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Thesis title: Effects of policy instruments and collaborations on circular innovation- case study of Almere

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Summary

Circular economy (CE) is witnessing a collective promotion by the countries of European Union along with associated stakeholders since climate mitigation measures need to be coupled with CE models to reach the Paris climate agreement goals. Considering the imperativeness of climate mitigation targets, facilitating a transition towards circular models of operation requires radical changes in products and processes to transform the system. These radical changes or innovations would hence require greater coordination amongst stakeholders involved at the system level (Vence & Pereira, 2019. P2). Amongst the various stakeholders, local governments have a substantial importance in waste management and transition to a circular approach. In many cities, waste management remains a function of local governments or at least is partly regulated by them (Christensen,2021, p2). Though circular economy is not limited to municipal responsibilities, considering the niche level of circularity, the role of facilitating the systemic transition of local actors to circular models falls upon the approach of the municipalities. Increasing number of cities in Netherlands function today as urban living labs (ULLs) to serve as testing grounds for novel practices in circular economy. Their detailed mode of operation and the policy instruments employed by their municipalities to facilitate experimentation is relatively unknown in the academic space. This research attempts to bridge this gap by contributing to the literature on policy instruments, especially on the potential of demand pull and supply push instruments such as public procurement and co-financing in enabling innovations. To this we also add the contribution of collaborative networks since they form an intrinsic characteristic of urban experimentation.

The initial findings of the research agree with the literature's suggestions that policy instruments such as public procurement have a positive impact on creating traction for circular innovations. The research finds that stimulating circular experimentation for transition and the diffusion of results through policy instruments is highly reliant on municipalities' self-organizing capacities. While this is often impeded due to institutional challenges faced by municipalities as documented during this research, it is also noted that strong coalition with actors at higher hierarchical levels, coupled with shared commitment and goals amongst collaborating actors act as positive factors in enabling stimulation of innovations and their diffusion.

Keywords

Circular innovation, policy instruments, collaborations, circular tendering & procurement, co-finance, transition management

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Abbreviations

IHS	Institute for Housing and Urban Development Studies
CE	Circular Economy
GCA	Raw materials collective
SNM	Strategic Niche Management
TM	Transition Management
UCC	Upcycle city competition
MRA	Metropoolregio Amsterdam
TNO	Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek

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Chapter 1: Introduction

1.1. Background

Expanding urban populations, increased standards of living, and the subsequent rise in consumption of materials and goods threaten to lead to a higher generation of solid waste in cities in the forthcoming decades (Christensen,2021, p2). Across the world, high material consumption in cities has been associated with increasing e-waste, plastics, packaging waste, etc. Cities grapple with inadequate waste management strategies owing to the historic lack of attention on their waste management infrastructure, on par with traffic or energy (Zaman et al, 2011, p177). Mismanagement of waste has direct effects on health, the environment, and the economy and has a positive correlation with greenhouse emissions. As a response to mitigate these risks, circular economy as a concept has gained traction in recent years, as a regenerative design model which deviates from the take-make-dispose paradigm (De Jesus et al, 2021, p1). Circular economy (CE) is witnessing a collective promotion by the countries of the European Union along with associated stakeholders since climate mitigation measures need to be coupled with CE models to reach the Paris climate agreement goals (Korhonen et al, 2016, p37; De Jesus et al, 2021, p2).

A circular model decouples environmental impact from economic growth while eliminating or minimizing the production of waste during processes and post-consumption (Hull et al,2019, p1; Scheel et al, 2020, Vence & Pereira,2019, p2). Circularity is not only approached as a waste management strategy but also as an opportunity for promoting a new model of economic growth, innovative businesses, and combating scarcity of supply while reaping the parallel environmental benefits (Kalmykova,2017, p190). Due to such benefits, the advocacy of circular economic models is reflected in policies, and business models across various sectors to facilitate a transition from the existing regime (De Jesus et al,2021, p42; Geissdoerfer et al, 2017, p758). Thus, the circular economy can largely be regarded as a top-down approach that aims to instigate bottom-up initiatives from diverse actors (Hodson, 2018; Almeida&Anton,2020).

Considering the imperativeness of climate mitigation targets, facilitating a transition towards circular models of operation requires radical changes in products and processes to transform the system. These radical changes or innovations would hence require greater coordination among stakeholders involved at the system level (Vence & Pereira, 2019. P2). Amongst the various stakeholders, local governments have a substantial importance in waste management and transition to a circular approach. In many cities, waste management remains a function of local governments or at least is partly regulated by them (Christensen,2021, p2). Though circular economy is not limited to municipal responsibilities, considering the niche level of circularity, the role of facilitating the systemic transition of local actors to circular models largely falls upon the approach of the municipalities (Dagilienė et al, 2021, p1). Bolgor&Doyon (2019), in their research on circular cities, highlight the importance of municipal interventions for stimulating circular activities, particularly in sharing knowledge amongst networks of stakeholders. Municipalities are not solitary actors anymore but face emerging roles in enabling, facilitating, or even regulating urban transitions (Kronsell& Mukthar-Landgren, 2018, p988; Mukthar-Landgren,2019, p718).

The role of local governments in accelerating circular transition is also highlighted in the Netherlands Integral Circular Economy Report. The report follows the government-wide program called ‘Circular economy in Netherlands 2016’ providing a set of actions to be 50%

circular by 2030 and fully circular by 2050. By setting transition agendas across five cross-cutting themes, the Netherlands conforms itself to twin goals of achieving climate targets and to gaining value through raw material reduction while taking advantage of the resulting new opportunities (VNO-NCW et al, 2017, p1). The program is focused on innovation as a driver for opportunities for existing and upcoming businesses and scientific advancement. The program opens room for experimentation within its framework to support circular initiatives through 10 clusters of policy instruments (Rijkswaterstraat,2016). The responsibility of exercising these instruments is handed over to the regional parties with a direction to utilize their facilitating, cooperative, and purchasing powers to create collaborative actions and stimulate circular initiatives (Hanemaaijer and Maikel Kishna, 2021, p21)

In the Netherlands, the Urban Living Lab (ULL) manner of approach towards uncertainties of a city, in co-creation with local actors, allows for testing new solutions to complex problems before their large-scale implementation (Scholl et al, 2020, p162). Despite the platforms offered by the urban living labs for experimentation, their potential for instigating transition is dependent on how they are conducted (Sholl & Kraker, 2020, p162; Cuomo et al, 2020, p14). Multiple combinations of policy instruments that are market-based, financial, regulatory, etc. are adopted at regional levels for fostering circular business models and collaborations. However, the studies on the use of these instruments for the implementation of circular economy are primarily concentrated to large economies and ‘frontrunning’ cities such as Amsterdam in the Netherlands. The role of local governments and their governance tools/policy instruments in smaller economies and cities in the initial stages of transition are largely absent from academic records (Dagiliene,2021, p2). The study needs a case example of a niche experiment space where policy instruments are implemented by the local government for circular innovation. This thesis hence picks an emerging circular city of Almere for this research to document the local government’s approach to experimentation in circularity. The case of Upcycle competition in Almere, conducted by the local government to conjoin circular innovation and use of local raw materials serves as an appropriate case for the study.

1.2. Problem statement

Almere, a part of the Amsterdam Metropolitan Authority (MRA) is the newest city in the Netherlands built on reclaimed land from IJsselmeer Bay. Following the National goals on circularity, the province of Flevoland set its ambition to be the primary supplier of raw materials in the Netherlands by 2030 by focusing on residual flows to make circular raw materials and products (Province of Flevoland,2021). In line with this ambition, Almere formulated the ‘Almere 2.0’ program plan with goals to reduce greenhouse gas emissions by 49% by 2030 and 100% circular by 2050. The ‘Energy on Upcycling’ program plan under Almere 2.0, focuses on circular strategies, encompassing domains such as urban raw materials, energy, mobility, etc. as depicted in Figure 1. Upgrading the prominent raw materials- biomass, asphalt, concrete, and wastewater, is one of the primary domains of the program. Through this program, Almere aims to be a ‘living lab’ i.e., a site of innovation for the transition towards circular economy as a ‘living lab’- a test area in terms of legislation, entrepreneurship, and citizen’s initiatives (Municipality of Almere,2016; Cortés-Cediel et al, 2019, p53).

Under this domain, Almere municipality conducted the ‘Upcycle city’ competition in 2017 to tackle the predominant biomass and demolition waste with the help of businesses to create value out of waste and to stimulate their innovative strength (Municipality of Almere,2016).

According to the program plan-

“The competition is looking for ways to use one or more residual flows in products. The competition is used to select partners, with which the municipality will also use its performance (financial, in-kind) to achieve a successful result in a collaboration with the business community that is yet to be formed” - Municipality of Almere,2016, p95.

Through this competition, the municipality planned to support business initiatives for innovation through circular tender along with procurement and co-financing of proposals. The competition was conducted to stimulate experimental pilots, which upon successful implementation can be replicated throughout the Netherlands (Growing green cities & Municipality of Almere,2016).

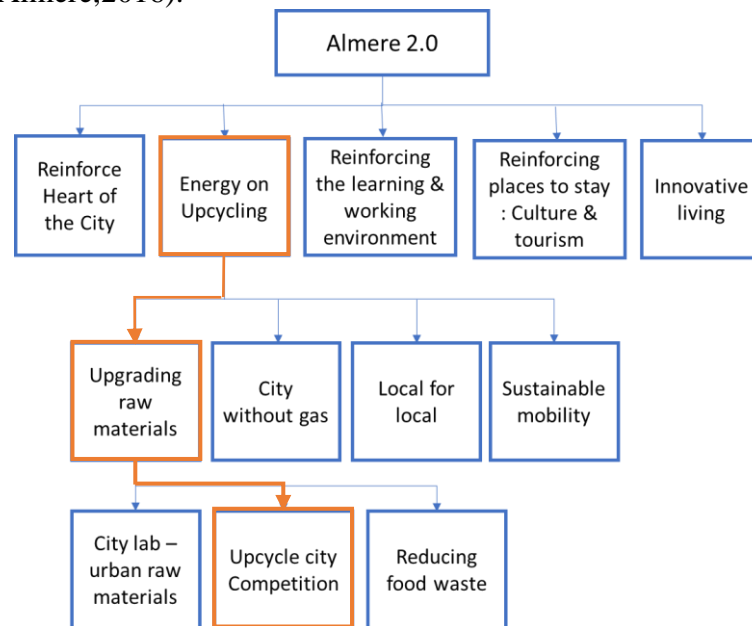


Figure 1: Program structure of 'Almere 2.0' showing the hierarchy level of Upcycle city competition (Municipality of Almere, 2016)

The competition was communicated as an ‘innovative tender’, thereby anticipating innovation as a prime component of solutions (Pianoo,2017). As depicted in Figure 2, the competition resulted in the research, development, and implementation of two innovation pilots by two separate collaborating parties, that fulfill the qualitative goal of finding innovative and circular usage for local raw materials through collaborations. The two winner groups and their implementations are listed below:

1. A concrete batching plant that recycles the city’s construction debris which in turn was utilized to produce ‘green concrete and cementless concrete’ with local biomass- both components of the proposal submitted by the parties.
2. Fully circular street furniture implemented in public spaces for Floriade, partly as ‘sitting as a service’.

The literature points out the necessity for municipalities to lead a local transition of communities and businesses according to a state’s strategy and in bringing diverse stakeholders together (Dagiliene,2021; Jesus&Jugund,2021). In the case of Almere, it is observed that innovation policy instruments such as circular tendering, procurement, and financing yielded positive effects in initiating experimentations and execution of pilots for circular economy. Such instruments along with collaborative networks proved successful in the execution of innovative circular solutions that tackle residual flows and produce high-value raw materials

(Eurocities, p3). This thesis uses both innovation projects as cases for the study in an attempt to map the utilization of co-financing and public procurement as policy instruments for two different products and value chains to identify any differences in the effects.

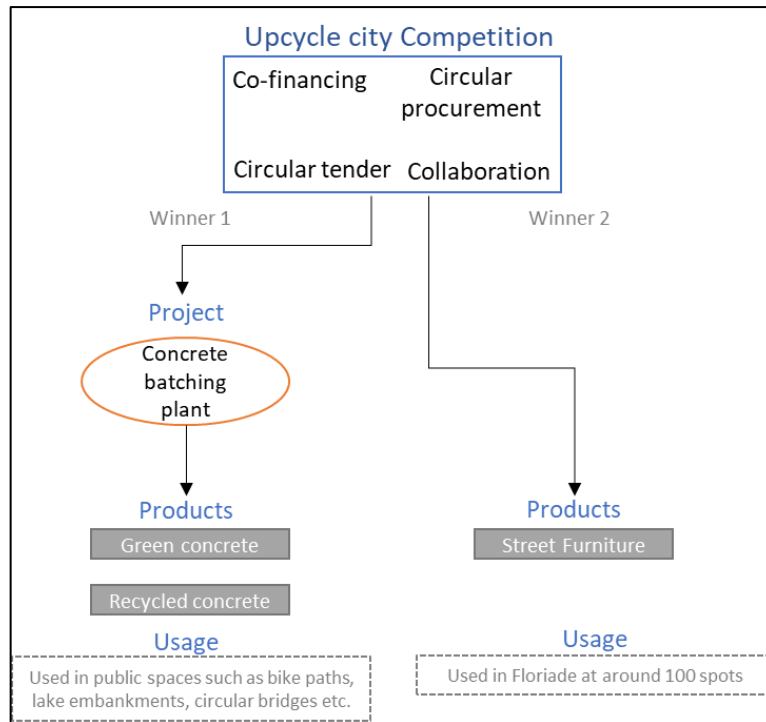


Figure 2: Outcomes of the Upcycle city competition

1.3. Research objective

The objective of this research is to empirically observe the strategies employed by municipalities in the form of policy instruments and their influence on circular innovations. To this we also add the contribution of collaborative networks since they form an intrinsic characteristic of urban experimentation.

1.3.1. Research Question

How did circular tendering & procurement, co-financing, and collaboration in the Upcycle city competition help in creating circular innovations in Almere?

1.3.2. Sub questions

- i. How was the Upcycle city competition implemented to help create circular innovation in Almere?
- ii. How did circular tendering and procurement influence circular innovations in the Upcycle city competition?
- iii. How did co-financing influence circular innovations in Upcycle city competition?
- iv. How did collaborations influence circular innovations in Upcycle city competition?

1.4. Relevance of the study

1.4.1. Scientific relevance

Various academics have highlighted the necessity of a systemic transition at different levels toward a circular economy, involving technological innovations, novel business models and collaboration between diverse stakeholders (Alhola et al, 2019). Despite the importance given to businesses for their role in circular transition, studies have highlighted multiple roadblocks to develop circular business models in existing linear system (Caldera et al, 2022; Rizos et al, 2018, p1-2). These barriers identified at micro, meso and macro levels include inaccessibility to financial support, technical knowledge, insufficient market, resource availability amongst many others (Caldera et al, 2022, p7). Reports by organizations as well as academicians have highlighted some key interventions to address these issues, emphasizing on policy changes, collaborations, and government support to tackle the barriers (Hull et al, p10; Veleva 2021). Through experimentation, cities have various scales have come up with innovative governance tools to stimulate local circular economy and enhance collaborations (Mungo & Franco-García, 2019, p195-196). The academic documentation of policy instruments for innovations and their empirical contexts is limited and fragmented. This research contributes to the existing evidence for the role of policy instruments in creating favourable climate for circular innovations.

1.4.2. Social relevance

This study can contribute to added knowledge on the implementation of circular economy by municipalities. The insights derived from this study can explain the enablers and constraints encountered by municipalities and businesses in utilizing the policy instruments for circular transition. Academics have pointed out the importance of contextual factors for successful deployment of policy instruments. As an empirical study, this research can throw light on how these contextual factors translate into activities of the government for activating an eco-system for experimentation in cities. Mapping out drivers and barriers for utilizing these policy instruments is necessary to overcome perceived obstacles in their implementation process. This research thus tries to generate knowledge on the practical implications of implementing policy instruments in cities and regions.

1.5. Scope and limitations:

This research concentrates on the enabling contexts and factors in the form of policy instruments and collaborations for stimulating niche innovations towards circular transition. While it is a vital research agenda to establish the circularity levels or indicators of these innovation projects, it does not comprise a part of this study. It is also not an objective of this research to estimate the potential of regime transition of these innovations; but it will document the current transition trajectory of the cases in study and the factors enabling or impeding the transition process. The research anticipates system level factors reflecting at a local level, deterring, or enabling innovation processes and hence recognizes the vitality of looking at niche level innovations from a systems perspective which will be detailed in the subsequent chapters.

Chapter 2: Literature review and hypotheses

2.1. Introduction

This chapter assembles the building blocks for this research by compiling the key concepts for operationalizing circular innovation, collaboration, co-financing, circular public procurement, which form the basis of the conceptual framework. The motive of this chapter is not only to present the key concepts but also to showcase the theoretical interlinking between them. The theme of the case in study is centered around the innovation for circular transition in urban context. Operationalizing policy instruments and collaboration for this research needs to reflect this aspect, hence requiring a transition theory lens. The author hence compared the application of transition theories such as strategic niche management (SNM), technological innovation systems (TIS), and transition management for this research. All these theories hold experimentation as a key for transition. However, a transition management lens is used for this research for the following reasons:

- Transition management framework utilizes a societal problem as a starting point when compared to SNM and TIS which revolve around technological solutions.
- Transition management has better focus on the ‘managerial’ aspects of transition when compared to the other two theories. This is necessary for this research since it focuses on the implementation aspects of policy instruments, collaboration, and the innovation experiments (S van den Bosch, 2010)

This chapter hence introduces transition management as a theoretical backdrop since its key characteristics will be reflected in the variables and indicators used for this research. The next few sections synthesize the theories formed by various scholars on the afore mentioned topics and presents the key excerpts that will be adopted for this thesis.

2.2. Circular economy principles

Circular economy is a concept that contrasts with the current linear economic and industrial model in which resources are mined, manufactured into products, and disposed of as waste. By its characteristic, a circular economy model is regenerative or restorative, enabling the retention of resources used in the processes as long as possible while maintaining their highest value (Morselleto, 2020, p763). Circular economy does not have a standardized definition- rather it is based on fragmented ideologies that have evolved over time (Korhonen,2016). One of the earlier definitions of circular economy comes from Boulding (1996) who emphasizes the limited assimilative capacity of earth which therefore demands an equilibrium between natural resources and economic consumption. The main driver of circular economy is hence the compounding dearth of natural resources owing to excessive per capita consumption. Korhonen (2018, p38) explains this phenomenon as a ‘head-collision’ between the economy as a physically growing subsystem and the natural ecology i.e., the parent system; this is exacerbated by increasing waste and emissions. The circular economy model, on the other hand, is conceptualized as a straightforward solution to reverse the flow of resources back into the system through the reuse, remanufacturing, or recycling of products in the chronological order of energy demand and raw material usage as depicted in Figure 3.

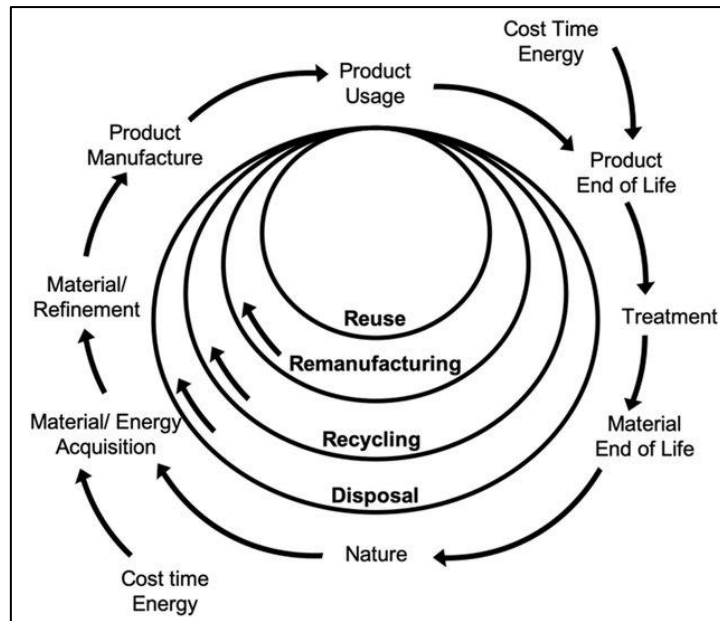


Figure 3: Concept of Circular economy (Fontana et al.,2021)

Since the inner circles demand fewer resources and energy usage, it is recommended that the CE approaches aim for maximizing the time spent on resource values in them. This will effectively lessen the proportion of resources being disposed of in landfills while incineration for energy will be the least preferred option (Korhonen,2018). Material optimization through circular economy hence offers scope for creating new roles for labour leading to socio-economic benefits such employment in addition to environmental ones (Stahel, 2012, p4; Ogunmakinde et al,2020, p900).

Circular transition requires transformation of not just end products but their entire supply chains owing to the environmental impacts of manufacturing processes and consumptions that contribute to greenhouse emissions. Supply chains are hence integral as a driver for the circular transition implementation (Hazen et al,2019, p511). A circular supply chain integrates external actors, stakeholders in its value chain thereby maximizing resource efficiency through collaborations. Figure 4 summarizes the differences between the linear, closed loop and circular supply chain loops.

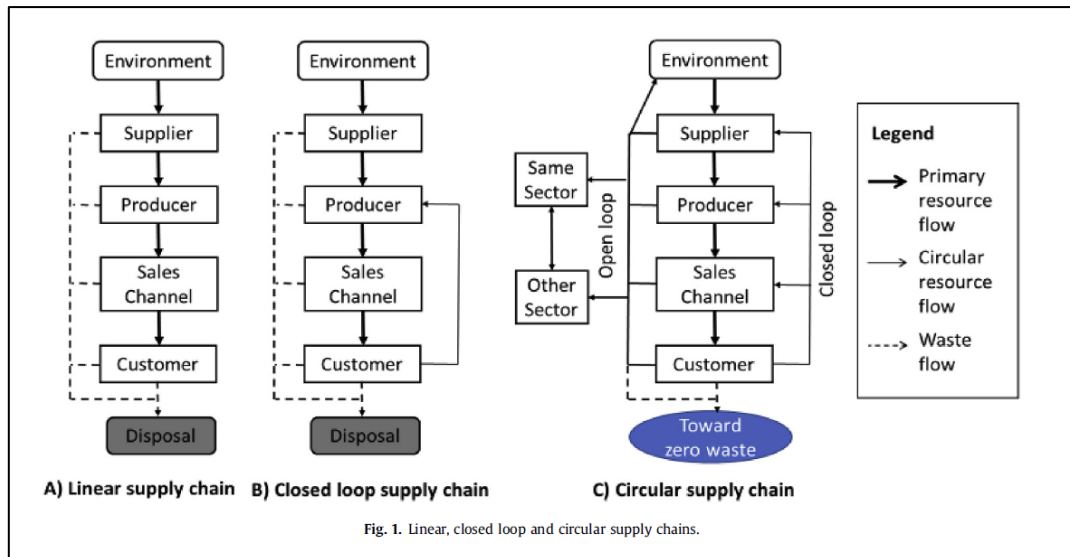


Figure 4: Linear, closed and circular supply chains (Farooque et al, 2018)

A linear system utilizes resources extracted from the biosphere but disposes the end-of-life products. A closed loop supply chain on the other hand brings the residues from used goods back to the producer thereby enhancing the environmental performance. A closed loop supply chain still offers limitations in value recovery since the potential for complete value recovery within the same supply chain is not possible. It hence produces substantial waste in the process. A circular supply chain tries to tackle this limitation through collaborations with other organizations within the same sector or different sectors. It adopts system wide innovations to produce zero waste by regenerating the resources in the given industrial and natural ecosystem contexts. Aligning with these principles require re-imagining existing supply chains hence demanding new cooperative studies which present new opportunities and challenges for innovations (Farooque et al,2018).

Multi-level perspective for CE:

Circular Economy is strategized as re-organization of production and socio-technological systems to minimise consumption and create closed circuits at different scales. Hence a holistic approach for circular transition with efforts at different scales/levels has been advocated by various academics and experts alike (Vanhamaki et al,2019). These scales, as depicted in Figure 5, are broadly termed as macro, meso and micro at which the analysis for CE can be analyzed.

- The macro scale is a socio-technological ‘landscape’ constituent of structural tendencies such as policies, predominant cultural, social values, climate changes etc. (Lindgreen et al,2020; De Jesus&Jugend,2021).
- The meso level or the regime level allows incremental changes and includes network interactions between actors which includes industrial symbioses between companies (Florido, Jacob, & Payeras, 2019).This meso or regime level is key to generate stability through incremental innovation (Geels, 2021).

- The micro level comprises of niches which are the sites for experimental and radical innovations that can lead to regime shifts. It deals with the set of rules or decision-making boundary of a single firm or a single actor which, however, can vary in scale and are shielded from external effects (Lindgreen et al, 2020, p2). The niches are often expensive but often opportunity for empirical, pragmatic learning since they are shielded from market externalities (Geels,2021).

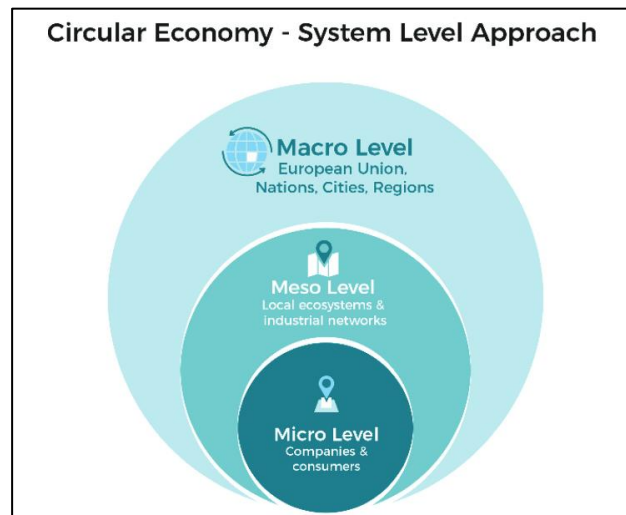


Figure 5: Multi level perspective of CE

Together these scales form a multi-level framework aimed at reconfiguring production and consumption systems (Jesus et al,2017, p3000). According to the MLP, the elements from the landscape level such as geo-political shifts cause disruptions in regime which simultaneously offer an opportunity for niche innovations to diffuse. However, the diffusion of niche technologies is a function of broader socio-economic dynamics, beyond the control and influence of niche level actors (Smith, 2007, p429).

2.3. Circular innovations (Dependent variable)

The literature review for this research showcased that the term ‘circular innovations’ has not been extensively used in scientific literature. However, innovation in CE has been explained through various terms such as ‘eco-innovations’, ‘sustainability innovations’ etc. which encompass circular components along with broader socio-economic concepts. For example, the eco-innovations, as stated by de Jesus et al. (2016), refer to the product and organizational realignments necessary for achieving ecological and economic benefits. While there is an overlap between the descriptions of circular innovations and eco-innovations etc. in academic literature, this research adopts the term ‘circular innovations’ according to the definition of ‘Circular Oriented Innovation’ as suggested by Brown et al. (2020):

“The coordinated activities that integrate CE goals, principles, and recovery strategies into technical and market-based innovations, such that the circular products and services that are brought to market purposively maintain product integrity and value capture potential across the full life-cycle” (Brown et al., 2019, p. 3).

Edquist & Charles, (1997) explain that innovations are a result of interactions arising from activities such as R&D and normal activities such as production, procurement etc. In CE,

innovations are mostly oriented at slowing or closing resource loops as two vital approaches which forms their essential characteristic (Jakobsen et al., n.d.). These innovations’ diffusion can undertake three distinct pathways as follows (Seyfang & Haxeltine, 2012;Boyer, 2015)

- i. Replication – When the innovation is diffused through a committee group of actors or advocates.
- ii. Scaling up – Diffusion amongst broader audience beyond an advocacy group
- iii. Niche to regime translation- Adoption at higher levels with structural changes in the institution adopting the innovation.

Note: The diffusion pathway, as an indicator is labelled as ‘level of diffusion’ in the operationalization for easier understanding.

2.3. Transition management

This section on transition management is introduced to provide a context for the operationalization of concepts and variables used for this research. From a multi-level perspective, transitions are the result of interactions between the niche, regime, and landscape levels. While transition dynamic frameworks such as multi-level perspective help in visualizing the dynamics of socio-technological innovations, transition management is instrumental in governing the transition experiments(Kemp, Loorbach, & Rotmans, 2007a). This approach assumes that socio-technological transitions emerge as innovations, transcend regimes and landscapes in a temporal fashion ((Kalinauskaite et al., 2021).Transition management is a model of coordinating bottom-up innovations through strategic governance approaches and interactions at multiple levels thereby serving as an intermediary bridge (Kemp et al., 2007a, p. 80). Kemp & Loorbach (2003) suggest a “modulatory and adaptive” approach of transition where pilot projects offer learning opportunities for informed policy decision, hence acting as transformative start-points (Nevens et al, 2013).

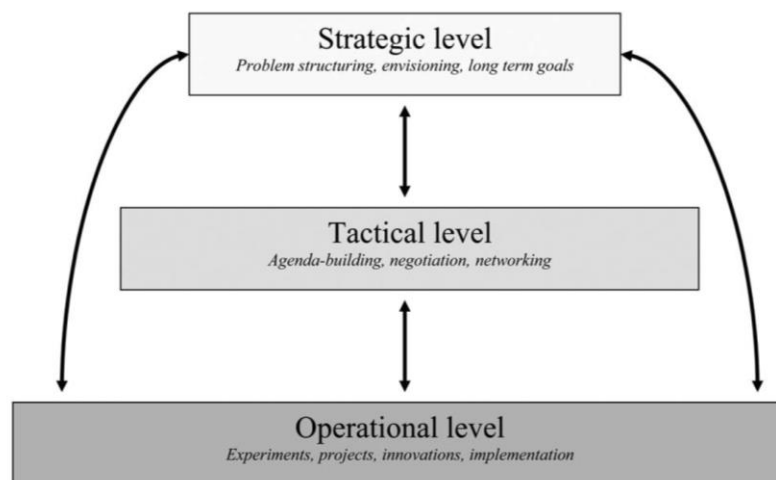


Figure 6: Transition management -multi level framework ((Kemp et al., 2007)

The governance for transition process occurs at three levels as depicted in the multi-level framework of transition management in Figure 6. The participating actors, their competencies, policy instruments vary across the three levels. The transition outcomes are materialized when the innovation actions are coherent between the levels. The strategic level deals with developing leadership capabilities, long-term goal setting and developing integrative strategies.

At the tactical level, the transition governance process focusses on existing regimes, prevalent practices to open room for new ideologies and innovations. Finally, at the operational level, transition management aims at “creating spaces” for experimentation, learning, co-creation and stimulating innovators. An element of reflexivity related to monitoring, assessing the policies and societal transformation is also integrated in the framework across the three levels, which forms the crux of transition management (Loorbach, 2010, p170)

For effectiveness, transition experiments are recommended to be conducted in real-life settings with the involvement of multiple state and non-state actors and their alliances. According to Kemp & Loorbach (2013), “Governance strategies in this context should include structuring and coordinating activities as well as allowing for and creating room for spontaneous and surprising activities”. New combinations of actors, knowledge, policy instruments etc, can pave way for new innovations (Kemp & Loorbach, 2013, p11). This research focusses on the operational level strategies of transition management with emphasis on the policy instruments and collaboration involved in innovation processes. The research however recognizes the embeddedness of the operational level strategies in the multi-level transition framework and the positive and negative feedbacks existing amongst the different levels.

2.3.1. Collaboration (Independent variable)

Transition studies highlight the importance of collaborations for activities in niches and between niche and regime for a transition process (Suzanne van den Bosch, n.d.). In niche level settings such as urban living labs, transdisciplinary collaborations are emphasized as key elements for co-creation. Transition towards circular economy requires reconfigurations of value chains and system level changes, demanding interactions amongst different levels and between different disciplines (Brown et al., 2020). By collating the recommendations from multiple authors, the following essential factors for collaboration are derived:

Shared vision and commitment: Transition experiments can be successful only if they are executed by ‘frontrunning’ actors who showcase commitment to the goals of the transition arena. The transition success is determined by the level of commitment, openness and trust showcased mutually. Committing to shared vision and goals can generate a cohesive space as well as nurture an environment where the relationships are sustained despite immediate results (Nevens et al., 2013; Kalinauskaite et al., 2021). Additionally, innovation can foresee higher chances of diffusion if supported by participating actors’ commitment for dissemination and ambassadorship (Sørensen & Torfing, 2013).

Leadership: The commitment amongst collaborating members is further strengthened by the presence of leadership with strong regional networks. According to transition management theory, collaborations are usually led by the local governments although the facilitating role could be fulfilled by any other. In collaborative settings, leadership is strongly challenged with the need to design an arena to mobilize actors and facilitate the collaboration process of actors (Sørensen & Torfing, 2013).

Resources for collaboration: Resources for collaboration include the financial, human, and logistical aspects that are required to facilitate the process. The logistical resources also include availability of technology support, physical sharing platforms etc. (Marek, Brock, & Savla, 2015). Kalinauskaite et al (2021) find that co-creation workshops not only provide a scope for collaboration but also facilitate exchange of ideas, vision mapping, providing further support.

With the incorporation of these factors in an innovation development and implementation process, it is anticipated that organizational boundaries would be blurred, paving way for a transformative learning process.

2.4. Innovation Policy instruments

Policy instruments also known as governing instruments are the mechanisms of governing to achieve policy goals (Bali et al,2021, p295). The increased complexity of the society due to myriad of actors involved in ‘governance’ stresses the necessity for new forms of operationalization, apart from administrative methods such as taxes. The emergence of new forms of governance paved way for novel policy instruments which are representative of less-hierarchical forms of public policy (Gales,2010). The transition to circular economy demands innovative approaches in which municipalities often uptake an enabling role. Hartley (2010) conveys that public sector is driven to innovate for increasing the efficiency of services for public good. The instruments for policy implementations are hence utilized as a tool by public actors to influence innovation; the instruments themselves form a part of the implementation process (Borras&Edquist,2013). The choice of instrument is dependent upon the suitability to the context, its customization and mix with other complementary instruments. Some broad types of policy instruments categorized by Borass&Edquist (2013) are as follows:

Regulatory instruments: Regulatory instruments are the obligatory legal mechanisms employed by the governments to set the framework of interactions in society and markets. They encompass laws, rules etc. which set the rules of game of what an actor is permitted to do or not. Non-obligation to regulatory instruments is often met with sanctions which can be inferred as their primary characteristic. The regulatory instruments are reflective of the hierarchical mode of governance with the government holding the authoritative position.

Economic and financial instruments: Economic instruments offer incentives or disincentives to support certain activities towards social goals. They are often employed by governments to influence market mechanisms (Bouwma et al,2015). This includes research funding, tax subsidies, provision of capital etc. Economic instruments are vital for encouraging initiatives that attract less demand but are necessary for public good; examples include circular products, green technologies etc. Incentives for such goods are crucial for preventing their market failure.

Soft instruments: soft instruments are non-coercive means that promote non-hierarchical modes of operation through partnerships, coordination, knowledge sharing etc. They are not characterized by sanctions and depend on voluntary agreements between partners. The soft instruments are often termed as ‘governance’ where the government adopts the role of a facilitator or an enabler. Examples of soft instruments include codes of conduct of parties, campaigns, knowledge dissemination, public private partnerships.

From a systems perspective, Edler & Georghiou (2007) convey that policy instruments can be categorized into supply-side and demand-side measures. While supply side measures support experimentation through financial and resources, demand side instruments help in transitioning niche experimentation to regimes by creating market demands. The prominent supply side and demand side instruments used are listed out in Figure 7 and Figure 8.

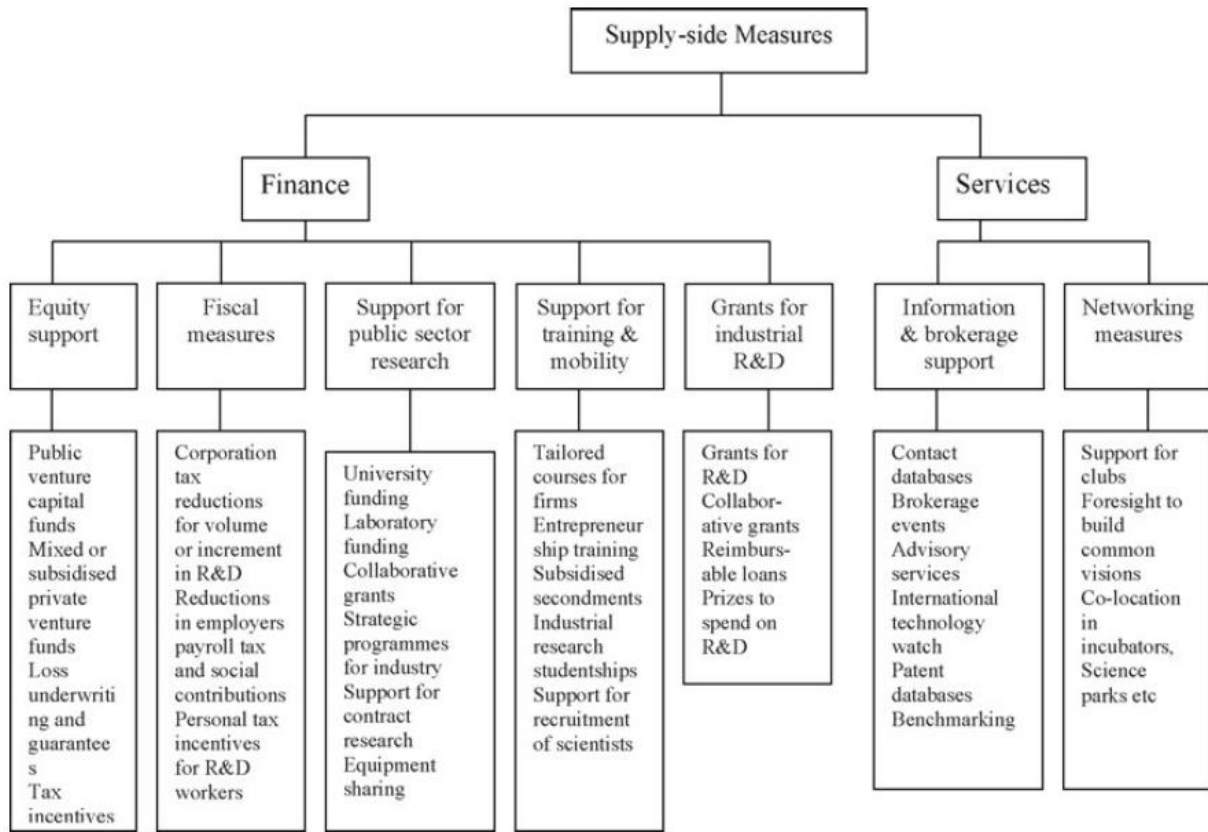


Figure 7: Taxonomy of policy instrument-Supply side (Edler&Georghiu, 2007)

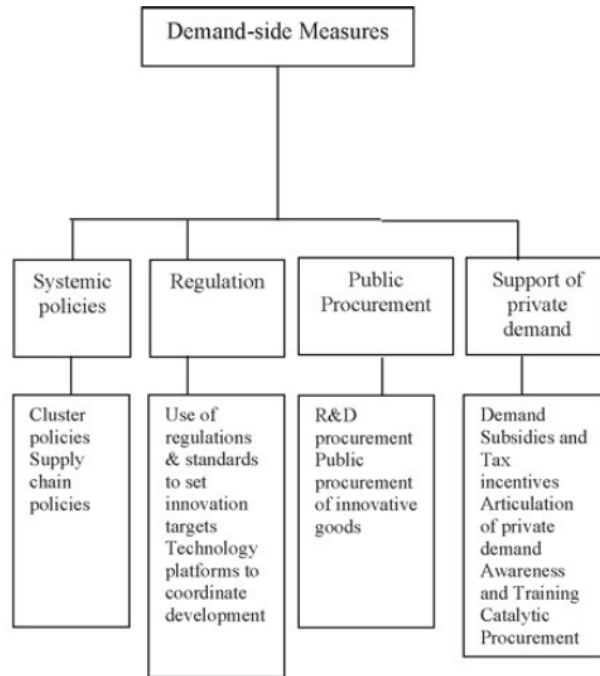


Figure 8: Demand side measures (Elder & Georghiu,2007)

The following sections elaborate further on the policy instruments of circular public procurement and co-financing which are being studied for this research.

2.4.1. Circular public procurement:

Public procurement is defined as the “acquisition of goods and services by governments and public organizations”. While conventional procurement practices are oriented towards purchasing ‘off-the-shelf’ goods, public procurement practices often target innovation by creating a demand for products that do not exist yet (Edquist et al, 2015, p1; Nstone & Aggeri, 2021, p1). It is hence used as a demand-pull strategy to create a transition opportunity for niche level innovations. Public procurement is often utilized by governments and public organizations to meet societal challenges such as environmental concerns, energy etc. which are unlikely to be addressed by the persistent market (Lember et al,2014). Public procurement is hence considered by some authors as an effective policy instrument to generate an inertia for circular products which otherwise suffer from lack of support and innovation from public and private actors (Nstone&Aggeri,2021, p2). As many studies have indicated, fostering innovations requires interplay between diverse actors. Public procurement hence serves as an opportunity to instigate this interplay (Lember et al, 2014, p3).

A. Tender qualities

Nature of specifications:

The ability of public procurement to influence innovations is impacted considerably by the nature of tender specifications. Outcome and performance-based specifications allow industries more room to experiment with alternative solutions rather than rigid, fixed criteria which counteract the purpose of innovation procurement (Edler & Yeow,2012; Edquist,2014). Procurers need to communicate the needs to be fulfilled by the innovation rather than technical specifications. Formulating the criteria and evaluating them against the set targets also demands additional capacities and knowledge from the procurer’s side (Sonnichsen&Clement, 2020; Kristensen et al,2020).

Alignment to policy goals:

Sönnichsen & Clement (2020) convey that the tender needs to include criteria pertaining to the environmental and social policy goals that the instruments are aiming to achieve. For example, studies on circular public procurement convey that inclusion of circular criteria in the tenders direct the bidders in orienting their proposal with the policy goals. The embeddedness of the tender in larger transition goals also incentivizes the procuring organization in orchestrating the process (Sonnichsen & Clement, 2020, p8).

B. Organizational factors

While sufficient attention has been paid to the ability of public procurement to stimulate technological and process innovations, the procurer organization’s ability to steer the process is often ignored (Gee&Uyyara,2013). The literature on public procurement in the purview of transition highlights the importance of the following factors:

Organizational silos and path dependencies:

While public procurement is seen as an effective means to stimulate innovations, its day-to-day activities are often hindered by the norms and structures in the procuring organization. This calls for a need to integrate the circular public procurement objectives into the existent organizational culture. Public procurement for innovation, from a project management perspective, is influenced by organizational contexts within which it is set up (Yeow & Edler ,2012, p483). This involves changes in existing procurement practices and integrating circularity in the case of circular procurement. Also, integrating new concepts such as

innovation and circular economy in formal procedures involves resistance from regime factors since people are accustomed to performing their formal duties as per their job descriptions. These behavioural factors often act as barriers to circular public procurement (Christensen et al,2020, p4). A deviation from the conventional procurement practices will demand and open the procuring organizations to additional knowledge, collaborations, and capacities (Christensen et al, 2020).

Internal knowledge and competencies:

While seen as an effective means to harness public purchasing power for innovation, public procurement is often impeded due to limited capacities, leadership, and resources in the public organizations. Contrary to the purchase of off-the shelf goods, procurement for innovation requires greater in-house competencies to elicit innovation from suppliers (Yeow&Elder,2012). Public procurement for innovation raises additional complexities to procurers with contrasting goals within the organization(s) and hence rises the need for adopting novel practices and capabilities to assure effective implementation. For circular economy, the procuring organization needs to develop new knowledge and competencies to understand supply chains and achieve policy goals through procurement (Edquist, 2014, p 66). This knowledge and competency will be reflected in the procuring organization's ability to set functional, technical requirements for the suppliers, and in evaluating them against the policy goals. Some authors also point out that it is commonplace for public organizations to privatize this aspect of procurement process by hiring external research organizations and experts to complement or compensate for their limited abilities for utilising the policy tool for innovation (Yeow & Edler, 2012, p483; Sonnichsen & Clement, 2020). However, a complete outsourcing of the process coupled with limited capacities of the public organization to comprehend it results in an unsatisfactory process that does not fulfil the end goals (Yeow& Edler, 2012). Hence, literature recommends some in-house building of capacities even when sourcing external expertise (Edquist, 2014, p82). Developing these new competencies and implementing them drive municipalities to form new partnerships and collaborations (Kristensen et al,2020, p4).

2.4.2.Co-financing (Independent Variable)

Though the role of incorporating circular/eco/green innovations practices in business models have been highlighted by policymakers and academics alike, the traction towards innovation and experimentation is diluted by lack of financial support. Aside from public procurement, financial instruments such as fiscal incentives, subsidies etc. have been identified as leverage points for accelerating transition towards circular models (Aranda-Usón et al,2019, p4). The development of innovations requires extensive partnerships, research & development and procurement of new technologies which demand accessible and reliable financial resources. Compared to larger firms, SMEs have greater difficulty in accessing fiscal resources for investing in research and transition towards circular models. Moreover, financiers find CE models riskier than conventional innovations and hence are apprehensive towards funding circular innovations. This opens the necessity and opportunity for public funding for circular innovations and in mitigating risks and uncertainties associated with it (Cuesta-González & Morales-García, 2022). Parallely, studies have recommended private funding to be complemented by public funding rather than being replaced by the latter, owing to higher rate of innovation success by private funding when compared to public finance (Olmos et al,2012). Apart from the general shortage of public funds, this can also be attributed to the relatively

higher competencies displayed by private parties in identifying innovative technologies than public actors (Olmos et al, 2012).

Literature yields mixed results on the effects of public funding on green innovation capabilities of firms (Cecere et al., 2016). While public funding aids in simplifying innovation processes, especially in SMEs, it is only effective for innovation when used for investment in resources rather than liquidity (Cecere et al., 2016, p27). The resources might include R&D for innovation development, equipment, building competencies or forming knowledge relationships (de la Cuesta-González & Morales-García, 2021). While the type of investment reflects on the competencies and resources enhanced by the financial injection, the derived benefits refer to the utilization of these resources in innovation process and the perceived risk mitigation due to the financial support.

2.5. Conceptual Framework

Based on key takeaways from the literature, the conceptual framework has been derived as shown. From the literature review, it is understood that innovations at niche level need to be reinforced by collective action from actors as well as relevant support mechanisms from the local government. The transition management literature showcases that the actions at operational level are influenced by tactical, strategic levels and vice versa. It is hence also evident that the operational tools are subject to these effects. Hence, while operationalizing policy instruments (circular tendering & procurement and co-financing), it should also be noted that their execution is deeply embedded in the institutional settings within the transition hierarchy. Hence both transition management and policy instruments concepts are used to operationalize the variables. This assumption holds true for the independent variable, collaborations too since the actors in a trans disciplinary set up can act and interact at different transition levels. Based on this theoretical foundation, the conceptual framework for this research has been depicted as follows in Figure 9.

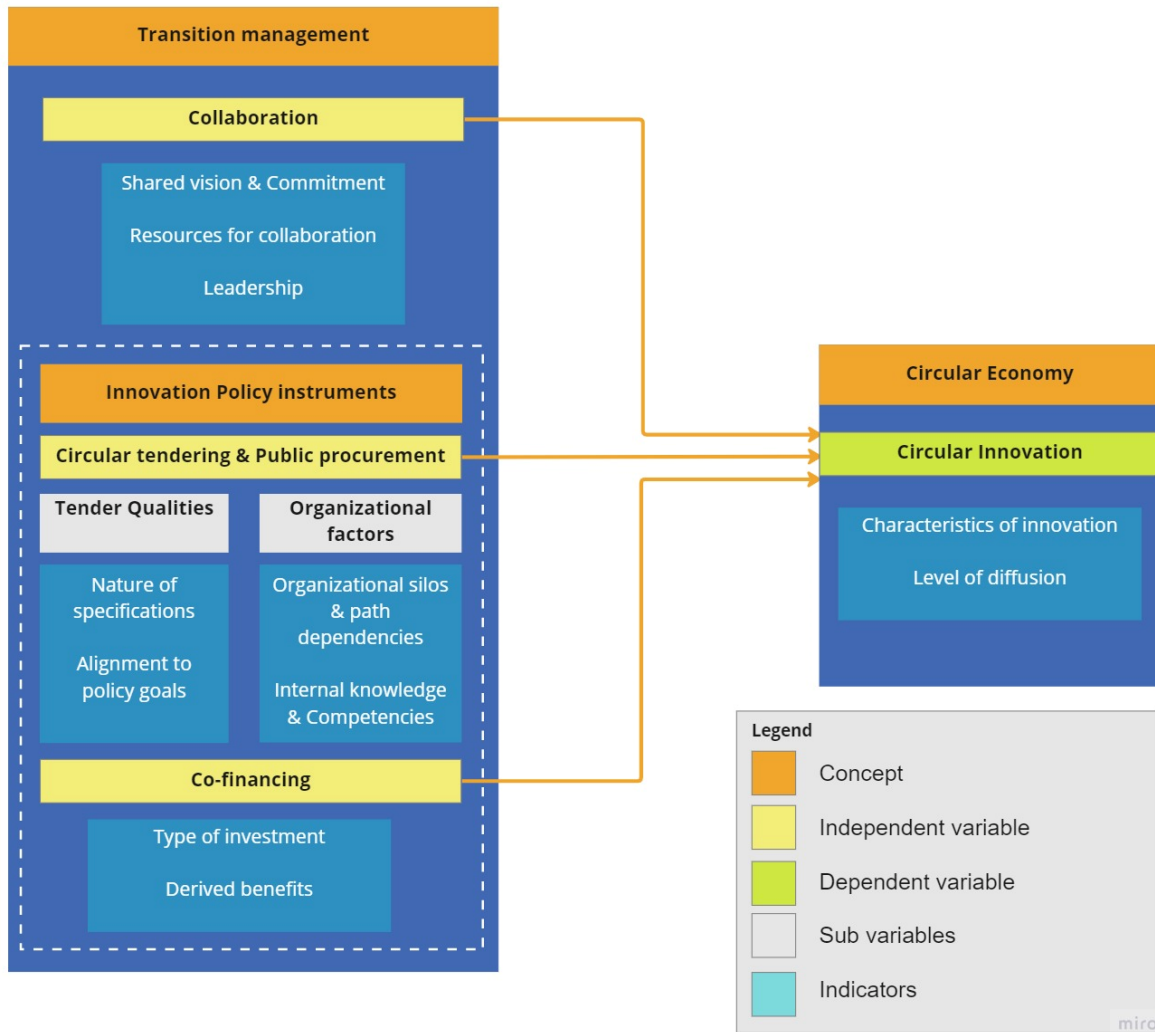


Figure 9: Conceptual framework depicting the relationship between variables (source: The author,2022)

Chapter 3: Research design and methodology

3.1. Introduction

This chapter details the research design, methodology, sampling, and data collection methods to be used for research. The chapter further states the scope of the research along with the validity and limitations of the findings. The variables identified in the literature review will be translated into measurable entities through operationalization with relevant indicators.

3.2. Operationalization

Operationalization offers an overview of variables used in the research and their measurement using relevant indicators. The operationalization in Table 3 explains how the author attempts to answer the research questions, sub-questions along with the various data sources and collection methods used for the indicators.

3.3. Research design and methods

The research follows a qualitative and explanatory approach. A qualitative approach attempts to understand a phenomenon in its natural setting, using a naturalistic approach with case studies, interviews, observations etc. Perskin(1993) convey that a qualitative research serves the purposes of describing, evaluating, interpreting and verifying the nature, validity and effectiveness of a phenomenon in a real world context. Hence, a qualitative approach will be adopted in this research to understand how the policy instruments such as circular tendering, co-financing and collaborations have been executed to influence innovations for circular transition.

3.4. Research type

The research follows a desk research strategy with the use of both primary and secondary data sources. A desk research strategy employs the use of data which had been produced for purposes other than the usage for this research (Van thiel, 2007, p116). Desk research can employ primary sources such as municipal documents, policy information etc. which are available for open public access. This is especially relevant for this research where existing information can provide value to the study. Additionally, secondary data sources such as interviews, youtube videos or website information can be included to study the behavioural aspects of the subjects (Van thiel, 2007, 117).

Furthermore, the desk research is complemented with semi-structured interviews of stakeholders who are closely associated with subject of research, with selective representation of respondents. This allows deeper understanding of behavioural and social aspects that are vital for this research and help in triangulating the data obtained through desk research.

3.4.1. Research instruments for data collection

The research uses qualitative desk study to gather vital information on policy goals, objectives, tender criteria, process, pilot development and executions. Secondary data refers to the data compiled for reasons other than the purpose of our study. The research will collate data obtained through project reports, government documents etc. The secondary data sources include open access documents such as city program plans, tender calls, project reports etc. Apart from this, documents collected from stakeholders will also be used with their

authentication and permission. While these documents are expected to give objective information about the projects, subjective perceptions are also sought through sources such as interviews, websites etc.

To support the secondary data, semi-structured interviews are used to gather data from the stakeholders involved in the case. The data will be collected from representatives of the companies- project leads, managers etc. involved in developing circular innovation products through the upcycle city competition. The data will also be collected from representatives of the Almere municipality to understand the implementation of policy instruments from the local government’s perspective.

Semi-structured interviews with a mix of open-ended questions and closed questions will be used to allow the interviewees to express their opinions freely within the boundaries of the research topic.

3.5. Sampling design

3.5.1.Sampling size

The data collection through interviews is planned to be conducted with interviewees identified with purpose sampling. Purposive sampling is appropriate for qualitative research especially if it involves a special case where in-depth investigation is required (Ishak et al.,2013 p32). The sampling involves selecting participants in accordance with their relevance and role in the specific case being studied in this research.

This research will include interviews from the municipality representatives who are affiliated with the Upcycle city competition and execution of the policy instruments such as co-financing, circular tendering, and collaborative platforms. The other participants include the collaborative businesses who had won the competition and delivered circular innovation products. The competition had two sets of winners- Group A with four collaborating organizations and Group B with two organizations. Semi-structured interviews or questionnaires will be conducted with the participating companies to understand their experiences of taking part in the competition and developing innovations. The comprehensive list of sampling units is provided in the table below:

Table 1: Interview guide for the research (source: author)

Data source	Planned interviews
Companies- street furniture	2
Companies- green concrete	5
Municipality	2
Facilitator- collaboration platform (GCA)	2
Knowledge partners & experts	2
Total	13

3.5.2.Data sources for desk research

The following data sources consisting of both secondary and primary will be used for analysis in this thesis. The data sources along with their descriptions are given below in Table 2

Table 2: data sources for desk research

Source	Information
Innovation Agenda, Almere 2016-2018	Program agenda, financial plan
Upcycle City Competition-invitation to tender	Tender objective, criteria, rules, and financial plans
Almere 2.0, 2020- Annual report	Program plan, objectives, goals, project structures and progress
Almere 2.0, 2021- Annual report	Program plan, objectives, goals, project structures and progress
Program plan Almere 2.0	Program plan, objectives, goals, project structures
White paper, circular street furniture	Product description and secondary information
Proposal, upcycle city competition	Tender submission, project plan and sub plans
Inventory of waste flows, TNO	Quantitative data of Almere waste flows, recommendations for waste-free goals
Upcycle city presentation by Millvision, CIRWINN etc.	Plans and sub plans of winner group 1 – concrete products
Magazine on Almere circular economy by Municipality of Almere	Information on concrete products by project partners along with description of GCA

This is complemented with various news articles, reports, interviews, and podcasts collected online for this research. The secondary online data were collected through keyword search on Google.

3.6. Data analysis method

The data collected from interviews will be analysed using data triangulation. The data analysis can be divided into two segments. The data analysis for this research is composed of two components. The first part consists of a content analysis of secondary data sources such as the program plans, project proposals, tender notice, new articles etc. to understand the tender process and pilot implementations. This yields the sequence of activities carried out for developing circular products, identifying the stakeholder participation, their roles, and the diffusion level of circular innovations. Secondly, the qualitative data from the interviews is coded against the framework derived from the literature review using Atlas Ti. This helps in triangulating the data collected from secondary sources and in finding additional qualitative information, especially on how the policy tools & networking are perceived by municipalities and businesses. Further codes will be developed during the coding process, if necessary, to cover the aspects that are not included in the framework. The coded information will be grouped into categories if common patterns are found in the data. This data triangulation will help in understanding different viewpoints and in also piecing together factual and qualitative information to derive findings and conclusions.

Table 3: Operationalization

Sub-Question	Concept	Variable	Sub-variable	Indicator	Data collection method	Data collection source	Data collection instrument
How did circular tendering and procurement influence circular innovations in the Upcycle city competition?	Transition management & Innovation Policy instruments	Public procurement	Tender quality	Nature of specifications	Qualitative	Municipality of Almere, companies participating in UC competition, secondary data, knowledge partners	desk research. Semi-structured interviews, questionnaires,
				Alignment to policy goals	Qualitative	Municipality of Almere, companies participating in UC competition, secondary data	desk research. Semi-structured interviews, questionnaires,
			Organizational factors	Organizational silos & path dependencies	Qualitative	Municipality of Almere, companies participating in UC competition, secondary data	desk research. Semi-structured interviews, questionnaires,
				Internal knowledge & Competencies	Qualitative	Municipality of Almere, companies participating in UC competition, secondary data, knowledge partners	desk research. Semi-structured interviews, questionnaires,
How did co-financing influence circular innovations in Upcycle city competition?	Transition management & Innovation Policy instruments	Co-financing		Type of investment	Qualitative	Municipality of Almere, companies participating in UC competition, secondary data	desk research. Semi-structured interviews, questionnaires,
				Derived benefits	Qualitative	Municipality of Almere, companies participating in UC competition, secondary data	desk research. Semi-structured interviews, questionnaires,

How did collaborations influence circular innovations in Upcycle city competition?	Transition management	Collaboration		Shared vision & Commitment	Qualitative	Municipality of Almere, companies participating in UC competition, secondary data, knowledge partners	desk research. Semi-structured interviews, questionnaires,
				Resources for collaboration	Qualitative	Municipality of Almere, companies participating in UC competition, secondary data, knowledge partners	desk research. Semi-structured interviews, questionnaires,
				Leadership	Qualitative	Municipality of Almere, companies participating in UC competition, secondary data, knowledge partners	desk research. Semi-structured interviews, questionnaires,
How was the Upcycle city competition implemented to help create circular innovation in Almere?	Circular economy	Circular innovation		Characteristics of innovation	Qualitative	Municipality of Almere, companies participating in UC competition, secondary data, knowledge partners	desk research. Semi-structured interviews, questionnaires,
				Level of diffusion	Qualitative	Municipality of Almere, companies participating in UC competition, secondary data, knowledge partners	desk research. Semi-structured interviews, questionnaires,

3.7. Data validity and reliability

Data validity and reliability increase the incorporation of transparency in research and aid in reducing researcher bias. This helps in enhancing the accuracy of the research work (Mohajan, Haradhan, 2017).

3.7.1. Data validity

Validity of a research indicates the accuracy level of the findings. Data validity is concerned about the extent to which a data collection instrument measures what they intend to measure and their consistency when replicated (Van thiel, 2007). Of the many types of validity, two types are most referred to in research- Internal validity and external validity. Internal validity indicates the extent to which the research has studied what they intended to study. External validity represents the applicability of the research findings to other groups (Brink ,1993).

The internal validity depends on the operationalization of the key concepts to measure the case being studied. This is ensured by referring to multiple articles on the same topic and incorporating them while deriving the conceptual framework. Internal validity is also ensured through data triangulation with multiple data sources. The subject of this research is highly case-sensitive, which reduces the external validity owing to its subjective nature. This is dealt with using measurement instruments that have been used in previous studies on similar topics.

3.7.2. Data reliability

The reliability of the research reflects on its ability to yield consistent (same or comparable) results if tested over periods of time. It showcases the credibility of the research and the extent to which it has managed the factors that could potentially lead to measurement errors (Brink, 1993).

The reliability in this research is accentuated by the method of triangulation by verifying data with multiple data sources and interviewees. Data validity is ensured by referring multiple documents, mapping, and comparing the consistency of information. Data validity is increased by choosing participants of considerable credentials within an organization to procure fairly accurate informative accounts. The respondents are firstly identified with desk research (news articles, publications, website information etc.) to take note of their credentials including their direct involvement in the competition, innovation research, implementation process etc. The research aims to interview multiple participating organizations as well as the municipality to increase the reliability of information. The data is cross verified with secondary data and through non-participant observation during the field visit conducted for this study.

3.8. Data limitations

While it is true that the subject of the study is better suited as a case study approach with semi-structured interviews as the primary data sources, this could not be adopted due to the data limitations. Hence this research adopts a desk research approach, triangulated with primary data collected from project sources. There are considerable constraints to data collection by interviews due to the following factors:

1. Timing of the study- The summer holidays from July to September after two years of pandemic placed several constraints on the study as the intended participants were either unavailable due to holidays or communicated that they are busy due to the

pending workload after holidays. They hence expressed their inability to partake in this research.

2. Reluctance to participate: Some participants expressed their disinterest in participating in the research and were unavailable for interviews. Despite some key participants expressing their interest initially, they were unapproachable later to schedule an interview due to unknown reasons. Some participants also preferred answering questions by email or questionnaires which limited the scope for an in-depth conversation.
3. Unavailability of respondents: Some key stakeholders who participated in the project case were not available to contact since they no longer work in the same organization. These factors deterred access to some details that were important for the study.

To compensate for the above factors and still retain the validity and reliability of the study, the research makes use of grey literature, municipality documents and other secondary sources of data. Though the respondents are limited, their organizational position, extensive knowledge on the subject matter and their direct involvement with the case in study increases the validity of the study. The data sources are also varied in composition thereby allowing triangulation. Multiple secondary data sources are compiled and verified with the interview data for data triangulation. The site visit to the project sites in Almere also helped in integrating observation as a strategy in the research methodology.

Chapter 4: Results, analysis, and discussion

This chapter presents the comprehensive findings of the primary and secondary data collection conducted as a part of this research. The first segment of this chapter follows a descriptive analysis method to explain how upcycle city competition was conducted and provided scope for implementing policy instruments for innovation. The second segment will present the findings for the indicators and variables which were operationalized from theory in the previous chapters.

4.1. Data collection

This section presents the list of respondents who contributed to the study in comparison to the intended sample size along with the profiles of respondents. The respondents include the municipality representatives, companies in charge of research, development and implementing circular innovation pilots and the facilitators of the collaborative platform in Almere. In some cases, questionnaires and follow-up email exchanges were preferred over interviews due to the respondent's personal preference and language constraints. These limitations are compensated to a certain extent with the author's observations and face-to-face conversations with stakeholders during the field visit to the project sites. These interviews are meant to supplement the findings from the desk research which was conducted through the data sources described in Chapter 3.

Table 4: Details of interview respondents

Data source	Planned interviews	Respondents	Profile	Code
Companies- street furniture	2	1 (Interview)	Product designer	C1
Companies- green concrete	5	1 (questionnaire+ interview)	Plant manager	C2
Municipality	2	2 (interview)	Program manager 'Green and healthy Almere; Sector developer circular economy	M1 & M2
Facilitator- collaboration platform (GCA)	2	1 (questionnaire)	Program manager/project leader for green concrete pilots	F1
Knowledge partner & experts	2	-	-	-
Total	13	5		

4.2. How was Upcycle city competition implemented to help create circular innovations?

The planning of upcycle city competition has its legislative origins in the ‘Energy for Upcycling’ transition agenda under Almere 2.0 program plan (Municipality of Almere,2016, p4). The competition was one of the strategies planned by the Almere municipality to fulfil its objectives of being a frontrunner for circular economy in the Netherlands.

“..the city of Eindhoven, for example, is called a tech city. Likewise, we have an ambition to be known as a circular city and to supply raw materials to the country”- M1, interview,2022

Parallely, the city also formulated an ‘Innovation Agenda’ for 2016-2018 to finance innovative programs and projects in the city (Municipality of Almere,2016). The agenda lists the Upcycle city competition as one of the opportunities to identify projects for innovation. This is supported by a collaboration with TNO to link Almere’s sustainability goals with the organization’s research programs. With the Almere Urbanization Funds, the city also made financial and resource provisions to enable this transition with the Floriade acting as a catalyst (Municipality of Almere,2020). While the policy goals served as one of the drivers, the second was the mounting expense borne by the municipality to clear the biomass from its waterbodies such as Weerwater lake, and the construction debris from the expansion of A6 highway on the city boundary (M1, interview,2022; Municipality of Almere, 2017, p96).

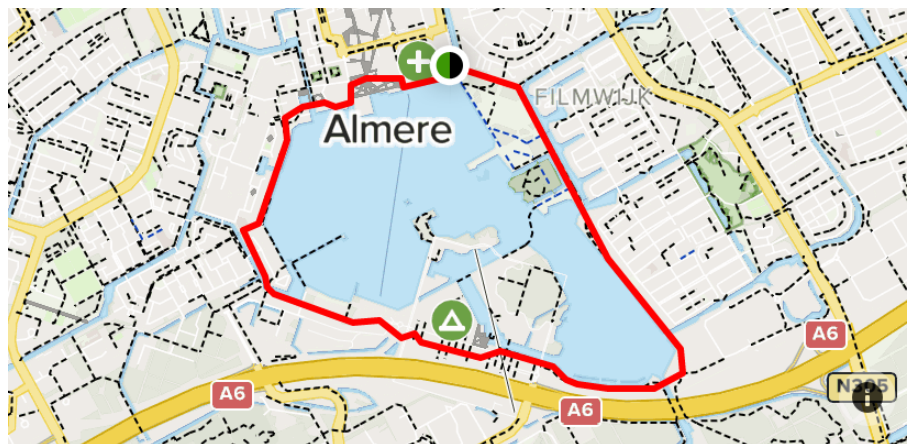


Figure 10: Map of Almere indicating Weerwater lake and A6 highway (source:Google images)

The competition, as a first edition, hence revolved around the prominent waste flows of the city such as asphalt, biomass, and street furniture as analysed by the inventory issued by TNO. The participating tenders were expected to draw proposals that generate value from the waste, generate economy and preferably generate employment especially for low skill workers who are distanced from job markets (Municipality of Almere,2016). The competition is designed as an innovative tender process that contributes to material security and circular economy in the city as well as the region. The tender follows the Procurement law of 2012 with the competition defined as follows:

“Procedure which aims to provide a contracting authority with a plan(s) or a design(s) which will be selected by a jury after announcing the assignment, with or without the awarding of prizes” (Municipality of Almere,2016).

The result from the competition was expected to be economically feasible business cases. The emerging winner from the competition would be awarded with the opportunity to negotiate the execution of their proposal with the municipality along with 1000.000 euros financial capital for the realization of their proposal/s (Municipality of Almere,2016). This budget for co-financing the projects was made available through Almere Urbanization Funds which has been included in the Almere 2.0 program.

The results:

The tender offered the winners an opportunity to negotiate with the municipality regarding their implementation plans. The first winners included a local recycling company CIRWINN, in collaboration with Millvision (bio-based knowledge partner), Theo Pouw (construction partner) with a proposal to implement a five-part sub plans. The sub plans included product and process innovations to integrate circular principles in their existing infrastructure and developing circular innovation end products. The schematic below, collected by the author from the respondents during their symposium, showcases the implementation plan:

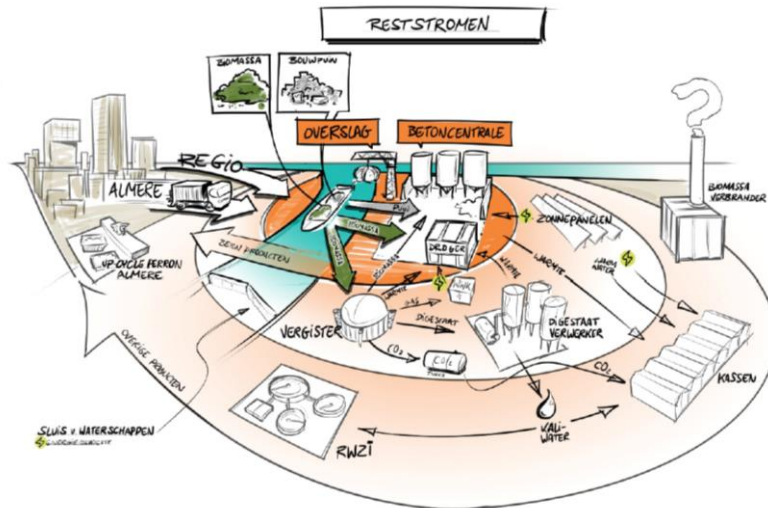




Figure 11: Schematic showcasing implementation plan of Winner group 1

The process reconfigurations include inclusion of solar power, and biogas for energy, use of wastewater from municipal treatment plant and upgrading infrastructure suitable for high-value recycling of asphalt waste (Municipality of Almere,2016; C1, observation,2022). The final sub-plan pertains to developing circular products suitable for commercial and public usage in collaboration with the other parties. With the other sub-plans serving as infrastructural support, two concrete products were developed as a part of the final sub-plan- 1. Green concrete 2. Cementless concrete with characteristics as indicated in **Error! Reference source not found.** The current waste management practices in Almere are reconfigured to enable disposal of certain fraction of construction debris and biomass waste at the CIRWINN site to ensure recycling.

The second winner was the proposal for creating circular furniture out of biomass and calcium waste from wastewater treatment plant as indicated in the city waste flow inventory. The competition’s support initiated the research and development for a suitable bio-composite that can fulfil the circularity goals desired by the municipality. The process, which lasted over four years led to the development of a product termed CIRCISIT with circular concepts integrated in the product design and composition, explained in Table 5.

Table 5: Circular innovation characteristics (The author, 2022)

	
<p>Figure 12: Circular bridges constructed in Floriade using cementless concrete</p>	
<p>Green concrete+ Cementless concrete</p> <ul style="list-style-type: none"> - Lighter than conventional concrete - Less carbon footprint - Utilizes local biomass waste - Produced from plant that is fully circular 	<p>Circular principles</p> <ul style="list-style-type: none"> - Closing the resource loops - Reducing virgin material use - Recycling local waste flows
	
<p>Figure 13: Circular Street furniture by Velopa + NPSP</p>	
<p>Circular street furniture</p> <ul style="list-style-type: none"> - Made of dismountable steel frame and bio composite ribs. - Fully reusable - Replaceable by parts - Uses biomass and calcium from Almere waste flows. 	<p>Circular principles</p> <ul style="list-style-type: none"> - Sitting as a service - Closing resource loops - Remanufacture/ Refurbish

Diffusion of innovations:

According to Boyer (2015), diffusion of innovations developed in niches can manifest at three levels, depending on the actors partaking in their adoption. Referring to the framework provided by Boyer (2015, p322), it is deduced that the innovations developed in Almere are at a replication stage, with committed actors advocating for their broader regime transition. While

the concrete rubble products developed at CIRWINN find commercial usage in the city, the innovation products i.e., green concrete and cementless concrete are at a pilot stage (F1, questionnaire,2022). After the lab tests, the products were used in pilots such as a 3km bike path and as retention wall to test their quality and properties. After two years of observation, the experiment was deemed successful and was subject to further certification processes to establish its use in sustainable construction practices (Reimart,2020). The most notable use of the green concrete is in the circular bridges at Floriade which are completely constructed out of residual wastes (Municipality of Almere,2021). This was executed through a separate competitive tender.

In the case of circular street furniture, the agreement with Almere municipality accelerated the development phase of the product. The first 100 benches were installed at the Floriade with 50 benches leased as ‘sitting as a service’. Post a cradle-to-cradle certification, the product is now venturing into commercial use with other municipalities who are adopting a similar approach in their cities (C1, interview,2022; Bakker,2021).

From the interviews, it is evident that both products are aimed at closing resource loops with reliance on the municipality as both supplier and buyer in the product supply chain. From the primary and secondary data, it is observed that both products have market diffusion at nascent stages but have recognition amongst sustainability advocates as viable practices for circular economy. The perception of innovation diffusion amongst the respondents are listed in Table 6.

Table 6: Innovation diffusion level according to respondents

C2, Questionnaire, 2022	M1, Questionnaire, 2022	C1, Interview,2022
<p><i>“One of the projects is the upcycle competition project. We combined that with the application of cementless concrete. See our bridges on the Floriade (www.bruggencampus.nl), we made them form concrete rubble in combination with geopolymers as a binder instead of cement. But it will be a long way to let the market accept that cementless concrete is also very good”</i></p>	<p><i>“We have created green cycle paths which are created with the help of entrepreneurs in De Vaart. For the green concrete the local bio waste such as grass and water plants were used. These cycle paths were created out of the green concrete. This is one example.</i></p> <p><i>The main challenge of such initiatives is that they are always pilots and currently they are never scaled up. The main goal of 2022 however is about how we can scale these pilots”</i></p>	<p><i>“And we're going to sell it commercially now. We sold the first 100 to Almere which is a part of the deal. Okay. And. We also talked about this, Almere, about closing the loop. So, getting our stuff back at the end of the lifespan and we came to a deal that 50 benches are in a lease construction, so they just pay a monthly fee. So, we sell assets, we sell at a sitting as a service.”</i></p>

4.3. Circular tendering & procurement

How does circular tendering & procurement help in creating circular innovations?

The literature review for this research showcases a strong influence of tender qualities and organizational factors on the creation and diffusion of circular innovations. Through the procurement tenders, municipalities act as launching pads of niche creations and influencing

regime practices. The characteristics of tender process hence play a crucial role in the selection of niche innovations as well as their applicability to the transition goals of the city.

4.3.1. Tender qualities (Sub Variable)

The tender criteria specified by the procurers has a heavy influence in introducing sustainability and circularity aspects to products while also promoting innovation (Wurster et al,2021; Sparrevik et al., 2018, p884-885).). Hence a content analysis of the tender documents could give an indication of how well the tender integrates the circular and innovation components. The evaluation of the requirements can also offer an understanding of how the tender set itself apart as an innovation procurement rather than a technical procurement (Sparrevik et al., 2018, p884-885). On the other hand, the alignment of the tender process with the regime level policies aid in shaping innovations that can translate into mainstream market practices (Sparrevik et al., 2018, p884).

Nature of specifications:

Following the literature’s recommendations against static, pre-defined solutions in innovation procurement processes, the tender criteria and evaluation process of the case are analysed to understand their scope for circular innovations. The tender documents, secondary data along with interviews are analysed for this purpose. The Table 7 offers a summary of the tender’s evaluation criteria. It is noted that while degree of innovation is mentioned as a criterion of evaluation, there is no mention of specific product specifications in the tender documents.

Table 7: Tender criteria of Upcycle city Competition

Specifications	Explanation
Vision and Clarity	Contribution to the city’s plan as a waste free city and degree of innovation.
Collaboration	Use of ecosystem and resources within Almere and MRA, team qualifications and collaborative partners and their durability
Implementation and feasibility	Clarity and realistic nature of the proposal, financial feasibility of proposal
Impact	Impact on Circular economy and employment especially on low-skilled workers.

The characteristics of tender criteria could be analysed using the tender documents and program plans. Upon examination and coding process using Atlas Ti, two characteristics are noticed:

1. Flexibility of criteria 2. Linkage to transition plans which are the prominent attributes observed while grouping codes under this indicator.

- a. **Flexibility of tender criteria:** The first category group that has been deduced from the interviews is the flexibility of the tender criteria. While the specifications draw an outline of the expected qualities of the plans, they refrain from mentioning the qualities of the end products. The respondent from Municipality of Almere explained that the tender specifications were designed in such a manner to ensure flexibility to the businesses. From the comparison of interview statements and the secondary data as shown in Table 8, it is deduced that this flexibility was a desired aspect for companies interested to innovate. This concurs with the literature’s standpoint that public procurement for innovation profits from non-specificity of product specifications and

focus on the solution for the societal/ environmental challenge (Sönnichsen & Clement, 2020).

- b. Linkage to transition plans:** The documents mandate the linkage of the proposed solutions to the circular goals of Almere and MRA through creation of economically viable activities that utilize the waste flows mentioned in the document. With the Floriade being chosen as MRA’s test space for circular transition, the tender documents direct the proposals to complement the other activities carried out as per MRA and Almere’s agenda (UCC invitation to tender, 2016). This context while providing a context to the firms, also enables to embed the process in the transition agenda.

Table 8: Flexibility of criteria- triangulation (Author, 2022)

M1, Interview, 2022	C2, Questionnaire, 2022	C1, Interview, 2022	Eurocities, 2017, p2
<p>“...we didn't want to give too much Let's say guidelines or imposing too many ideas on the companies, because we think the most innovation come from them.” – Respondent from Municipality, interview, 2022</p>	<p>“The concrete plant was constructed with this competition. It was more about circular economy and not just concrete. We just had to make a circular product. And finally the jury selected us and we implemented the concrete plant..”- Respondent Group 1, Interview, 2022</p>	<p>“So as a straight guaranteed company, we did it with street furniture. But it also could have been a phone company or could have been anything.” – Respondent Group 2, Interview, 2022</p>	<p>“Rather than asking for a specific service or product, Almere asked the entrepreneurs to write a convincing business case that shapes not only new economic activities but also employment.”</p>
<p>Literature reference: To develop the innovation and creativity of the supplier, the function to be achieved should be defined instead of specifying a specific product (Edquist et al, 2015)</p>			

Alignment with policy goals:

For an effective public procurement tender, adequate organizational and policy goals are necessary to enable provisions for the resources and time required by the process (Sönnichsen & Clement, 2020). This indicator hence reflects on the governance aspects of the tender and its embeddedness in the policy goals at city, regional and national level. For conducting a procurement process directed towards circularity, it is vital to reinforce it with policy goals since this will translate into organizational structures and provisions (Sönnichsen & Clement, 2020, p16).

From the primary and secondary data analysed, it is evident that the competition derives its qualitative objectives from the ambitions set in Sustainability Implementation Agenda and the Almere 2.0 program plan. The flowchart in Figure 14 showcases how the tender process fits into the qualitative objectives set in policy plans.

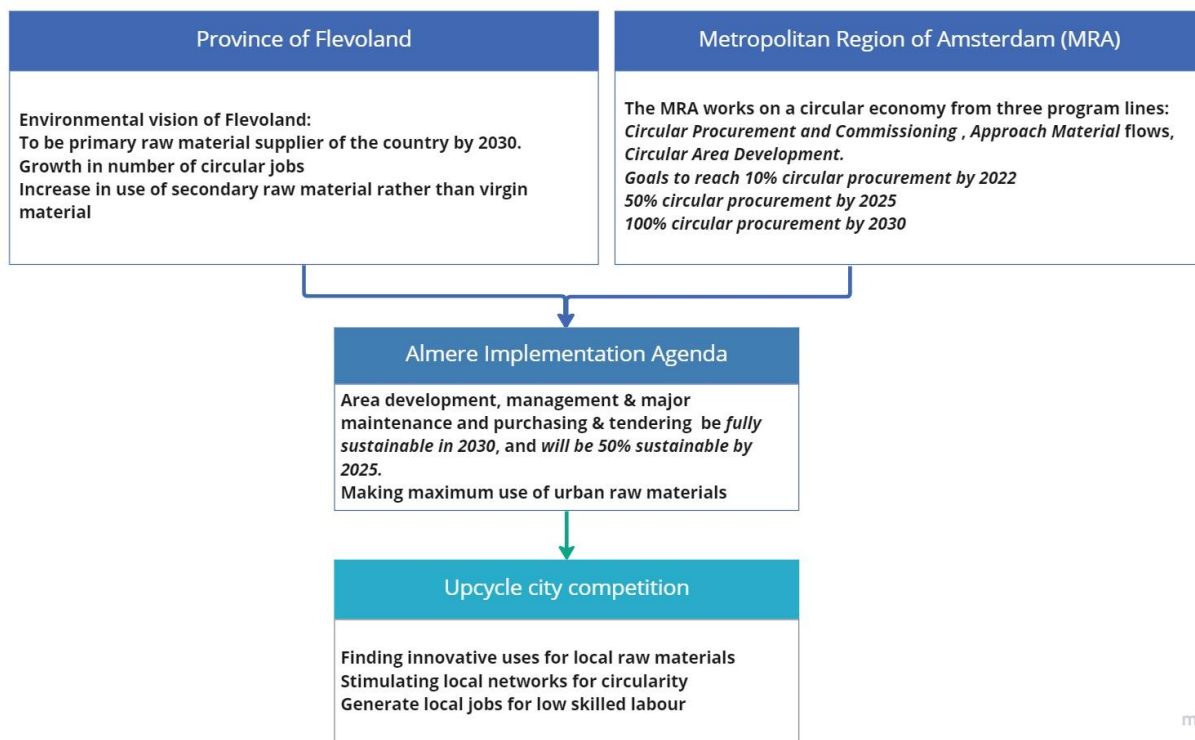


Figure 14: Alignment of Upcycle city objectives with city and regional goals (compiled by Author, sources: Municipality of Almere,2015; MRA)

As shown in Figure 14, the regional and city agendas for circularities offer the policy requisites for the Upcycle city tender. The Almere municipality was one of the 32 municipalities that signed the letter of intent for at least 50% circular procurement by 2025 (MRA,20 20). (Kern & Howlett, 2009) imply that the policy regime structures transformation goals, stakeholder-government interaction patterns, instruments, and their perceptions, which ultimately influence the delivery of the goals. In this case, the legislative provision for procurement practices plays an important role in making budgetary and formal requirements at the city level. From the interviews with the municipality as shown in Table 9, it is observed that city and regional goals certainly help in mobilizing resources for procurement of innovation, including human, financial resources, and knowledge exchange. It is also observed that Floriade acted as a catalyst for executing of circular pilots owing to its theme of circularity. The pilots were integrated to the area development plans of Floriade which was centred around sustainability and circularity (Municipality of Almere,2016).

Table 9: Aignment of policy goals: Data triangulation (source:Author)

M1, Interview,2022	C1, Interview,2022	Mousson, Pianoo,2017 (secondary data source)
<i>"...And Almere here does not have an own economy, we function under the Metropolitan Region of Amsterdam. So we have our motivation to be known for circular economy based city.... province of Flevoland and our</i>	<i>"And I think it's a good thing that we instead of these do stuff like this. Almere is really a front runner and. A lot of municipalities don't do stuff like this that are aware that and need to change because they do have this target to be a</i>	<i>"It was the first time for Almere. that we have approached the tender in this way, benefiting greatly from the example of the Amsterdam Metropolitan Area, which launched a competition in the field of digital economy in</i>

<i>economy help us facilitate procurement financially”</i>	<i>reduction of the carbon footprint by 50% in 2030 and like 100% in 2050”</i>	<i>2015. Especially the contact with lawyers and tender specialists, who shared their knowledge with us, was very valuable”</i>
Literature reference: “Underlining the importance of political strategic ambitions and supporting top-level management in creating and maintaining continuity, are necessary to create <i>effective circular public procurement Processes</i> ”-(Sönnichsen & Clement, 2020, p7)		

4.3.2.Organizational factors (Sub Variable):

Lessons from empirical studies indicate the importance of organizational capacities including awareness, knowledge, technical capacities etc. for conducting an effective public procurement tender (Alhola et al,2018; Sönnichsen & Clement, 2019). Cross-departmental co-operation, allocation of budget etc. are imperative for leveraging procurement for circular transition to overcome systemic barriers such as knowledge gaps, lack of coordination amongst officials and budget constraints. An overview of the literature studies on this topic led us to examine the organizational factors concerning procurement from two main perspectives- Path dependencies of the procurers and the internal knowledge/competencies.

Organizational silos and path dependencies:

From the interviews with the respondents from Municipality of Almere, it is evident that the drive to implement pilots with circular innovations is not completely unchallenged. While the competition served as a demand-pull measure for circular innovations in Almere, their diffusion is impacted by regime factors such as the existing organizational structures and procurement practices in the municipality.

The respondent M1 communicates that officials are usually apprehensive about implementing pilots with circular products owing to the additional costs and research they entail. The budget allocation and priorities across the municipal departments pose difficulties for coordinating circular projects. M2 also cites that there is a lack of lifecycle thinking in the current norms and procedures amongst the municipal departments (M2, interview,2022). Their perceptions are explained in Table 10.

Table 10: Data triangulation-organizational factors

M2, Interview, 2022	M1, Interview,2022	Literature reference
<i>“...because maybe they (municipality) don't get the time, maybe they don't have the budget because in the beginning things are a little bit more expensive because there is a lot of a lot of R&D involved and R&D is also ways costing money.”</i>	<i>“the vendors should tell how sustainable the product is. We aim to achieve 100% sustainable purchasing by 2030. But even this is difficult since it cost more money and its a new process and new material so there are always challenges. There is always a tension between sustainability and the time and efforts that go into it.”</i>	<i>“Practices are resistant to change, as people tend to perform the same tasks the same way every day, and therefore, these practices are based on habits. This can be a barrier against the implementation of new initiatives, as practices need to be revised” - (Kristensen,</i>

		Mosgaard, & Remmen, 2021)
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They further emphasize that path dependencies existing amongst public officials deter circular pilots' execution since they do not wish to deviate from the usual processes and involve risks. This is compounded with the relatively low ratio of officials sharing circular economic principles in the municipality existing currently-

"..because we are the couple of individual enthusiasts, let's say, and we are 10 and the rest of us are 1500 within Almere.^[17] And they say, well, I have a job"- M2, Interview,2022.

Internal knowledge and competencies:

Due to shortage of data from interviews pertaining to this indicator, this section makes use of secondary data to gather insights regarding the strategies employed by the municipality to equip for developing skills for procurement.

While literature indicates the importance of procurer' skills for dictating functional requirements of a product/process, public organizations possess limited internal capacities owing to the nascent state of circular economy. While this is acknowledged by the sector developer of CE in Almere municipality, the respondent conveys that regional governance and collaborations play an important role in fulfilling these gaps (M2, Interview,2022). In the case of the competition, the government relied on TNO for developing an inventory of waste flows in the city along with consultancy on the possible pathways to tackle this waste flows in a circular manner. The municipality also collaborated with research institutes to set circular goals and principles (Upcycle city invitation to tender, 2016). Likewise, experts were consulted to act as a jury for selecting the winning proposals. This has been facilitated using budget provided by the Province of Flevoland and Almere Urbanization Fund, again highlighting co-operation of regional governance and policies in implementing procurement in municipalities (M1&M2, interview,2022; Municipality of Almere, 2016).

In practice, innovation procurement faces a substantial deal of uncertainty (Edquist et al, 2000, p4. The municipality not only faces constraints in internal capacities pertaining to circular knowledge & skills but also in terms of logistical and human resources to monitor circular implementations-

".... it's always a discussion with colleagues that we do not monitor the circular criteria. Let's say there are houses to be built with 50% bio-based materials. The companies claim that they can implement with 60% but if they implement with 10%, we can't monitor. Someone has to be at the building site all the time, but we don't have the resources. If they deviate, companies will just take a fine since the fine is small for them." – R1, Interview,2022.

The interviews also bring out the limited capacities of municipalities in generating market through circular procurement. In case of Almere, the procurement so far has been limited to pilot demonstrations such as the bike paths, circular bridges, and few other installations since public tenders need to be transparent and cannot be confined to select known 'sustainable' actors.

4.4. Co-financing

The competition offered an opportunity for the winners to negotiate with the municipality about the mutual investment in terms of finance, man hours and networks required for the execution of their project plans. According to the rules, the funds are allocated in the ratio of 1:3 where the winning parties need to possess the capacity to contribute at least three times the funding requested to the municipality (Municipality of Almere,2016).

Investments and Derived benefits:

Adopting a circular model of business or product manufacture is usually met with perceived risks concerning costs and marketability. In such cases, public finance is considered an encouraging factor for manufacturers to attempt innovation (Uson et al,2019). Insufficient funds, risk of investment in circular activities and infrastructure are prevalent barriers that hinder eco-innovation. For the respondent from Group 2, working on circular furniture, public finance gave the required push to experiment with an engineering design that the firm had been apprehensive about bringing to the market owing to the risk of financial failure. The respondent states that a previous attempt to launch a similar circular product was unsuccessful owing to insufficient market demand and the firm's limited power to create market for it. The respondent indicates that the firm ultimately had to roll the product back.

".. it didn't really sell, so we only sold ten of them. I think we did get them back last year, so we did close the loop, but the product was very unsuccessful in the market and there was no demand to the markets."

The initial financial subsidy helped in investing for a mould that costed upwards of 10000 euros. While most of the investment was made by the participating companies NPSP and Velopa, the financial subsidy coupled with the guarantee of public purchase enabled the investment (C1, interview,2022). The firm made an agreement with the municipality to sell them 50 units of benches and to lease the remaining 50 benches with a monthly rent and maintenance if required. The benches will be returned to the firm after their use to close the loop according to the agreement.

For Group 1, the financial push through the competition allowed them to invest in equipment and machinery for washing the rubble (waste) effectively. This was followed by the setting up of further collaborative research and development for optimizing the product and process design as well as for conceptualizing new circular products using the resources. The funds for research are split amongst the municipality and the involved businesses. As, explained in Table 10, Co-financing as a stand-alone instrument would have had limited effects if not accompanied by additional measures such as procurement and with other 'soft' forms of support such as knowledge access, mentoring, raw material access, as evident in this case.

Table 11: Data triangulation- Co-financing (Source: Author, 2022)

M2, Interview,2022	C2, Interview, 2022	C1, Questionnaire,2022
<p><i>we invested in in the In the collective so And and, but we say it's it's always like 50-50, so if we. We find there's 50% and the, let's say the industry should finance also 50%.</i></p> <p>- Municipality respondent 2, interview,2022</p>	<p><i>“Yes. But we really needed Almere as a municipality, to participate. Otherwise, we would not have done it. It would be too risky.”- Respondent Group 2, Interview, 2022.</i></p>	<p><i>And just because of that financial injection. we could do all the innovation on the concrete and buy the machines to break down concrete from the city into six or seven. The new raw materials with which we can make new concrete.</i></p> <p>- C2, questionnaire, 2022</p>
<p>Literature reference:</p> <p><i>Subsidies for research and development are more effective if accompanied by ‘behaviour additionalities’ such as acquiring new connections, competencies, new market opportunities etc.- (Sönnichsen & Clement, 2020)</i></p>	<p><i>“All the molds to make one rib cost like €100,000. I think those are really expensive mold. And it's due to the high pressure in the in the process. Okay. Normally, we would never invest €100,000 for a bench. You can never sell enough to earn your investment back... I think we maybe did the investment, but Almere guaranteed I will buy 100 businesses. So, with this business guys, we had break even.</i></p>	

4.5. Collaborations

Transition management literature suggests that transitions begin with people seeking changes in systems, supported by clear mandate, provisions, space and funding that support experimentation and learning (Loorbach et al., 2015, p53). Achieving a co-creative space for experimentation was one of the qualitative goals of the competition. It is observable from the data collection that the innovations were developed and implemented with collaborations amongst businesses, knowledge partners and the municipality. While collaboration remains a pre-requisite for most innovations, transitions require empowerment of frontrunners through active facilitation, not limited to financial support (Loorbach et al., 2015, p. 61).

Resources for collaboration:

Resources in this context refer to the means available for forming collaborations including financial, logistical etc. From the analysis of the case, two means of collaboration for stakeholders were identified-

1. The Raw materials collective (Grondstoffen Collectif Almere-GCA): A collaborative network formed by businesses and Almere municipality to bring together diverse actors of circular value chains.
2. Conferences, symposiums, and other networking, capacity building events organized by municipality to connect with stakeholders who share same circular goals.

Through the GCA, collaborating companies gain access to physical working space, raw material collection site and mutual knowledge exchange with the municipality holding the facilitating role of identifying actors for circular innovation. This shared platform is a conglomeration of industries, knowledge partners, suppliers and the municipality formed for the purpose of research and innovation using raw material flows of Almere and the surrounding region. This collaboration is funded partially funded by the municipality and the rest by the participating organizations as mentioned in Table 12. In the case of the second winners, the collaboration was through a formal sub-contract, partially enabled by financial subsidy from the municipality (C1, interview,2022). There is a distinction between the two modes identified here. According to F1, the GCA was formed through a bottom-up response to Weerwater lake’s biomass overgrowth that deterred recreation and boating. The companies CIRWINN and Millvision collaborated to create paper out of the biomass for which they approached the municipality. This collaboration was expanded and continued for participating in the Upcycle city competition (Municipality of Almere,2017). This highlights that transition management benefits from governance approach where a shift from normal practices opens space for bottom-up approaches (Loorbach et al, 2015, p62).

Table 12: Viewpoints on resources for collaboration from respondents (Author, 2022)

Manager GCA, questionnaire, 2022.	M1, interview,2022.	C1, Interview, 2022
<p><i>“The aim of the GCA is to set up circular chain projects and to allow the partners within them to work together. Discovering together which added value (positive business case plus sustainability objectives) can be achieved, what is needed in the process and in terms of techniques”</i></p>	<p><i>“We don’t actively facilitate but we do conduct seminars, conferences but it is still the responsibility of the company to find their collaborations”</i></p>	<p><i>we entered the competition, but they were also there in Almere on the day the municipality invited a lot of people, and then presented this design competition and ___ was also there and we already knew So when we were there we said, okay, let's do this together.</i></p>
	<p>M2, Interview, 2022</p>	
	<p><i>“we invested in in the In the collective so...but we say it's it's always like 50-50, so if we. We find there's 50% and the, let's say the industry should finance also 50%. And so, they do all the R&D in hours and we invest for maybe materials or extra”</i></p>	<p>Circulair Terrenbeheer, 2018, p20</p> <p><i>“We need that industrial environment. All kinds of green companies work on the site that can learn from each other. So, there are many practical opportunities. We are all in this as entrepreneurs. That is a different attitude to work than on closed campuses elsewhere in the Netherlands”- Knowledge partner (Group 1)</i></p>

Leadership and facilitation:

Literature suggests that innovation ecosystems can be orchestrated by a single ‘Keystone’ actor who functions as a main provider of collaboration opportunities (Steenros et al,2022). While also encompassing the resources for collaboration, leadership also implies the responsibilities of identifying actors, facilitating networks and interactions. From the interviews with the two

groups and the municipality, it is inferred that the municipality held a facilitating role for the collaborations for circular innovation projects. This was done through the circular hub GCA and through the various presentations, seminars and conferences held for the competition and otherwise. According to the Program Manager of Almere municipality:

“For the first five years, the municipality must initiate the activities. The municipality acts as a project leader to start the circular activities etc...”

Academic references to experimentation in transition management suggest that the collaborative role of local governments in the ‘triple-helix’ model of innovation i.e., including industry, knowledge, and government network, allows removal of barriers to implement empowering policies (Barrie et al, 2017, p32). In this case, the involvement of municipality in the innovation process does include advantages of materializing niche experiments and transferring knowledge. It is observed that municipality takes an active role in disseminating learnings from innovations through municipality-organized seminars, forums, symposiums. This is noted by the author by attending one such symposium and also through secondary research.



Figure 15: Symposium on "Old& New materials" at GCA, attended by the author, 2022.

Though initial data analysis seems to indicate the position of municipality as a facilitator and leader in the collaborative network, this needs to be verified by triangulating with other participants which has not been possible due to limitations in data access.

Shared goals and commitment:

One of the necessities for accelerating a co-creation process is to create a conglomeration of actors who are driven with the same purpose. Developing common strategies and goals is necessary for charting a direction acceptable to all participating parties (Konietzko et al,2020). “Working with waste” and “sustainability” are the frequently mentioned goals and objectives during the data collection¹. For example, in the case of Group 2, the core reason of collaboration is the orientation of both firms in working with plant wastes that are locally produced (C1, Interview,2022). The opportunity provided by the Upcycle city competition helped in executing the plan. In the case of group 1, some key individuals within the network had already collaborated to resolve a previous waste problem in Almere, where they manufactured paper from the local biomass harvested from the lake. This previous collaboration played a role in the further networking during the competition (M1, interview, 2022; F1, questionnaire, 2022).

¹ Due to data shortage for this indicator through interviews, secondary data from websites regarding company profiles and their sustainability goals are gathered and presented in annexures.

Though the individual goals and objectives for the firms in Group 1 were unable to be assessed due to data limitations, the representative of their collaboration platform (GCA) cites that the firms collaborate to form circular chains that enable to execute and launch markets for the circular products that they develop and have circularity as one of their organizational goals (Manager GCA, questionnaire, 2022).

M2 mentions that collaboration is often not a smooth process owing to the tensions and scepticism arise between firms in sharing information between each other.

“And also, because to get to know each other you have to get to trust each other and. Well, with innovation, everybody wants to get you know, they don't want to give too much of their recipe, let's say to the other”

F1 seconds this opinion and states that while shared goals and values help in building a collaborative network, facilitating it difficult since people are not used to working in this manner. However, they also concur that firms do operate without stringent agreements and contracts and operate strongly on shared goals and objectives (F1, Questionnaire,2022; M2, Interview,2022).

4.6. Results and discussion:

Demand-pull instruments such as public procurement have been advocated for aiding innovation diffusion by academics and policy experts alike. Circular tendering & procurement, in the circular innovations in Almere has been found to yield positive effects in creating necessary traction for research and development that not only concerns a new product but also in altering the waste management protocols of a city. The ambition of the tender process extends to business innovations becoming an integral part of how the city deals with waste. While this will understandably take more time to realize and remains to be seen, the tendering process has been successful in presenting new collaborations, generating an experimentation space and novel products towards circular transition. Pre-commercial procurement, in the case of group B seemed to have reduced initial investment risks that are characteristic to most circular innovations. Financing, on the other hand serves as a complementary measure that negates some of the initial financial risks and gaps that the firms encounter.

Procurement processes not only present new challenges in terms of organizational limitations but also present new risks in the form of unjust preferences to select firms and corruption. Though this research does not expand upon the regulations in place to mitigate these risks, it is accounted as a source of tension between municipalities and firms since the municipality has limited powers to procure the latter's innovation products on a regular basis. This dimension has not been explored further due to data limitations.

The research also presents some interesting perspective on the interdependencies between some variables and indicators. While alignment to policy goals is vital for the operationalization of tender process, it is also vital for building the capacities of the municipality and in building resources for collaborations. Hence, the research finds that the alignment of everyday policy actions with the broader transition agenda at tactical levels plays an important role in the former's successful implementation.

Chapter 5: Conclusions

5.1. Results and Findings

This chapter summarizes the key findings of this research and answers the main research questions along with the sub questions. The purpose of this chapter is to connect the findings of the research with the research objective and the academic gaps that it attempts to fulfil. Subsequently, the limitations of this study alongside the recommendations for further research are also presented to allow the broader reflection on how regime shifts of innovations can be targeted by operational level activities.

How did circular tendering & procurement, co-financing, and collaboration in the Upcycle city competition help in creating circular innovations in Almere?

The purpose of the research is to understand how innovations for circular transitions are influenced by policy instruments and collaborative networks that are designed to support them. The research attempts to place the operational level strategies for circular transition within the multi-level framework of transition management with the assumption that the feedbacks from higher levels influence the actions at the operational level and vice versa. For the case of Almere, the research particularly focussed on financial instruments such as co-financing and public procurement, facilitated by the municipality through an innovation tender process. The expectation of the Almere municipality was that the tender process would open an opportunity for the business community to find solutions for local waste flows, for which the municipality could act as both supplier of raw materials and as a buyer. The resulting innovation development and implementation of pilots are characterized by coordinated efforts with municipality and amongst businesses to materialize reconfigurations on both product and process fronts.

The research attempted to analyse if the innovations are influenced by the tender characteristics and implementations as suggested by the literature. Firstly, it is observed that the outcome-based specification that offer flexibility to address the given societal goals were preferred by both municipality and the supplier firms. This finding concurs with the innovation literature standpoint that flexibility in policy tools can have a positive effect on eco-innovations (Kemp & Pontoglio, 2010, p34). While circular tendering and procurement provided the necessary demand pull for business innovations and incentivized circular experimentation, it is observed that it is often impeded by regime factors such as existing organizational tendencies and market practices. In addition to public procurement, the financial subsidies provided by municipality also acted as a supply push for the research on new alternatives. Aside from the 'hard' financial support, the municipality also provided 'soft' financial support through supply of raw materials, access to knowledge networks etc. However, it is visible that the risk of investment remains when not supported by commercializing measures. Though there is positive perception on the financial backing offered by the municipality amongst both groups, there is a disparity in perception of risks with regards to the scope offered by procurement in navigating them. Group B reported complete investment recovery and subsidized R&D through the co-financing and procurement process. Group A, on the other hand, needed to undergo additional tendering and regulatory procedures to implement pilots thereby indicating complexities in procurement according to the innovation type and characteristics.

One of the objectives for these innovations is that they will transform into mainstream practices for handling waste flows. While it is too early to estimate if this will materialize in the forthcoming years, the initial barriers in the form of limited municipal capacities and market

resistance are apparent. In the case of Almere, it is observed that the tactical level agendas had influence on local experiments since municipality's strategies in Almere are embedded in the regional and provincial goals set by MRA and Province of Flevoland respectively. This allowed the operationalization of policy goals in the form of knowledge exchange, financial support, and legislative provisions to build the self-organizing capacity of the municipality. At the same time, the procurement process and the diffusion of innovations are impeded by existing regime practices, organizational silos, especially in budgeting procedures of municipalities. The municipality also possessed limited logistical and human resources to monitor the transition experiments and their implementation quality.

From the analysis, it is found that collaborations within the transition space can aid in navigating some of these resistances to a certain extent. It is a widely accepted opinion that innovations pave way for new coalitions and offer opportunities for new knowledge exchange and creation. The research finds a similar pattern, since the implementation of tender process required the municipality to develop new competencies or source additional support for the same, thereby enabling new coalitions with research organizations, water boards etc. Also, collaborations amongst businesses not only allow resource exchange for innovations but can also help in forming a transition team to disseminate learning and advocate transition objectives. It is also observed that shared commitment and vision amongst collaborating partners builds ownership, thus aiding in dissemination and advocacy of the product/ process amongst wider audience. For eg, in the case of Almere, the diffusion of innovation products by group A is being materialized through a collaboration with a larger construction firm. The strategies of municipalities can not only be using procurement as catalyst for innovation, but also in knowledge sharing and advocacy.

5.2. Conclusions and recommendations:

This research expands upon the 'enabling' role of municipalities by examining the strategies employed at 'operational' level of transition management. The conceptual framework focussing on transition management and policy instruments at operational level, is helpful in identifying the aspects of tactical level that impact the policy instruments and collaborations for operational level innovations. This is especially visible not only in the form of policy goals' coherence but also in their operationalization. The operational level experiments and diffusion of their learnings are highly reliant on the municipality's self-organization capacities that in turn need to be strengthened by tactical and strategic level measures. But the self-organizational capacities are also limited since the municipalities often act at the interface of operational and tactical levels, thereby being subject to resistances on both fronts. But it can be deduced that municipalities can channel bottom-up innovations through initial support, that might gradually manifest into regime shifts. Forming strong coalitions with frontrunners possessing shared commitments and goals, aligning with transition agenda, plays a key role on this front.

While collaborations are inherent characteristics of innovation development and implementations, as indicated by literature, the research also concurs with the widely agreed upon argument that public procurement processes facilitate collaborations. This research, however, refrains from stating that procurement processes organically produce collaborations in a transition management context. Collaborations are intrinsic to any invention. But an innovation challenge such as Upcycle city competition is embedded in a transition agenda with the ambition of creating a collaborative transition team. Identifying the right frontrunners requires careful communication of expectations along with criteria and procedures that enable participation. Therefore, this research opines that public procurement in the context of

transition management needs to be reinforced with sufficient interaction between business communities and municipalities. The research also recognizes initial financial subsidies as a necessary supply push for R&D with necessary reinforcement with other measures involving both 'hard' and 'soft' instruments. 'Innovation partnerships' are another novel way of shared ownerships between municipalities and business communities which could address some of the uncertainties faced in innovation processes.

The framework falls short of explaining the complexities in evaluation and monitoring of circular innovations with respect to their technical aspects. The framework hence cannot be used for explaining the effects of tender specifications, for example, on the quality and circularity levels of innovations. Incorporating this aspect would also require deeper reflection on the monitoring capacities of the municipality and their methods of evaluation. This could be a direction for further research on this topic. Furthermore, examining the interactions within and between the hierarchical levels requires greater emphasis on the mutual trust, perception of goals and organizational limitations. An explanatory study of empirical cases can offer further evidence on the how these factors affect niche level experiments and how organizations perceive these challenges.

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Appendix 1: Interview guide

The Table below presents the guiding questions used in the interview process.

Circular tendering and procurement
Sub-variable: Tender quality
Indicator: Nature of specifications
What were the specifications you received for developing your product?
Did you find the specifications flexible or stringent?
Why did you choose to create this product?
Indicator: Alignment to policy goals
What motivated you as an organization to participate?
Have you created circular products before?
How is this competition related to the Almere goals? (to municipality)
What is the municipality's expectations from this competition?
Sub-variable: Organizational factors
Indicator: Organizational factors and path dependencies
Do you face any challenges as a municipality in conducting procurement processes?
What are the kind of limitations you face while conducting a procurement process?
How do you overcome these limitations?
Indicator: Internal knowledge and competencies
What measures do you undertake to improve your internal knowledge for circular economy and procurement?
What resources do you have to develop your competencies?
What skills and knowledge were important during the competition?
Variable: Co-financing
Indicator: Type of investment and derived benefits
To what extent did the co-financing help your cause?
Did you have any financial barriers for creating circular products?
How did the financing help in materializing your proposal?

Collaboration
Indicator: Shared goals and commitment
What was your objective for participation?
How is trust and transparency ensured in the collaboration?
Do you make use of stringent agreements for this purpose?
How do you identify who to collaborate with?
Indicator: Resources for collaboration
What are the resources available for you to enable a collaboration process?
What are your means to collaborate? -Online/ physical places etc.
What resources do you contribute in collaboration?
Indicator: Leadership
What is your role in the collaboration network?
Who leads the research and development process?
Circular innovation
Indicator: Characteristics of innovation
What makes this product circular?
What is the creation process?
Indicator: Level of diffusion
Is the product for commercial use now?
What is the quantity/ units that you have sold until now?
Who are your main customers?

Appendix 2: Profiles of companies involved in UCC

Company name	Involvement in UCC	Profile
CIRWINN	Manufacturing site for green concrete and site of GCA	Former recycling company, currently operating as a circular concrete batching site. Deals with construction, plastic and household waste
Reimert Group	Shareholder of CIRWINN, contractors for implementation of circular pilots	Almere based construction company with CIRWINN as a subsidiary
Theo Pouw	Supplier of equipment and infrastructure for recycling concrete	Business revolving around manufacturing secondary raw materials. Working towards building material re-usability
Millvision	Knowledge partner and expert in processing biomass	Works for creating bio-based products from regional flows
Velopa	Design of circular furniture for Floriade	Has a CSR agenda with products particularly oriented towards public procurement guidelines – Durability as a sustainability agenda.
NPSP	Research and development of biocomposite for circular furniture	Specialized in creating natural-fibre reinforced plastics.

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