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ROUND THE BLOCK

Exploring the aims and outcomes of the Kissanmaa circular economy themed plot handover

Bachelor's thesis
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ABSTRACT

Aku Puskala: Round the Block – Exploring the aims and outcomes of the Kissanmaa Circular Economy themed plot handover

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Circular Economy has been brought up as one potential solution to the simultaneous and mutually contradicting global dilemmas: the climate crisis and biodiversity collapse requiring rapid action in our land use and GHG emissions, and increasing urbanization creating continuous demand for construction, consuming virgin materials and creating waste. The city of Tampere has attempted to encourage circular construction with a plot handover concept competition to develop new circular building material solutions and to advance the city's carbon neutrality goals.

The goal of this thesis is to evaluate the aims and outcomes of this thematic plot handover policy as well as its potential effect on circular transition in the construction industry in Finland. The data used includes the concept plans and interviews with a city representative and a select group of participants. The methodology consists of two rounds of analysis: a qualitative content analysis of the concept plans and a thematic analysis of the interview data.

The competition provided a unique stimulus for the industry and was an awaited challenge. Key factors in the success were the appealing location combined with adequately demanding requirements. The city's aims were to advance city strategy, develop building product reuse and support their partners, but along the process they were surprised by the high level of competition and as an outcome a dozen notable concepts plans of diverse approaches were created, not only material-based. The organizational learning was highly valued and despite its flaws, the concept competition succeeded in challenging the conventional construction regime.

Keywords: circular economy, construction, plot handover, concept competition, sustainability transitions, building product reuse

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TIIVISTELMÄ

Aku Puskala: Round the Block – Exploring the aims and outcomes of the Kissanmaa Circular Economy themed plot handover

Kandidaatin tutkielma

Tampereen yliopisto

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Kiertotaloutta on esitetty mahdolliseksi ratkaisuksi globaaleihin haasteisiin, jotka nykyisellään vaativat ristiriitaisia toimia. Ilmastokriisi ja biodiversiteetin romahdus edellyttävät pikaisia ratkaisuja maankäytön ja päästövähennysten saralla, mutta samalla kiihtyvä kaupungistuminen lisää uudisrakentamisen kysyntää, kuluttaen yhä enemmän neitseellisiä luonnonvaroja ja tuottaen jätettä. Tampereen kaupunki on yrittänyt kannustaa rakennusliikkeitä kiertotalouden mukaiseen rakentamiseen järjestämällä uuden tontinluovutuskilpailun, tavoitteenaan kehittää kiertotalouden mukaisia materiaaliratkaisuja ja pyrkiä kohti Tampereen hiilineutraaliustavoitteita.

Tämän tutkielman tarkoitus on arvioida tämän tontinluovutuskilpailun tavoitteita ja tuloksia, sekä sen mahdollisuuksia vaikuttaa kiertotaloussiirtymään rakennusalaalla Suomessa. Aineistona on käytetty 16 kilpailijan konseptitaso suunnitelmaa ja haastatteluja, joihin valikoitui osa kilpailijoista sekä kaupungin edustaja. Tutkimusmenetelminä konseptisuunnitelmille toteutettiin laadullinen sisällönanalyysi ja haastatteluaineistolle temaattinen analyysi.

Tontinluovutuskilpailu antoi rakennusosalalle ainutlaatuisen kimmokkeen ja osoittautui alalla odotetuksi haasteeksi. Onnistumisen taustalla oli luovutettavan tontin houkutteleva sijainti yhdistettynä kilpailun riittävän korkeaan vaatimustasoon. Kaupungin tavoitteena oli toteuttaa strategiaansa, kehittää materiaalien uudelleenkäyttöä sekä tukea kumppaneitaan, mutta kilpailun edetessä kaupungin yllätti sen korkea taso ja tuloksena oli kymmenkunta varteenotettavaa konseptia, jotka sisälsivät monipuolisesti myös kiertotalousratkaisuja materiaalipohjaisten ulkopuolelta. Organisaatioiden oppimiskokemuksia pidettiin arvokkaina ja puutteistaan huolimatta tontinluovutuskilpailu onnistui haastamaan tavanomaisten rakennusmenetelmien muuttumatonta luonnetta.

Avainsanat: kiertotalous, rakennusala, tontinluovutus, konseptikilpailu, kestävyys siirtymä, rakennustuotteiden uudelleenkäyttö

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PREFACE

I would like to thank all my peers in the Sustainable Urban Development degree program for these three years. I am infinitely grateful to the entire VATACO research group for recruiting me as a research assistant in the fascinating project on circular economy in residential functions. Without them, this thesis would have looked entirely different. Throughout the process the group provided me with great support and but also responsibility to steer the research towards my interests, and through VATACO I gained access to most of my data. Special thanks belong to my supervisor Markus Laine who connected me with the group last year. Laura, thank you for all the affirmations on big choices and tiny details when making this thesis.

Tampere, May 28th 2023

Aku Puskala

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1. INTRODUCTION

1.1 The wicked problem

Buildings and construction use half of earth's natural resources and create roughly a third of the world's waste and greenhouse gas emissions. In addition, construction and demolition is responsible for over a third of all waste generated in the EU. (Huttunen 2019 p.9; Ministry of Environment Finland, 2023). As the growing need for new buildings in the age of global urbanization is at odds with the urgency of addressing anthropogenic climate change and biodiversity loss (ibid; Morel et al. 2021), governments, cities and the construction industry find themselves between a rock and a hard place. The much-needed new construction causes an early spike in the life cycle emissions of buildings at a time when GHG emissions should be drastically cut (Huuhka & Lampinen, 2019, p 49; Huttunen 2019 p.8).

Where the decarbonization of energy production is expected to decrease the emissions related to building use and energy consumption, the same expectations don't apply to the manufacturing of fundamental construction elements (Huuhka & Lampinen 2019, p 49). Masonry and concrete mixing are carbon intensive processes. Burning clay to manufacture brick requires high temperatures and therefore large amounts of energy, emitting plenty of CO₂ and toxic gases with the addition of logistics emissions from hauling the heavy cargo (Nordby et al. 2009). The calcination process of Portland cement – the conventional binder for concrete – releases a significant amount of CO₂ directly as a product of the chemical reaction, as well as indirectly from the energy intensive furnaces (Maddalena et al. 2018, p 1). Concrete is typically needed in high volumes to construct floors, load bearing walls and roof structures and thus cement is one of the most manufactured materials in the world (ibid; Lahdensivu & Lahdensivu, 2021).

Circular Economy (CE) has been brought up in discussions as one solution to the dilemma of simultaneously increasing resource demand and looming environmental disaster. It is depicted as a new economic paradigm that has the potential of decoupling economic growth from growth in resource consumption. Its core principles are keeping

once invested natural resources in use and minimizing virgin material use and waste. However, despite the raised awareness and the conspicuousness of the common vernacular Reduce, Reuse & Recycle, for many construction professionals it appears to be reduced to recycling (Huuhka & Lampinen 2019, p 32). The embedded emissions of concrete can be decreased by replacing some of the cement with substitute binders from industry derivatives, such as pulverized fly ash, blast furnace slag and silica fume (Lahdensivu & Lahdensivu 2021), but the availability of the substitutes will drop if coal burning ceases and steel production moves to hydrogen-based processes (Huttunen 2019, p 85).

It is thus clear that a more systemic shift is needed. As urban and land use planning are statutory duties of local governments in Finland, they have a big responsibility – and opportunity – to steer construction as an industry in a more sustainable direction. Public procurement is often mentioned as an important instrument that can set an example in sustainability transitions, recognized in the 12th UN Sustainable Development Goal and the Circular Economy Action Plan of the EU (Carvalho 2021). There's however a clear lack of attention and a knowledge gap in the steering power of the opposite side of procurement that is very relevant to construction – handing over public property.

1.2 Background for this thesis

The city of Tampere has attempted to engage the market with a new thematic plot handover for a residential plot in Kissanmaa, where qualitative criteria for a CE building were set and the market was challenged to develop new CE construction solutions. Generally when it comes to city owned plots, construction companies are only given planning permissions via a public handover process, which attempts to incentivize timely construction, control the distribution of apartment sizes, ensure the equal treatment of construction companies, and the fulfillment of housing policy goals (Tampere City 2023). The Kissanmaa model is a hybrid between a concept competition and a plot handover and for a lack of a better term, both will be used in this thesis.

This thesis will evaluate the aims and outcomes of the handover at this stage, where the winner has been selected but the construction stage has not begun. I will analyze the criteria set by the city and resulting concept plans in relation to CE literature, as well as the prospects of affecting circular transition in construction companies with this kind of CE plot handover. In this thesis I will conduct two rounds of analysis. First, I will conduct

a qualitative content analysis on the 16 concept plan documents that were published on the city of Tampere website after the submission period for the competition ended. To gain more insight into the aims of the city and the competing teams' dynamics and attitudes towards the competition, interviews with a select group of companies and a city representative were conducted.

In Kissanmaa, the concept competition's evaluation criteria focused on CE solutions in materials and building components. The reasoning presented in the competition guide was that as close to zero emission construction is already a largely required, and the energy consumption-based life cycle emissions will decrease as energy systems transition away from fossil fuels, the importance of decreasing material-bound emissions within the new building's life cycle is emphasized. The applicants for the plot had to submit a concept plan showing how the development would utilize 1) reused parts or elements disassembled as whole and not significantly reprocessed 2) parts or elements using recycled material and 3) renewable materials. The concept plan also needed to include a calculation of the building's carbon handprint. The solutions were valued based on:

1. The degree of refinement/the quality grade of the CE solutions. The goal was to reuse parts or materials in their original purpose, or as close to it as possible. Reused steel beams were valued higher than steel beams from recycled steel, or new wooden beams.
2. Novelty and ambition level of the CE solutions. The concepts were rated higher, the fewer precedents there are in Finland. Also, the extent to which the CE solutions were implemented to the plans affected the valuations. If the CE solutions were implemented to more significant parts of the building (such as the frame, facades, floors and roof), the concepts were valued higher than those which target the CE solutions on doors or windows for instance.

After these initial competition instructions were published, clarifying questions could be submitted for the city to answer publicly. In this questions and answers document, it was clarified that the city's definition of carbon handprint was the "reduction of emissions on the part of the proposed above-ground CE solutions, when compared to conventional methods". The baseline data could be found at co2data.fi.

1.1 Research questions and structure of the thesis

The research questions of this thesis are:

1. what were the aims and motivations of the city in the policy design?

2. what were the outcomes of the Kissanmaa concept competition pre-construction?
3. what kind of an impact could the Kissanmaa concept competition have on circular transition in the industry?

First, a literature review will provide overview of the theoretical background and definitions of terminology, as well as examine previous research and recent developments in circular economy policy. Following the literature review is a section on methodology and ethical considerations. The results section is dedicated to demonstrating the outcomes of the analyses, whereas the research questions will be answered more conclusively in the end, along with discussion on limitations of this thesis, the future of the thematic plot handover competition and possible topics of future research.

2. THEORETICAL FRAMEWORK

2.1 Circular economy

Circular economy (CE) refers to a new economic model, where human activities that consume material resources and energy are fit into earth's capacity to sustain life (Huttunen 2019, p 9). The EU describes CE as maintaining the value of products, materials and resources and closing material loops by returning them to the product cycle at the end of life, while also minimizing the amount of waste generated (European Union, 2020). The Finnish Ministry of Environment claims that CE provides opportunities to tackle many global issues simultaneously, by decoupling economic growth from growth in natural resource use (Ympäristöministeriö 2022). The Ministry defines CE principles as using materials efficiently, sustainably and keeping them in circulation safely for a long time. Products are shared, rented, repaired, and recycled and “as a service” -thinking is a part of CE. In many senses circular economy is not new, but merely forgotten in the past decades of linear economy, where natural resources are assumed to be endless and products can be discarded at the end of life (Savolainen 2019). Emphasizing the novelty is however useful in the juxtaposition with the linear economic model and describing the societal change CE represents.

CE strategies have been categorized into four types: 1) narrowing resource loops – using fewer resources, 2) slowing resource loops – keeping the products in their original use, 3) closing resource loops – recycling materials at the end-of-life of products and 4) regenerating resource loops – using renewables and solutions regenerating the natural environment (Nußholtz et al 2023.)

2.2 Circular economy in the construction sector

Circular economy has been a recent addition to the discussions within the construction industry as the more dominant discourse has been on energy consumption and low carbon construction (Leising et al. 2018). It's difficult to learn from pilot projects, as construction projects generally are all unique. No plot, surrounding environment, client, budget, ambition or design requirement is identical to the other. "Ready information" will always need a layer of ad hoc interpretations, calculations and evaluations in each individual project. In advancing Circular Economy construction this effect is pronounced, since precedents are still few and far between and thorough evaluations of them are uncommon, leading to a lack of ready information. New demands are set for the entire value chain early on in the project (Leising et al 2018). This can make partnerships more difficult to form and ambitious visions harder to commit to. (Kooter et al. 2021.)

Yu et al. (2022) conducted a systematic literature review on CE in the construction industry and summarized that: "The core of CE is generally perceived as a sustainable vision of realizing a circular or closed-loop structure of materials and energy consumption in the whole economic system, based on but not limited to the conventional waste management practices". The Architects Council of Europe outline four approaches to CE in construction as 1) cultural approach, where buildings are primarily renovated and all construction strives to be the cultural heritage of the future and thus preserved, 2) functional approach where the occupants are enabled to change spaces according to changing needs, 3) technical approach, where components with a shorter life span than the entire building are designed to be easily repaired or replaced and 4) material approach, where such materials are preferred that circle around the economy as long as possible (ACE, 2019). As can be seen in Figure 1, the Architects Council's principles are limited in the sense that they don't include the narrowing and regenerating approaches, nor do they mention energy efficiency or grey water reuse that were brought up by Huttunen (2019) as focus points in circular construction. They do however bring in a creative and functional perspective to slowing resource loops, which is also the approach valued the highest in the Kissanmaa concept competition.

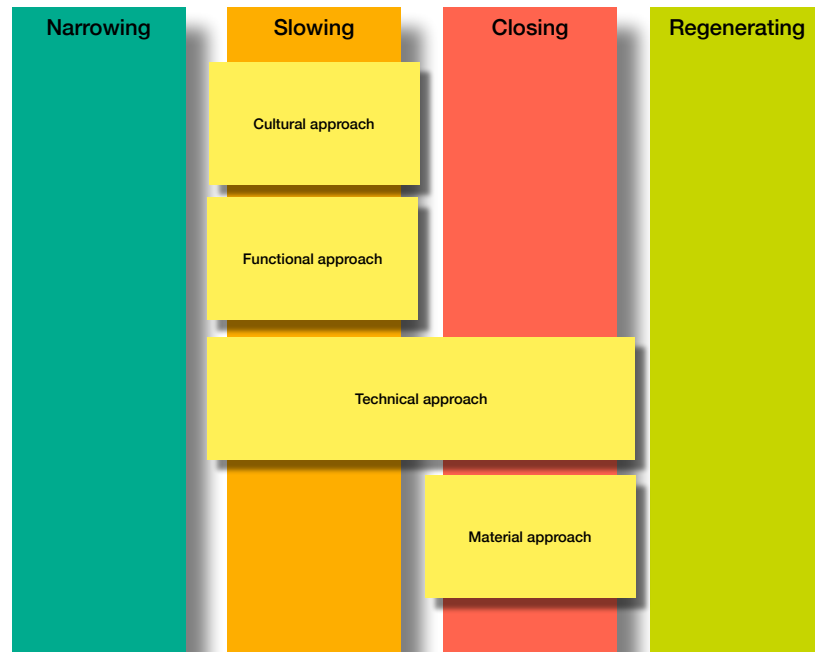


FIGURE 1. Circular economy business model approaches overlaid with the CE principles of Architects Council of Europe

2.3 Sustainability transitions and the built environment

The way in which the conceptualizations presented above are operationalized is complex. In order to understand *the urban* in the age of CE, one must evaluate circular economy's relation to urban regimes, and how CE values find their way within them. Investigating the dynamics of sustainable transitions can help us understand this.

This thesis will be drawing on sustainability transitions research, which takes a systemic perspective to organizations, societies and economies moving towards sustainability. The change has been conceptualized to happen in the interaction between the niche and the regime which exist within sociotechnical landscapes that over decades will be shaped by the former two (Geels & Schot 2007; Kooter et al 2021). The sociotechnical regime represents forces that maintain the status quo with formal and informal rules, lock-ins, path dependencies and reliance on convention in the face of uncertainty. Even if sustainable ambitions exist within the organization, the regime constitutes barriers to change course in practice. However, Circular Economy has also been considered a socio-technical regime itself (Heurkens & Dabrovski 2020, p. 12).

Niche represents more nimble actors with sustainable or circular ambitions, standards, innovations and new terminology that are yet to take hold in a certain sector. Transitions are described as open-ended co-evolutionary changes across markets, technology, infrastructures and behavior (Kooter et al 2021). and simply as moving from one regime to another (Geels & Schot 2007). Kooter et al (2021) investigated 8 circular interorganizational construction projects as arenas for niche partners to introduce new ambitions, practices and ideals and challenge the socio-technical regime of conventional construction. They found that involvement of intrinsically motivated people and a partnership based on increased equality are prerequisites for succeeding in circular construction. They also found that the team dynamics of finding roles, taking pioneering leadership and having continuity in staffing are crucial for the regime individuals to learn from the niche and create day-to-day change within the regime.

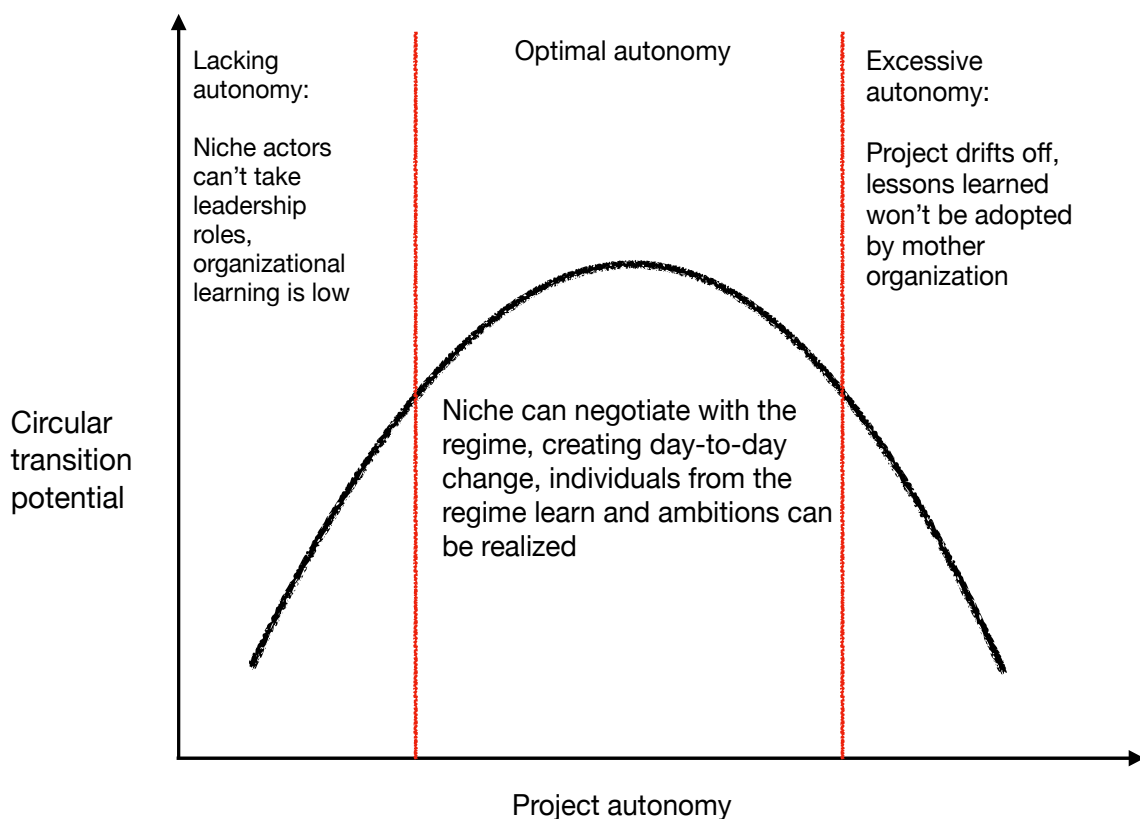


FIGURE 2. Circular transition potential in multi-organizational construction projects

As interorganizational construction projects are only temporary spaces of interaction, the degree to which the project is afforded autonomy influences the abovementioned dynamics and the potential for organizational learning (Kooter et al (2021), as can be seen in Figure 2. If the project autonomy is lacking, the niche actors can't take pioneering leadership roles and the conventions are difficult to overcome. If there is excessive autonomy, the project likely drifts off and the lessons learned are too far removed from the day-to-day actions of the mother organization, resulting in little organizational learning. The optimal autonomy is negotiated between the parties, where niche actors can find the right role and introduce new innovations and ways of thinking, but in a way that is adoptable beyond the single project. This also requires a shared ambition among the partners (Leising et al 2018). Individuals, construction experts who represent the regime are in a crucial role, as they are the ones who learn from the niche and potentially carry the lessons learned with them.

An adjacent conceptualization of the sociotechnical regime of conventional construction is presented in the framework of Matthew Carmona (2009) as the market-oriented tyranny – one of three tyrannies that are involved in urban development. The creative tyranny is crystallized in the artistic ambitions of the architect, the regulatory tyranny consists of governing bodies, public officials like building control services and institutions who attempt to enforce building safety and correct market failures and the market driven tyranny consists of developers and construction companies who examine everything through the lens of sales and market assessment. The tyrannies approach urban development with different motives and modes of praxis, which may be at odds, ultimately limiting each other and leading to wasted opportunities and poor urban spaces. In the CE context, the designers already have piloted ideas to reduce construction's impact to ecosystems and the climate, but struggle to bring them to life being limited by the other two tyrannies. The market-oriented tyranny brings limitations by having concerns of standardization, buildability and marketability of CE, while the regulatory tyranny is at times lagging behind in terms of legislation and policy which will be covered in the next section.

2.4 Promoting CE construction with policy

Building regulation policy has been criticized for limiting sustainability outcomes, as it is based on evaluations of what is reasonable to demand of the socio-technical regime of conventional construction (Gibbs & O'Neill 2015, p. 140). This only allows for incremental change, moderate enough to be fitted into the logic of the market-oriented tyranny, all the while undermining the true potential for sustainable transitions, the common commitments to climate action and corporate strategies of construction companies towards carbon neutrality. For construction policy to accelerate the sustainability transition of the industry, the policymakers should raise the bar and consider the sustainability standards of the niches instead (ibid). Different modes of governance around Europe are simultaneously constituting regulatory barriers to CE construction, launching piloting projects all the way to attaching CE requirements to all land sales by creating circular tendering principles, which is a part of the comprehensive CE roadmap of Amsterdam (Heurkens & Dabrovski 2020, p. 22).

CE policy is largely stemming from conventional waste management legislation. Going over the policymaking approaches to implementing CE in the construction industry in a systematic literature review, Yu et al (2022, p. 7) categorized the policies into five types:

4. Subsidizing recycling investments and innovative sustainable construction waste management schemes
5. Increasing taxes for virgin material use, charging for waste dumping
6. Regulating waste recycling on construction sites and end-of-life waste management
7. New technical assessment procedures and standards for reused and recycled materials, for example concentration standards for green concrete toxicity
8. Creating guides and suggestions for circular design strategies

It should be noted that the literature review was conducted on academic peer reviewed sources, and not on government reports or plans. This may result in leaving some policies out because they haven't been studied at universities yet. However, as can be seen from the results the literature review by Yu et al (2022), the existent policies seem to build on waste management and recycling efforts. Using less material and narrowing resource loops or taking regenerative action are not on the agenda.

However, out of the five types identified in the literature review, type 4 applies to enabling element reuse. It was found in the review that policies that provide adaptive quality assessment schemas for reused and recycled products can increase their demand. In Finland, these kinds of quality assessment schemas rose to prominence in the summer of 2022, when the Finnish Ministry of Environment clarified the ambiguity between EU and national regulation when it comes to reusing construction elements (Ministry of Environment Finland 2022). The ambiguity had to do with the CE marking (confusingly not referring to circular economy), which is an EU standardization tool for listed construction products that are used widely, like concrete slabs, windows, steel supports etc. The marking is supposed to ensure the structural integrity and safety of the products. The requirement for the CE marking was previously interpreted to cover to-be reused building elements, which would have meant that used products would need to be approved again by the standard to be reused. This, however, is not the case as the Ministry declared in June of 2022. Reused products do not require a CE marking if they are not altered significantly, but instead they fall under national regulation. Their suitability for reuse can be approved on a site-by-site basis in Finland. This is a pivotal moment that enabled the Kissanmaa concept competition to be framed to value reuse of “fundamental building parts”. As it stands, the testing practices for the reused products are not standardized whatsoever (ibid) and Kissanmaa also provides an opportunity to develop these standards.

In the literature review Yu et al (2022) did not find a policy precedent in academic literature of a CE concept competition or setting CE requirements for construction where a public body is involved. The impact of Kissanmaa must then be analyzed with a more data driven approach.

3. DATA AND METHODS

Two sets of data were collected and analyzed to answer these questions, namely the concepts plans and 9 interviews. First, the city published the concept plans on their official website after giving the participants an opportunity to redact from the plans whatever they considered to be trade secrets. 16 of 17 plans were published while some of them had details partly censored. A qualitative content analysis was conducted to map the CE approaches and solutions that the participants came up with as a response to the challenge presented by the city. This first round of analysis begun to answer the second research question but also helped with conducting the eight company interviews, which were conducted by Tommi Halonen to be used in his own research. The interview of a city official involved with the process was conducted by myself and my supervisor Markus Laine. The interview data was analyzed thematically to get an in-depth understanding of the project dynamics, learning outcomes and attitudes towards the competition, as well as hear about the aims and motivations of the city behind the scenes.

Ethical considerations led to anonymizing all interview data. On few occasions the interviewees remarked that they don't want some part of their statement read by their superiors and those sections will not be analyzed in this thesis. Some level of context about their role as a participant in the concept competition was necessary to convey, but since most of the company interviewees wanted to remain anonymous and there was no confirmation on the part of the city official, it was best to only refer to the interviewees by their role either as construction company, consultant partner or city official (See table in appendix 1).

4. RESULTS

4.1 Results of content analysis of the concept plans

4.1.1 Differentiation

CE construction has only gained attention in recent years and many innovations that are brewing in the niches are not widespread in the industry. In the ethos of low carbon construction – which arrived at the scene first – ideas such as wooden multi-story buildings, “green” or low carbon concrete, zero carbon construction site practices have been taking hold, but reusing building products is new. Thus, reuse became the ambitious solution and the difference maker in the Kissanmaa competition, as the city valued it the highest and the playing field seems roughly even in the industry when it comes to recycled and renewable solutions. Additionally, the evaluation criteria valued ambition, unprecedentedness and placing the CE solutions in fundamental parts of the building, incentivizing the reuse of significant parts with a large material volume. The carbon handprint calculations that were also required were largely censored in the plans and the companies that made the figures public had calculated and presented them in varying ways, making it difficult to compare the numbers. Thus, the focus of this analysis is on the qualitative aspects of the CE solutions.

It became apparent from the concept plans that the timing and location of in-house demolition projects, the fragmented state of the reusables market, the limitations set by building regulation, the timeframe of the competition and the overall sociotechnical landscape led to a situation where companies had to reconcile between their ambition level and their considerations of buildability. This led to three classes of concept plans that are presented in Figure 3: the Dreamers, the Conservative and underwhelming and the Advanced but feasible.

The Dreamers have high ambition and theoretical knowledge about Circular Economy solutions within the industry but are not able to commit to specific solutions.

They have willingness to look for solutions, but struggle with the availability of significant reusables and lack an in-house demolition project to utilize directly. Alternatively, they choose not to be concerned about finding the materials at the concept stage and instead develop the best ideas. The Conservative and underwhelming have looked at the challenge through the lens of buildability and concluded that they're not ready for reusing building parts. They minimize risk by proposing more modest concept plans with some recycled and renewable solutions, often incorporating CE solutions with a visual or storytelling motive instead of placing them in more fundamental parts of the building. The Advanced but feasible have ambitious solutions like the Dreamers but have also committed to their execution. Those who promised element reuse had already found reusables from their own demolitions and through partners they had even started developing practices to detach parts intact, test, treat and store them. They are confident that the reusable parts will be approved by the building control services on a site-by-site basis.

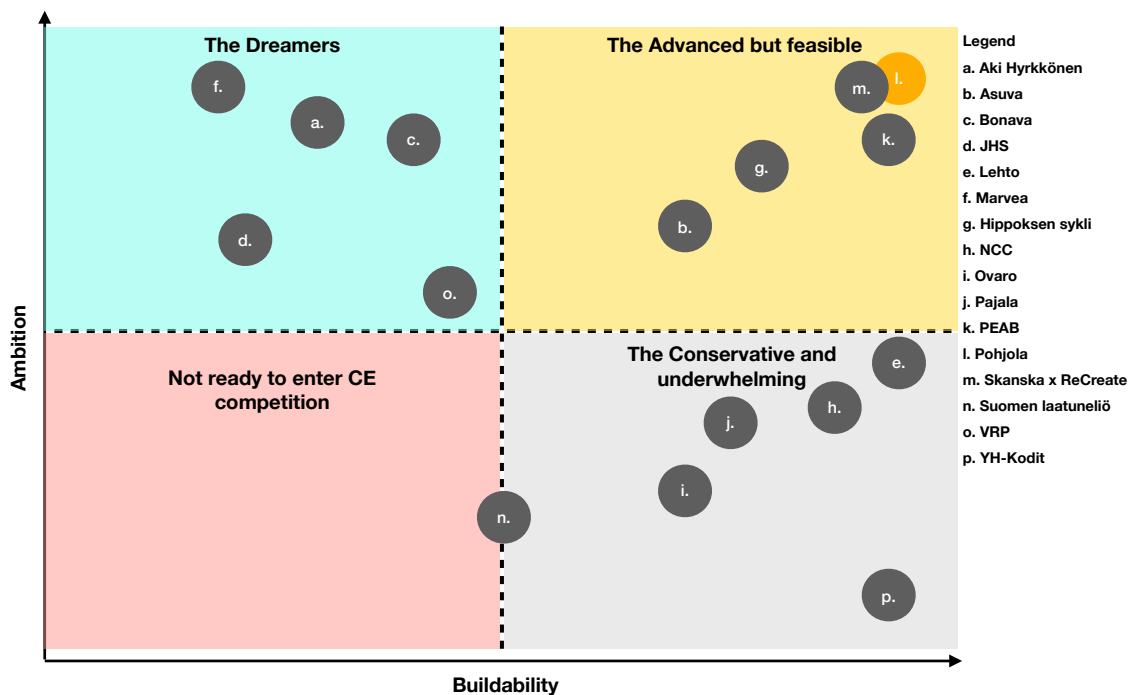


FIGURE 3. The illustrative classification of participant companies by their reconciliations between ambition and buildability

4.1.2 Approaches

The competition guide explicitly mentions that the emissions of buildings are distributed across the entire life cycle and there are many possible approaches to CE, but that the goal of this competition is to develop solutions in material reuse and recycling. Despite this material focus of the evaluation criteria of the competition, the contestants took a variety of approaches to Circular Economy. With qualitative evaluation criteria, a degree of variety is to be expected, but the concept plans included solutions ranging from sustainable construction site practices to shared economy services and even setting up beehives on the plot, on top of the material solutions. This suggests the participants might have not trusted that the material solutions alone will convince the jury, or that they built on their previously developed low-carbon construction solutions and left them in, regardless of what scores points in the competition.

Reusable

As expected, reuse solutions were common. Only three concept plans did not include any (publicized) plans to reuse building products, but the reusable approach was most commonly combined with other ones, as only NCC's concept relied solely on reuse. As stated, reusing building products was the difference-maker in this competition, as only a handful of competitors were able to commit to specific fundamental building parts being reused. Without accounting for whether the origin of the material was named, the most common items to be reused in the plans were brick in six concept plans and concrete elements in seven. Reused steel plates on the roof, steel supports, corrugated iron from industrial demolitions and air ducts were included in more than one concept. Details such as reused old door handles, fixtures and benches were placed in common rooms in three plans.

Renewable & natural

Renewable solutions were used widely, but to varying degrees. For the most part, this meant wood construction, but for example Pohjola suggested using clay in the floor and coatings of the common room and Marvea planned to use biocarbon as carbon storage and to improve the soil quality. As a main approach to CE construction, the renewable and natural approach was taken by 4 contestants, but overall 14 of 16 planned to use wood to some extent. Pajala and NCC considered wood construction as a last resort, in case their reuse or recycling plans weren't enough to meet their emission targets. Four

concepts included wooden balconies, six had a wooden façade, five had a wooden roof structure in which PEAB would have reused laminated beams from Hakametsä practice ice hall, and two intended to build the entire frame from wood. Renewable solutions were valued lower than reused or recycled ones, but wood construction is commonplace in the industry and some wood products even for multi-story buildings are standardized, for example the balconies.

Holistic

Seven contestants took a holistic approach to CE construction, incorporating solutions throughout the lifecycle of the building and even beyond. Pohjola's winning concept was one of the holistic ones, although they had ambitious reuse solutions as well. These contestants introduced solutions such as low carbon construction site practices and enhanced in-situ recycling schemes, geothermal and solar energy production, A-class energy efficiency and individual consumption meters in apartments during the use phase of the building, shared economy services like shared EVs, bicycles and cargo bikes as well as dedicated secondhand exchange facilities. The holistic concepts attempted to enable sustainable lifestyles and paid attention to the social sphere. In addition to the shared economy, spacious high quality common areas were proposed in several plans and community plant houses or "green rooms" in a few of them. Regenerative actions were also proposed in the holistic concept plans, like urban agriculture and rainwater collection for irrigation, green roofs, urban meadows, using biocarbon for soil improvement and building a beehive. Going beyond the initial lifecycle of the building, Pohjola's holistic plan also mentions design for disassembly, in order to easily detach building elements.

Material network

Going beyond a single joint venture, these plans sketched out the future of material reuse as a network of construction and demolition experts. The nodes in the network were well connected individuals within the construction companies, or third-party collaborators, who could correct the temporal and spatial mismatches in the supply and demand of reusable building products. These collaborators rose to a pivotal role in three ways: firstly, they could utilize Building Information Modeling to identify and plan the detachment of reusable parts in a demolition, secondly, they were able to form connections and gain access to a stock of smaller reusable and recycled products, and thirdly they could feed surplus back into the market as reusable products or something to be recycled. Pohjola,

Skanska and Bonava are examples of the material network approach, in that Pohjola promises to develop and document the interfaces and areas of responsibility of product reuse, Skanska collaborates with EU-funded research initiative ReCreate to study and transform their entire value chain and Bonava envisions a new paradigm in design where the availability of reusables outlines the entire design phase, the shape of the building to begin with. The common denominator is close connections with the demolition site, although only the first two had such a material source in-house, and Bonava had to settle for “dreaming”.

For show

A dividing factor between the concepts was whether Circular Economy affects the visual outlook of the building. Some chose to strive for conventional architecture to conceal the CE solutions, whereas others found it important to communicate a change of paradigm with the visual outlook of the building. Bonava went out of their way to state “the aesthetic of newness of the 2010’s must subside” in their concept plan, hinting at a new style of architecture for CE buildings. There were visual elements to concepts that are labeled under a different approach, but this is a group that seemed to lead with the visuality or storytelling effect, by installing mosaic walls from porcelain waste, or assembling the red ochre painted façades of old wooden houses into a new one for the Kissanmaa building. Ovaro Kiinteistösi joitus and YH-Kodit had particularly “for show” solutions, and Marvea, Lehto Asunnot and Bonava included CE visuals in their otherwise more in-depth concepts.

Outliers

Two concept plans were particularly unique, in that they couldn’t be placed in the above categories. First, Asuva Oy were the only one to base their concept on reducing material volume, with a light pillar structure and low carbon concrete to cast specially made voided concrete slabs. They also planned to import treated reused brick from Denmark to build the façade, but it was less central to the concept. Second, Hippoksen Sykli did not include plans to reuse or recycle anything, but instead enable such actions in the future by designing the building for disassembly. The frame of the building could be deconstructed easily and cost effectively, and thus the concrete elements could be reused after their initial life cycle. Non-load bearing walls would be wooden.

4.1.3 Analysis of the interviewed contestants' plans

Bonava

Bonava's concept is a rather ambitious take on a new paradigm in design dictated by available reusable elements. The core idea is based on establishing local material partnerships to source reusable concrete slabs for the floors and roof. This includes a proposition towards the city to publish upcoming demolitions that could be used as material sources. The plan hinges on the availability of these elements, and the alternative is to use low carbon concrete. The guaranteed targets for reused components are fixtures in common spaces, reused bathroom tiling and reused or surplus paneling in accent walls with the intention of making CE visible. Light outdoor structures and the playground and would utilize reused wood. The goal is also to exceed 53% in concrete used being low carbon, which is a benchmark in the company's Helsinki development. Low carbon concrete would be used in load bearing walls and wherever reusable elements can't be found. Kitchen fixtures would be made of renewable materials. Bonava adheres to the hierarchy of slowing material loops ahead of closing material loops ahead of renewables, but considerations of buildability limit what they can promise in the concept plan. They are a developer company, not a contractor, and have no in-house demolitions.

Bonava presents carbon handprint as was instructed by the city as emission reduction compared to a baseline and they present two scenarios, the larger handprint of 30% with reusable elements and the smaller 10% handprint if the reuse targets can't be met. CE solutions that go beyond the competition criteria include A-class energy efficiency with geothermal energy, modifiable floor plans with an existing apartment concept, and shared economy solutions like spacious high quality common areas and shared bikes.

Lehto

Lehto's concept is a great example of balancing between ambition and buildability in that they are committed to searching for novel CE solutions, but they haven't been able to identify or secure the reusable elements and won't overpromise. As a result, the planned reusables are mostly for visual effect and not placed in the prominent parts of the building. The company would apply for LEED, BREEAM or RTS certificate for the building and

they calculate a carbon handprint of 827 448 kg, 246 885 kg of which is carbon storage effect.

The CE material solutions are as follows: reused brick in the facade of the first floor if available, reused fixtures and doors in common spaces and if possible, reused wood in the bike shelter on the yard. Lehto counts using surplus materials from their other sites as reuse, including products such as steel wool, paving stones and concrete poles in plant benches and embankments. Recycled materials include low carbon concrete (20-60% handprint) where possible, steel reinforcements, 20% of the roof metal plates, interior wall coatings from recycled paper plaster mix, floor vinyl and outdoor asphalt. Renewables are very prominent in the concept, as the entire facade (from the first floor up if reusable brick is available) is wooden, the balconies are wooden as are the light structures in the yard.

Other CE measures pay attention to other life cycle emissions, as construction would be done with 100% fossil free energy paying special attention to improved recycling and packaging reuse, the building would be A-class in energy efficiency and include geothermal and solar energy with automated optimization and metering of energy and water consumption. In addition, there would be an extended recycling area and bike maintenance room. Lehto is in the holistic and renewable groups, but can still be classified one of the more conservative concept plans.

NCC

NCC have narrowed their focus on the most significant sources of emissions in their concept and haven't presented plans for the use phase of the building. NCC purely take the reuse approach, but for this competition the availability of materials limits their ambition. The planning team includes reusable material expert Revisol and consultant A-Insinöörin. They rationalize that material-based emissions are roughly 50% of all life cycle emissions, and that when using conventional methods, concrete constitutes 60% of the material-based emissions. The plan is formed around a material hierarchy: the team commits to achieving a certain emission reduction first with reused materials and parts and if it fails to meet the target, then it would be achieved with a combination of recycled and renewable materials. Fulfilling the commitment with reusables would not prevent further emission reductions down the line. Thus, the team has operationalized the qualitative evaluation criteria with quantitative emission reduction thresholds.

Reused elements and materials are not specified, but the targets are brick, steel, chemical free lumber and concrete slabs. These are based on the findings of the PURATER initiative (Zhu & Tähtinen 2022). The reusables would be searched for by the entire team throughout their networks keeping an eye on quality, price and product declarations/licenses. Recycled materials include low carbon concrete in foundations, pillars and dry indoor spaces. This would constitute a 27% reduction in all material-based emissions. The concept also utilizes recycled materials, such as gravel, crushed concrete, high quality grade recycled steel, plaster plates, glass wool and asphalt. Renewables are only used in case the target emission reductions are not reached with the previous solutions. Other measures include working with Revisol to put any construction surplus or waste to use elsewhere.

Pohjola

The winning concept plan incorporates many CE approaches and is certainly holistic despite their material focus. There are plans for the entire life cycle of the building, including solar energy, shared economy services, bicycle maintenance facilities, green roofs for biodiversity services, flexibly modifiable floorplan and design for disassembly. The planning team includes AFRY Consulting and Spolia Design, who provide expertise in building with reusables.

This concept places reused elements and parts in very prominent parts of the building. Pohjola commits to using at least 5 concrete elements in the building frame, which can be taken from an in-house deconstruction in Tampere or Helsinki. This means the specific elements have not been identified at the point of planning the concept, but it hasn't affected the team's confidence in the project's buildability. A significant amount of brick from Pohjola's demolition site Tullitikkutehdas will be used in Kissanmaa. The brick will be used in interior masonry in stairwells, the bicycle shelter walls and the parking garage entrance ramp. Another Pohjola demolition site, a congregation building in Kaukajärvi is also promised to provide windows, brick, paving stones, light poles, some suitable interior fixtures and furniture and AC components for reuse in Kissanmaa. In addition, reused wood would be used to build the entire frame of the outdoor bicycle shelter, a part of the facade and at least 10% of the roof support structure.

Recycled material solutions include green concrete, insulation materials in mineral wool and eco wool, mainly recycled metal sheets on the roof, and partly recycled plaster in interior walls. Renewable solutions include wooden balconies, wooden roof structure,

clay floors and coatings in the common room which would be recycled or possibly dug on site. For some regenerative efforts, the plans include green roofs on the bike shelter, the garage entrance and the “green room”.

In an effort to develop the material network one of the goals of Pohjola’s plan is to clarify the processes and stages of reusing building elements, as well as to conduct studies with their expert partners for the industry to utilize. The areas of responsibilities and interfaces of exchange in CE construction would be outlined between the different team members. In addition, the construction site practices would be done with a “low carbon” model, allegedly reducing emissions by 24% compared to business as usual.

Skanska (ReCreate x BoKlok)

The standard BoKlok building is claimed to produce 25% less life cycle emissions than a conventional concrete frame building. In collaboration with ReCreate, Ramboll and partners in demolition and concrete manufacturing, the deficit would be brought up to 40% by reusing at least half of the building’s concrete elements. In the BoKlok model the first floor is concrete, and the rest of the frame stands on wood elements. The to-be reused elements are already identified and laboratory tested by ReCreate, and the construction would be studied closely by the university-led initiative. The team would produce openly available information about construction with reused materials, both peer reviewed studies and industry guidebooks. Skanska believes this concept plan has potential for scalability beyond the pilot project and within this competition the concept is very advanced and ambitious but also feasibly buildable.

The reused elements are voided concrete slabs for the ground floor and 1st floor, and the pillars and beams in between them would be reused as well in their original purpose. Some reused elements may be put in the garage entrance which also acts as a noise barrier. All reused concrete would be factory treated before construction. Recycled solutions include the necessary castings on the ground floor made with low carbon concrete (35-64% emission reduction), 85% recycled glass wool, interior and exterior plaster and the kitchen cabinet doors. Renewables account for the bulk of the building as the upper frame would be wooden, but the approach is still led by element reuse since the standard BoKlok is already largely wooden. There are also plans to use solar energy, but this is not included in the handprint calculations as the competition guide said the figure should only account for the material solutions.

VRP

VRP's concept plan shows a willingness to take a holistic approach to circular economy and to reuse plenty of building elements, but the plan is not too developed in terms of sourcing the elements and the team must settle for "for show" solutions. Reused solutions are excluded from the carbon footprint calculations, because none have been available for VRP to identify or study for this concept plan. The placement of the reused elements – if they were to be found – is comparatively modest when it comes to ambition within this competition, since the plan is to place them in the parking garage and not in the living areas. VRP is a bit of a dreamer and still their propositions are somewhat conservative.

The targeted reusables are concrete pylons, beams and slabs for the garage, corrugated iron and steel to build an outdoor car shelter, interior decorations and finishes and miscellaneous parts of the building frame if suitable. The facade would be made of reused logs, as well as the entrances and possibly the finishes in staircases, and VRP commits to finding an upcoming demolition project where the wood can be found. Recycled materials include 80% of concrete used being low carbon, casting reportedly the largest slab of geopolymers in Finland and using largely recycled insulation materials. Solutions pertaining to the use stage of the building include shared economy services like shared bicycles and bike facilities.

4.1.4 Interview results

For this thesis 8 company representatives were interviewed in total as well as a city official involved with the competition. The interview data is anonymized. Six of the interviewees were construction company representatives and two were from consultant companies that were part of two participating teams. The interviews give insights into the processes within the design teams in the Kissanmaa project and their views on the plot competition, as well as the intentions and processes on the city's side. The interviews were conducted in Finnish and the structure can be seen in Appendix 2. The structure of the city official interview can be seen in Appendix 3.

The thematic analysis of the interview transcripts produced five distinct themes: location as catalyst, convention meets innovation, unique impact of Kissanmaa, mixed thoughts on the arrangements and flaws of the competition. In addition, the city official

provided insight into the aims of the city and origins of the policy which will be covered first.

Aims of the city and origins of the Kissanmaa concept competition

According to the city official a series of thematic concept competitions attached to the city's public property handovers has been planned according to Tampere 2030 strategic roadmap and more are in the works with varying sustainability themes. The city official described the initiative to the competition as:

“The Circular Economy theme was nudged forward by a construction company approaching the city with a plan to reuse elements from a to-be demolished office building. – – because all city properties are surrendered for construction via a public bid and none could be given to the company directly, a circular economy concept presentation was appended to a public plot handover in Kissanmaa.”

It was confirmed in the interview that the company in question was Skanska. Because what was arranged in Kissanmaa was officially a public plot handover with a concept presentation, the city official prefers not to use the word competition, although in the strategy documents the compound word used translates to “plot handover competition“ (Tampere City 2023). In fact, the word competition is not mentioned once in the Kissanmaa plot handover guide, but the construction companies seem to have largely got the idea of the plot handover as a competition. This discrepancy ended up causing criticism towards the arrangements, which will be covered later in this section.

The city's panel of experts that evaluated the concept plans included a representative of building control services, an independent third-party expert and a city representative. According to the city official, the concept plans were not graded with points like some of the construction companies would have wished, but instead it was a deliberative process of elimination considering the fulfilment of the criteria, how realistically and quickly the concept would be buildable and factors having to do with the public plot surrender policy, such as undeveloped plots previously handed over to a company. Furthermore, any deviation from the zoning caused elimination from the considerations of the panel, limiting the chances of the concepts with a “for show” approach.

Location as catalyst

All six construction company representatives stated that the desirable location of the Kissanmaa plot was the number one factor in them trying their hand at the CE

competition. This was designed by the city who wanted to maximize the number of participants and analyzed all the upcoming properties for the most suitable one. They landed on the one in Kissanmaa because it had already been requested frequently. Despite this built in intention, even the city representatives were surprised by the high number of participants. In addition to the location, many companies spoke about how not competing on the highest bid for the plot but instead for the best concept added to the interest of the competition, because it left room in the budget to develop ambitious and novel CE solutions. Interviewee 4 described a good balance between the scope, the risk and the reward even in the case they didn't win, echoing the reasoning of the city official who wanted to keep the competition as relatively low cost. 6 was less interested in innovating and said they entered "despite" the CE requirements.

Interviewee 7 believed thematic competitions like this show promise in changing the industry, but "as ugly as it sounds" there needs to be a business case to it, which this prime location did provide. They suggested that in a less attractive location, there would have to be additional incentive such as reduced lot fees to develop CE solutions, because at a piloting stage these solutions bring about extra costs to the companies. Two interviewees hinted at having to raise the apartment prices, if they had had to pay a market price for the plot and develop CE solutions as well. It is important to note in the future iterations of these competitions, that even with their strategic goals of emission reduction, construction companies are not interested in bearing all the extra costs or risk to further circular economy without a business case.

Convention meets innovation

Only one of the interviewed companies – number 3 – didn't collaborate with a CE expert consultant, meaning the competition successfully forced the bigger companies to get expertise from outside their own pool of knowledge, as stated by consultant interviewee 8 and construction company 6. All but one of the planning teams formed around known connections and history of working together and interviewee 4 remarked that it was quite similar to how a planning team assembles for an architecture competition, but with a new focus of expertise. The interviews reveal the dynamics within the planning teams. Company representatives 4,6 and 7 reported the consultant partners taking a leading role in the design team and coming up with the solutions, while the construction companies themselves evaluated cost, risk and buildability and vetoed the overly ambitious ideas. Interviewees 1 and 5 described a more balanced negotiating process, where ideas arose

from both the consultants and construction company representatives. 2 – being a consultant representative – described it like this:

“It was about firmly negotiating and finding the suitable level that [the construction company] dared to commit to. – – They need to believe that what they depict in the concept can be implemented, so there was a balancing act between this, and on the other hand really trying to challenge the client that here’s a property surrender and the requirements are clearly based on reusing entire building products. The end product included only very careful proposals of reuse.”

Despite ending up not succeeding with a conservative bid, 2 thought the negotiation happened in good spirit and created new insights. 5 reported having come up with the idea and materials independently and their expert partners brought in research and planning resources. Interviewee 3’s company came up with the solutions independently, using consultant expertise only for visualization and carbon handprint calculation. When asked about whether new contacts were made, 2 mentioned a new connection to a demolition expert who they would collaborate closely with to execute the planned detachment of reusable parts.

Unique impact of the competition

The competition was widely welcomed and applauded by the interviewees, although they did provide a long list of criticism and improvement suggestions as well. The challenge presented to the market was long awaited, and as interviewee 4 described, competing on any qualitative grounds is better than with money. According to the city official, since the beginning of 2023 the city has standardized the requirement for carbon footprint calculation and constructing A-class energy efficient buildings, meaning some common solutions framed as CE in the concept plans are now the bare minimum. The Kissanmaa concept competition’s aim of finding more ambitious solutions is thus emphasized.

Every interviewee thought that their company would not have developed their CE construction concept without the plot competition. When asked about impulses from elsewhere that guide sustainable construction, interviewees 1, 4 & 5 mentioned strategic goals of carbon neutrality at the corporation level driving the development of low carbon solutions in their construction projects, but that those drivers haven’t incentivized reusing building components. Interviewee 4 spoke about their clients demanding standardized green building certificates like BREEAM and LEED to gain interest in the international real estate market, and 1 said some clients get funding from green funds that come with certain sustainability requirements. 7 said that recycling has been done for years, but

mainly with cost saving in mind. The role of the Kissanmaa competition was widely recognized as promising for accelerating the circular transition, even by the skeptical interviewee 6. The creative freedom provided by the qualitative evaluation criteria was applauded especially by the two consultant company representatives, who reasoned that at the beginning stage of CE in the industry, quantitative requirements would have excessively limited the innovative solutions. 5 spoke about the impact of the city's policy choices and wider implications of inaction to the common effort of governments and corporations to adhere to the Paris climate accord. This commitment happens in the form of corporate sustainability strategies and ambitious goals of carbon neutrality, but also in the public sector as setting the bar high with policy and procurement, and ultimately finding ways to hand out penalties. According to 5, if governance is not used to steer the direction in the industry, the sustainability strategies of the corporations are rendered useless. About the Kissanmaa competition interviewee 5 said:

“This is a brilliant tool. [carbon neutrality] doesn't happen by any other means than us companies getting a stimulus. – – it is business in the background of it all and if our strategy choices are not correct, then we need to change them. If we see that there's no demand for them and nobody truly wants them, then companies are going to struggle on a larger scale.”

For the consultant companies the impact of the competition was certainly different from the large construction companies and developers. Interviewees 2 and 8 were experts in low carbon and circular construction and were part of two design teams in the competition. Neither of them learned anything “revolutionary” as an outcome of the competition, but they got to do an extensive audit of CE construction parts materials in a real-life development for the first time. Interviewee 8 reported forming new connections with a construction company and especially the demolition expert, who they will continue working with. According to 8, wood construction and recycled materials are ubiquitous in the industry, but differentiation comes from reuse which took a leap forward with the Ministry of environment's declaration in June of 2022. Both 2 and 8 had the theoretical knowledge of reuse, but before the declaration of the Ministry and the Kissanmaa competition, they were not able to implement the knowledge in a real construction project.

For all but the winning team, the organizational learning was considered valuable, but interestingly interviewee 3 mentioned having lost some of the newly created understanding as almost all the responsible employees have left the company. In their study on organizational learning in project work, Kooter et al (2021) note that staff

retention is crucial for the regime to change through projects. Naturally the winners are waiting for the main learning outcomes as construction commences. New insights into the praxis of CE in construction were gained by all teams, and even when most utilized old contacts when assembling the design teams, three companies reported forming new connections. The tighter contacts and a closer negotiating relationship to demolition experts were brought up by interviewees 1 and 2.

Mixed thoughts on the arrangements

Overall, challenges arose from both the novelty of CE to the industry and the competition instructions. The novelty of CE appeared in the interviews as lack of ready knowledge and understanding within companies, limits to the opportunities to go from theory to praxis and various interpretations of concepts. The competition instructions and the fragmented landscape of CE construction left four of the construction companies “wondering what the city wants”. Interviewee 4 said they very quickly realized they need an expert partner to interpret the instructions for them. They strongly expressed their confusion about what the city’s aim was since their CE solution wasn’t optimal in terms of saving emissions, which caused outright disbelief in the logic of circular economy. They still believed that the market would find the route there in the long run.

The framing and the qualitative nature of the competition criteria were both applauded and criticized. Especially the consultant partners expressed their appreciation for the interpretive freedom in the qualitative criteria, arguing that new innovations need creative freedom and piloting as CE construction is still in early development. Despite the freedom they still thought it was clear what was sought for. Interviewee 2 juxtaposed the criteria to a thematic competition they participated in Helsinki as consultant partners, where there were three low carbon indicators: green score, energy efficiency standard (E-luku) and carbon footprint. This was much more laborious and costly to design than Kissanmaa and didn’t incentivize element reuse as such, but on the other hand it spurred a holistic low-carbon concept, that the construction company wanted to build even though they didn’t win that particular competition. A similar idea came up in the interview of the Tampere city official, who said the city is very open to construction companies utilizing their concept plans on some other plot. Consultant representative 8 reflected on the criteria as potentially narrowing the focus of conventional construction companies whose aim is at winning the plot. However, although the criteria were focused on materials

interviewee 7 stated that they did not feel limited by them. This sentiment might apply to the entire field of participants as they came up with a variety of solutions within and without the criteria, but 7 also recalled feeling like they didn't exactly know how solutions outside the evaluation criteria would affect the evaluation, so they "sprinkled in" some holistic CE solutions. They were also wondering if the city wanted to show off with the appearance of a CE building but ended up with conventional architecture.

The evaluation criteria caused some confusion among the conventional construction companies 3 and 6, who would have preferred quantitative indicators, or a chart or a list of solutions to pick from along with a clearer explanation on the significance carbon handprint calculation. 3 thought the carbon handprint calculations were "redundant" and lamented the extra cost sunk in them. 6 critiqued the competition instructions having the qualitative criteria but also the requirement to calculate the reduction in emissions, which company 6 found were at odds.

The timeframe to design the concept plan appeared to be rather short. Interviewee 6 described some companies as lucky, when they had in-house demolition projects happening in a suitable time and place. They claim their company would have had the competency to reuse concrete elements but couldn't source and earmark specific elements to reuse within the short planning schedule, because they didn't have in-house demolitions on the horizon. Instead, they could only promise to investigate solutions and find emission reductions. When asked about whether more market dialogue would be beneficial during the process only one interviewee supported the idea saying that it would have helped set a suitable time limit. The others were neither strongly for nor against the idea.

Flaws in the competition

5 found that the purity of the concept competition was muddled by the considerations of the regular plot surrender policy of the city, which attempts to distribute plots equally between construction companies. They reasoned that next time they don't have the incentive to put effort into their concept plan, if the winner is not absolutely determined by the best concept, but factors such as previously surrendered plots and unbuilt plots in company's possession are considered as well. 7 also echoed this sentiment, saying a "closed envelope" policy would have worked better. The city representative did admit that as the top concepts were all impressive to the panel of experts the decision was made

by comparing the unbuilt stock of properties. The city chose to arrange thematic version of the standard handover process arguing it's more cost effective for both the city and participants and they wanted a maximum number of participants.

Overall, the construction company representatives agreed that the future iterations of the competition should be more transparent and the jury should publish a reasoning as to why the winner was chosen. This feedback was also heard by the city. Companies 3,4 and 6 wished for more accurate requirements to fulfill in terms of documentation, much like in architecture competitions which too are subjectively evaluated to an extent. In the long run however, 3 would prefer to base the criteria more on quantitative carbon impact rather than subjectively evaluated ambition. As an example of inaccuracy, 6 said they compared the ways in which the different companies interpreted the carbon handprint calculations and were disappointed to find that they had presented theirs in a disadvantageous way. In addition, 3 and 5 want the future versions to include requirements for monitoring the true carbon handprint and conditions for situations where promises can't be fulfilled.

A suggestion that appeared already in the concept plans was reiterated in the interviews, as 1, 4 and 6 appealed to the city to declare upcoming demolitions for construction companies to investigate the reuse possibilities. 4 suggested pairing these CE competitions with known demolition sites so that the properties of the reusables would be known early in the planning phase. 1 suggested the city should help the reusables market by hosting an exchange platform, referring to one hosted by the city of Helsinki in one of their CE initiatives. Another interesting suggestion came up in the consultant interview 8, where they proposed activating smaller players on the market as a new point of evaluation for the competition. Even though the Kissanmaa plot handover managed to form teams of construction companies and CE experts, adding it as a criterion would actively support regime-niche interaction and give an arena for organizational learning to take place.

5. CONCLUSIONS AND DISCUSSION

5.1 *Aims of the city*

The Kissanmaa thematic concept competition was a result of a series of developments in – and dialogue between – governance and business. According to the policy outlines in the Carbon neutral Tampere 2030 strategic road map, thematic concept competitions around themes of low-carbon construction were planned for. It was however Skanska contacting the city is what sparked the preparation of the Kissanmaa competition and landing on the theme of CE construction specifically. The interviews revealed that the EU Horizon 2020 funded research project ReCreate (Tampere University 2021) provided its partner Skanska with strong R&D resources to prepare for element reuse. Other partners of the project include the engineering consultant company Ramboll, Tampere University and the city of Tampere itself, creating a public plot handover almost tailored for Skanska. Even the framing of the challenge suited the research of ReCreate since it valued element reuse highly.

The city's original aim of the Kissanmaa competition was to kill two birds with one stone: to tick a box in the city's carbon neutrality road map and to support the research and development of building product reuse in construction. They were clearly motivated by supporting their partners and manoeuvred around the plot handover policy rules to do it. Certainly there could be conflicts of interest in arrangements like these, but evaluating this however is not the purpose of this paper. Along the way, the city officials were admittedly surprised by the number of high-quality concepts and the amount of attention they attracted nationwide. The competition went from Skanska being a shoo-in to a tight match up, which ended up being decided by non-competitive means. Afterwards the strategic leadership of the city was reportedly very ecstatic about what happened with the plot in Kissanmaa as they realized the concept competition's potential impact. The impression from the interview was that another CE plot handover might be arranged, or an official competition where only the points scored with the concept will decide the winner.

5.2 *Evaluation policy outcomes and impact on circular transition*

5.2.1 Policy outcomes

For the purposes of this thesis, more important than focusing on what concept won is evaluating the impact on the field of participants and their responses to the CE challenge. Because of this thematic plot handover, 17 construction companies or developers created a circular economy concept of a residential building. Apart from Skanska who initiated the competition, none of the interviewed companies would have got the stimulus to research the topic, interact with CE experts, or to dare to propose unprecedented solutions to this extent without the concept competition. Despite the aim of the city, the concept plans took a variety of approaches both in addition to and instead of the material solutions. These ranged from biodiversity efforts to green energy production to enabling sustainable urban lifestyles.

Kissanmaa is an example of a policy that managed to overcome some of the failures of the regulatory and market-oriented tyrannies. The plot handover created an environment where in order for the market-oriented tyranny to gain access to a lucrative building location, they needed to give space for the creative to diverge from the standard and innovate. Some regulatory failures were avoided, such as extinguishing the freedom in design by setting overly specific demands. The Ministry of environment enabling the site-by-site based approval of reused building parts is a removal of a regulatory failure. However, the creative tyranny as described by Carmona (2009) still remained somewhat limited by the others. The evaluating panel didn't consider anything that didn't conform to the zoning plan, largely eliminating the concepts that showed circularity in their visual outlook beyond the small detail. In addition, out of the four CE approaches of the Architects Council of Europe (2019) only the functional approach in the form of flexible floorplans were planned by four teams, two of which were interviewed. Their material approach was taken by only one team who based their concept on design for disassembly. Narrowing resource loops was only considered by one team who planned a light pillar structure. Some regenerative solutions were proposed, but as a curiosity grey water reuse didn't appear in any of the concepts. While utilizing the framework of Carmona (2009) it is also notable that in Kissanmaa the general public is again left to receive the outcome of this urban development in the position of a passive consumer, with no apparent participatory element to this concept competition.

5.2.2 Impact on circular transition

The policy design succeeded in combining an adequately high level of demand with a worthwhile potential reward for the conventional construction companies, in that the competition attracted many participants who were forced to interact with the niches of the industry to develop their concepts and all interviewed participants reported learning valuable lessons. The policy created an arena where circular transition happens in construction, but for organizational learning repetition is also crucial (Kooter et al 2021). The positive feedback in the interviews would suggest the city and the industry is keen to repeat the competition, showing potential for impacting circular transition beyond a single pilot.

City owned plots in central locations are sought after and cities should keep use the demand for those plots as leverage of sustainability transition. It is crucial that city governments don't attempt to maximize the monetary yield from these plots, but instead make the construction companies compete in circular quality and normalize competitions like the one in Kissanmaa. Based on this study the construction companies would have required extra incentives or financial benefit to spend on innovation in a more remote location, meaning competitions like this are not likely to succeed in outskirts.

From the analysis of the concept plans and the interviews it became apparent that the group dynamics in several planning teams reflected those found by Kooter et al (2021). These included a shared ambition, balanced autonomy for the project which manifested as equal playing field between consultant, demolition expert and contractor, leading to meaningful roles for the niche actors. Perhaps most importantly, the more successful teams dared to promise to reuse fundamental parts. The threshold for the latter was significantly lower if the construction company had a source of reusables already known to them, but for instance the winning bid of Pohjola did not include a known source for the concrete slabs they promised to reuse.

5.3 *Improvement suggestions, future research and limitations*

The criteria and the evaluation process divided opinion, as some were confused and criticized the lack of transparency, but others thought the aim was clear. The message was that the qualitative and piloting-friendly criteria are useful now in the beginning phase of CE, but the focus should move onto calculated impact on life cycle emissions once the

best material solutions are found through the creative process. Transparency in the evaluation process and unambiguous documentation requirements were called for even when the qualitative criteria were applauded. The ambiguity in requirements was especially apparent in the carbon handprint instructions, which were only clarified in the questions and answers document and produced incomparable submissions.

As suggested in the interviews, future iterations of CE concept competitions could be paired with a demolition to get information of the reusables ahead of the planning phase. Alternatively, it was suggested the city should open upcoming public demolitions for material reuse generally, since the barrier that many companies hit was the poor availability of reusables. The former arrangement was trialed in 2021 in Vattuniemi, Helsinki, where building product reuse and recycling was approached starting from planning the demolition, while also piloting a data platform and investigating what kind of information and service is useful for the construction companies with regards to reuse (Finér et al 2023). Further comparative research is needed to evaluate the costs and benefits of these different arrangements.

Further research is also needed as the construction phase progresses. As part of outlining the areas of responsibility in CE construction, the testing practices and guidelines for reused and recycled products need to be developed and studied, as well as the city's policy tools to monitor the construction and make sure it goes according to the concept plan.

Limitations of this thesis start with the lack of engineering prowess when conducting the qualitative content analysis for the first time, which was laborious and at times obscured the focus of the research. Working with the research group was a privilege, but it did constitute some limitations as well, namely having to work with interview transcripts while not having access to audio or video of them, nor getting to personally conduct the interviews. This made it impossible to sense emotion in the interviews and caused difficulties in identifying all the key information.

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APPENDICES

Appendix 1: Table of interviewees

Interviewee number	Representative role
-	City official
1	Construction company
2	Consultant partner
3	Construction company
4	Construction company
5	Construction company
6	Construction company
7	Construction company
8	Consultant partner

Appendix 2: Structure of the company interviews

YLEISIÄ KYSYMYKSIÄ TONTINLUOVUTUKSEN VAIKUTTAVUUTEEN LIITTYEN

- Millainen yleinen vaikutus Kissanmaan tontinluovutuksella oli teidän/rakennusliikkeen näkökulmasta? o Olisiko kiertotalousratkaisuja ehdotettu rakennushankkeessa näin laajasti ilman kaupungin asettamia kriteerejä?
- Näettekö yleisesti, että kaupunkien maapolitiikalla/tontinluovutuksella on rooli rakennusalan muuttumisessa kohti kiertotaloutta? o Voiko tontinluovutus toimia kannustimena liiketoimijoille kiertotalousratkaisujen kehittämiseen?

KILPAILUEHDOTUKSEN SUUNNITTELUVAIHEESEEN LIITTYVÄT KYSYMYKSET

- Yleisesti mikä konseptien rakentamisessa oli helppoa ja mikä vaikeaa, miksi?
o Oliko jotain osa-alueita jotka vaativat erityisen paljon suunnittelua ja laskemista, vai oliko alusta asti aika selvää millaisia ratkaisuja haluatte/voitte tarjota?
- Yksi yhteistyökumppaneihin liittyvä kysymys: tarvitsitteko te uusia yhteistyökumppaneita teidän konseptiehdotuksen suunnitteluun vai onnistuiko työ sisäisillä resursseilla - tuliko ideat pitkälti teiltä sisäisesti vai ulkoisesti? Löytyikö mahdolliset yhteistyökumppanit helposti?
- Mitä kanavia pitkin löysitte konkreettisesti kiertotalouden mukaisia rakennustuotteita/-ratkaisuja? o Löytyikö tuotteita sisäisesti (esim. muilta työmailta) vai yhteistyökumppaneiden kautta? Tai onko jotain tuotteita mahdollista ostaa selkeästi joltain tuottajalta?
- Mitä tontinluovutus ja siihen liittyvä suunnittelu synnytti teidän organisaatioonne? Esim. uutta osaamista, uusia verkostoja tai uusia ideoita ja ymmärrystä?

KISSANMAAN TONTINLUOVUTUKSEN PALAUTE JA KEHITYSIDEAT KAUPUNGILLE

- Millaiset päällimmäiset fiilikset jäi Kissanmaan tontinluovutusprosessista? Mitä hyvää siinä oli ja mitä olisi tärkeä kehittää jatkossa? (millä tavalla se järjestettiin, mitä siinä tavoiteltiin tms.)
- Oliko tontinluovutuksen kiertotalousohjeistus yleisesti helposti ymmärrettävä: tuliko teille heti selkeä käsitys mitä siinä tavoitellaan ja oliko sen pohjalta helppo lähteä aloittamaan suunnittelua?
- Tarkemmat kehitysideat:
o Sisältö: oliko kiertotalous rajattu hyvin vai jäikö jotain tärkeitä näkökulmia ulkopuolelle?
o Kriteerit/arviointi: toimiko laadullinen arviointi vai olisiko määrälliset kriteerit paremmat? (onko teillä referenssiä tiedossa missä olisi hyödynnetty määrällisiä kriteerejä?)
o Prosessi: mitä kehitettävää itse prosessiin liittyen? Aikarajat? Vuoropuhelu? Muuta?
- Jos Kissanmaan tyylinen tontinluovutus järjestetään uudelleen, niin mitä erityisesti olisi tärkeää kehittää jatkossa?

LOPETTELUKYSYMYS:

- Mikä asia erityisesti teki Kissanmaasta teille sen verran kiinnostavan casen, että päätitte jättää konseptiehdotuksen kiertotalousratkaisuihin? Isossa kuvassa se oli kuitenkin vain yksi tontti muiden joukossa, niin miksi haluttiin lähteä tähän kilpailemaan?

Appendix 3: Structure of the city official interview

1. Tontinluovutuksen taustasta ja suunnittelusta
 - Miten aloite tontinluovutuksesta syntyi ja missä suhteessa tämä erosi tavanomaisesta tontinluovutuksesta?
 - *Jatkokysymys jos tarvitaan:* Haastattelujemme perusteella tontinluovutus vaikutti tontinluovutuksen ja kilpailun välimallilta. Avaisitko syitä miksi tällaiseen järjestelyyn päädyttiin?
 - Oliko kaupungin hallinnossa tai poliittisissa linjauksissa tapahtunut jotain erityisiä muutoksia, jotka mahdollistivat tämän kilpailumenettelyn? Jos, niin mitä ne tarkalleen ovat olleet?
 - Mitä kaupungin strategisia tavoitteita Kissanmaan kiertotalousprojektilla pyritään toteuttamaan? Onko projektilla ollut vaikutusta strategisen tason keskusteluihin TAI miten kaupungin strateginen johto on nähnyt kilpailun vaikuttavuuden?

2. Kilpailuehdotuksista ja arvioinnista
 - Olemme analysoineet konseptiehdotukset ja niiden perusteella kilpailu oli tiukka. Avaatko miten valikoitte kilpailuehdotuksissa esitetyt kriteerit ja voitko kertoa yleisesti konseptien arviointiprosessista?
 - *Mahdollisesti tarkentavana ylempään:* Kilpailun arviointikriteereissä kuvattiin materiaaliratkaisujen arvoista. Analyysimme perusteella moni kilpailuehdotus sisälsi samankaltaisia materiaaliratkaisuja. Voitko avata tarkemmin, miten näiden eroja hahmotettiin ja arvotettiin keskenään?
 - Millainen vaikutus oli kilpailukriteerien ulkopuolisilla tekijöillä, kuten asuntojakaumalla, rakennuksen käyttövaiheen kiertotalousratkaisuilla, rakennuksen ulkoasulla tai rakennusprojektin yhteydessä tuotettavalla tiedolla?
 - Mitkä tekijät erityisesti ratkaisivat voiton Pohjolalle?
 - Mitä asioita muissa ehdotuksissa oli ratkaistu hyvin? (Tässä voisi nostaa asioita, jotka olivat hyviä, mutta erilaisia kuin Pohjolan ehdotuksessa. Siis jos haastateltava ei itse huomioi näitä...)
 - Ideoi vapaasti: Millainen olisi ollut täydellinen voittava ehdotus?

3. Kilpailun hyödyistä, merkityksestä, korjaustarpeista ja jatkosta (pitkälti Tommin kysymysehdotuksia)
 - Millaista keskustelua kilpailu on herättänyt kaupungin poliittisessa johdossa ja hallinnossa? Onko keskusteluissa jotain normaalia tontinluovutuksesta poikkeavaa?
 - *^ 1. osion strategiakysymyksen mukaan:* Mikä rooli kaupungin strategisilla tavoitteilla on tällaisten temaattisten kilpailujen järjestämisessä?
 - Millaista palautetta olette saaneet kilpailuun osallistuneilta tai eri toimijoilta yleisesti? Voitko arvioida palautteen pohjalta kilpailun vaikuttavuutta rakennusosalalla?
 - Jos kilpailu järjestettäisiin uudelleen, tekisittekö tähän mennessä havaitun tai saadun palautteen perusteella jotain eri tavalla? Onko kaupungilla tarkoitus jatkaa tällaisten temaattisten kilpailujen järjestämistä?

- Millaiset kokemukset tonttipäällikkönä jäi Kissanmaasta? Tuliko kilpailun aikana vastaan jotain yllättävää?