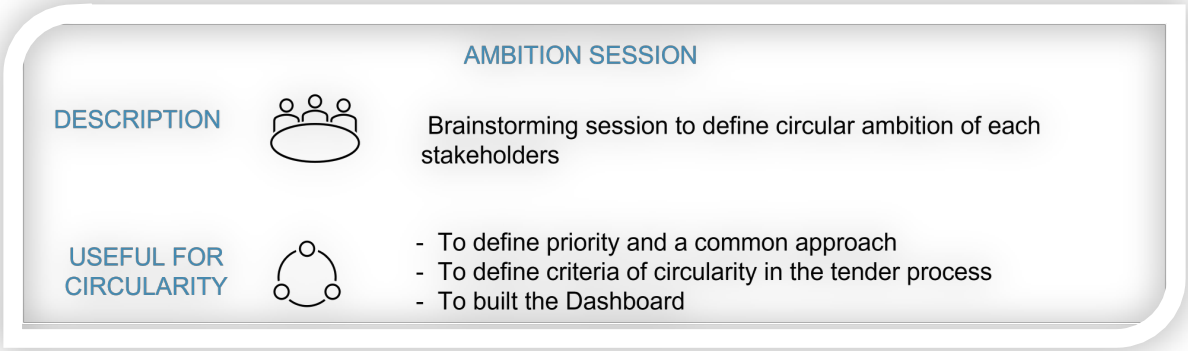

Figure 4: Description of the ambition session as a tool to build the Dashboard to enable circularity in the Hezelpoort project

In August 2021, the consulting companies provided a cost study to assess the global cost of the circular ambitions and support the design of the tender procedure. The cost study compared the building methodology and cost of two existing similar high tower designs with circular ambition. This comparison gave the municipality a cost reference for its circular ambitions to ensure its feasibility with the available budget (Figure 5).

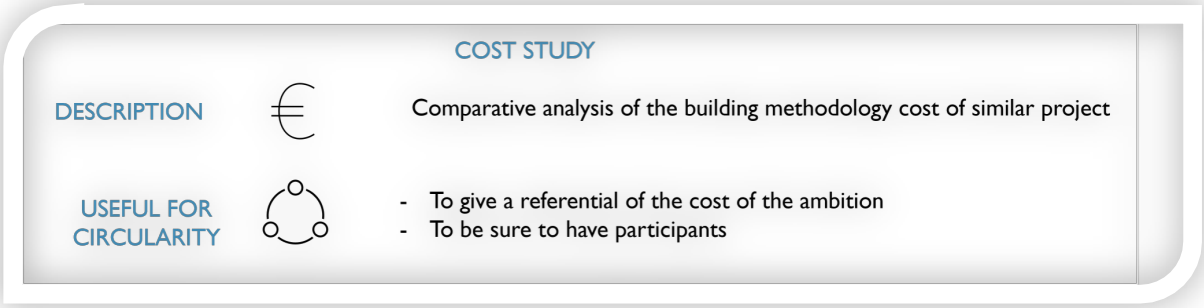

Figure 5: Description of the cost study as a tool to enable circularity in the Hezelpoort project

3.3 During the tender process: the dashboard and the action plan

W/E adviseurs exploited the results of the Ambitie Session to design the circularity assessment tools to use during the tender process: the Dashboard. The Dashboard is a table that refers to five Key Performance Indicators (KPI) of circularity for the project: the MPG, the building method, the adaptivity of the building, the use of biobased material and the use of recycled material. Concerning the MPG, the municipality chose to increase the circularity ambition by lowering the maximum score to 0.6, instead of the mandatory6 0.8. Each KPI is

[6] The reduction in the score MPG indicates a better circularity of materials.

detailed in actions (Figure 6). The developers must fill each line of action to obtain a score by KPI. Each score is a percentage of the final note of circularity in the tender process, that is related to the ambition preference's order of the ambition session.

The sum of the KPI's score provided a final score as an indication of the degree of circularity of the building, should support the decision process and reinforced the transparency of the tender procedure (Figure 7).

Ontwikkeling en realisatie Hezelpoort Nijmegen

Invulformulier

Projectgegevens

Project	
Indiener	
Datum	

Kenmerken project

parameters		*punten*	*keuze*	*score*	*% van max*	*max*	*weging*
gewogen resultaat				**0**	0%	43	100%
KPI 1 MPG				**0**	0%	5	20%
>	**MPG**			**0**	0%	5	
ⓘ	1 MPG van de woontoren	5	0,60	0			
KPI 2 Adaptiviteit				**0**	0%	81	30%
5.2.3	**Draagstructuur**			**0**	0%	17	
ⓘ	1 kolommen-/balkenstructuur	17		0			
ⓘ	2 mix kolommen-/balkenstructuur met schijven	8		0			
ⓘ	3 schijven	0	100%	0			
5.2.4	**Aanpasbaarheid elementen**			**0**	0%	31	
ⓘ	1 scheiding van drager en inbouw	10	☐	0			
	2 doorbreekbare zones in dragende wanden of wanddelen	3	☐	0			
ⓘ	3 doorbreekbare zones in (dak)vloeren	3	☐	0			
ⓘ	4 bereikbare en demontabele verbindingen van elementen	3	☐	0			
ⓘ	5 gevel gereed voor buitenzonwering	3	☐	0			

Figure 6: Extract from the Dashboard created for the Hezelpoort project (Source: W/E Adviseurs)

Resultaat op basis van het ingevulde formulier

	Totaal KPI 1-5	MPG KPI 1	Adaptiviteit KPI 2	Bouwmethodiek KPI 3	Circulair KPI 4	Biobased KPI 5
Resultaat		0,60	0%	0%		
Score max		5	5	5	5	5
Score invoer		0	0	0	0	0
Weging	100%	30%	25%	25%	10%	10%
Max gewogen score	5,0	1,5	1,3	1,3	0,5	0,5
Gewogen score	**0,0**	0,0	0,0	0,0	0,0	0,0

Figure 7 : Extract of the final score per KPI of the Dashboard created for the Hezelpoort project (source: W/E Adviseur)

The dashboard was also useful for circularity because it pushed the developers to think about high circular ambitions in the early stage of the project. Table 3 below presents the 5 KPIs in detail and how they were translated into concrete and precise actions by the developer who won the tender process.

Table 3: Description of each KPI of the Dashboard and the proposition of the circular ambitions of the Hezelporrt project developer

KPI	DESCRIPTION	DEVELOPER CIRCULAR AMBITIONS
1- MPG	- Environmental impact of the Building - Score as low as possible by using a minimum of material or choosing materials with a good environmental performance (ACV). - Legal measurement: max 0.8. For Hezelpoort: max 0.6.	- MPG of 0,45m2/year (good one) - Use of bio-sourced and recycled materials - Use of a small amount of glass.
2-Adaptivity	- Degree of adaptivity of the conception - Evaluation of the future use of the building - Preserved the investments in the long term.	- The main elements of the structure and facade will be removable/modular: beam, column, floor. - The first level of the building will have a high ceiling. Its use can change with time (supermarket, restaurant, gym club, etc.)
3-Construction method	- Degree of removability of the elements and products of the buildings	- Consider the building as a bank of materials: register a material passport of each elements to reuse the raw materials in the future. - Building with structures that are easily removable.
4-Use of circular material	- Recycled materials and precise use - The score explains the ambition and the degree of certainty to reach that ambition.	- use of reused products and materials with high quality as much as possible - partnership with New Horizon Urban Mining (specialist in demolition and reuse of raw materials) which will provide freemen (circular cement) and the reuse of material from bitumen (citumen).
5- Use of biobased material	- Biobased material and precise use (quantity, part of the building, etc.)	- 10% of biobased material in the building - The last levels of the tower will be built with cross-laminated timber - The isolation will be in cellulose. - The outside envelope will be in wood with the label Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification (PEPC).

The scores of each KPI will also be used to design the contract and assess the next phase of the design (Figure 8).

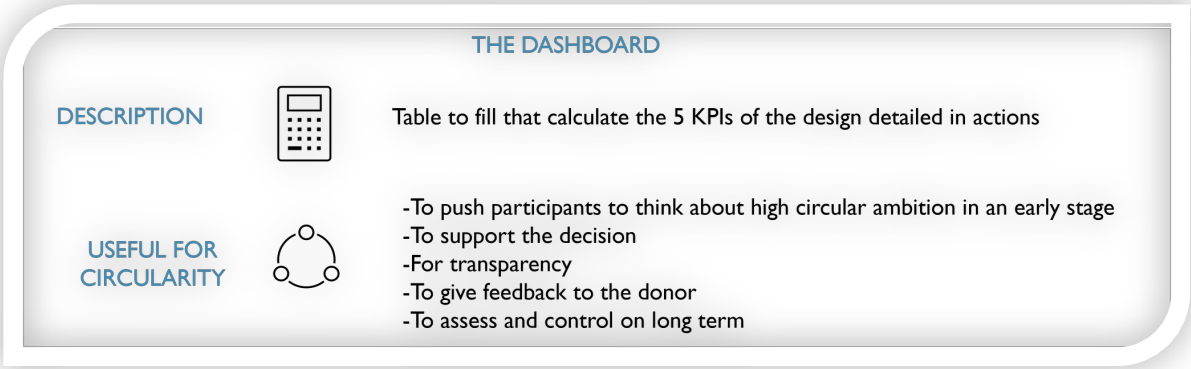

Figure 8: Description of the dashboard as a tool to enable circularity in the Hezelpoort project

During the tender process, the municipality also added another tool: the action plan which was a description written by the participant of their method to reach the KPIs score of the Dashboard and the circular approach of the development of the parking garage. The action plan provided therefore details of the circular approach of the developers and helps the selection committee in the decision-making. If the dashboard is only based on score, the action plan bring a description of each score. Hence, this tool also completed the dashboard to support the decision (Figure 9).

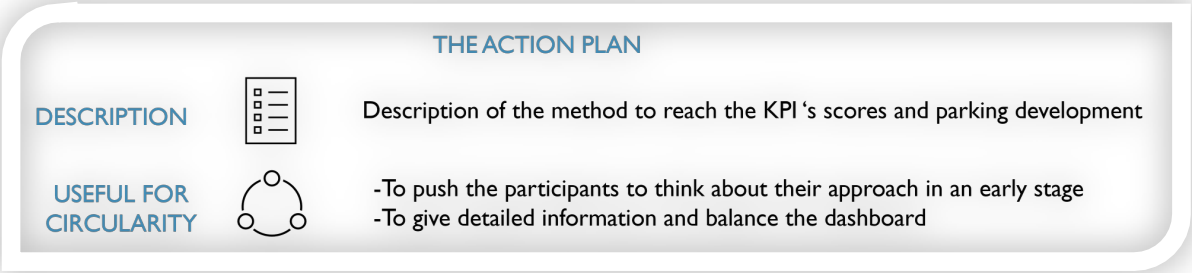

Figure 9: Description of the action plan as a tool to enable circularity in the Hezelpoort project

3.4 After the tender process: the contract based on scores of the Dashboard

Finally, after the tender process, the municipality designed a contract based on the the tender process selection criteria , including circularity. For circularity, the contract is based on the score of each KPI of the dashboard that the developer promised in its design. The contract based on the score of the dashboard provides security to the municipality to reach its circular ambition and to obtain quantifiable results. The contract also gives the responsibility of the assessment of circularity to the developer and discharges the municipality from micromanaging the project development. Finally, it also helps to secure the price of the

project in the long term. In fact, the main goal is to reach the score of each KPI of the circularity promised in the first design. If the price of materials is fluctuating or if there is a shortage of materials, the developer can readapt its construction plan as long as scores are recahed (Figure 10).

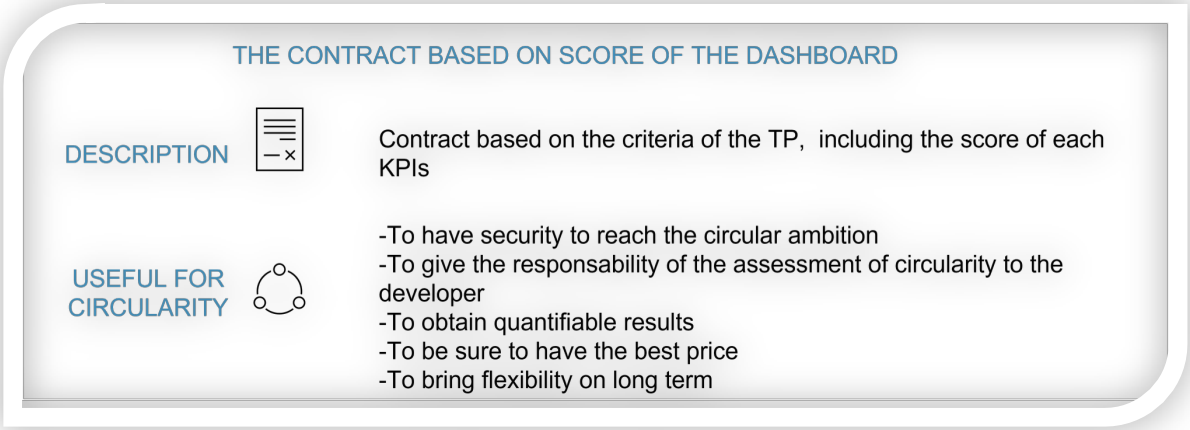

Figure 10: Description of the contract based on score as a tool to enable circularity in the Hezelpoort project

This description highlights the innovative tools that the municipality developed at each phase of the decision process of the Hezelpoort project. The tools aim to enable circularity in the project in a different manner. The tools were used to:

- the ambition session to define jointly the criteria of circularity;

- the cost study to be sure that the ambitions are feasible;

- the Dashboard to push the developers to think about circularity during the competitive dialogue process and to assess their design;

- the action plan to add some flexibility to the developers in the description of their circular approach and support the decision; and

- the contract based on the score of the dashboard to ensure circular ambitions are reached.

4 LIMITATION OF THE USE OF TOOLS TO SUPPORT THE DECISION IN THE HEZELPOORT PROJECT

Despite the innovative approach and tools developed to support the decision process of the Hezelpoort and their role in reaching the circular ambitions, the interviewed stakeholders highlighted some limitations. In the next chapter, a discussion on the limitations of the

dashboard and the contract based on scores, which are related to the different points of view of the stakeholders (Figure 10) will be made.

4.1 Limitation of the use of the dashboard as a decision support

The dashboard was created to push the developer's participant to detail their circular ambition in an early stage and is intended to support the decision-making by assessing the circularity of the design. Nevertheless, almost all the stakeholders involved in the decision process admitted that the dashboard was not useful to decide on and to choose the best design. Indeed, the two final developers filled the dashboard with the ambition to score well, so the score of each KPI were in both designs high and almost similar, making the distinction impossible. This situation highlights the limitations of the dashboard which is based only on numbers.

For the municipality, the dashboard was needed to secure its circular ambitions. However, even though the developer understood the need for this sort of framework to enable circularity, the developer also considered it as a limitation of creativity. Indeed, the dashboard was too strict and did not allow enough space for the design team to propose their circularity approach. The main goal was to win the tender process, so the design team tried to have the best score for each KPI. Thus, the willingness to score well often drove the choice for the design of the Hezelpoort tower instead of the best building and/or circular option.

For instance, initially, the plan was to build the main structure of the parking garage in concrete and the columns and floor in timber. However, the parking garage was not considered in the dashboard scoring, so this choice was not counted in the score of the KPI related to the use of biobased material. To score well on this KPI, the design team decided to build the last 10 levels of the building in timber, even if it was not the best construction choice, and drop the idea of a parking garage in timber. They made that choice because otherwise, it would be too much timber in the design leading to increased costs.

4.2 Limitation of the use of the contract based on score

The contract based on scores was also a source of disagreement between the stakeholders. For the municipality, the contract secures the results of the circular ambition and the price of the project in the long term. It gives therefore some flexibility to the developer in developing the project. However, it puts some pressure on the developer that must assess its design at each phase of development and must be double controlled by the municipality. To assess the KPI score of the design, the developer must work with an external company, specialist in the measurement of circularity. Moreover, for the client, the social housing company, this type of contract limits their control and visibility on the final design of the apartments that the client is buying. Indeed, the goal to respect the KPI s scores promised during the tender

procedure but not the methods to reach the score. In case of the fluctuation of prices of material for instance, the developer would have the flexibility to change of material use if it reach the same KPI scores. In this context, the final design of the building might be different than the one chosen during the tender procedure. For the client, it is an uncertainty on the final aspect of the building that they are investing in.

Table 4: Feedback of the stakeholders involved in the Hezelpoort project on the Dashboard and the contract

STAKEHOLDERS	FEEDBACK DASHBOARD	FEEDBACK CONTRACT
Municipality	-Not useful to support the decision -too `clinical` -Good to learn about CE	-Need to control on long term -Max. measurement responsabilities on the developer
Client (Social housing company)	-Not useful to support the decision -Not agree on the definition of circularity -Just a proof for the donor -Good to learn about CE	-Worried about the final design and construction, no control
Design team	- Too strict, no flexibility - Barrier for innovation - Choice based on scoring not on the best solution - Understanding of the need of a framework for high CE ambition	-Give more pressure and control than usual -Focus on score only -Need external support -Good way to obtain result

5 CONCLUSION: BEST PRACTICES TO ENABLE CIRCULARITY IN THE BUILT ENVIRONNEMENT

The experience of Nijmegen was innovative, and the role of the municipality which took the lead to implement circular ambition in the project can be highlighted. The municipality wanted to reach high circular ambition and invested energy, time and budget to develop an approach and tools to support their procurement process. The municipality also defined high circular ambition and hired external companies to support the process. Together, they used a participative approach to develop an innovative tool, the dashboard. The dashboard presents some limitations but also proposed an inspiring approach to push the circular ambition in detail in the earliest design phase of the project and a way to assess the circular results in the long term.

The dashboard is used all along the process and after the decision to design the contract. The dashboard and the contract based on the scores are therefore useful to secure the realisation of the high circular ambition, give flexibility and protect against unexpected factors during the tender process and after. If the municipality can secure its ambitions and get precise results to give feedback to the donor (the government and the Province especially), the dashboard and the contract increased the uncertainty for the client on the final design and pressure for the developer who must follow a score instead of their approach. Nevertheless, the tools developed are part of an interesting learning process to enable circularity in the built environment for all the stakeholders.

Based on the experience of the municipality of Nijmegen within the Hezelpoort project, the following tables present the best practices to enable circularity in the built environment. They are divided into 3 categories: the global approach (Table 5), the use of tools (Table 6) and the governance and institutional context (Table 7). Furthermore, an evaluation of each best practice and how it might support the circularity in the built environment, but also the limit of these practices was made. These tables might provide insight to other cities on how to further develop practices to enable circularity at the municipality level.

Table 5: Best practices and limits of the global approach to enable circularity in the built environment

GENERAL APPROACH		
BEST PRACTICES	**ENABLE CE**	**LIMITS**
Leadership of the municipality to innovate for circularity in the BE	To reach high circular ambition	Risk to have too high ambition which are not feasible for the developer
Dialogue and open to learn position: -to **define the CE ambition** of each stakeholder before the tender process (ambition session) to create criteria of selection -**Using the Competitive Dialogue** as a tender procedure	-To limit the conflict between stakeholders -To exchange and readapt the procedure if necessary, regarding the context	-Adaptative approach risks to don't be transferable to another project; -In this context: creation of the Dashboard based on the definition of CE of the stakeholders, so specific to the project

Table 6 Best practices and limits of the tools to use to enable circularity in the built environment

TOOLS TO USE		
BEST PRACTICES	**ENABLE CE**	**LIMITS**
Cost study of the CE ambitions	To have references of the cost of CE and be sure the ambitions are reachable	Risk to have too high ambition which are not feasible for the market stakeholders
Define precise criteria of selection (KPI) of circularity to assess the design during the TP and after (Dashboard)	-To push the participant to think about high circular ambition in detail in an early stage -To have a design that fit the circular ambition of the municipality	-Adaptative approach risks to don't be transferable to another project; -In this context: creation of the Dashboard based on the definition of CE of the stakeholders, so specific to the project
-**Define precise criteria of selection** (KPI) of circularity to assess the design during the TP and after (Dashboard)	-To push the participant to think about high circular ambition in detail in an early stage -To have a design that fit the circular ambition of the municipality	-The decision is based only on score. Risk that all the participant score well, making the choice difficult; -The rigidity of the KPI limits the innovation of the developer to have its approach of circularity; -The need to score well oriented the choice of the design even it is not always the best architectural choice
Ask **the participant to explain** how they will reach the KPI score (action plan)	To obtain more detail of the approach of the design and support the decision	
Elaborate a contract based on the KPI score	To secure the result of circularity after the tender process and to give flexibility in the long term to the developer (variation of price or shortage of materials)	-Put pressure on the developer who must reach the score of KPI for circularity -raise the need for the developer to have external partner to assess the design (need budget) -raise the control of the municipality on the assessment of the design -No visibility on the final design

Table 7 Best practices and limits of the governance and institutional context to enable circularity in the built environment

GOVERNANCE/INSTITUTIONAL CONTEXT		
BEST PRACTICES	**ENABLE CE**	**LIMITS**
Assess the circular result after the TP and instore **PPP in the long term** (municipality/expert in assessment/design team/developer)	-To secure and assess the circular impact; -To valorise the circular effort of the municipality	-Requires skills or budget to collaborate with expert in assessment of circularity; -Raise the role of expert company in the long term of the project; -No legal framework about the role of assessment after TP might raises the tensions between stakeholders;
Law to make the assessment of the environmental impact of a building mandatory with a limit to don't exceed (MPG of 0.8 in NL)	Limit the environmental impact of every new building;	A law with a score to don't exceed raises the need to measure, assess and decide with quantitative indicators;
Development of the **use of a material passport** of each building	Create a database of materials available in each building at the city level and to know their degree of reuse;	In NL, the Material Passport is not mandatory yet, so difficult to have data for all the buildings, especially the old one and the one of private owners; -requires a platform to stock the data;
Norm of different definitions of CE (in preparation in the Netherlands with `Het Nieuw Normaal`)	-To know which lever of CE a project is using and what to assess; - To have a common language of CE between all the stakeholders	-Different way to assess the different definition of CE brings confusion -At the city level, each project can use different lever of CE and limit the capacity to assess the global effort of a municipality