

Environmental Sustainability in Urban Infill projects

A study of the influence of development process characteristics on the implementation of Environmental Sustainability principles in redevelopment projects of Beurskwartier & Lombokplein and Merwedekanaalzone



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Environmental Sustainability in urban infill Projects: A study of the influence of development process characteristics on the implementation of environmental sustainability principles in redevelopment projects of Beurkwartier & Lombokplein and Merwedekanaalzone

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Preface

Before you lies my master thesis, the endpoint of the master Spatial Planning and herewith the summum of the life as student. The process of writing a master thesis can be characterized as riding the Tour de France as cyclists. It's the most satisfying and challenging aspect of the master. It requires dedication and focus. As the famous Joop Zoetemelk states: "Paris is far away". During the process, flat stages, with smooth progress are alternated with mountainous stages, with slow progress and obstacles to overcome. But when ultimately, 'Paris is reached', the feeling of pride dominates.

I like to thank Peter Pelzer, my supervisor for his time and feedback which really helps me writing this thesis. He steered me in the right direction, and gave helpful insights to structure this thesis. Also i want to thank all interviewees, who gave really interesting insights in the development process of urban infill projects and Marcel Janssen, for useful information about the municipal approach on such projects.

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Summary

The expected population growth in Dutch cities, especially in Utrecht challenges the municipalities to provide enough housing opportunities. Environmental Sustainability becomes more important in spatial projects. But as ambiguous concept, organizations pose its own vision and therefore the implementation of Environmental Sustainability in urban infill projects is influenced by different aspects. Therefore this study answers the following question: ***How do development process characteristics influence the implementation of principles of Environmental Sustainability in the urban infill projects Beurskwartier & Lombokplein and Merwedekanaalzone?***

The theory of stakeholder salience (Mitchell, Agle & Wood, 1997) implies that actors have different kind of influence on the implementation of environmental sustainability. This concept consists of four principles: circular economy, sustainable energy, climate adaptation and sustainable mobility. The implementation of these principles are hindered by technical, financial, cultural and regulatory barriers, all having different influence on the implementation of Environmental Sustainability.

This study consists of a case study on Utrecht. Insights can be applied to other cases, and therefore is useful to improve scientific and practical knowledge. A qualitative approach is used, as the aim is understanding how aspects, like stakeholder salience and perceptions influence the implementation of Environmental Sustainability. The document analysis and qualitative interviews capture more in-depth data, analysed through open-coding to capture this in a more comprehensive way.

The study shows that stakeholder salience is the starting point for developments. Its decisive for which organization is relevant in the process and how these organizations influences the implementation. Power is considered as most influencing aspect, while legitimacy and urgency are related to the kind of power organizations have. In Beurskwartier & Lombokplein the primacy is on the integration of municipal visions in tenders, and the elaboration by private developers, while in Merwedekanaalzone it's the outcome of collaboration between the private developers and municipality. The Omgevingsvisies determines which aspects of the principles of Environmental Sustainability are relevant, and which ambitions have to be achieved by the construction. So it indicates how this concept is implemented in both areas. Circular economy is focused on the reuse of materials and disassembly of flexible buildings. Sustainable Energy consists of limiting energy consumption, which is provided by local sustainable energy sources, like solar panels and geothermal energy. Climate adaptation mitigate the effects of heating stress and peak rains by providing sufficient green infrastructure at building and in public space and enough water retention capacity. Sustainable mobility is focused on limiting individual car use by restricted car infrastructure and emphasizes on improving other sustainable transport nodes as public transport and slow traffic. The circular economy is perceived as recent concept causing limited options, which are more expensive, and not expected by municipalities and customers, who are not familiar. Sustainable energy already is incorporated in projects, because of regulations. Spatial characteristics limits the possible options, while the lack of consumer commitment causes that limited investments can be made to achieve the high ambitions of the municipalities. Climate adaptation is sometimes limited by project boundaries and the limited commitment of municipalities and consumers to provide opportunities constraints investments. Sustainable Mobility is favoured when spatial characteristics allow citizens to take alternatives. This study recommend a integral debate on how to tackle the interrelated barriers comprehensively, and collaboration between market, municipalities and knowledge institutes to improve the implementation of Environmental Sustainability,

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1. Introduction

In the next decades, Dutch cities will face a large population growth. Prognoses suggest that in 2030 Amsterdam consists of almost 1 million citizens, Rotterdam will have around 680.000 inhabitants, The Hague has grown to 635.000 residents and Utrecht has a population of 450.000 people (Gemeente Amsterdam, 2019; Gemeente Rotterdam; 2017; Gemeente Den Haag, 2017, Gemeente Utrecht, 2017). Especially the municipality of Utrecht is growing fast. In 2017, it had a population of 350.000 people, while in 2025 the line of 400.000 inhabitants will be passed (Gemeente Utrecht, 2017; NRC, 2017). The population growth will cause a huge challenge in providing sufficient housing opportunities in the next decades in their 2016 Spatial Strategic Vision, the municipality adopted 'urban infill' as key strategy to deal with the population growth. It stated that the increasing number of citizens has to be accommodated with projects within the built environment. Two large-scale locations are determined: Beurskwartier & Lombokplein and Merwedekanaalzone, industrial sites that will be redeveloped in high-urban neighbourhoods (Gemeente Utrecht, 2016).

In Dutch Spatial Planning, much emphasis is on the integration of sustainability in new projects. Since the Brundtland Report in 1989, an increased notion of this concept has emerged. In 2010, the VROM-Raad, an independent advisory committee already argued that sustainability is a central starting point for each spatial project (VROM-Raad, 2010). The Dutch central government created in 2011 a guide for sustainable spatial planning (Rijksoverheid, 2011). With the new "Omgevingswet", there is more focus on the environmental aspects of spatial planning. This has to be integrally approached in new projects. This implies that environmental sustainability will become a core aspect in the urban infill projects in Utrecht. Despite the growing importance of this concept, still much ambiguity exists on what should be understood as sustainability and which environmental aspects could be attached. As Robinson (2004) argues: "Sustainability can literally mean everything to everyone", no common understanding of this concept is yet created. Redevelopment projects, like Beurskwartier & Lombokplein and Merwedekanaalzone consist of multiple involved actors, such as the municipality of Utrecht and private developers. Those organizations have a particular vision on how environmental sustainability and related aspects. This vision appears in the governance process of redeveloping such areas. The different visions complicate the implementation of this concept in concrete spatial projects.

1.1 Knowledge Gap

Currently Environmental Sustainability is considered as fuzzy theoretical concept. There is not a common accepted agreement on a definition, conceptualization or characteristics, Most academic literature related to environmental sustainability focuses on particular 'sustainable' alternatives for current daily practices, such as circularity (opposing linear economic system), sustainable energy (opposing fossil fuels), climate adaption (solution for dealing with climate change), and sustainable mobility (opposing traffic congestion, and related negative causes). For each alternative, multiple scholars describe characteristics and benefits for the environment. However, less literature purely focuses on the implementation in planning practices. Only a limited amount of scholars have elaborated on which barriers private developers perceive, that could hinder the implementation, by using Delphi studies, surveys or qualitative interviewing. So there is limited knowledge about how these alternatives can be implemented in spatial projects. Because of this, no general understanding exist of how the concept of Environmental Sustainability can be integrated in new spatial developments.

1.2 Problem Definition.

The current conceptualization of Environmental Sustainability remains quite theoretical, with limited practical implications. As spatial planning is foremost a profession with practical approach, it's difficult to implement a rather theoretical concept as Environmental Sustainability in spatial projects, such as Beurskwartier & Lombokplein and Merwedekanaalzone. Without a general understanding of how Environmental Sustainability can be implemented, it's difficult to improve the way it's currently is. Because of this, limited progress can be made in integrating principles of Environmental Sustainability in the Dutch spatial planning profession.

1.3 Research Objective

This study has the aim to provide an understanding how principles of Environmental Sustainability can be implemented in redevelopment projects, like Beurskwartier & Lombokplein and Merwedekanaalzone. It provides a broader understanding of how the theoretical concept of Environmental Sustainability can be incorporated in Dutch Spatial Planning, and which aspects need to be improved.

1.4 Central Research Question

“How do development process characteristics influence the implementation of principles of Environmental Sustainability in the urban infill projects Beurskwartier & Lombokplein and Merwedekanaalzone?”

Sub-questions

1. How does stakeholder salience in the development process influence the implementation of Environmental Sustainability in urban infill projects
2. How does the integration of Environmental Sustainability in the Omgevingsvisies structure its implementation in Urban Infill projects?
3. How do perceptions of private developers on environmental Sustainability influence the implementation in urban infill projects

1.5 Scientific Relevance

In urban studies like spatial planning, most literature on Environmental Sustainability focuses on the success of particular measures in cities. The literature therefore is fragmented and focused on particular aspects. This study uses a different approach by covering four main principles, consisting of multiple aspects that are relevant in the built environments. Therefore this study provides a more comprehensive way of studying Environmental Sustainability in spatial planning,

As Environmental Sustainability is barely linked with redevelopment projects, this study focuses on a rather underdeveloped topic. By studying the implementation, before the actual realization will happen, instead of the success rate afterwards, it focuses on a different phase of the redevelopment. Therefore this study is rather unique and contributes to the exploration of underdeveloped themes in literature. The objective of this study is to provide insights on the way Environmental Sustainability can be implemented in spatial projects. It provides insights in how private developers in the Netherlands perceive circular economy, sustainable energy, climate adaptation and sustainable mobility. It contributes to the robustness of how these principles are conceptualized within literature, adding more robustness to the literature, with data from Dutch spatial planning. It explores the barriers that private developers perceive in the implementation, which provides more data for a comprehensive, common understanding of how barriers hinders the implementation.

1.6 Societal Relevance

The objective of this study is to provide insights on how environmental sustainability can be implemented in redevelopment projects. Environmental Sustainability is a key theme for the next decade in Dutch Spatial Planning, and municipal officers have to incorporate it within spatial policies. As Utrecht already adopted the new spatial policy forms, obligatory when the new Environmental Law comes into effect, this study gives practitioners of other municipality the opportunity to get insights in the way they should deal with those issues in their cases, and improve their policy-making. The study shows how Dutch private developers perceive principles of Environmental Sustainability. It provides insights in how they envision circular economy, sustainable energy, climate adaptation and sustainable mobility. Private developers could use this study to learn from the insights of other individual developers and herewith the knowledge and understanding of these concepts become more common. This helps to improve how these principles are perceived and integrated in their development projects.

The study also provides insights in which technical, financial, cultural and regulatory barriers are perceived by private developers. Therefore it becomes clear which aspects hinders the practical implementation in projects. Private developers, municipalities and suppliers can use these insights to dissolve these barriers and improve the implementation of Environmental Sustainability in the Dutch built environment.

2. Theoretical Framework

2.1 Urban Infill

In scientific literature, an ongoing debate exists related to which type of urban development is appropriate for dealing with the expansion of urban populations: urban sprawl vs. the compact city (Burton, 2000). The compact city counteracts negative effects that expansion of built environments causes (Jenks et al, 1996). It reduces sprawl, preserve green space and will upgrade older areas, as well it creates neighbourhoods with less car-dependency (Wheeler, 2001). However, it's not clear if the concept city is a sustainable urban form and has the positive effects that scholars claimed (Williams, 2000; Neuman 2005). Although no consensus is achieved, the concept of compact cities is adopted by Smart Growth Movement and New Urbanism movement. The first movement mentions the advantages of using infrastructure that already exists in the built environment. The New Urbanism Movement envisions dense neighbourhoods providing a high quality of life (McConnell & Wiley, 2010). The compact city is aligned with the strategy of urban infill: redeveloping areas within the current built environment, instead of further expansion. However, multiple obstacles exist that hinders the achievement of the compact city. Land speculation and landowner resistance increases the costs of acquisitions, and hinders land assembling for reasonable prices. This lowered the investment return (Farris, 2001). Also residents' resistance is a concern for private developers and municipalities, as this blockade new development. Another concern is derived from the prisoners' dilemma theory. This social theory, if applied to urban infill, argues that private developers rely on the activities of neighbouring property, as those affects their own land. So the return on investments will increase as urban infill is jointly implemented and simultaneously organized (Farris, 2001).

Brownfields and Greyfields

Urban infill strategies are related to two kinds of areas: "brownfields" and "greyfields". These sites are located within the built environment and have different development contexts and other spatial characteristics. Brownfields are 'underused and potentially contaminated'. (Da Sousa, 2008). Most European countries use the CAPERNET definition: "sites having been affected by former uses and surrounding land, having real or perceived contamination problems" (Oliver et al, 2005). Brownfields are former industrial sites, mostly owned by single organizations (Newton et al, 2012). Greyfields traditionally refers to outdated retail malls, located in inner-city suburban areas (Sobel, 20002). Greyfields are sites that currently are built-up, having low economic value, relative to their potential. These sites are usually located between city centre and developed suburbs (Newton, et al, 2012). No strict redevelopment is needed, but actors are willing to increase the economic value (Newton, 2010)

2.2 Stakeholder Theory

The classic, most used definition of stakeholders is "any group or individual who can affect or is affected by the achievement of objectives" (Freeman, 1984:46). This statement is considered as an early attempt to conceptualize all organizations (Friedman & Miles, 2006). After this starting point, many scholars have adjusted the stakeholder-concept. Stakeholders are organizations which have interests in projects, influence activities and decision-making and are crucial for the success of projects (Starik, 1994, Gary Owens & Adams, 1996, Freeman, 2004, Eden & Ackermann, 1998, Friedman & Miles, 2006). Not only input is important, stakeholders will also have benefits from the outcome of decisions (Phillips et al, 2003). Stakeholder possesses claims on both attention and resources (Bryson, 1995; Agle et al 1999). The claims have to be legitimate, through the exchange of

critical resources (Hill & Jones, 1992). Therefore this legitimacy depends on power (Kivits, 2013). So 'stakeholders' is a fluid term, which is context-dependent with interrelated aspects, as power and legitimate claims.

2.3 Stakeholder Saliency

Shifting from definitions, stakeholder analysis has been developed by several authors in the last decades. Since the 1994 Toronto Conference of Stakeholder Theory, stakeholder attributes have become a central aspect of the analysis (Mitchell, Agle, Chrisman & Spence, 2011). Mitchell, Agle & Wood (1997) poses the 'theory of stakeholder saliency', which is based on stakeholder attributes. It's defined as the degree in which stakeholders have potential to influence decisions. It clarifies the extent in which organizations have attention from decision-makers (Maigness, 2008). Aaltonen et al (2008) argues stakeholder saliency is crucial for them to deal with organizations in their practices. This theory has become predominant in stakeholder analysis and considered as substantial contribution to the development of stakeholder research and identification (Kivits, 2013; Neville, Bell & Withwell, 2011). The model of Mitchell, Agle & Wood (1997) identifies three stakeholder attributes that construct the stakeholder saliency: power, urgency and legitimacy. The model is considered as dynamic, as those attributes are not stable, but can be transitory. Organizations can gain and lose attributes (Friedman & Miles, 2006). Another feature of the attributes is that they're social constructs, and therefore not objective (Agle et al, 1999). Although its importance and acceptance much criticism exists. The exhaustiveness of only three attributes is doubted (Nevill, Bell & Withwell, 2011). Driscoll & Starik (2004) remarks that also proximity, as in engagement of organizations with projects is relevant. Furthermore, the approach of stakeholder attributes is doubtful. The binary conceptualization neglects the relative presence of the attribute (Maindress, Alves & Raposa, 2012) which is expressed by Parent & Deephouse (2007) who envision differences in the relative contribution of particular kinds of power in the consideration of being stakeholder by decision-makers.

Power

Power is the (potential) ability of stakeholders to impose their will on projects, through coercive, utilitarian or normative means (Etzioni, 1964). It's interest-driven: achieving organization's objectives and therefore relative: who is regarded as powerful and powerless (Kivits, 2013). Therefore the power to negotiate is necessary in projects (Friendman & Miles, 2006). The attribute of power is not stable, but vary overtime, and therefore being powerful is not fixed: it can be gained as lost (Parent & Deephouse, 2007; Maigness, 2007; Friedman & Miles, 2006). Kivits (2013) identifies three categories of power: resources, formal and social power. Stakeholders rely on resources to achieve their interests (Mendelow, 1991; Eden & Ackermann, 1998). Formal power is the ability to influence policies, laws and regulations (Uhl-Bien, Marion & McKelvey, 2007; Mayer, Edelenbos & Monnikhof, 2005) Social power is the ability to organize and mobilize forces through community and media to achieve their objectives (Jonker & Foster, 2002). Although not stable or fixed, power is the most necessary attribute for organizations to be recognized as stakeholders in practice (Parent & Deephouse, 2007).

Urgency

Mitchell, Agle & Wood regards urgency as two dimensional: claims are time sensitive and critical. Jones (1993) defines those dimensions as claims' acceptance by and claims' importance for decision-

makers. They constantly balance the claims of particular stakeholders with each other (Bermann et al, 1999). Urgency is necessary for stakeholders, as then organizations will spend resources (time and finances) to projects (Jonker & Foster, 2002). However, urgency rely on the other attributes to gain attention from decision-makers (Friedman & Miles, 2006). Neville, Bell & Withwell (2011) argues that possessing only urgency is not sufficient to be regarded as stakeholder. Parent & Deephouse (2007) agrees, stating it's the less relevant attribute for an organization.

Legitimacy

Suchman (1995) defines legitimacy as assumption that actions of an organization are desirable, proper and appropriate, within a system of norms, values and beliefs. It's socially constructed. The variability of legitimacy defines the access to power, resources and rights to act within processes. Therefore it contributes to the likeness of being considered as salient by other organizations (Mitchell, Agle & Wood, 1997). Because of this the attribute is vague, problematic and multidimensional (Neville, Bell & Withwell, 2011). Also legitimacy is time-dependent: it's not fixed (Magness, 2007). Kivits (2013) distinguishes four main types of this attribute: capital investment, property rights, law and externalities.

2.4 Definition Sustainability

The impact of climate change and the effect of rapid urbanization and our modern lifestyles pushed sustainability into the foreground of policy making (Yigitcanlar & Teriman, 2015). It became a dominant policy paradigm since the end of the twentieth century and a major part of what policies have to achieve or result in. (Finco & Nijkamp, 2001; Kuhlmann & Farrington, 2010). The emergence of sustainability started with the Brundtland Report in 1987 (Castro, 2004). This report defines it as 'the development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987). The ambiguity of this definition causes nowadays a large scope of approaches concerning what sustainability really means of and what characteristics can be attached (Kates, Parris & Leiserowitz, 2005). Sustainability is a buzzword: it has different definitions and meanings, which are fluid and context-dependent (Chan & Lee, 2009; Berke & Conroy, 2000; Evans & Jones, 2008). Therefore sustainability is by nature complex, normative, subjective and ambiguous. It's not a single, well-defined concept, but has various positions and perspectives (Van Zeijl-Rozema et al, 2008). Because of this, still no general consensus exists of what is regarded as sustainability (Connely, 2007). Without this consensus, also debates exist about which meaning it has in practice and how it could be implemented (Gibson, 2001). Sustainability can mean different things to different organization (Robinson, 2004). The interpretation of organizations emphasizes their interests and directs the focus within processes (Evans & Jones, 2008; Bossel, 1999). Therefore different responses to sustainability emerge in practice, which leads to a heavily contested concept in practices and different perspectives on the implementation in projects (Hopwood, Mellor & O'Brien, 2005; Jacobs, 1995). This contestation is not constraining as the malleability of this concept indicates it fits in different contexts and situations, and multiple interpretations can be sufficient to achieve targets in projects (Kates, Parris & Leiserowitz, 2004; Kemp, Parto & Gibson, 2005).

Characteristics of Sustainability

The concept of sustainability is considered as multi-dimensional (Bossel, 1999) it's about the growing concerns of both environmental and social-economic issues (Hopwood, Mellor & O'Brien, 2004).

Those issues are blended in an integrative way (Davidson, 2010; Evans & Jones, 2008). It's related to the environment, society and economy. Hempel (2009) translates this to 'sustainability aims to become green, fair and profitable in an integrative way. It's about economic growth, such as welfare and efficiency, must not lead to ecological degradation, and support the equity, diversity and liveability of the planet (Kemp, Barto & Gibson, 2005; Khomeily & Srinivasan, (2015). The aspects are equally important within the concept and multiple supportive benefits for each dimension is required to achieve sustainability (Book, Eskilon & Kahn, 2010; Kemp, Parto & Gibson, 2005).

Sustainability is visualized as pillar structure: it's an overarching concept supported by economy, society and environment. Each aspect has its own distinctive kind of values, but they are interdependent, and occur at different scales: local, regional, national and global (Hansmann, Mieg & Frischknecht, 2012; Kates, Parris & Leiserowitz, 2004). The visualization on intersected circles, including environment, society and economy covers this interrelationship between the three aspects of sustainability. The pillar approach however, doesn't visualize conflicts within an aspect of sustainability, and the overlap and inter-relationships between the three dimensions. (Hansmann, Mieg & Frischknecht, 2012; Kemp, Parto & Gibson, 2004). As sustainability is intrinsically normative and ambiguous, multiple inherent conflicts emerge within the implementation of sustainability (Loorbach & Rotmans, 2006). Conflicting interests because of different agenda's leads to inescapable objectives for environmental, economic and social issues (Owen, 1994; Parris & Kates, 2003). Godschalk (2004) concretizes the conflicting objectives: economic development, ecological preservation and intergenerational equity, and resolving is essential for integrating and balancing sustainability in projects. However the integration of the three dimensions of sustainability not often happens in practice (Couch & Denneman, 2010) and Campbell (1996) argues that it's impossible because the conflicts will always exist and block the integration of the three objectives of sustainability.

2.5 Environmental Sustainability

Environmental Sustainability is a concept with different approaches and definitions. Morelli (2011) emphasizes the environmental production, reusing and recycling of goods. Goodland (1995) notes similar aspects: the input rule and output rule: increase use of renewable resources, deplete the use on non-renewable resources and limit the waste produced by projects. It indicates that for the built environment it implies: buildings are constructed with reusing existing materials, recycled elements and materials from renewable sources with limited environmental impact. Energy generation is from renewable energy sources and limits the environmental impact of energy consumption. The public space is adapting to limiting the causes of climate change, and mobility infrastructure encourages sustainable nodes of transport, which have limited impact on the environment. This implies four principles of Environmental Sustainability: The circular economy, Sustainable energy, climate adaptation and Sustainable Mobility. These principles determine the extent in which environmental sustainability is achieved for the built environment.

2.5.1 Circular Economy

The current linear produce-use and dump model of economic goods is considered as unsustainable. The shrinking natural ecosystem in size and volume, expanding deserts, and sea level rise, as well growing population and consumption, with growing livestock and cattle volumes and depleted biodiversity indicates that the current economic model conflicts with the idea of sustainability: the present generation should not disturb the ability of future generations to meet their needs The

circular model provides an alternative economic approach, based on the idea of material cycles. It's not only about recycling products, but it emphasizes a larger scope of reuse, remanufacturing, refurbishment, repair and upgrading materials and products (Korhonen, Honkasalo, Sepälä, 2018). The production process of building materials effects the environment, and is a major issue in achieving environmental sustainability (Sodiq et al, 2019). Circular economies don't lead to resource depletion, and herewith, the economic development can happen without growing pressure on the environment (Pomponi & Moncaster, 2016). The concept has different meanings and associations (Murray et al, 2015), as Kircherr et al (2017) states: 114 specific definitions exist. Most scholars refer only to economic, social and ecological aspects, but the role of material, behavior and policy is missing (Pomponi & Moncaster 2016). These aspects are highlighted by other scholars. The reuse and recycling as substitutes for raw materials is an essential aspect (Sauve et al, 2016), only societal and political challenges is a simplistic viewpoint (Gregson et al, 2015), but are necessary for implementation (Naustdalslid, 2014). Aesthetics and attractiveness, aligned with providing education will encourage consumers to adopt the principles of circular economy in their behavior and decisions (Pomponi & Moncaster, 2016; Webster 2013). Also governments are important in implementing circular economy: they are facilitators to overcome limitations and barriers, with taxes and regulations (Genovese et al, 2017; Esposito, 2015). This could with three kinds of policies: encouraging reuse, repair and remanufacturing of products, rearrange public contracts with a focus on circularity and strengthen the recycling market, with harmonized quality standards for those products (Milios, 2018).

Circular economy in the built environment

The built environment as sector has the large volume of material flows within our current economy (Glass, Greenfield & Longhurst, 2017). Because of this, this sector puts the most pressure on natural resources. The adoption of circular economy in new built environments is pivotal for achieving sustainable development (Pomponi & Moncaster, 2016). In academics, the built environment is approached as three different levels: macro, meso and micro. At macro-level, sustainability is studied with concepts as eco-cities. The micro-level studies focus on the material dimension of built environments, such as resources (Pomponi & Moncaster, 2016). There is less focus on the meso-level: the building as entity. Brand (1994) explains that a building consists of five layers: site, structure, skin, space plan and stuff, each with different requirements and life-spans. So this indicates that the circularity of a building is multi-layered.

Barriers of implementing circular economy

Four categories of barriers hinder the implementation of the circular economy in the built environment: technical, financial, cultural and regulatory barriers. The lack of knowledge and little collaboration both within businesses and between organizations in the supply chain challenging the integration of circular economy aspects (Hart et al, 2019; Adams et al, 2017). It further is constraint by the lack of regulations and incentives from the governments. Financial barriers are multifaceted: the focus on short-term returns, high investment costs and limited space for proper business cases limits the integration of circular economy (Hart et al, 2019). The business case, with considerations about costs and profits is the most important enabler for circular economy (Adams et al, 2017).

2.5.2 Sustainable Energy

Buildings are an important factor in the total energy consumption. Energy is used for multiple purposes: cooling, heating and air condition. This indicates that buildings as such, are important contributors to CO₂-, NO- and CFC-emissions. Those emissions have negative impacts on the environment. Therefore, in the late 1990s, awareness arose to reduce energy consumption and decrease the depletion on world energy resources (Omer, 2007). Therefore energy is considered as a main factor within the strive for sustainable development (Dincer, 2000). Two approaches leads to the limitation of environmental impact caused by energy consumption: an economical design can limit and decrease the use of energy for heating, lighting and cooling. Using opportunities for natural ventilation will reduce the energy needed for air conditioning. Second, dissolving the depletion of world energy resources, stating only renewable energy sources are completely sustainable (Omar, 2007).

Barriers of implementing sustainable energy

Painuly (2001) argues that several types of barriers hinder achieving the potential of renewable energy systems. Economic and financial, technical, institutional and regulatory, and knowledge & behavior issues constraints the implementation of such systems. The first category of barriers includes the large payback period, high capital investments and limited access to capital because of the current mentality of short economic thinking. The existence of failures during the development of energy generation facilities, affects the willingness to invest in this measures (Painuly, 2001; Sheriff, 2015; Allen, Hammond & MacManus, 2008). Technical barriers consist of the lack of standards, reliability on existing non-renewable sources, the lack of grind integration and the quality of buildings. This causes limited available successful cases (Painuly, 2001; Sheriff, 2015; Allen, Hammond & MacManus, 2008). The social acceptance is necessary, and the current public attitude and lack of knowledge and understanding hinders the implementation (Sheriff, 2015). As buildings don't use energy, but people, the role of professionals to educate people and providing common knowledge on energy consumption is necessary (Janda, 2011). Also the lack of municipal leadership, policy, such as a long term framework and short-comings of the current planning systems, as such technologies hasn't been adopted by governments (Sheriff, 2015; Allen, Hammond & MacManus, 2008). However, most barriers are constructed through perceptions, as there is little knowledge and evidence (Balcombe, Rigby & Azapagic, 2013). Watson (2004) argues that the removal of technical, economic and regulatory barriers is a necessary condition, but is not sufficient to encourage citizens to make investments and adopt sustainable energy generation.

2.5.3 Climate Adaptation

In the next decades, climate change influences the urban landscape. Current urban areas are warmer, retain less water, and emit greenhouse gas emissions and have less biodiversity, which made them vulnerable to the impacts of climate change (Withford et al, 2001). Higher intensity and frequency of precipitation causes an increased flood risk in cities, while as cities becoming urban heat islands, the demand for summer cooling will emerge (Mees & Driessen, 2011; Roberts, 2008). Therefore extreme events as flooding and heat waves appear more often, causing damage to the buildings and liveability of cities. Mees & Driessen (2011) concretizes this argument: temperature can rise four degrees Celsius, due to the Urban Heat Island effect. Built Environments are more vulnerable to warmth than natural surfaces. The role of green infrastructure in both public space and

building design and recovering the lost green space in built environments will be necessary to adapt to climate change effects (Van Woert et al, 2004; Lennon, Scott & O'Neill, 2014)

Green Buildings

Beshir & Cuse (2018) points out that a green building lay-out is considered to be an appropriate, sustainable solution for urban-heat islands. It has multiple side-effects: improving to indoor and outdoor environments, contributing to the health of citizens, and it raises the price of real estate. As van Woert et al (2004) suggests, green surfaces mitigate peak rains runoffs. Green roofs and facades are the most used forms (Perez, Coma, Martorelli & Cabeza, 2014). As roofs account for nearly a quarter of overall urban surface areas, it has a great potential to contribute both to the performance of the building and its surroundings. A green covered building will conserve energy, improve living conditions inside buildings, reduce the waste and limits use of resources (Ahn, et al, 2013). It also reduce greenhouse gas emissions, air pollutions and urban heat island effects, as the vegetation limits energy use, filter the air, and will cool the surroundings. Vertical greenery systems consist of green walls and facades. Green walls have similar environmental benefits (Berardi, 2014). It reduces temperature, and provides shading and cooling (Sheweka & Mohamed, 2012). Combining those measures will achieve the best results for climate adaptation (Alexandri & Jones, 2007).

Green public space

Tzoulas et al (2007) states that green infrastructures consist of all natural, semi-natural and artificial networks of multifunctional ecological systems in and around urban areas. It's the environmental asset of an area, including stand-alone elements and planned, constructed networks of high-quality green space and other features (Dover, 2015). It reduces rainwater run-offs, mitigate temperature rise, and reduces greenhouse gas emissions and energy demand for buildings (Bowler et al, 2010). Also it offers additional benefits, such as increased property value, reduction of noise and air pollution and health benefits. Concrete it implies the increase the attractiveness of property and herewith increases the price and rentability. Green infrastructure also absorbs several organic chemicals and improves physical and mental health, by encouraging cycling and walking, as more relaxed ways of transport and helps distressing and socialization (Dover, 2015).

Barriers of implementing green surfaces

Williams, Raynor & Rayner (2010) mentions multiple barriers to implement green roofs: a lack of standards, high costs, the lack of implemented examples, and a lack of reliable studies emphasizing the economic and ecological benefits of green roofs. The barriers cause problems in all phases of the development: plan & design, construction and management (Zhang, Platten & Shen, 2011). The limited space in urban environments and without extensive knowledge of practical cases limits the possibility of integrating green infrastructure (Mees & Driessen, 2011). Financial barriers are caused by high implementation costs and long pay-back time of investments, maintenance costs aligned with risk and failure constraints clients to prefer such measures (Dover, 2015; Ahn et al, 2013; Hendricks and Calkins, 2006). The lack of knowledge and skills of contractors causes resistance on implementing green infrastructure (Ahn et al, 2013, Hendricks and Calkins, 2006; Zhang, Platten & Shen, 2011). Also the lack of planning regulation and municipal incentives constraint the adoption of green roofs (Dover, 2015).

2.5.4 Sustainable Mobility

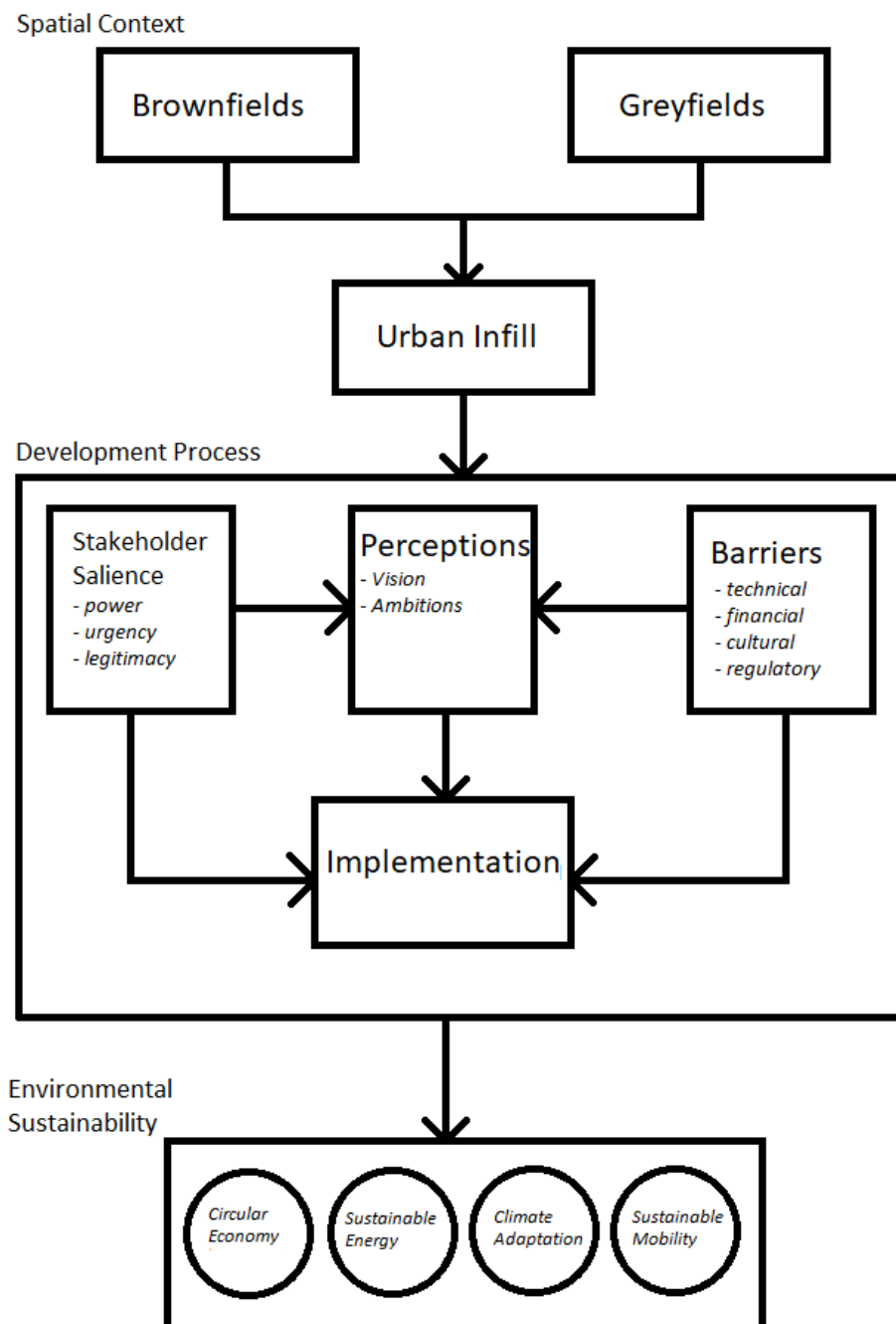
Banister (2008) argues that transportation is a large source of environmental impacts. Issues as air quality, energy use and waste production are main consequences of current transport patterns. It suffers from congestion and pollution, and is a major energy consumer, and herewith contributor of global warming (Kemp & Rotmans, 2004). However, not yet is a political or scientific agreement on a common definition of sustainable mobility, which tackles these consequences (Holden, Linnerud & Banister, 2013). Therefore it's project-dependent, relating to local problems and issues. Sustainable Mobility can be defined in two ways: a narrow definition, which includes the alternative fueled vehicles, with bio-fuel, hydrogen and electricity, and a broad definition, incorporating land-use planning, consisting of service allocation and proximity of activities (Kayal, Singh & Kumar (2014). Three approaches leads to more sustainable transport: efficiency, alteration and reduction. Concrete it implies: efficient, different and less traveling (Holden, Linnerud & Banister, 2013). This can be achieved with improving the attractiveness, giving priority to alternative mobility and reduce the need of cars Hrelja (2019). This implicates the focus on parking control, investments in public transport, and prioritizing walking and cycling reduce the use of single-occupancy cars. (Banister, 2011)

Barriers of implementing sustainable mobility

Nowadays, mobility consists of car dependency and two kinds of barriers are noticed by scholars. Litman (2006) suggests that local policies are emphasized and focused on car mobility. Land-use and infrastructure facilitates individual care-use. So he argues that a policy shift is necessary to change the current mobility pattern. This political commitment is crucial to implement sustainable mobility as policy makers create the municipal ambitions (Decdker et al, 2012). All actors have to adopt this concept, to effectively shift towards a new mobility pattern (Hull, 2008). However, consumers tend to be resistant to new forms of mobility, because of unfamiliarity, and these forms are unproven (Egbue & Long, 2012). A lack of knowledge, higher costs and low risk tolerance hinders the adoption in practice (Diamond, 2009). So consumers will choose for options of their preferences, which they know and their budgets (Roche et al., 2010). However, the attitudes, knowledge and perceptions differ across gender, age and education. So although technical barriers, such as usability and performance are important, consumer acceptance is the key aspect for implementing sustainable transport measures (Egbue & Long, 2012).

2.6 Conceptual Model

FIGUUR 2 CONCEPTUEEL MODEL



An urban infill strategy is applied to two kind of sites: Brownfields and Greyfields. For this research it captures the spatial contexts of the cases: it reflects the spatial characteristics of both studied areas have. The urban infill strategy leads to a development process, which results in the construction of new neighbourhoods. Within the implementation, considerations are made about the extent and way of integrating Environmental Sustainability. This concept consists of four principles: circular economy, sustainable energy, climate adaptation and sustainable mobility. Each with its own related

aspects. The implementation is influenced by three aspects, stakeholder salience, perceptions and barriers. The stakeholder perceptions are dominating the implementation, as it leads to ambitions and visions for the area. These perceptions are both influenced by stakeholder salience and barriers. The theory of stakeholder salience suggests that stakeholders act upon their positions. Perceived barriers influences the way of envisioning the principles of Environmental Sustainability by actors. The final implementation, as guided by the perceptions is influenced by both stakeholder salience and barriers. Stakeholder salience determines which role actors have within the development, and indicates their relevance and how they could influence the implementation. Barriers, as technical, financial, cultural and regulatory issues, actually hinder the implementation, and constraining the extent in which Environmental Sustainability can be implemented in urban infill projects.

3. Methodology

3.1 General Research Design

The research is based on an interpretative epistemology. The research subject is considered as a social construct. The concept of sustainability is developed by scholars and practitioners, as alternative way and approach to guide actions. The ambiguity of the concept suggests that it consists of rather aspects that have been acknowledged as sustainable, than what is purely is sustainable. So this indicates this study focuses on a subject that has multiple ways of understanding and is changeable. This determines the choice for a qualitative approach. This kind of research is about the understanding of perspectives that individuals and organizations have on the research subject (Bell & Waters, 2014). This aligns with the objective of this research: understanding the perceptions of private developers on measures to achieve sustainability in spatial projects. This research consists of a single embedded case study of Urban Infill in Utrecht. Within this case, the urban infill projects of Beurskwartier & Lombokplein and Merwedekanaalzone are studied. The case is used to get in-depth insights in the implementation of environmental sustainability in urban renewal projects. A case study supports the understanding of the research subject in a real-time planning practice (Flyvbjerg, 2006). Another determined reason for choosing a case study as research design is the characteristic of the research subject. The implementation of environmental sustainability is considered as non-controllable and is a contemporary subject. The researcher has no influence on the manifestation of environmental sustainability in the urban renewal projects, as it is part of a development process, consisting of municipality and private developers and the projects are developed in the next decade. Because of these arguments, a case study design is the most appropriate design for this research.

The selection of the case is based on the logic of information-orientation. Flyvbjerg (2006) suggest that single cases are selected based on the expectations about their information content, to maximize the utility of information that is derived from small samples of cases. The case of 'urban infill projects in Utrecht' is regarded as representing an extreme or unique case. According to Flyvbjerg, such cases provide information on unusual cases, which are problematic or good in a defined sense. Two assumptions support such categorization of the study's case. First, multiple scholars argues that within spatial planning, urban infill is considered as more complex than Greenfield development. The spatial context is pre-set, instead of a blank scheme. This suggests that barriers, highlighted in the theoretical framework, are more present in urban infill projects: the existing built environment limits which technical options are possible, and increases the costs of their implementation as the conditions have to be taken into account by private developers. Also policy and regulations are more difficult, because these are the result of long lasting considerations in the past. These are less flexible to adjust. Second, urban infill projects in Utrecht have high spatial scales. The expected number of constructed housing is not common in the Dutch Spatial Planning profession. It insists that conditions of scale and complexity are relative high: it provides information for the implementation of Environmental Sustainability in an unusual case.

The reason to focus on two infill projects within Utrecht is based on the logic of robustness. Studying environmental sustainability in multiple spatial contexts gives a more compelling evidence of how this could be integrated in urban infill projects. It gives a broader more comprehensive overview of visions and ambitions related to environmental sustainability. The choice for an embedded case study is based on the research objective. It distinguishes multiple aspects that has to be studied: the position of municipality and private developers in both urban infill projects, the incorporation of

Environmental Sustainability principles in 'Omgevingsvisies', and perceptions of private developers of implementing such aspects in spatial projects with related perceived barriers, So in this research, consist of multiple 'units of analyses. The aim is not only to describe the presence of these units, but to understand the reason behind their presence. It indicates that those units of analysis are subdivided in several smaller parts that are analysed within the case.

3.2 Research Materials

Utrecht's Spatial Planning

The current municipal policy of spatial planning is guided by the document "Ruimtelijke Strategie Utrecht 2016". This document determines the 'spatial and economic development tasks and focus areas for the period 2016-2030'. Spatial ambitions regarding the concept of 'healthy urban living' are connected to necessary investments to achieve this ideal (Gemeente Utrecht, 2016). The municipality states that the expected population growth will be facilitated with urban infill projects. It argues that this kind of developments contribute to a healthy way of urbanization. For the period 2016-2030 two key locations are selected: Beurskwartier & Lombokplein and Merwedekanaalzone. Here, large scale, high-dense residential neighbourhoods will be developed. Both areas have a considerable size, similar functions, a focus on industry and business. With the redevelopment, the municipality tries to connect neighbourhoods with each other, to create a consecutive urban environment. In Beurskwartier & Lombokplein, approximately 3500 houses will be realized, while the Merwedekanaalzone will consist of 6.000 houses.

Beurskwartier & Lombokplein is located adjacent to the main train station area, just west of the historical city Centre. Beurskwartier will be developed at the terrain, currently leased by Jaarbeurs and the Westplein will transform to Lombokplein. The area is bounded by Lombok (north), Station Area (East), Dichterswijk & Merwedekanaalzone Sub-area 4 (South) and Overste Den Oudenlaan (West). The first attempts to redevelop this area were initiated in early 2000s, when the municipality organized a referendum about the future of the area. This resulted in the "Masterplan Stationsgebied 2003". Due the financial crisis, and shifting trends and issues, the redevelopment was postponed. After several negotiations, in 2013 a breakthrough was initiated. There was an agreement about the ground lease of the Jaarbeurs in the area. In 2015 the municipality initiate the creation of a spatial vision for the area, by a starting document "Toekomstvisie Utrecht Centrum". In 2018, the Omgevingsvisie Beurskwartier & Lombokplein (EVBL) has been established by the city council. This document guides the future redevelopment of the area.

FIGUUR 1 SUB-AREAS BEURSKWARTIER & LOMBOKPLEIN. SOURCE CU2030



Merwedekanaalzone is located west from the city centre and main train station (Utrecht Centraal). The area is bounded by Europalaan & Overste Den Oudenlaan (West), Dr. M.A Telligenlaan (North), Highway A12 (South) and the Merwedekanaalzone (East) and consist of 65 hectares. In 2005 the municipality already made a Spatial Vision (Structuurvisie) for the area. In this vision, it defines 7 sub-areas. The first attempts of redevelopment were the restoration of Villa Jongerius and the build of City Campus Max (Gemeente Utrecht, 2017). The financial crisis led to postpone large developments in the area. In 2016, the city council choose to accommodate further population growth within the existing city and designate the Merwedekanaalzone as location for redevelopment (Gemeente Utrecht, 2017). The current redevelopment program, as described in the Omgevingsvisie Merwedekanaalzone, only includes the sub-area 4,5,6 of the former vision as part of the program. As the municipality argues, the other parts are not relevant for the redevelopment plan: Subarea 1 & 2 is considered as part of Oog In Al, Sub-area 3 is incorporated in the development of the Train Station Area and for sub-area 7, and there is no expected transformation until 2030. So in this study the Merwedekanaalzone refers to the area described in the Omgevingsvisie.

FIGUUR 2 SUB-AREAS MERWEDEKNAALZONE. SOURCE: GEMEENTE UTRECHT, 2017



3.3 Data Collection and Data Processing.

Qualitative research is based on multiple sources of evidence, to achieve convergence and confirmation through different kinds of data. In general qualitative research is engaged with the analysis of data from direct fieldwork observation, in-depth open interviews and written documents (Patton, 2005). Using multiple research techniques gives the possibility to study the research subject from different perspectives (Laws, 2013). The data obtained with a particular method can be

adjusted and challenged by information of other methods (Bell & Waters, 2014). In this study, the research techniques of document analysis and qualitative interviewing are used to collect data. This is based on the logic of 'triangulation of means'. Using different data sources and methods lead to convergence and confirmation of insights. Using multiple techniques will improve the data derived from particular sources (Bowen, 2009). The triangulation is two-sided. Data obtained with document analysis provides insights that are used as input for the qualitative interviewing. It provides the opportunity to elaborate on these findings in more detail, which increases the output of the interviews. Herewith it increases the value of those interviews for this study. On the other hand, data from the interviews provides insights that can be further studied in the documents. This leads to a broader document analysis. It deepens the data from documents and increases the value that documents have for this research.

3.3.1 Documents

Documents are considered as an artefact, with a text as central feature (Scott, 1990). They are situated products of particular organizations and exist in a variety of forms (Prior, 2014; Bowen, 2009). They are considered as both agents of the organization that has produced them, and a source of relevant content (Prior, 2014). This indicates that different kinds of documents are used as a data source for specific reasons. The main feature of documents is the stable content: it doesn't change over time. Furthermore, they are regarded as an accurate representation of multiple units of analysis (Wildemuth, 2017). In this study both organizational documents and newspaper articles are analysed as data source.

Organizational documents are considered as agents of involved stakeholders, and providing insights in the identity of those organizations (Owen, 2014). In this research, two kinds of organizational documents are studied. First municipal policy documents are analysed: the 'Omgevingsvisie Beurskwartier & Lombokplein', 'Omgevingsvisie Merwedekanaalzone' and 'Strategic Spatial Vision 2016'. Second, documents and texts of private developers related to the principles of environmental sustainability are included within this study.

Newspaper articles are considered as source of different kinds of content. First, these documents give an overview of the entire process of redevelopment. It clarifies the position of the municipality and private developers in both cases. Second, news articles are regarded as a way for stakeholders to express themselves to the public.

For the selection of news articles, the databank Nexis Uni is used as source. In this databank is searched on the location names ("Beurskwartier" and "Merwedekanaalzone". The timeline is set from January 2017 until April 2019, as for both cases in this period is a peak of the amount of news articles. In this study, newspapers are regarded as relevant if it includes: general information about the project or a stakeholder statement about actualities in the redevelopment process. This has resulted in 10 relevant newspaper articles for Beurskwartier & Lombokplein, and 43 relevant newspaper articles mentioning Merwedekanaalzone

3.3.2 Interviews

In qualitative research, interviewing is a widely used method for data collection (Bryman, 2013). This method provides flexibility considered as necessary for doing qualitative research. In this study these are designed as semi-structured expert interviews. This means that for the interviews, a topic list is

used. This is a predetermined list of subjects and open-ended questions that guide the interview (DiCicco-Bloom & Crabtree, 2006). Another key feature of such kind of interviews is adaptability: the possibility to interact with interviewees, and to investigate the motives behind their answers (Keats, 2000; Bell & Waters, 2014).

The logic for using semi-structured interviews is two sided. First the semi-structured character provides the possibility to get the motives and reasoning behind the answers of stakeholders. This provides the flexibility to adapt to particular aspects of the principles of environmental sustainability, stated by them. It leads to a more in-depth understand of how these organizations perceive the implementation of those principles. Second, this structure allows a comparison between the data and answers obtained from particular interviews. Although each interview has its unique and slightly different questions, the interviewees elaborates on similar topics. A comparison between the interviews gives a more compelling understanding of how certain aspects of the principles of environmental sustainability are perceived by different organizations.

In this study, the aim of expert interviews is theory-generation. Analysing the subjective dimension of expert-knowledge: reconstructing how private developers perceive measures to achieve sustainability in spatial projects (Bogner & Menz, 2009). The selection of experts is based on the constructivist definition, using a method relational approach. Experts are based on the relevance of information they could provide for this study (Bogner & Menz, 2009). For this study, advisors working by private developers are considered as experts. They have relevant information of how those businesses perceive measures and in what extent these companies will invest in those measures in spatial projects. The focus within the interviews is therefore to obtain interpretative knowledge: the subjective points of view and interpretation of private developers (Bogner & Menz, 2009).

For this study, 8 private developers are selected as 'experts'. A private developer is considered as an organization, which main activity is housing and area development. For the selection is the member list of NEPROM used. NEPROM is the association of Dutch Private Developers. The main criteria for specific organizations is based on the size of their projects and association with infill projects. Furthermore, also interviews are held with municipal servants. They are considered as experts on particular knowledge about the strategic policy and redevelopment projects. These interviews will provide more in-depth information about the cases and sustainability ambition of the municipality, and therefore are complementary on the data derived from documents. Each private developer and civil servant is interviewed once, in the period May-July 2019.

TABEL 3.1 LIST OF INTERVIEWEES

Private Developer	Interviewee	Date
ABB	Ferry Lassche	12-07-2019
AM	Geert Fleuren	14-06-2019
Blauwhoed	Debby van der Werf	21-06-2019
BPD	Jos De Vries	05-07-2019
JanssenDeJong	Martijn Stemerding	19-06-2019
Synchroon	Maaïke Perenboom	05-07-2019
Timaan	Richard Dijkstra	25-06-2019
VORM	Christiaan Groeneweg	21-06-2019
Municipality of Utrecht	Marcel Janssen	05-06-2019

3.4 Content Analysis

The investigated documents and semi-structured interviews provide a large amount of data. This data is processed through the use of qualitative content analyses. This research technique goes beyond only counting words and phrases and is about the interpretation of content. It focuses on characteristics of the contextual meaning of texts, through, classification and identifying themes within those texts (Hsieh & Shannon, 2005). The document texts and interview transcripts are equally processed. This means that the content analysis is for both kinds of texts similar. The structure of the content analysis is based on the key units of analysis: stakeholder salience, sustainability measures in policy, and perceptions about investing in measures to achieve sustainability. The different conceptualization and different kinds of data of those subjects lead to a particular analysis strategy of each unit of analysis.

Stakeholder Salience.

The theoretical framework shows that the stakeholder salience model by Mitchell, Agle & Wood (1997) is widely used by other scholars, focusing on stakeholder analysis. Several authors have elaborated on the three stakeholder attributes: power, urgency and legitimacy. The analysis consist of open coding. Stakeholder attributes are divided in several sub-categories, aspects related to the particular attribute (Table 3.2). As multiple heterogeneous texts are analysed, relevant parts are placed at the particular sub-categories in the analytical scheme. Herewith this scheme provides a comprehensive oversight of which stakeholder actors consists. The next step is to analyse the content of each attribute, to capture how these stakeholder attributes are attached to the actors. This results in a categorization based on the stakeholder salience theory of Mitchell, Agle & Wood (1997) (table 3.3; Figure 3.5). The last step is providing insights in the implications of this stakeholder salience for both development projects. So how the involved actors have influence on the implementation of environmental sustainability and what consequences this have for the integration of this concept in the actual development.

Principles of Environmental Sustainability in Omgevingsvisies

The theoretical framework distinguishes four principles of Environmental Sustainability. Each principle consists of multiple related aspects (table 3.4). The first step is to put nodes on those parts of the Omgevingsvisies mentioning particular aspects of the principles. Herewith the heterogeneous texts is systematically filtered. The next step is to rearrange the texts by putting all relevant content in an analytical scheme, to get an overview of which principles are covered in the Omgevingsvisies. The last step is to analyse the actual content: what is written about the different aspects. It results in an overview of how the related aspects are incorporated in the documents. It shows both how the municipality envision the four principles (which aspects are relevant) and which ambitions are set for both areas (how the principles are achieved and incorporated). This implies how the Omgevingsvisies influence the implementation of Environmental Sustainability.

Perceptions and Barriers of the implementation by private developers

The theoretical framework mentions several types of barriers hindering the implementation of Environmental Sustainability. These types are grouped in four categories, consisting of two more specific kinds of barriers (table 3.5). The first step of the analysis is dividing each transcript of private developers in four sections, particularly related to the principles of Environmental Sustainability. The similar sections of each specific transcript are put together resulting in a four texts, each with a

comprehensive overview of a particular principle. Then in each of these texts, notes are placed on parts that mentions a particular category of barriers. The next step is to group all content, related to similar notes, to rearrange the texts in segments that relates to a particular barrier. The last step of the analysis is to capture the actual content of the segments: what say private developers about the barriers of implementing environmental sustainability. This results in a perception of those principles and an overview of which barriers are perceived relating to each principle. It suggests why barriers are perceived and how it hinders the implementation. This implies the influence of these barriers on both how, and the extent of, the principles of Environmental Sustainability are incorporated in urban infill projects.

3.5 Operationalization

Actors.

Olander (2007) distinguishes two kinds of actors in construction projects: internal and external stakeholders. The first category are organizations, actively involved in project executions, and the second category are those who are affected by the project. Regarding the research aim, this study only focuses on the internal stakeholders. This includes the municipality of Utrecht and private developers. The municipality is considered as single organization, consisting of the city council, city administration and municipal officers. Private developers is a heterogeneous group of businesses that focuses on spatial developments. In this study, it consist of the organizations that are involved in redevelopment projects in the Netherlands. This group, although consisting of multiple organizations, is studied as single actor in stakeholder salience (sub-question 1), while for the barriers related to the implementation (sub-question 3), private developers are considered as single autonomous organizations.

Stakeholder attributes

Mitchell, Agle & Wood (1997) defines stakeholder attributes as variables, which are included in their theory of stakeholder identification: stakeholder salience. They poses three key attributes: power, urgency and legitimacy. For this study, these attributes are concretized in several aspects, based on elaborations, stated in the particular sections of the theoretical framework (Table 1).

TABLE 3.2 STAKEHOLDER ATTRIBUTES,

Stakeholder attribute	Description	Aspect	Description
Power	The degree to influence the regulatory; plans; and other stakeholders in the favour of its interests.	Resource Power	The extent in which the actor has control over financial and land resources
		Formal Power	The ability to influence policies, laws and regulations
		Social Power	The ability to mobilize social forces
Urgency	The sensitivity of a stakeholder’s claim and the criticality or importance of the stakeholder’s relationship	The importance of the development for the actor	The extent in which the actor perceives the development as important, and related activities to insist the project

	with the organisation		
Legitimacy	The generalized assumption that actions of the stakeholder are desirable, proper and appropriate	Law	The law requires the participation of the actor
		Capital investments	The actor has the aim to invest capital in the area
		Property rights	The organization owns particular properties in the area
		Externalities	The activities of the actor will be affected by the developments.

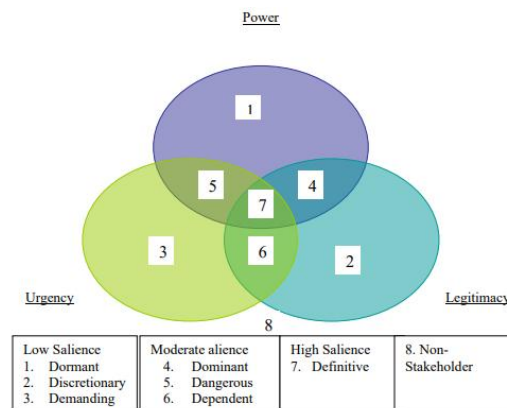
Stakeholder salience

Stakeholder salience is based on the *descriptive theory of stakeholder salience* posed by Mitchell et al (1997). The classification (table 3.2) is derived from the presence of stakeholder attributes at actors. The typology is based on the combination of the attributes power, urgency and legitimacy. The types possess particular kinds of salience (Figure 3.5).

TABLE 3.3 CLASSIFICATION OF STAKEHOLDERS

Category	Description
Dormant	The organization possesses power to influence the debates, but have no legitimacy or an urgent claim for the development.
Discretionary	The organization has the legitimacy to participate, but has no power or an urgent claim for the development.
Demanding	The organization has an urgent claim for the development, but lacks power or legitimacy to influence the process.
Dominant	The organization has both power and legitimacy to act, but has no urgent claim for the development.
Dangerous	The organization has power and an urgent claim for the development, but has no legitimacy for the development.
Dependent	The organizations has both an urgent claim and the legitimacy to act, but has no power to influence the development.
Definitive	The organization has power, legitimacy and an urgent claim for the development.

FIGURE 3.5 CONCEPTUAL MODEL OF STAKEHOLDER SALIENCE. SOURCE: BEACH (2008)



Environmental Sustainability

The theoretical Framework suggests that sustainability and in particular environmental sustainability is not a well-defined concept, but consists of multiple definitions and understandings. In this study is this concept is based on four principles: the circular economy (1), sustainable energy (2), climate adaptation (3) and sustainable mobility (4). These principles are divided in multiple related aspects (table 3). This conceptualization is used as basis for the analysis of sub-question 2 & 3. The content of the Omgevingsvisies will be related to these aspects. Also the perceptions will be aligned to which particular aspects are covered in their vision.

TABLE 1.4 OPERATIONALIZATION PRINCIPLES ENVIRONMENTAL SUSTAINABILITY

Principle	Aspect	Description
Circular Economy	Re-using building materials	The inclusion of circular materials or re-using existing materials in new buildings
	Using Environmental-friendly building materials	Using building materials with a low environmental impact (Cradle-2-Cradle, bio-based)
	Circular construction of buildings	Inclusion of material passport, circular construction techniques (flexibility and disassembly)
	Incorporation of existing buildings	Integrating existing buildings in the new neighbourhoods
Climate adaption	Climate control	General measures as climate adaption, climate neutrality and climate robustness
	Relation green and climate adaptation	Notion that green infrastructure contribute to climate adaption
	Integrating green in buildings and public space	Green rooftops, green facades, public space designed with incorporation of green measures (vegetation, trees, grass)
	Biodiversity	The inclusion of vegetation, with purpose to maintain the level of species
	Water retention	Buffering capacity, local drainage
Sustainable Energy	Using renewable energy sources	The implementation of sustainable energy, such as solar energy, geothermal energy and wind energy

	Local Energy production	Energy generation at building or neighbourhood level
	Reduction of energy demand	Emphasis on insulation, limited energy demand by construction and design
Sustainable Mobility	General Mobility	Comments on mobility issues in general. Not specified to particular transport nodes
	Infrastructure for walking and cycling	Comments on the construction of infrastructure for walking and cycling (logical routes, parking, encouragement of travel behaviour)
	Infrastructure for car mobility	Comments on the construction of infrastructure for car mobility (Shared Cars, Electric Cars, Park-on-distance concepts)
	Infrastructure Public Transport	Investment in the improvement of public transport

Implementation Barriers

The theoretical framework highlights a wide range of barriers that hinder the implementation of the pre-mentioned principles of Environmental Sustainability. This study distinguishes four types of barriers: technical, financial, cultural and regulatory (table 4). Each barrier is divided in two specific aspects. The arguments and visions of private developers will be linked to these barriers to understand the influence of these on the implementation of environmental sustainability in urban infill projects.

TABLE 3.5 BARRIERS OF IMPLEMENTATION PRINCIPLES OF ENVIRONMENTAL SUSTAINABILITY

Technical Barrier	Technical options	The lack of multiple sufficient options for implementation
	Geographical conditions	Insurmountable spatial conditions in the building or area that constraint the implementation of measures
Financial Barrier	Higher Costs	The implementation costs of the alternatives, related to the principles are too expensive
	Business cases	Incorporating measures, related to the principles, constraint having profitable business cases.
Cultural Barrier	Knowledge	Knowledge is missing to implement measures related to the principles.
	Behaviour of Clients	Clients don't favour the implementation of measures related to the principles
Regulatory Barrier	Policy	There is no decent policy or vision about the implementation of measures related to principles
	Incentives	There is no incentive for private developers to choose for implementing the measures related to principles

4. Results

4.1 Stakeholder Saliency: The role of the municipality of Utrecht and private developers in the development process

4.1.1 Beurskwartier & Lombokplein

Municipality of Utrecht

The municipality of Utrecht owns all land plots in the area. Currently, in Beurskwartier, sites are leased to Jaarbeurs, while Lombokplein (Westplein) is used for traffic infrastructure. In 2016 an agreement was reached with Jaarbeurs. This agreement foresees everlasting leasehold on sites with buildings of Jaarbeurs in 2023, and other leased areas can be redeveloped by the municipality. The municipality has adopted the development strategy of plot-tendering and will not construct housing itself. In the 'Ruimtelijke Strategie Utrecht' (RSU), the municipality has allocated 75 million for investments in 'accessibility', 10 million for 'public space investments', and a not-specified amount for 'urban development'. In this document, the municipality argues that for passing on the investments in green, blue and grey infrastructure to spatial initiatives is guided by criteria as profit, accountability and proportionality. The development of Beurskwartier has a large municipal policy history. It started already in 2003 with the Masterplan Stationsgebied. Due to the economic crisis this document was postponed. In 2015 the municipality investigated multiple development scenarios which resulted in the document "Utrecht Centrum: Healthy Urban Boost". The EVBL guides the actual development of the area. Future zoning plans & urban design plans will be determined by the municipality, but in collaboration with private developers. The redevelopment of the area is of importance for the municipality. It's proclaimed as necessary to develop in high-density to improve the city. In de 'Toekomstvisie Centrum Utrecht', the municipality suggests an agreement with Jaarbeurs was crucial for the redevelopment, and therefore its vision was necessary. Also in the 'Reactienota Zienswijzen Omgevisie Beurskwartier & Lombokplein', the municipality arguments for the new high-rise development. It declares "the buy and demolishment of current housing at Croeselaan, is a vital aspect of the future development, although the concerns of inhabitants". The municipal vision and activities imply that this development is crucial to achieve its ambitions. The current spatial Law, and upcoming Omgevingswet, insist the municipality to create plans and regulations for spatial developments. This declares that the municipality have to be an involved actor for each new project. As the municipality is the only landowner and agreed to invest in blue/green/gray structures of the area, it has both capital investments and property rights and can choose how the area will be redeveloped.

Private developers

Private developers don't own any land plots in Beurskwartier or Lombokplein. Despite the lack of land positions, they do have finances to invest in the actual redevelopment of the area. As the EVBL suggests, through plot-tendering, they will construct the buildings and create the neighbourhood. Although the municipality determines urban design programs of requirements, and zoning plans, it's in collaboration with private developers. The three plot-tendering strategies imply a large role for private developers in the pre-development phase of construction.

During the tender processes, private developers will be involved in the area development, and then have urgency to construct the new neighbourhood. Private developers search for opportunities to

create profitable projects, and the redevelopment of Beurskwartier & Lombokplein is such an opportunity with a scale of 1.500 housing. As private developers are currently not related to Beurskwartier, so the Law Spatial Planning does not require specific involvement of private developers. Despite, this position, as they will invest to actual develop the area, private developers will invest, and take risks and profits. As the private developers don't own land plots yet, they have no property rights, and also externalities will not affect them directly

TABLE 4.1 OVERSIGHT OF STAKEHOLDER ATTRIBUTES MUNICIPALITY OF UTRECHT AND PRIVATE DEVELOPERS IN BEURSKWARTIER & LOMBOKPLEIN

	Municipality	Private Developers
Power	High: the municipality owns all land plots and has financial resources to invest in the boundary conditions. Also during the tendering process, the municipality can guide the direction of the development. It also is empowered to create the policies that allow the construction of the new neighbourhood, and herewith it can structure the development.	Medium: Currently private developers don't have ground positions in the area. But while the municipality would not develop the area, with tendering, private developers will construct the actual neighbourhood. As the municipality suggest, private developers has influence on Urban Design Plans and the actual functions of buildings So there is both resource power and little formal power, but only granted by the municipal approach on the development of Beurskwartier & Lombokplein
Urgency	High: The municipality possesses that the development of Beurskwartier & Lombokplein is for great importance, to create sufficient housing. Therefore it aligns policies to the new development. It also creates commitment of other parties to the new neighbourhood.	Medium: Private Developers are not committed to the area yet. They have not an actual claim to develop. But as it's their business, and with other tenders, they seek opportunities to develop new neighbourhoods. So the creation of Beurskwartier is a large opportunity.
Legitimacy	High: as landowner, they have property rights, while the law requires action and involvement of the municipality. The investments in boundary conditions (green, blue and grey) insists that the municipality is a legitimate actor in this development.	Low: As they are not landowners, the law doesn't require any particular involvement in the process. However, the prospected capital investments made them legitimate actors in the development process.
Stakeholder Salience	Definitive. The municipality has all three stakeholder attributes. The landownership implies that this organization is leading the development process. The municipal vision on Environmental Sustainability will be crucial as it defines the way this concept is integrated in plot-tendering, which indicates how the area is redeveloped by private developers.	Dangerous. Private developers has some power (resource and formal), a medium urgency and low legitimacy. Because they currently have no land plots, there is no legitimacy and limited urgency to implement Environmental Sustainability. However, as they will be involved during the development process, they then will have influence of the implementation of Environmental Sustainability.

4.1.2 Merwedekanaalzone

Municipality of Utrecht

The municipality of Utrecht owns two land plots in Merwedekanaalzone: 'the OPG-terrein' and 'Voormalig Defensierrein'. The first terrain is bought in 2018 after remediation, and the OPG-terrain is already bought in 2004. Both terrains will be developed by private developers with a construction agreement. In the 'Ruimtelijke Strategie Utrecht, the municipality reserves for Merwedekanaalzone: 20 million is reserved for urban developments, 10 million for accessibility (Such as walking and cycling), and 20 million for 'public space and green'. Furthermore, resources allocated to "Necessary system scale jump Public Transport", will be partly used for measures related to Merwedekanaalzone. The municipality has created the Omgevingsvisie and determines policies such as zoning plans, urban design plans and related aspects as building heights, and environmental regulations. The city council has decided that the municipality only has a facilitating role, related to a passive ground policy (Gemeente Utrecht, 2016). It implies a large role for private developers. For Merwedekanaalzone, two urban design plans are yet to be determined: the Urban Design Plan Defensierrein (sub-area 4), and Urban Design Plan Merwede (sub-area 5), created by a private developer. The redevelopment of Merwedekanaalzone is a long-time aim for the municipality. Already in 2005, it created a vision for this area. Also a land position (OPG-terrain) was taken. In the 'Ruimtelijke Strategie Utrecht', the Merwedekanaalzone is considered as priority area for spatial development, to create sufficient housing opportunities. Also the municipality has insisted multiple policies and studies, like the EVM, zoning plans, and the study on mobility and "Study Future of Buildings and Renters", which investigate what can remain in the new neighbourhood. Already in 2016, the municipality signed an agreement with private landowners to develop the area. And although concerns exist among city council members and citizens, the municipality not incorporate all adjustments in the Omgevingsvisie. The current law insists the municipality to make plans and regulations for spatial developments. Herewith it guides the new spatial projects within their borders. This implies a large legitimate role for the municipality. As owning two land plots and invest in multiple related aspects of the new neighbourhood, such as accessibility and public space, and societal organizations as schools and health care, it declares that the municipality both has property rights and do capital investments in the area. The municipality is not directly affected by the externalities that the redevelopment causes, as there is no municipal building in the area. However indirectly, the redevelopment can cause effects that affect the municipal ambitions and policy aims.

Private Developers

Several private developers have bought property and land in the Merwedekanaalzone. Greystar has bought an area of 3,7 hectares for 46 million euro (Franck, 2017). AM & Synchroon has purchased a land plot of 4 hectares for 26,5 million. The combination of RoundHill Capital, GS Vastgoed and BoelensDeGruyter has acquired 4.5 hectares of land. BPD has signed an agreement with the municipality of developing its land plots. These private developers committed to construct 6.000 housing, green infrastructure and car-free neighbourhood. This indicates that they've allocated financial reserves to invest in the development of the area. The municipal facilitating ground policy indicates that private developers have responsibility for the spatial program on their plots. It results in private developers creating urban design plans for their land plots which have to be determined by the municipality. So private developers have no decisive power on policies, but their visions are leading these spatial policies

Private developers, as landowners have a large urgency to develop the area. The prospected neighbourhood and amount of housing will gain profits for them. They have insisted the development process and collaborate with each other to develop collectively the neighbourhood for a more appreciated result. So this indicates that a prisoner's dilemma is tackled. As there is little citizens resistance, some private developers has initiated consulting rounds to incorporate the concerns.

The private developers have several kinds of legitimacy. First, they are currently landowners, and therefore have property rights. Also the municipality has to consult them by creating new policies, such as the Omgevingsvisie and Urban Design plans. However, the key aspect, which made them legitimate actors is that their financial resources and risks are necessary to develop the area. They have already invest in the bought of properties and will invest to make them profitable. As the private developers will sell the project after development, or renting out their properties, they will not face externalities of the development.

TABLE 4.2 OVERSIGHT STAKEHOLDER SALIENCE MUNICIPALITY OF UTRECHT AND PRIVATE DEVELOPERS IN MERWEDEKANAALZONE

	Municipality of Utrecht	Private Developers
Power	Medium. The municipality has limited land resources in the area, and restrictive financial reserves to invest in the new neighbourhood. However, the municipality still has formal power, as determining the Omgevingsvisie, zoning plans and urban design plans.	High: Private Developers own actually almost all land in Merwedekanaalzone, and will also develop the land plots of the municipality. They also have the financial resources to actually build the new neighbourhood. Also they have some formal power, as they can create the Urban Design Plan by itself, and collaborate with the municipality on conditions, such as energy and mobility.
Urgency	High. The municipality already acted in 2005 on behalf of the development of the area. It views it as essential to provide sufficient housing in the future. In the last years, it agreed with private developers to collectively create the new neighbourhood, aligns different kinds of policies and tried to commit city council, and citizens to the new development.	High: As the private developers owns the land. It will be profitable to build housing on this land plots. So private developers are urgent to start the actual development to secure their profits. Merwede already is considered as project by the private developers.
Legitimacy	Medium: The law requires that the municipality is involved in the development process' but it has limited capital investments, property rights and no externalities from the development.	High: The private developers have property rights for their land plots. The law requires that landowners are involved in development processes. As the whole area will be developed, their property also will be influenced by the development.
	Definitive. The municipality possesses all three stakeholder attributes. However the extent of power and legitimacy limits the role of the municipality. Their vision is crucial because with its formal power, it sets conditions of the new neighbourhood.	Definitive: The private developers possess all three attributes in large extent. Because their landownership they possesses power and legitimacy, while it also creates urgency to made it profitable. As creating the new neighbourhood, they will influence the extent of Environmental Sustainability.

Sub-conclusion

The cases show that the municipality and private developers both have at least moderate stakeholder salience. This implies that both organizations are relevant in the redevelopment processes and therefore have influence on the implementation of Environmental Sustainability in projects. However the characteristics of salience suggest that each organization have in a different way influence on the outcome of the process.

In Beurskwartier & Lombokplein, the land distribution indicates that the municipality is the leading actor in the redevelopment process. As only landowner with large formal power and urgency it's the municipality that sets the conditions of the new neighbourhood. The municipality uses a tender process, wherein it highlights and determines its ambitions for the redevelopment. This will align with the broader municipal vision and policies such as the Omgevingsvisie. Within the tenders, the municipality sets boundary conditions regarding the characteristics of the neighbourhood, such as circularity, energy, climate adaptation and integrating sustainable mobility. However, the tenders are signed by private developers. These organizations have to construct the actual buildings and herewith the neighbourhood. They have to invest to implement Environmental Sustainability in the area. So it's influenced by the vision of private developers, which is reflected in the concretization of the tender ambitions. So this indicates that the current stakeholder salience implies that both the municipal conditions, as the elaboration by private developers have influence how after all Environmental Sustainability is integrated in Beurskwartier & Lombokplein.

In Merwedekanaalzone, the differentiated landownership insists that private developers have a large influence on the development of the area. Their visions and considerations will be leading in the construction of the new neighbourhood, as they will construct the buildings, and will in some extent circularity, energy, climate adaptation and mobility in their plans. Their urgent claim of making profits suggests environmental sustainability is not their core aim for the area. However, as the municipality has formal power, it can create boundary conditions for the development of the new neighbourhood. This influences the space private developers have in creating their plans. The stakeholder salience implies that the integration of Environmental Sustainability in Merwedekanaalzone both depends on the visions of private developers, on the creation of the new neighbourhood and the municipal conditions that are attached to the area.

So the stakeholder salience indicates the influence of both organizations on the implementation of Environmental Sustainability in the two areas. Herewith it implies which visions are more decisive in the development process. In Beurskwartier, the primacy lies on the municipal visions, and integration in tenders, while in Merwedekanaalzone it's more an outcome of the collaboration between private developers and the municipality.

4.2 Environmental Sustainability principles in Omgevingsvisies: the integration of principles in municipal spatial policy

4.2.1 Circular Economy

The municipality of Utrecht mentions the concept of circular economy in both Omgevingsvisies. It considers the concept as a starting point for the construction of buildings. Nevertheless, it is slightly different approached in both documents.

In the EVBL, the circular economy is considered as part of Sustainability. The municipality aligns the concept with construction and living. The municipality argues that 'the transition to a circular

economy is an important aspect within the development of the area'. Circularity is defined as 'closing the biological and technical loops of materials' (p.26). The biological loop is 'accounting the return of materials in the biological cycle within the process of manufacturing and applying (p.27)' and the technical loop: 'the reuse of applied materials in a high-quality way' (p.28). So the municipality connects the resources with their appliance in buildings. Rather than materials, the municipality argues that buildings have to be flexible and could be disassembled: functions of buildings should be able to change. Also the municipality highlights the introduction of material passports and a different approach to ownership, but these aspects are not concretized. The municipality suggests private developers are challenged to incorporate ideas in their tender suggestions. The text also indicates that some existing buildings can remain. The historic Korenbeurs and several social housing will be integrated in the high rise buildings. The houses will function as entrée, office space or meeting room. The demolished Jaarbeurs parts will not be integrated within the new neighbourhood.

In the EVM, the circular economy is part of the 'Materials and Reuse' theme. It's considered as the ambition: "Circular construction is the norm". The term is defined as "consciously using available materials and resources to limit the environmental impact". Therefore the municipality emphasizes the use of bio-based materials, derived from sustainable, renewable resources and the flexibility and preferred disassembly of buildings. The municipality also highlights the introduction of materials passports "which guide decisions about material use". Although not directly mentioned in the text, in the Merwedekanaalzone existing buildings remain. The Historic Villa Jongerius retained in the new neighbourhood and also several buildings at the OPG-terrain will be integrated. The municipality studies the potential of these buildings.

TABLE 4.3 MUNICIPAL APPROACH AND AMBITION ON CIRCULAR ECONOMY

	Beurskwartier & Lombokplein	Merwedekanaalzone
Comprehensive Vision	The municipality uses a comprehensive approach for circularity. It's attached to multiple aspects of building construction, such as the characteristics of elements and the kind of design. It's not only about the new buildings; the municipality also envisions the future of existing buildings. Although it focuses on both micro and meso level of the built environment, it still sticks to a single aspect of circularity: 'encouraging reuse, repair and remanufacturing products'.	The municipality uses a comprehensive approach for circularity, as it both emphasizes the kind of materials that should be used and how buildings should be designed. However, it sticks to the material aspect of circularity, and is not a broader vision on circular economy in the built environment. And although the micro and meso level is covered, only a single aspect is mentioned: encouraging reuse, repair and remanufacturing of products.
Clear, Concrete Ambitions	Although the municipal ambitions provide a clear direction on the way circularity is integrated in the new neighbourhood, no clear targets or aims are set. Therefore it's not clear in which extent these ambitions will be realized. The municipality argues that private developers will be challenged to incorporate circularity	The municipality states that circular construction is the norm. Its concretizes as "milieuprestatie van 0,5 per m2 bvo" and for each project a "GPR score of 7 is minimum". Also if there is deviation, substantiation is required. So these targets are leading for the incorporation of circularity in the built environment of the new neighbourhood. However, the

	in their tenders. So the EV only sets boundary conditions and starting points.	flexibility and disassembly of buildings are not concretized with targets or concrete ambitions.
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4.2.2 Sustainable Energy

In Both EVs, energy is considered as essential aspect of redeveloping both areas. In the EVBL the municipality states its ambition is “becoming energy neutral”, defined as “local energy generation meets the total energy consumption of the area”. This indicates a focus on limiting the energy demand, and increasing local energy sources. However, the municipality suggests that the ambition is a ‘point on the horizon’: current technical options are not sufficient to realize it in short term. The municipality also highlights that critical energy norms are included in the tenders, and emphasis is on limit energy demand by natural air circulation.

Sustainable resources will supply energy for the area. The new neighbourhood will be gas free, as the municipality argues Dutch gas will run out, and reliance on foreign supply is not preferred. Urban design plans foresees maximum use of rooftops, but only 50 percent of total energy consumption, can be generated at this way. The current geothermal energy systems are not yet deployed to a maximum so it suggests energy has to be transported from elsewhere. The municipality highlights that this issue will be covered in tenders to challenge private developers to make considerations.

In the EVM is a core theme of the redevelopment. The municipal ambition for this area is to become ‘climate neutral’. This term indicates that with energy generation and consumption no emissions are caused. Marcel Janssen, municipal director of the area clarifies that it’s broader than energy, which is only a single aspect. As the municipality highlights that ‘energy services have to be fossil-free’ it indicates a focus on integrating sustainable energy resources. However, this ambition is somehow downsized, as Marcel Janssen declares: “the high density of Merwedekanaalzone challenges our ambition., as energy consumption is relatively large. Therefore the EVM highlights achieving BENG-norms and EPC=0, as intermediated steps. The EVM focuses on the integration of renewable sources, as the current gas energy system causes climate emissions and doesn’t contribute to the ambition of climate neutrality. The municipality highlights the integration of solar energy and geothermal energy. For solar energy, an optimal building design is necessary. Marcel Janssen suggests that it’s not clear what the potential of rooftop solar energy is, as it depends on urban design plans and considerations about rooftop functions. Façade solar panels are not automatically incorporated because esthetical reasons. For geothermal energy, a large collective system will be developed and also the potential of using the Merwede Channel will be investigated. So this indicates that multiple energy sources will be combined to supply sufficient energy to the area. As the high density foresees, total local energy generation will be almost impossible, because there is limited space. Negotiations happen at the issue of which organization has to invest for energy generation outside the area: the municipality, with energy as ‘public task’ at a larger, regional scale or private developers, as energy is an integral aspect of area development.

TABEL 4.4 MUNICIPAL APPROACH AND AMBITION ON SUSTAINABLE ENERGY

	Beurskwartier & Lombokplein	Merwedekanaalzone
Comprehensive Vision	The municipality envisions energy comprehensively. It has a clear vision on energy consumption, energy generation and local energy sources.	The municipality envisions energy comprehensively, by incorporating energy consumption, energy generation and local energy sources. Both approaches of Omar

	Both approaches of Omar (2007) are integrated: using an economical urban design and only local renewable and sustainable energy sources. It highlights the role of other aspects, such as the urban design, green rooftops, and consumer behaviour which influences the energy aspect in the neighbourhood.	(2007) are mentioned: using an economical urban design and only local renewable and sustainable energy sources. It relates energy to building design. It focuses on the environmental effects of energy: it should not contribute to climate emissions.
Clear, Concrete Ambitions	The municipality has a clear ambition: becoming energy neutral. Targets of maximum reduction of energy use, constructing the urban design regarding the maximum potential of solar energy and wind and the connection of geothermal energy systems, and use the potential of solar energy leads to achieving this ambition. It provides concrete measures and solutions for these targets. However the municipality states that its ambition is a point on the horizon. It depends on collaboration between actors. Private developers will be challenged in the tenders to create facilities that contribute to the municipal ambition.	The municipality has several ambitions. Some are very concrete: fossil-free energy generation and energy neutral cooling and warming of buildings. This results in the aim to realize BENG-buildings. However, other ambitions are not specified: the building design reduces the energy demand to a maximum, and energy will be locally generated as much as possible. With such ambitions, it's not clear how these are integrated and realized in the new neighbourhood, as 'maximum' is not specified. This limits the concreteness of such ambitions. The EV also states that much further research is necessary to concretize the possibilities of sustainable energy in the area.

4.2.3 Climate Adaptation

In both EVs, climate adaptation is similar approached. Climate change is linked with negative effects on the built environment. The EVB mentions 'climate change will cause flooding, because of extreme raining, and heating stress due the gritty surface of built environments'. The EVM relates climate change with 'wet winters, and summers with extreme rainfall'. This results in an ambition to become climate neutral, climate adaptive and climate robust. However this ambition is differently expressed in both documents: the EVBL highlights the three steps of climate adaptation: limiting flooding, counteract droughts and decreasing heating stress. Climate robustness is about mitigating the effects of climate changed, while climate neutrality is not specified. The EVM highlights the role of green public space, as necessary for climate adaption, and does not further elaborate on the other two aspects.

The municipality emphasizes the role of green infrastructure for climate adaptation. In the EVBL, green is related to health and sustainability and in the EVM is part of the ambition on 'nature'. In both visions, the areas are foreseen as green: For Beurskwartier & Lombokplein it will be a single characteristic, while it's 'a signature value for Merwedekanaalzone. Green is both related to buildings and public space. The EVBL highlights green rooftops: that all rooftops below 25 meter will be covered with green. The EVM emphasizes a broader approach: all buildings will have 25 percent filled with green surfaces: green rooftops, green facades and green inner-gardens. Also the public space

will have a green character. The EVBL emphasizes the construction of ‘green connections throughout the neighbourhood’, while the EVM highlights green slow traffic routes, and green connections with Park Transwijk, designed as ‘green fingers’. The green infrastructure is used to create shadows and limit temperature rise (heating stress) and to increase the water infiltration (peak rains). In both documents, the municipal approach to dealing with peak rains is similar: the processing of water happens in the area itself, and no water transfer to sewage systems will be constructed. The first measure is to slow down drainage, with green rooftops and public space as storage for water infiltration. The EVBL mentions the use of ‘water passing hardening’ and ‘water squares’ to create storage facilities. The EVM highlights the use of green rooftops and green public space for water infiltration. Water is linked with other functions: it creates cooling, moisture for green space and can be used for leisure.

In both texts, a green public space is besides climate adaptation, linked to other purposes: an increased biodiversity and contributory to physical and mental health of citizens. The biodiversity will be increased with more space for animals and plants. In both documents, special attendance is for three particular species: house sparrows, vulture swallows and bats. The EVBL highlights that green infrastructure leads to “encouragement of movements, a better social cohesion and dealing with stressful moments’. The EVM suggests “green supports movements, recreation and meetings”.

TABLE 4.5 MUNICIPAL APPROACH AND AMBITION ON CLIMATE ADAPTATION

	Beurskwartier & Lombokplein	Merwdekanaalzone
Comprehensive Vision	Climate adaptation is regarded as necessary. It’s incorporated both with the design of buildings and public space. It’s related to two challenges of climate change: peak rains and heating stress. The measurements of the municipality, such as green buildings, green public space and incorporating water retention contributes to adapting to both challenges. Also these measures are related to several other issues, such as biodiversity, the health of citizens and recreation facilities. Therefore climate adaption is integrated comprehensively.	Climate Adaptation in integrated in two aspects of the EV: nature and water. It suggests that both the integration of green infrastructure and water retention is necessary to adapt to climate change. These aspects are both incorporated in building design as well in public space considerations. The measures also have multiple functions such as increasing biodiversity, facilitating leisure and sports and improve the citizens’ wellbeing. As measures contribute to climate neutrality, climate robustness and climate adaptation, the municipality envisions climate adaptation comprehensively.
Clear, Concrete Ambitions	The municipal ambition consists of climate robustness, climate adaptive and climate neutral. These aspects are not specified in the document. However, foreseen measures contribute to limiting heating stress and peak rains. The municipality envisions how green building and infrastructure and water retention has to be incorporated in the new neighbourhood with clear statements. This indicates how	Although the ambition of climate adaptation is not clarified, as aspects of climate robustness and climate adaptation, are not concretized, the municipality do have concrete targets for heating stress and peak rains: a maximum temperature rise of three degrees Celsius, and the full retention of t=100. This indicates that the measures will contribute to these particular targets and the design of the new neighbourhood will be achieving these targets. The measures

	<p>climate adaption will be realized in the area. However, at building level, the municipality expected private developers to incorporate measures that contribute to the climate adaptation.</p>	<p>of green infrastructure are further specified in requirements of green infrastructure: minimum width and requirements of building construction, but water retention is less specified, only mentioning that peak rains should have limited damage. So this indicates that its rather clear how climate adaptation will be integrated in the Merwedekanaalzone.</p>
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4.2.4 Sustainable Mobility

In both EVs, mobility is considered as a key aspect within the redevelopment. The term ‘mobility’ is overarching for particular nodes of transport. Both EVs highlights the notion that the high density of the new neighbourhoods conflicts with private car use. Because of this assumption, the municipality focuses on the discouragement of car mobility, and emphasizes other nodes of transport, such as walking cycling and public transport.

The municipal approach causes that the new neighbourhoods will be car free. The infrastructure design doesn’t allow cars within the area. The EVBL states that car-ownership is not stimulated and car-use is discouraged. This is concretized as not investing in car infrastructure, parking at distance in existing facilities at Jaarbeurs and Lombok and the introduction of car sharing. The municipality already allocated parking space for car sharing (120). The EVM highlights that from the start of the development, alternatives for individual car-use will be facilitated. In Merwedekanaalzone, limited parking space is available (1.800 at 6.000 citizens), parking is concentrated in car hubs at the boundaries of the neighbourhood and also car sharing will be integrated in the area. The EVB suggest that a transition to electric cars will happen, while the EVM is more reserved with only investigating the consequences of large scale use of electric cars.

The municipality envisions in both EVs a two-sided approach to limit car mobility: walking and cycling as alternative for short distances, and public transport for commuting and longer distances. Both documents highlight the importance for both kinds of alternatives. Slow traffic is envisioned as “important for high density neighbourhoods’ (EVBL) and “a key transport node for developing new neighbourhoods”. The EVBL prioritize the “creation of maximum necessary space for pedestrians” and a “logical system of connected routes” (p.33). In the EVM, walking is linked to health behaviour: contributing to the physical and mental health of people and therefore needed to be stimulated. This perception leads to the ambition to construct a fine grained grid of logical bicycle and pedestrian routes. In the EVBL it results in a schematic vision of such network, while the EVM sets specific boundary conditions, relating to minimum width. Furthermore, walking and cycling is considered as alternative for transportation within the city, through the establishment of connections with other routes, such as the city centre and other areas (EVBL) and the train station, Utrecht Central Station and Vaartsche Rijn, and Utrecht Science Park (EVM). Besides the construction of cycling lanes, the municipality also focusing on bicycle storage. In both areas the storages are incorporated within the residential buildings, with also external facilities at ground level.

Public transport is less mentioned within the Omgevingsvisies, because it’s on a larger scale than the neighbourhood development. The municipality wants to stimulate the use of public transport for long distances. In both EVs, this transport node is considered as necessary to develop high dense neighbourhoods. The EVB suggests that the current situation in Beurskwartier is already satisfying

and therefore less challenging, but could further be improved. In the EVM, the municipality highlights the creation of large scale jumps in public transport for larger areas. In both visions the idea for the extension of current infrastructure is adopted: (A small bus in Beurskwartier and several bus lines along the Europalaan in the Merwedekanaalzone), but also to develop new mobility (new door-to-door concepts in Beurskwartier and a tramway for the Merwedekanaalzone),

TABEL 4.6 MUNICIPAL APPROACH AND AMBITION ON SUSTAINABLE MOBILITY

	Beurskwartier & Lombokplein	Merwedekanaalzone
Comprehensive Vision	The municipality envisions that sustainable mobility is preferred for the new neighbourhood. It suggests that cars are not desirable in the area. Herewith it aligns other transport nodes, such as walking, cycling and public transport. The urban design will be develop in favour of the slow trafficking, and discourages care mobility. regarding the incorporation of a vision on all mobility forms, the municipality uses a broader definition of mobility.	For the density of Merwedekanaalzone it's required to adopt alternatives for car mobility, as the limited space constraints the parking of cars. Therefore the municipality adopt the ambition of sustainable mobility. It adopts walking and cycling as primary transport nodes in the new neighbourhood, and created sufficient routes and services at limited distances to encourage the use of these forms of transport. Public transport is considered as alternative for longer distances. So the vision is basically structured by limiting car use in the area, but with incorporation a vision for all transport nodes, the municipality uses the broader definition of sustainable mobility.
Clear, Concrete Ambitions	The municipality has the ambition to create a car-free neighbourhood with parking at distance. In the document, the municipality already set concrete amounts of parking space at specific existing facilities. Also the municipality created a schematic scheme, on how the fine-grained network of walking and cycling routes will be created and how public transport can be extended through the area. Therefore it clarifies how sustainable mobility will be implemented in the area according to the municipality. The municipality envisioned no clear role for private developers.	The municipality states that the area will be car-free, and a parking norm of 0,3 is set for the neighbourhood. This indicates a clear and concrete ambition for car mobility. The ambitions for the alternative, sustainable nodes of transport are less clarified: infrastructure for slow trafficking is sufficient with bicycle parking at building level. And public transport increases related to the demand, and only envision multiple 'possible' solutions. These ambitions implies that reduction of car mobility will be integrated in the area, while it's not clear in which way other transport is integrated concretely in the Merwedekanaalzone.

Sub-conclusion

The Omgevingsvisies are principal, leading spatial policy documents for the municipality. These documents indicates in which way the new neighbourhoods will be constructed. Herewith is also determined how principles of Environmental Sustainability are integrated in the development. In these documents, the municipality highlights relevant aspects and focus points of these principles and argument which targets and ambitions are set for both neighbourhoods. The content of the

Omgevingsvisies imply that the circular economy is mostly integrated as buildings are flexible and should be disassembled, and consist of reused existing materials or environmental friendly materials. In Beurskwartier & Lombokplein, the extent depends on the inclusion of circularity in tender applications by private developers, while in Merwedekanaalzone, circularity is integrated through meeting municipal requirements. For sustainable energy, the both Omgevingsvisies indicate that although the ambitions are unfeasible, the focus is on limiting energy consumption, integration of local sustainable energy. In Beurskwartier & Lombokplein the actual implementation depends on the visions of private developers and collaboration between existing systems. In Merwedekanaalzone the potential isn't clear, and further investigation will concretize the possibility of integrating sustainable energy in the area. Measures for climate adaptation are related to incorporating green and water in the neighbourhoods. As the Omgevingsvisies suggest, it will be aligned with other function, such as leisure and health. In Beurskwartier & Lombokplein, a clear vision on public space exists, while on building level private developers will be challenged, while in Merwedekanaalzone, measures have to lead to clear targets on limiting heating stress and peak rain mitigation. Sustainable mobility is focused as limiting car mobility. Therefore improvements on slow traffic facilities and public transport are envisioned. Car use and car parking is limited within both areas. While in the EVBL is a complete schematic scheme on how this should be integrated, the EVM only mentions targets and requirements.

The Omgevingsvisies implies that these documents both sets the visions and regulations on how principles of Environmental Sustainability should be integrated in the neighbourhoods and indicates the role of both municipality and private developers in the implementation. In Beurskwartier & Lombokplein it depends on how the municipality incorporate their ambitions in tenders, and how private developers envision the realisation. In Merwedekanaalzone, the municipality sets more targets and measures, and the collaboration with other landowners results in a final vision on the way these principles are implemented

4.3 Sub-question 3: Perceptions and barriers of the implementation of principles Environmental Sustainability in spatial projects

4.3.1 Circular Economy

Perception of circularity

Most private developers perceive circular economy as concept, related to reusing building materials. It's envisioned as an approach to construct new buildings. BPD, Synchroon and AM also highlight a broader conceptualization of circularity, connecting it with other aspects of developments. The private developers emphasize two aspects: reusing resources, and construction elements. ABB and Timpaan both mention the reuse of rubble granulate, BPD possesses the use of facade components, from reused materials and AM highlights the project Bijlmerbajes, in which old prison doors are refurbished to bridges in the public space. VORM and JanssenDeJong bring up the use of material passports, an overview of all used materials in a single building.

Private developers describe the circular economy differently, relating it to other aspects, and refers to the implementation in their own projects. ABB and VORM both note that their organizations are not really familiar with circularity. ABB states: it's a concept that you hear about and it's included in some tenders. But we don't do much with it in our projects". VORM emphasizes "it's is some pilot projects, and currently we are discovering which opportunities and challenges exist in the integration of this concept in our projects, but it's still at its infancy. There is not yet a business strategy or

targets created". Timpaan, Blauwhoed and JanssenDeJong are somehow familiar with the concept, although it's not a standard in their projects. Timpaan argues "as a societal developer, affordability is predominant in projects, and the incorporation of circularity depends on the value for projects". Blauwhoed mentions that "there are two moments of considerations about materials: at the start, by deciding on unique selling points, and in the construction phase by choosing the materials that will be used". JanssenDeJong states "we try to be ahead in circularity, that's a business ambition, although it's considered as illusion to built full circular housing, that's unrealistic, but we will try". It's still at its infancy. AM, BPD and Synchroon already adopt circularity in some extent in their business visions. AM argues that "relative to the market, we're ahead in using circularity, with projects like Bijlmerbajes and Merwede". Its business strategy is "to implement the concept in an increasing amount of project, but not as basis condition for each project. AM envisions the concept as "reusing existing materials or using circularly new materials". BPD incorporates circularity in its business vision on sustainability. It suggests that "the concept is relatively new, but still yet has to be developed. It has a large material component, but also has to be integrated in broader area developments". We "already experiment with circular construction materials, such as facades from reused materials and allow consumers to choose such kind of components". Synchroon argues "circularity isn't only about building materials, but also about energy, CO₂-emissions, biodiversity and health. A broader concept than only materials, as new approach to our economy, by integrating sustainability, social issues and profitability in business models".

Perceived Barriers

Private developers perceive multiple technical barriers related to implementation. Most concerns are about the applicability of circular materials in buildings. JanssenDeJong states 'not all components can be constructed circularly'. Most used materials, such as cement and concrete are not circular (BPD), material characteristics don't always allow reuse (AM & Timpaan), Also convenient new materials have higher quality and less maintenance (ABB & VORM). All Private developers agree that circular materials are more expensive than convenient materials. As processes and scale changes, they are differently priced (BPD), the preparation of materials increases costs (ABB) and new concepts leads to mistakes, causing extra costs (Timpaan). This leads to higher construction costs (Synchroon & Blauwhoed). It conflicts with business case of redevelopment projects. The private developers also argue that circularity is a recent concept. Multiple organizations suggest it's at its infancy and yet have to be further developed. There is a lack of knowledge among professionals about the potential of circularity. Circularity stays at each mind, but it's doubtful if all stakeholders, such as consultants, municipalities and private developers and consultants prioritize this concept in their projects (AM). Another cultural barrier is convincing consumers. As BPD mentions: a question mark exists in how customers perceive circularity. As ABB and Synchroon highlight 'the difficulty is to convince them the advantages of circular materials. Consumers and investors are holding back and only preferred circularity as it's not leading to extra investments. Another constraint is a regulatory barrier: municipalities have no concretized vision on circularity. Several private developers mentions that differences exist between municipalities. Although it's adopted in tender processes, is not prioritized and not clear what precisely is preferred by them. Synchroon and Blauwhoed have more critical arguments: municipalities stick to their framework setting role, and it's too simple to only be normative and create a stacked ambition. Also it conflicts with municipal design plans, and therefore is difficult to incorporate (AM & JanssenDeJong).

TABLE 4.7 PERCEPTION PRIVATE DEVELOPERS ON CIRCULAR ECONOMY

Vision	Private developers are unfamiliar with all aspects of the circular economy and therefore its use is limited to the re-use of material and components, because it's a recent concept that yet has to be further developed.
Technical Barrier	The lack of circular materials and their applicability constraints the implementation. Private developers have limited options to choose within the considerations about the used materials in developments. It's fuelled by a lack of knowledge, caused by the recentness of this concept, and the lack of knowledge about its implications for developments.
Financial Barrier	Circular materials have higher implementation costs and therefore this conflicts with the integration in a profitable business case. It limits the options to choose such materials. The higher costs are caused by a different production and implementation process, and a different scale. This increases the cost of manufacturing and applying circular materials.
Cultural Barrier	Circular materials are not a priority among professionals and customers. Therefore circularity is not always expected to have influence on the considerations. This is caused by limited knowledge among professionals and customers about the benefits and consequences of using circular materials.
Regulatory Barrier	Circular Economy is not much integrated in municipal tenders and visions. As it's not highly expected, private developers don't always integrate this concept automatically in their considerations.

4.3.2 Sustainable Energy

Perception of sustainable energy

Private developers already integrate sustainable energy generation in their development projects. BPD argues "housing has to be heated one way or another. The sustainability component has become standard. We use district heating networks or heat pump systems. Solar panels are almost always incorporated, as they are necessary for those networks. As in some projects the ambition is zero-energy housing or energy neutral buildings, it ensures the use of such mentioned systems is required. ABB highlights using two different systems: "large 'airco units', outside housing, or geothermal energy. Both systems are accompanied with solar panels". However, it focuses on 'passive construction, with investments in facades and insulation, rather than in energy installations". Blauwhoed argues that the use of sustainable energy sources, mostly solar panels and geothermal energy, is obligatory regarding current norms. "Sustainable energy is necessary to meet those norms". Also VORM suggest that the 'gas-free regulations', made it almost obligatory to use other solutions: geothermal energy or combinations between air and water heating systems. AM highlights that "due to the 'omgevingsvergunning', gas systems are not allowed and fossil fuels are debited". It argues that "three categorizations of energy performance exists: EPC-norms, energy neutrality and zero-energy buildings. In long existing projects, still EPC-norms of 0,4 are use, in line with the 'Bouwbesluit', while new projects are more focused on energy neutrality and zero-energy buildings". Synchron argues that energy is dominant in climate targets, and is prioritized in municipal policy agendas". It's already incorporated in development frameworks, although it's difficult to exceed ambitions because of high investments and the competitiveness of our projects. Timpaan already uses solar panels and heating pump systems, although these systems not always fit in projects. It highlights that optimizing the use of energy systems is a priority. JanssenDeJong already uses sustainable energy, but noting that in some projects, such as high-density areas, independent energy generation is almost impossible.

Perceived Barriers

As private developers already incorporate sustainable energy systems, as regulations requires, it implies that sufficient options exists. However, the constraint is the applicability of such systems in each spatial contexts.. Not every system fits in each location (Timpaan), but there is always a specific kind of systems can be integrated in a specific project (ABB). With geothermal energy, the constraint is the limited space underground. Some functions, such as parking space conflicts the creation of geothermal energy systems (VORM & Blauwhoed). Also limited depth, by regulation or possibilities restrict the implementation of such energy system (Timpaan & JanssenDeJong). With solar panels, the crux lie in the density. BPD, Synchroon, AM and JanssenDeJong notice that in high dense areas, it's difficult to meet norms and energy demand because the limited rooftop space. The private developers argue that energy systems are highly expensive. Therefore it constraints the profitability of business cases. In the Netherlands, finances go beyond the environment, and as private developers are commercial organizations, it must be profitable: we still are entrepreneurs (VORM & JanssenDeJong). As BPD mentions: high ambitions on sustainable energy is not profitable or money making. This constraint is related to cultural barriers. AM and Timpaan argues that the affordability of housing is important in projects. It's sometimes difficult to sell sustainable energy to customers. It's difficult to pass investments on higher housing prices. Also customers are not willing to invest much more in integrating such systems in their housing (Synchroon, Blauwhoed, BPD and AM) They prefer investments in other aspects. Although this is a constraint, some private developers also emphasizes an upcoming trend towards the commitment to sustainable energy. Nowadays such energy systems are part of their considerations, and less explanation is required and customers prefer the low energy costs (BPD, ABB and JanssenDeJong). Municipalities always set ambitions on energy. Several private developers question the achievability of high ambitions. Sustainable alternatives are still expensive, and the stacked ambitions conflicts finding solutions appropriate within business cases (Timpaan & Synchroon) However ambitions are also perceived as necessary, as it contributes to 'a level playing field (Synchroon), it sets a framework (VORM) and it leads to improvements (BPD). As BPD argues: it's not necessary to have the highest score on all aspects: "there is no decathlon winner that is the best in each sport". However also the relation with other policies restricts the possibilities of sustainable energy. Urban design plans limits options (BPD & Timpaan), while the current policy of 'postcoderozen' restricts the opportunities of sustainable energy systems outside the project area (Blauwhoed, AM and JanssenDeJong)

TABLE 4.8 PERCEPTION OF PRIVATE DEVELOPERS ON SUSTAINABLE ENERGY

Vision	Private developers are already familiar with the concept of sustainable energy and integrate it within projects. Most used systems are solar panels and geothermal energy. The regulations forces private developers to implement such systems, to meet the requirements.
Technical Barrier	The spatial contexts limits the applicability of sustainable energy systems in each project. Limited underground and rooftop space constraints the integration of systems. Therefore it determines which options are feasible for each project. Therefore it limits the potential of sustainable energy.
Financial Barrier	The integration of sustainable energy systems is a large financial investment for private developers. Such systems are expensive to integrate in each project. Therefore it conflicts with a profitable business case, and marketability of projects. Herewith it limits the willingness of private developers to invest to achieve all aspects of sustainable energy .

Cultural Barrier	Customers are not fully committed to sustainable energy systems. They not favoured such systems which implies that the necessity of implementing is limited. Private developers are aligned to the customers' preferences. As they not want to pay for extra investments, it conflicts with the marketability of projects and herewith with a profitable business case. The lack of knowledge about the profits and advantages of such systems hinders the increase of commitment.
Regulatory Barrier	The high ambitions of municipalities constraining with the business case of private developers. It's difficult to achieve such ambitions in a profitable project, because it requires large investments of private developers.

4.3.3 Climate Adaptation

Perceptions of climate adaptation

Each private developer notion the importance of climate adaption. They perceive it as necessary aspect within their projects. VORM suggests "although it's not our priority and we don't discuss this specifically, we won't forget to incorporate it in our plans. In large projects, landscape architects are involved. Timpaan suggests it's accounted within their projects, especially water management. ABB mentions "we always investigate possibilities to include green structure in public space, such as water-infiltrated pavements, wadi's etc. Synchron states: "climate adaptation is important in our projects, and we sometimes do more than regulations or municipal ambitions require". Blauwhoed highlights that "visible and facile measurements are our priority" and "much can be solved within the landscape, such as wadi's, small water loops and less pavements". AM suggests that it's part of the overall development", it depends on the project how climate adaptation and green infrastructure is incorporated in the plan. The role of municipality, how it's financed and customer preferences are important considerations. BPD argues climate adaption is an important theme, although in new built neighbourhoods the situation is quite satisfied: "new neighbourhoods are miles ahead on peak rains, relative to existing areas. Highlighting water neutral building envelops, which requires water retention on location, and not drainage to sewer systems become more common, and this adjusts the design of public space, with incorporating wadi's, infiltrating sewages etc. Heating stress in new neighbourhoods has to be nuanced, as heat pumps and floor cooling limit the effect inside housing, and outside green infrastructure limits the effect". JanssenDeJong argues that if our position allows, developments are not limited only to the building, but also includes its surroundings, while mentioning an exemplary project in Driebergen, which includes a created ecological zone, adjacent to housing.

Perceived Barriers

The realization of climate adaptation measures in projects, depends on land positions. Developing only single plots limits the possibility to incorporate green infrastructure and water retention facilities. The integration of rooftops conflicts with other functions, such as solar panels, which is favoured by private developers. As BPD suggests: "a roof fully covered with solar panels, doesn't facilitate the possibility for green". Green rooftops are perceived as costly. It's considered as "expensive and vulnerable (Blauwhoed), not yet profitable (Synchron), an addition not valued in higher housing prices (BPD), limiting the marketability (JanssenDeJong) and an 'expensive hobby (ABB). Also investments in green public space is limited due to profitability: business cases limits the investments"(AM), higher housing prices conflicts with profits (BPD and JanssenDeJong) and it depends on the necessity (Blauwhoed and Synchron). Consumers are not fully committed to climate

adaptation. Preferences of customers are part of considerations about measures and quality (AM), low maintenance costs are preferred and convincing them about benefits is needed(ABB), ‘we have to nurse them about green gardens and maintenance costs (BPD) and they prefer “not pre-set balconies, as they prefer styling on their own (VORM). Private developers argue that municipal regulations and vision limit considerations: Municipalities use their guidelines of public space’, allowing limited flexibility in choosing materials, which are mostly standard (Blauwhoed), the maintenance department mostly argues that it’s more costly and more difficult to maintain green infrastructure. Due to lack of knowledge or little flexibility (BPD) and “sometimes municipalities take responsibility to maintain the quality of green infrastructure in public space, but also it happens that it’s considered as impossible, and ambitions are lowered” (AM).

TABLE 4.9 PERCEPTION PRIVATE DEVELOPERS ON CLIMATE ADAPTATION

Vision	Private developers notices the importance of climate adaptation and already incorporate measures in their projects. Both covering buildings and public space is implemented by green roofs, wadi’s, and water infiltration. They perceive it as important theme within the considerations in projects.
Technical Barrier	As private developers develop building blocks, the limited space on building blocks constraints the integration of measures on climate adaptation. Only feasible measure can be incorporated in the considerations. Therefore it depends on the space within project sites which measures are implemented.
Financial Barrier	Green infrastructure is not valued in higher housing prices, as customers not want to pay extra investments. Herewith it conflicts with the business case as the marketability and profitability of projects is constraining. So private developers only invest when it’s allowed within a profitable business case.
Cultural Barrier	As customers don’t expect green measures and it has large maintenance costs, it’s difficult to convince them about the need for such measures. They don’t yet see the advantages of such measures. Therefore private developers not invest more than the customers appreciate, and the business case allow.
Regulatory Barrier	Municipal visions and restrictions constraint the possibility of investment in climate adaptation measures. It limits the options can be integrated by private developers in their projects as they are set to preferences of municipalities.

4.3.4. Sustainable Mobility

Perception of sustainable mobility

Private developers are in favour of integrating sustainable mobility in their projects. They distinguish three kinds of measures: car-sharing & electric cars, investments in public transport and encouraging walking and cycling within the area. Several private developers highlights their focus on car-sharing. AM mentions systems as Car-2-Go, Greenwheels and Hely. JanssenDeJong poses the collaboration with WeDriveSolar, and Timpaan co-operates with BMW to facilitate car-sharing. BPD mentions that already in 20 projects, car-sharing is integrated. Also VORM is “busy with integrating concepts like car-sharing and we already collaborates with BMW to introduce such mobility in projects. Synchroon suggests that they incorporate sustainable mobility, if it’s necessary and favourable within the area . Also electric cars become more common. BPD already considers the incorporation of recharging facilities in their design on aesthetics. Timpaan collaborates with large companies to integrate this kind of cars in their project. Public transport measures are considered mostly as public task. Nevertheless private developers collaborate with the municipality, as it’s perceived as necessary transport. As AM poses: it’s a boundary condition”, BPD argues that “public transport have to exist

before developments starts. The other private developers argues that public transport can be an alternative for car mobility if it's exploited sufficiently. Investments are part of the so-called "bovenwijkse plankosten", investments in aspects that go beyond the project area . All private developers acknowledge the importance of encouraging slow traffic, like walking and cycling. It depends on their position in which extent they can invest in improving this kind of mobility.

Perceived Barriers

As private developers already incorporate sustainable mobility measures, such as car-sharing, parking at distance and logical routes for slow traffic, each solution is feasible. However the location determines which measures can be integrated. In cities, the market is more favourable, because the proximity of public transport (AM & Synchroon), in inner city developments more possibilities exist (ABB), in cities we dare to do more as car mobility is less used (Blauwhoed) and in large cities it's easier to implement (Timpaan). In villages, public transport is limited (AM), and not sufficient developed (Synchroon), car mobility is common (Blauwhoed), in small and commuting communities it's more difficult to implement (BPD & Timpaan). Investments in public transport are restricted to the 'bovenwijkse plankosten'. it's logical to contribute as it increases the project value (VORM), it's a paid contribution to the municipality (Synchroon), "investments in public transport cannot be arranged by private developers, but agreements are created with the municipality about the investments (JanssendeJong), "private developers pay a certain contribution for accessibility for particular areas, but public transport has large starting investments (BPD), and it's an agreement between municipalities to contribute to everything that goes beyond the project scale, as developers cannot invest solely in public transport (AM). The constraint is that realisation of sustainable mobility limits the marketability of projects, especially in relation to car mobility: it's putting risk on our project as you miss certain customers (Synchroon). It's related to the preferences of customers. Therefore the implementation of sustainable mobility is constrained by their perceptions. "well designed brochures can convince consumers, and it seems that everyone get used to these new forms of mobility (VORM), but 'if target groups depend on car mobility for commuting, it's difficult to integrate alternative forms (Timpaan), it's not efficient to introduce alternative transport as someone rely on cars for work (BPD), it's at its infancy: as in meetings only a few are in favour of shared cars (Blauwhoed), and in inner cities, customers are more favoured of sustainable mobility, as it's more common (ABB) "as in cities, everything is accessible in reasonable time, by walking, cycling or public transport citizens are not forced to use cars (AM). Another perceived constraint is the municipal parking norms, which determine the required amount of parking. It restricts the efficiency and profitability of introducing car sharing as alternative for private car uses.

TABLE 4.10 PERCEPTION OF PRIVATE DEVELOPERS ON SUSTAINABLE MOBILITY

Vision	Sustainable Mobility is perceived as favourable. Especially in cities, there is the notion on integrating other transport, to limit car mobility and contribute to the accessibility and liveability of cities.
Technical Barrier	Location determines the efficiency and favourability of introducing sustainable mobility. It determines which alternatives are yet deployed and how customers appreciate measures in care use discouragement, such as limited parking space. These aspects are part of the considerations of private developers to invest in sustainable mobility measures, which are because of this not everywhere applicable.
Financial Barrier	Investments in sustainable mobility is perceived as constraining the

	marketability of projects. As consumers depend on cars, because of commuting or preferences, target groups are missed. Therefore private developers considers which kind of measures are feasible within the project, without conflicting the profitability of projects.
Cultural Barrier	Customers prefer car-use and are dependent on such mobility for commuting and leisure. Therefore they prefer to have private parking space and individual cars. By introducing sustainable mobility, focused on reducing car mobility it hinders the marketability of projects.
Regulatory Barrier	The municipal parking norms restricts the introduction of car-sharing as alternative transport node. It limits the possibility to introduce sustainable forms of transport in the area, as private car use is limited discouraged.

Sub conclusion

Private developers all have clear perceptions of what is understood as principles of Environmental Sustainability. These perceptions insist how private developers made considerations about how to incorporate them in actual projects. The perceived barriers also are related to the way they perceive the principles. As circularity is perceived as a recent concept, at its infancy, it insist that private developers are not familiar with its aspects. The limited availability and applicability of materials, high costs, and low recognition by both consumers and municipalities constraint the necessity and possibility of implementing the circular economy in urban infill projects. Sustainable energy is already much more integrated in projects. As the law requires, private developers has created multiple systems to apply in projects. Also municipalities have high ambitions regarding energy, requiring private developers to invest in such systems. However the spatial context limits the possibilities and here with the opportunities to integrate sustainable energy in projects. Another constraint is the consumer commitment. Without their preference for sustainable energy and limited favour to invest or pay for sustainable energy systems, it conflicts with the profitability of business cases, as energy is a large cost. Climate adaptation is perceived as valuable and necessary, which implies private developers are willing to invest in such measures. However locations and spatial characteristics limits the possibility to create climate adaptation. A further constraint is that municipalities not always prefer large green infrastructure, because of maintenance issues. This issue is also related to customers, as they prefer low maintenance and investments. This hinders private developers to incorporate climate adaptation measures in urban infill projects. Sustainable mobility is perceived as only applicable to cities, as sufficient alternatives exists, and especially customers are more familiar with alternative transport nodes and less car dependent. Therefore it can be more easily integrated within the business cases of private developers.

This indicates that the perception of private developers on Environmental Sustainability principles consist of two aspects: a vision of integrating principles in projects, and barriers that hinder the implementation. The vision indicates how the private developer deals with aspects of the principle in actual projects. The results implies that they are more familiar with sustainable energy, climate adaptation and sustainable mobility and therefore have a higher priority than the circular economy. It insist that the three aspects more comprehensively are integrated in projects, while the circular economy remains focused on reusing materials. The perceived barriers further determines how the principles are integrated in projects. Technical, financial, cultural and regulatory issues are part of considerations in the business case of projects. So these influences in which extent the principles are implemented in actual projects. So this implies that the perceptions not only how principles are envisioned, but also how private developers integrate them in urban infill projects.

5. Discussion

This research focuses on the implementation of four principles of Environmental Sustainability in urban infill projects in Utrecht. It's not an isolated, stand alone study but contributes to a broader understanding in both academics and practical world. The study results can be placed in the debate on the way Environmental Sustainability is integrated in spatial developments, and will contribute to the improvement of Dutch spatial projects, especially relating to urban infill, by providing insights in the integration of Environmental Sustainability principles.

5.1 Theoretical implications

In the theoretical framework, environmental sustainability is considered as a fuzzy concept. Several scholars tried to capture the essential ideals of this concept. This research has applied these ideals to the built environment, resulting in four principles: circular economy, sustainable energy, climate adaptation and sustainable mobility. Herewith, it poses an integral way of studying this fuzzy concept in the practical world. This study shows that the four principles are envisioned by local government and private developers. However different perceptions of those principles exist both between actor groups and between particular organizations. This implies no general conceptualization could be created for the practical world. Therefore, the implementation of these principles depends on how it's perceived by organizations involved in the particular project.

The theoretical framework shows that technical, financial, cultural and regulatory barriers hinders the implementation of the four principles. This study shows that private developers perceive for each principle different extents of barriers. Also the perceived barriers differs among private developers. This implies that studying the implementation of Environmental Sustainability is the most valuable by doing case studies. This research method is the most satisfying to capture the way of how this concept is integrated in the practical world. It will give the most valuable data to develop a more comprehensive understanding of how Environmental Sustainability can be implemented in different spatial contexts.

5.2 Societal implication

In the next decades, Environmental Sustainability will be more important in Dutch Spatial Planning. Municipalities, private developers, consumers and private investors become more familiar with the different principles underlying this concept. It's already integrated in municipal policies, private developers integrate this concept in their considerations during projects and consumers and investors are more committed to sustainable solutions. However, private developers currently still perceive several kinds of barriers that hinders the implementation of Environmental Sustainability in projects. For the Circular Economy is the crux to further develop this concept, which is only recently introduced. Technical improvements and more extensive knowledge is crucial. As the municipalities currently are not familiar with this concept, knowledge could help them to incorporate it more concretely in their ambitions, while customers can be convinced about the advantages of such materials. This enforces private developers to make considerations about circular materials, as it's more demanded and expected by both. Technical improvements will increase the available applications, which allows private developers to choose feasible alternatives within their profitable business cases. Regarding Sustainable energy, the cultural, financial and regulatory barriers are interrelated. With an improved consumer commitment and acceptance it will increase the space of investments within the private developers' business case. Because of this, more measurements can

be integrated leading to higher extents of sustainable energy, which implies that municipal ambitions can be achieved. Technical improvements will increase the feasible solutions within particular spatial contexts, and increases the possibilities of implementing sustainable energy. Climate adaptation is mostly constraint by a combination of technical and regulatory barriers. If collaboration between municipalities and private developers will improve and extent, it widen the opportunities of investment in measures of climate adaptation. Convincing customers about the advantages of such measures will increase the investment space in business cases, and allow private developers to implement more sufficient measures on climate change. The implementation of sustainable mobility is hindered by a combination of spatial characteristics and customers preferences and related financial issues. The lack of alternatives forces citizens to be car-dependent, which make investments less favoured. However, with collective investments, by municipalities and private developers in improving other transport nodes, especially in public transport and car-sharing for commuting, will increase the commitment to sustainable mobility, and widen the marketability of project with such measures.

This shows that the bottlenecks of implementation are interrelated. It indicates that a broader understanding of how such bottlenecks can be solved has to be developed. So there is a need for a debate across the development profession, where each organization can learn from each other and collectively barriers can be overcome in projects. A collaboration between municipality, market (private developers and suppliers) and knowledge institutes is necessary to improve policy-making, adjust business cases and convince customers to commit to the principles of Environmental Sustainability. Collective action will increase the efficiency and effectiveness of improvements made within projects. Herewith it can lead to a broad, comprehensive implementation of all principles of environmental sustainability in urban infill projects.

With the new Environmental Law, environmental sustainability becomes more dominant in Dutch Spatial planning. Private developers suggest, small municipalities have difficulties with implementing this concept comprehensively and concrete in their policies. This study shows that the municipality of Utrecht is quite far in implementing this concept in their spatial strategies. Therefore other practitioners can learn from the Omgevingsvisies, how to cope with aspects as circular building materials, sustainable energy, climate adaptation measures and sustainable mobility forms. This could improve their own spatial policies, and contributing to a sustainable built environment in such places. So this study contributes to the spread of Environmental Sustainability across the country and contributing to a sustainable built Environment in the Netherlands

5.3 Limitations

Although the research has multiple implications for both academics as the practical world, particular limitations confronts the results of this study. The first limitation is conceptual. In this study, the fuzzy concept of Environmental Sustainability is defined by four principles. These principles are relevant for the built environment, and therefore a sufficient indication, but not exhaustive. Multiple approaches and related conceptualizations of this concept exist. The choice for these principles has guided the direction of this study, the data collection and therefore also the results and conclusion. This study is not representative as comprehensive, compelling understanding of the fuzzy concept of environmental sustainability.

The four principles are defined based on the existing literature. These definitions have guided and directed the approach of the data collection and analysis. It's not clear that the used definition and

conceptualization of those principles is exhaustive and comprehensive. The study's approach was to capture the perception of organizations, like the municipality and private developers. Nevertheless, their perceptions are in somewhat guided by what is understood in academic literature, as this is used as basis. Also the studied barriers, were generally based on the existing literature. In the interviews is tried to prevent pre-set directions and aspects, but most questions and answers could be related to the mentioned kind of barriers.

Another limitation is more methodological. This study consist of a single case of Utrecht, focusing on urban infill projects. Single cases lack the robustness to apply the results to a larger context. The study adds data and insights for more comprehensive understanding of Environmental Sustainability by academics, but will not change current conceptualizations and existing approaches, because of the limited scope. The choice to cover only urban infill, limits the applicability of results in Dutch Spatial Planning. However, as in this profession, the focus shifted to urban infill and redevelopment, rather than green field development, it's a good starting point.

Within the case, qualitative interviewing is used for data collection. Although this method collects more in-depth data on perceptions and barriers, it limits the number of participants. This implies that data is influenced by the involved interviewees. Although they are familiar with the profession of spatial planning and development for longer periods, it's not fully clear how representative these persons are for the total development business, and specifically for their own business. As they use multiple examples and projects to argument their visions, it's arguable that other interviewees results in other data and findings.

The last limitation is more practical. Currently, the development business is increasing. Especially in the research period, and data collection period (before construction holidays), multiple organizations could not participate, because of busy work scheme's, understaffing or prioritizing other activities. Therefore the number of interviewees is limited to eight. Although the participating developers cover a large extent of the development business, it's far from exhaustive. Larger numbers of participants would increase the validity of the results.

5.4 Further Research

This study contributes both to the academic understanding of environmental sustainability as well the implementation in spatial developments. This indicates that both academic as practical research can improve the knowledge about this concept. For academic literature, it's necessary to apply this kind of research to other spatial and geographical contexts. Herewith a broader understanding of the used principles and the perceived barriers related to the implementation can be developed. Herewith it becomes clear which bottlenecks exists in applying environmental sustainability to the spatial planning profession.

The perceptions of private developers suggest that for each principle different kinds of barriers exists for the implementation of environmental sustainability. A more comprehensive study, including large groups of (Dutch) private developers can lead to more general accepted perception of the principles of Environmental Sustainability. This can lead to follow-up research about dissolving these barriers, by posing measures, to improve the implementation of the principles of Environmental sustainability.

6. Conclusion

In the next decades, sustainability will become more integrated in Dutch Spatial Planning. Regarding the new Omgevingswet, emphasis is put on the environmental aspects of developments. Therefore the concept of environmental sustainability is necessary to integrate in new spatial plans. However, it's full of ambiguity, and without a common conceptualization, it constraints the implementation in practical projects, as stakeholder perceive it differently. This research tries to bridge the gap between theory and practice: how can a theoretical concept as sustainability can be integrated in spatial planning, and in particular in urban infill projects. It tries to capture how different aspects of the development, such as stakeholder salience, the municipal vision and perception of private developers influences the implementation of Environmental Sustainability. This is provided through answering the following research question:

How do development process characteristics influence the implementation of principles of Environmental Sustainability in the urban infill projects Beurskwartier & Lombokplein and Merwedekanaalzone?

Both cases imply that stakeholder salience is the basis for the development. It not only determines the role of actors within the development, but also which influence actors will have on the outcome of the development process. This implies that the implementation of Environmental Sustainability depends on how stakeholder salience is organized in the development process. In the cases the municipality and private developers both are necessary in the development. The municipality as 'setting conditions, in policies and tenders', and private developers 'as investors constructing the new neighbourhoods'. This indicates that for the municipality, its ambitions lead the considerations, while private developers emphasize the profitability of the projects. It implies that implementation of principles of Environmental Sustainability therefore depends on the integration of the municipal visions in tenders and boundary conditions, and in which extent, private developers perceive measures relating to Environmental Sustainability as profitable and applicable in their business cases. The Omgevingsvisies are the primary policy documents of the municipality. It guides how the new neighborhoods will be developed. These documents elaborate on the aspects related to the principles of Environmental Sustainability: building construction, energy, climate measures and mobility. The municipality determines how it envisions such aspects, specifically for both areas. Related to this vision, the municipality poses ambitions which have to be achieved through the development. The stakeholder salience in both areas indicates that such ambitions influence the implementation of Environmental Sustainability. This implies that for circular economy, the focus is on reusing materials, and incorporating environmental friendly materials in flexible and demountable buildings. For sustainable energy, the focus is on local renewable energy systems, that meets the limited energy demand. The neighbourhoods will be climate adaptive, and mitigating the effects of heating stress and peak rains by green infrastructure and the focus is on alternative transport, discouraging individual car-use and parking, and emphasizing the facilities for walking, cycling and public transport. However, as the Omgevingsvisies indicates, the stakeholder salience and actor positions will determine how these aspects are implemented in the actual development of both neighbourhoods.

As the stakeholder salience suggest, the private developers will actually develop the areas. Therefore their considerations are decisive on how principles of Environmental Sustainability are implemented in the areas. Their vision indicates how they foresee the integration, while barriers indicate the extent of implementation and which measures are applied within the development. The perceptions indicate that private developers are not familiar with this concept and the implementation stick to the reuse of materials. The extent in which it's integrated depends on how the municipality concretize its vision, and in which way it's feasible in the overall business case, as it causes extra investments and herewith limits the marketability. Private developers are more familiar with sustainable energy, as they already incorporate it. The extent in which it's applied to both areas depends on the applicability of such systems for high density neighbourhoods, and in which way it can be included in the business case. As private developers are in favour of measures related to climate adaptation, this principle will be integrated. As the municipality already has a concrete vision and the public space is collectively developed, it foresees no constraints in implementation. Private developers will invest in green buildings and green infrastructure, in consideration with the business case. The implementation of sustainable mobility is perceived as favourable, especially in inner-city developments like Beurskwartier & Lombokplein and Merwedekanaalzone. As the municipality already adopted lowered parking norms in its policy, and private developers perceive that such mobility is not a large issue in cities like Utrecht, it will be feasible for both areas. Investments in alternatives will limit the constraints of limited marketability caused by car-dependency of citizens. This study implies that the three development process characteristics influence the implementation of Environmental Sustainability in different ways. Stakeholder salience as starting point, determining the role of each actor, the Omgevingsvisie as boundary-setting policy document, that structures the implementation, and perceptions of private developers as concrete indication of how the principles of Environmental Sustainability are implemented in the areas. It shows that an integral approach covering these aspects is necessary to investigate how Environmental Sustainability can be integrated in spatial projects. This study can be seen as starting point to develop further knowledge on how to improve and increase the implementation of this concept in spatial projects.

7. References

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