Biodiversity-related negotiations in city planning:
A role-playing game

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The need to develop and expand urban areas is increasing in most countries, but urbanization also increases the threat for global biodiversity. Some cities have acknowledged this challenge and formed strategies and action plans for biodiversity preservation. How can we ensure that such strategies are realized in city planning? Negotiations are a crucial part of urban planning, and therefore can be a leverage point of intervention to effectively implement strategies to protect biodiversity. However, little is known about the dynamics of the actual negotiation process in city planning.

I applied a game theoretic approach to study how information availability influences the success and efficiency of negotiations. A role-playing game was used to simulate a negotiation on specific measures to preserve biodiversity in a residential building project. Eleven urban development specialists played the game with different sets of information. In addition to the direct outcomes of the negotiation, I analysed the post hoc discussion and arguments used to gain insights into perceptions of biodiversity-related negotiations in urban planning.

Results indicate that information availability can increase the efficiency of negotiations. Participants favour principled and integrative negotiation, but incomplete information seems to push them to take a more positional stance. The post hoc discussion also reveals some issues relevant to the design of urban planning process for biodiversity. The overall results suggest that a simple game-theoretic framework, implemented in (a) game-like simulation with quasi-experimental control and (b) qualitative analysis of discussions, holds potential for both understanding (i) how decision makers frame and resolve the negotiation with conflicting interests and (ii) how to design efficient administrative processes taking into account not only the participants' preferences but also wider public interests, such as biodiversity preservation.

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Table of content

1   Introduction

Sustainable urban planning needs strategies and action plans for preventing biodiversity loss, but how can we ensure that such strategies are realized in the complex processes and negotiations of city planning?

The global state of biodiversity is alarming. Widely due to human activities, a reduction in biodiversity is happening on a phase fast enough to evoke a discussion of a "sixth mass extinction" (Ceballos et al., 2015). The global state of biodiversity is uncertain and close to a tipping point – we are at high risk of exceeding the planetary boundary of genetic diversity (Steffen et al., 2015; *EEA, 2019, p.45*). Despite the targets to reverse global biodiversity loss adopted by parties of the United Nations Convention for Biological Diversity in 2010, called the Aichi Targets for 2020, all dimensions of biodiversity remain to be under a severe threat (Hugé et al., 2017). An alarming rate of loss is occurring in developing countries rich in biodiversity, but Finland is also struggling with this complex challenge: Although informational and structural settings to safeguard biodiversity has been established, the implemented measures have not been effective enough to halt biological impoverishment (Auvinen et al., 2020).

Biodiversity in urban environments is a critical aspect of the discussion. Understanding the risks and possibilities in city planning towards biodiversity is becoming more and more crucial due to the fast pace of urbanization – 68% of the global population is forecasted to live in urban areas by 2030 (United Nations, 2019), which drives the expanding of commercial and residential developments, causing stress to urban green spaces (Dallimer et al., 2011). Land-use change will likely be the primary cause of biodiversity loss, and it is estimated that urban areas will expand by 185% between 2000 and 2030 (Sala et al., 2000; Seto et al., 2012). The growing need for urban areas highlights the importance of understanding how city planning can be designed to prevent biodiversity loss in these areas.

The land-use change for residential developments results in losses in green and blue spaces in cities, highlighting the pressure to remain urban aquatic ecosystems to support the state of biodiversity in urban areas (Hill et al., 2017). Development of new living areas and residential buildings can affect biodiversity, for example, by accelerating flow variation and by increasing solids content in the waters and risk of erosion (Ferreira et al., 2018; Kokkila et. al., 2016.) In addition, urbanization increases the amount of run-off waters and affects the quality of run-off waters (Vakkilainen et al., 2005). Actions to protect and reverse the loss of biodiversity in urban aquatic ecosystems is not only essential to prevent the biotic homogenization and loss of species leading to the state of 'ecological deserts', but also to maintain the benefits for human health and well-being, including among others reductions in anxiety and increased social contact (Hill et al., 2017; McKinney, 2008). While urbanization causes a threat to urban biodiversity, urban freshwater could play an important part in adaptation and mitigation of the negative impacts, both in terms of health and environment, that urbanization and climate change cause (Higgins et al., 2019).

Preserving biodiversity is included in the City of Helsinki's strategy for 2017-2021. Multiple strategic goals are stated in the strategy, also regarding aquatic ecosystems: cherishing valuable nature and increasing diversity of urban nature, safeguarding the ecological quality, accessibility, and health impacts of green and blue areas, and improving and monitoring the state of water bodies and recovering migratory fish. The city's residents also appreciate the variable nature in the city and are concerned about the effects of constructions and development, which is a driver for the strategy. Flowing faces of water were perceived as a valuable, biodiversity-rich type of natural habitat in a resident survey conducted in 2018 (Hörkkö & Ormio, 2021)

However, plans and strategies alone do not secure a desired outcome. City planning is a process with multiple actors, and the processes tend to be long-termed, realized by a wide range of negotiations. Negotiations are a fundamental part of planning practice: they are present in all stages of planning, and their outcome is dependent on the abilities of the participants (Claydon & Smith, 1997; Glasson & Booth, 1992, pp. 67–68; Lord, 2012, p. 113,). As Alex Lord (2012, p. 138) frames *it: "... negotiation and bargaining being a, perhaps the, core business of planning practice in virtually every context within which it takes place."* Therefore, in addition to research on how urban areas should be designed

to protect biodiversity, it is necessary to study the social aspects of city planning processes, which play a crucial role in realization of plans.

These planning processes and negotiations tend to include at least some level of conflict (Lord, 2012, p. 72). This thesis investigates negotiations in city planning with an experimental approach. A game theory-based simulation is conducted to study behaviour in negotiations with conflicting interests. I use a role-playing game to simulate a negotiation on specific biodiversity preservation measures in a residential building project. With this approach, the following research questions are addressed:

1) How does information availability influence biodiversity-related negotiations in city planning?
2) Can we identify a useful theoretical framework through game-theory based problem structuring and participatory simulation?

This thesis was conducted in cooperation with the City of Helsinki as a part of HELSUS Co-creation Lab, a multidisciplinary master's thesis program organized by the University of Helsinki Institute of Sustainability Sciences (HELSUS). The overall theme of this program is biodiversity, and this thesis aims to contribute to a challenge that the City of Helsinki is facing: *How to accomplish city planning, construction and maintenance and use of environmental data to prevent biodiversity and ecosystem service loss in urban aquatic environments?* Therefore, in addition to the academic objective, I aim to gain understanding that can serve as practical advice for the City of Helsinki on behaviour in negotiations and how to design planning processes, taking into account individual preferences and public interests, such as biodiversity preservation.

First, in chapter 2, the theoretical and conceptual framework is introduced, starting with the concept of biodiversity and urban environments and moving on to game theory and negotiations. Decisions concerning methodological and research design are described in the third chapter, introducing role-playing games as a research method, city planning hierarchy as a background, and discussion on experimental approach in general. Results of the experiment are presented in the fourth chapter and further discussed in the fifth chapter, including the limitations of the study and methods. General conclusions are presented in the final chapter.

2 Theoretical background

In this chapter, I present the theoretical background and key concepts that form the analytical framework for this thesis and build up the research context. First I examine the concept of biodiversity with a focus on biodiversity in urban areas. Second I examine game theory, introducing its fundamentals and implications for planning and negotiation studies. In addition, the role of information in planning practice and negotiations in particular are examined.

2.1 Biodiversity

In addition to more specific aims, a broader objective of this research is to contribute to the creation of knowledge on how to prevent biodiversity loss. In the following chapters, I review the concept of biodiversity and examine existing literature on biodiversity in urban areas and aquatic ecosystems. The city of Helsinki's plan for biodiversity protection is reviewed in the final chapter of this section.

2.1.1 Definition and conceptual significance

The concept of biodiversity has its roots in the 1986 National Forum on BioDiversity, where the term was introduced by biologists worried about the accelerating rate of extinction and its effects on various spices. The stability of the biosphere was and still is at danger, and by adopting this new concept the aim was to create a new way to interpret human interactions with nature (Haila, 2017). Even before this, scientists (e.g. Norse & McManus, 1980) had introduced concepts such as genetic diversity and ecological diversity (Hawksworth & Britain, 1995). The conference in 1986 launched the term biodiversity into wider use and more scientific definitions emerged, including the three levels; genetic, species and ecological diversity, which led to an official definition in the Convention on Biological Diversity (CBD), at the UN Earth Summit. 168 UN member states signed the convention including the following definition for biodiversity (Haila, 2017):

"'Biological diversity' means the variability among living organisms from all sources, including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes biodiversity within species, between species and of ecosystems" (CBD, 2006)

In terms of practicality, the terms biodiversity and biological diversity can be seen as synonyms (Hawksworth & Britain, 1995). This definition by CBD is still serving as the most mainstream definition. A variety of definitions exist, but their core aim is the same: to thoroughly define the variability life of forms, considering the composition, structure and function (Savard et al., 2000). Although, even if well defined, biodiversity and conservation in general is perceived differently by different people, even among scholars (Holmes et al., 2017). Savard et al (2000) states that the fact that definitions of biodiversity includes all forms and levels of life, incorporates a complexity that creates misunderstandings and confusion, and that conceptional variations within biodiversity must be properly comprehended to benefit conservation. Also, in order to be assessed, biodiversity has to be expressed in some way, for example in numbers of species, but all species are not equally important for functioning ecosystems. Therefore, a certain level of context-specificity is needed, which complicates the functioning of general targets (Haila, 2017).

Unlike the long-lasting definition, the targets in the CBD have been revisited several times, latest in 2010, referred to as the Aichi Biodiversity Targets. The targets are divided in five broader strategic goals (CBD, 2020):

1. Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society
2. Reduce the direct pressures on biodiversity and promote sustainable use
3. To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity
4. Enhance the benefits to all of biodiversity and ecosystem services
5. Enhance implementation through participatory planning, knowledge management and capacity building

The targets has been revisited since they have been insufficient to stop biodiversity loss, and the threats just keep increasing to all levels of biodiversity (Steffen et al., 2015). The most pressing this issue is for global south which rely heavily on biodiversity and therefore biodiversity protection is closely linked into international cooperation for sustainable development (Hugé et al., 2017). Despite the ambiguities that lie in the scope and requirements of context-specificity, biodiversity as a concept has certainly made a significant impact on both international and national environmental policymaking: in addition, it expresses the demand of taking nature in account in the development of human society. It has also given birth to the related important concepts such as (ecosystem) resilience, ecosystem services and natural capital (Haila, 2017).

2.1.2 Biodiversity in urban ecosystems

All levels of biodiversity: genetic, functional, species and ecosystem diversity are threatened, which leads to changes in the functioning of ecosystems that provide services for human societies (Cardinale et al., 2012; Steffen et al., 2015). This issue highlights in societies that rely heavily on natural resources and biodiversity, mostly in developing countries (Hugé et al., 2017). It is evident that biodiversity needs to be protected in areas as this, which leads to a trade-off in the appreciation of urban biodiversity (Dearborn & Kark, 2010): how should the fixed budget of resources available for conservation be divided between urban and nonurban environments? Even though the most extreme effects of biodiversity loss do not take place in cities and in urban environments, existing literature shows support for biodiversity preservation in urban ecosystems as well.

Urbanization, the expansion of urban areas and the required land-use change causes a major threat for biodiversity, altering ecosystems and habitat of species (Seto et al., 2012). At the same time cities can be important for the conservation of native and endangered species (Ives et al., 2016). Urban areas may be surprisingly rich in species compared to the common image of a city as space far distanced from nature (Aronson et al., 2017). Urban biodiversity and urban green spaces are important to support the preservation of native species (Aronson et al., 2017).

Also, indirect impact occurs. Biodiversity in cities raises our attention in biodiversity elsewhere: exposure for natural elements in one's everyday life has been found to play a

significant role for ones sensitivity to environmental issues (Sebba, 1991). The importance of this keeps rising together with the proportion of people living in urban environments. The more people live in cities, the more perceptions of natural ecosystems are shaped by the natural ecosystems in urban environments (Savard et al., 2000). Dearborn & Kark, (2010) argue that urban environments have their place in conservation biology, but the goals of preservation needs to be clearly chosen and expressed. They have identified seven motivations for urban biodiversity conservation. They concur with the former by stating out motivations such as understanding and facilitating responses to environmental change, and conducting environmental education. Other motivations are preserving local biodiversity, creating stepping stones to nonurban habitat, providing ecosystem services, fulfilling ethical responsibilities and improving human well-being (Dearborn & Kark, 2010). Urban ecosystems also provides an opportunity to study how ecosystems develop due to their dynamic nature, and this information can be applied to other ecosystems (Savard et al., 2000). In other words, cities can be seen as microcosms of a global change, providing an brilliant opportunity to study how biodiversity respond to changes (Grimm et al., 2008).

Benefits for human well-being related to exposure to natural elements in urban environments has gained a fair share of academic interest. Increased greenspace in neighbourhoods has proven to be associated in longer life-span (Takano, 2002), and also peoples own perception of their well-being and self-reported health (de Vries et al., 2003; Maas et al., 2006). Natural elements in cities provide also social and psychological benefits for human well-being: exercising in the presence of natural elements has led to greater mood and self-esteem compared to exercising in nonnatural environments (Barton & Pretty, 2010), presence of natural elements increases social activity (Sullivan et al., 2004) and natural elements have proven to help in stress management and decrease in environment derived stress (Yamaguchi et al., 2006).

Fuller et al., (2007) found that environment with a greater diversity in species can help to clear one's mind, to process personal matters and to connect with nature. In other words, perceived biodiversity made self-reflection easier. In this study, the participants were able to recognize and estimate the level of diversity of plants and other species, and therefore the study indicates that not only greenspaces provide well-being benefits for people, but that the actual level of diversity plays an important role. Very interestingly, also

contradictory results exist: Dallimer et al. (2011) also acknowledge that increasing amount of research shows a correlation between exposure to nature and (psychological) well-being, but they argue it is not clear what exactly in those green areas contribute to well-being. They argue that there is lack of evidence proving a connection between well-being and actual richness of species. Instead, they find a positive relationship between the perceived level of diversity and well-being. The perceived level of diversity can vary significantly from the actual level, which is explained by generally limited skills to identify diversity of species, contradicting completely with the findings by Fuller et al., (2007). This is backed by Hur et al., (2010): despite people's perception of "greenness" tend not to be in line with actual measurements of the quality of nature, the ones who perceive their neighborhood more green, gains more well-being benefits. Carrus et al., (2015) support the positive link between biodiversity and well-being in urban areas: level of biodiversity positively affects self-reported benefits, well-being and perceived restorativeness, but with the notion that the individual's perception of the restorative potential is in a crucial role in the relationship between experience of the natural settings (e.g. high level of biodiversity) and the self-reported benefits (Carrus et al., 2015). Thus, even if the study indicates that biodiversity can promote well-being, the role of individuals perceptions about the natural elements in urban environments should not be neglected. The mismatch in the perceptions of diversity and actual diversity may cause a risk for sustainable urban planning: an individual may perceive a high level of diversity in a scenario where the actual diversity is not high. However, by increasing public engagement with nature recognition of natural elements can be increased, leading to situations where both biodiversity conservation and human well-being can be increased simultaneously (Dallimer et al., 2011).

To achieve the benefits and desired goals for urban biodiversity, challenges must be addressed correctly. Identifying the goals and motivations is important, since there are specific challenges related to only some goals. Common challenges threatening all urban biodiversity are localized pollution, disruption of ecosystem structure, and limited availability of land, (Dearborn & Kark, 2010). Savard et al., (2000) divide concerns related to urban ecosystems into three groups: First, the impact on biodiversity in close-by ecosystems that the city itself creates. Second, concerns on how biodiversity can be maximized in urban ecosystems. Third, concerns related to undesirable species in the urban ecosystem. As the mentioned existing research (e.g. Fuller et al., 2007)

demonstrates, species richness has proven to have a positive effect on wellbeing, but the linkage is not always positive due to the overabundance of some species (Clergeau 1996, as cited in Savard et al., 2000). In a review conducted by Schwarz et al., (2017), they also find that some relationships between biodiversity and ecosystem services are negative. Even if they state that majority of these relationships are positive, a greater level of biodiversity does not automatically lead to more ecosystem services (Sandbrook & Burgess, 2015; Schwarz et al., 2017). In other words, sense of well-being is an example of an ecosystem service, which does not automatically increase with the increase of some species. Biodiversity and ecosystem service relationships are complex and should not be oversimplified (Schwarz et al., 2017) and the spatial scales of biodiversity which are considered should be clearly specified (Savard et al., 2000).

2.1.3 Biodiversity in urban aquatic ecosystems

In urban environments such as cities, water systems provide some important benefits and services: They provide drinking water, resources for irrigation, means for transportation and possibilities for recreation, and related to biodiversity, a habitat for wildlife species (Postel & Carpenter, 1997). Urban acuatic environements can be found in different types; natural faces of water, meaning rivers, streams, lakes, transitional and coastal waters, modified faces of water, meaning natural water bodies that are heavily modified for human utilization, and artificial water bodies, meaning completely built by humans, usually to provide a service such as drainage (Vermonden et al., 2010, 11). In the following section I examine the literature on the impacts of cities on their aquatic ecosystems and the benefits of biodiversity preservation in urban environments.

2.1.3.1 Cities' impact on urban aquatic biodiversity

Urbanization causes threats to biodiversity in general, and water elements in urban areas face these issues as well. Out of all ecosystems, land use change causes most damage to freshwater ecosystems, and the effect is even more highlighted in cities (Ranta et al., 2021). Common negative effects of urbanization to natural aquatic environments are changes in the morphology, hydrology, water chemistry, flora and fauna (Paul & Meyer, 2001; Walsh et al., 2005). Compared to natural areas, a large share of urban areas is covered in hard surfaces that water can't get through (e.g. roads), and also banks near urban water elements are covered with impervious materials to avoid erosion. This alters

the hydrology and morphology of the water elements and increases the amount of run-off waters. Run-off waters from urban areas, combined with discharges from industrial and municipal sources affects the quality of water: increase in the amount of nutrients, metals and pesticides in the waters, causes decline in richness of species (Walsh et al., 2005). While urbanization causes a decline in the native species, it also causes a spread of exotic species that might be an additional threat to biodiversity. This homogenization of species and environments happens in cities because they are fundamentally built to serve only one species, humans. Cities are built to serve our needs and the species that can adapt the environment suiting these needs survive the best, which causes the homogenization of species in cities globally. Therefore, urban planning should focus on the efforts to support the local indigenous species (McKinney, 2006).

2.1.3.2 Benefits of species rich urban aquatic ecosystems

The challenges that urbanization creates for biodiversity in urban aquatic ecosystems is important to be addressed in city planning, since despite the challenges, urban faces of water offer an important habitat for species (Vermonden et al., 2010). Hill et al., (2017) found that urban ponds can support a similar number of species that nonurban ponds do. Even seemingly very urban faces of water, such as ponds composed of highway run-off waters, might have a similar level of some species than other ponds that exist in a wider, more natural environment (Le Viol et al., 2009). Urban ponds as other ecosystems provide also plenty of ecosystem services, for example related to water management or social functions, which offset some of the negative amount of development and urbanization (Hassall, 2014). Therefore, urban aquatic ecosystems may provide a double benefit: an opportunity for conservation of biodiversity and ecosystem services, such as stormwater storage (Hill et al., 2017). Urban streams have shown to offer an significant habitat for many species, including native fish species and macroinvertebrate species (Collier et al., 2009). Streams, that are an important source of urban aquatic biodiversity in Helsinki as well, not only serve as a habitat for species, but provide us services to urban areas related to recreation, air quality and humidity, aesthetical services and also well-being and health in general (Carvalho-Santos et al., 2016; Haase, 2015; Hunter et al., 2019; Ranta et al., 2021). However, it is important to acknowledge that evidence linking actual level of biodiversity in urban water environments and well-being effects for humans are

inconclusive: benefits might be depended on how humans perceive biodiversity and nature, not on the actual species richness (Higgins et al., 2019).

2.1.4 Biodiversity & planning in Helsinki: a review of City of Helsinki's Biodiversity action plan

City of Helsinki states to be committed to protecting and increasing biodiversity in urban areas. In the official strategy of the city, the city states that the quality, accessibility and health benefits of green and blue areas will be protected. Main goals related to the strategy are implementation of the natural conservation program, strengthening of forest networks and increase in diversity in forests and wooded areas, improvement in quality of small aquatic environments and costal waters, recovery of migratory fish stocks. Also increase of green spaces in urban structure is mentioned, in order to promote cost-efficient stormwater managemen and increase in biodiversity in urban parks. (City of Helsinki, 2017).

In order to fulfill this strategy, the City of Helsinki has established a program for biodiversity protection, called LUMO-program. The first program for actions were established for years 2008-2017, and in 2018 the city informed that 80% of the planned actions were completed or were in progress. Updating the program started in 2018 and a new LUMO action plan for the years 2021-2028 was approved by the Urban Environment Board on April 20, 2021. (Hörkkö & Uomio, 2021).

The new LUMO 2021-2028 biodiversity action plan describes the characteristics of nature in Helsinki being a combination of green areas, forests, woodly areas, swamps, cultural environments aquatic environments and costal areas. Biodiveristy is defined to describe the variation of nature at the regional level, habitat level, and species level. The starting point is geological diversity. The regional level means large areas of green space, ecological connections and the network of green areas. Habitat level is focusing on safeguarding the habitats typical of different species and the conditions of their communities, such as microclimate, soil and water management. At species level both the genetic diversity of an individual species and the habitat requirements of the species, such as feeding, shelter and nesting sites, are considered. (Hörkkö & Uomio, 2021).

Helsinki has rare, endangered habitats in various natural environments, majority of them in groves, forests and swamps, although the majority of the extremely endangered ones are traditional biotopes. The goal of biodiversity protection plan is to keep the habitat specific protection efforts on a level that secure that the habitats or their species would not perish. Already established and planned efforts for conservation are stated, related to green networks, forests, built environments, city trees, traditional landscapes, historical parks, ecological sustainability of surrounding nature, aquatic environments, soil, harmful exotic species and natural information management. (Hörkkö & Uomio, 2021).

Biodiversity targets and measures are listed in the action plan, including the following 11 main targets:

1) Helsinki's biodiversity will be increased and better utilized in the activities of the entire city.
2) The functioning of the blue and green networks shall be strengthened
3) Natural habitats shall be identified as comprehensively as possible and their conservation shall be promoted
4) The effects of forest management are identified, and biodiversity is systematically increased
5) The biodiversity of the built environments will be enriched in anticipation of the future
6) The underwater natural values of islands, beaches and the sea area shall be identified and the most valuable of them protected
7) The natural values of rivers, small waters, bogs and wetlands are identified and improved
8) The living conditions of the species will be improved
9) The control of invasive alien species will be stepped up
10) Helsinki's residents relationship with nature will be strengthened and awareness of the importance of biodiversity will be increased
11) Sustainable recreational use of nature will be promoted and activities of the inhabitants in favor of biodiversity will be supported.

For the context of this research, in addition to the goals and targets related to built and aquatic environments, relevant targets related to city planning and development can be

found. For example, Helsinki aims to develop means to increase biodiversity in detailed city plans (target 1.1.) and to increase the number of habitat and species surveys during detailed city planning and other city plans (target 1.2). (Hörkkö & Uomio, 2021). The next subsection will examine the specifics related to aquatic environments and ecosystems.

2.1.4.1 Biodiversity of aquatic environments in Helsinki

To address the negotiations that take place in planning in Helsinki related to biodiversity in aquatic environments, this chapter reviews the specifics that characterize these habitats, as well as the plans and efforts for conservation that city of Helsinki has established.

Some of the most endangered habitats in Helsinki are located in costal and aquatic environments: fladas, clogs, ridges, medium-nutrient cliffs, rocky ponds of the seashore, as well as blistering embankments and seaside reefs. Many of them are found in just few or single location only. In sea-areas, water turbidity undermines the success of perennial benthic vegetation, and has affected habitats such as mussel (Unionidae), red algae and bladder fever bottoms. Nitrogen nutrients that cause eutrophication in the sea has been successfully reduced. Despite these improvements in water management, ground water in Helsinki is still rich in phosphorus, which make good living conditions for cyanobacteria for example.

Costal sea areas, rivers and streams are quite rich in species, due to the fact that they consist of a mix of freshwater and saltwater species. In sea areas, shores with sand bottom are less rich in vegetation than rocky shores. The ecosystem functioning has weakened, and biodiversity is at threat in islands, shores and sea area. Underwater and above-water habilitates of the coast and islands provide protection against coastal erosion and filter nutrient loads from land. They are also important breeding grounds for many fish. Since a great part of Helsinki's coastline is already built environments, it is highly necessary to preserve the remaining in a natural state as much as possible. The goal for costal waters is to secure clean water quality and well-functioning ecosystems and diverse nature in the coast and archipelago. City of Helsinki aims to increase sustainable recreational use of the archipelago, without affecting biodiversity.

In streams and rivers, the biota on the shores is much diverse, but on the bottoms mostly only mosquito larvae can be found. Fish in rivers and streams are also diverse, thanks to the mix of freshwater and saltwater habitats. These small aquatic ecosystems, including also wetlands, form important habitats, breeding areas and routes for various organisms, but they are also very sensitive to the effects of human action. For example, a very endangered trout can be found in some streams in Helsinki, but its populations have suffered from deteriorating water quality and emissions. It is important to take into account the protection of small waters in urban planning: to preserve and rehabilitate small waters, to reserve adequate protection zones and to manage stormwater with natural solutions. (Hörkkö & Uomio, 2021).

To summarize, it is evident that the aquatic environments are a significant part of urban biodiversity in Helsinki, providing many benefits while being truly vulnerable and at threat, partly due to the development of the city. City of Helsinki has designed a comprehensive strategy to protect and preserve biodiversity. The state of biodiversity in future depends of the success in implementing this strategy. Implementation depends on a wide range of decision-making processes. In the following section, I examine game theory as a way of understanding decision-making processes.

2.2   Game theory

This thesis aims to gain insights into the negotiations in city planning related to biodiversity. Information, its availability and symmetry plays an important role in negotiations (Samsura et al., 2015; Shmueli et al., 2008). Building from information economics, I take a game theory informed approach to build a participatory experiment, to study negotiation situations and the role of information in them, between city planners and residential developers. This chapter reviews the theoretical foundations of game theory.

Information economics studies the role of information in economic decisions, where information can be seen as an economic commodity (Arrow, 1996). Building on the foundations of information economics, game theory is interested in the strategic decision-making between economically rational actors (Myerson, 1991). The widespread of

modern game theory started with the foundational work by Von Neumann and Morgenstern (Sebba, 1991). It can been seen that before this, the roots for the theory lie in decision theory, but with the distinction that game theory is interested in multiple actors and their interactions, while decision theory focuses on the view point of an individual (Myerson, 1991; Samsura et al., 2010). As conflicting interests flare prominently in game theory, it has been also seen as theory of conflict, for example by Myerson, (1991). After it's success of explaining economical behavior, in situations of cooperation and conflict, game theory has gained some attention in other fields of natural sciences and social sciences as well. For social sciences, game theory has provided valuable knowledge on collective decision-making processes and social change. Game theory can help us understand social interactions and interactive decision-making (Samsura et al., 2010) .

From a behavioral perspective, game theory can be seen as a theory to explain independent and interdependent decision-making (Kelly, 2003). Samsura et al., (2010) defines game theory as "*a theory of interdependent decision-making in which the decision-makers involved have conflicting preferences and the outcome of their decisions cannot be determined by one party or actor only.*" It discusses decision-making in situations where no individual participant has a complete control of the outcome, but the decisions of multiple actors affect the final outcome (Kelly, 2003). Game theory seeks to describe human interaction. Any human interaction with multiple decision-makers can be perceived as games: as Binmore (2007, 1) phrases, we play decision-making games in common everyday situations, while in traffic, driving game is played and while negotiating on our salary, bargaining game is played. The games take different forms, but a game is played whenever we are in interaction with others. City planning makes no difference: a planning game is played while making decisions with multiple stakeholders. Game theory aims to incorporate in modelling the assumption that decision-makers are influenced by other's decisions. Therefore, the possible strategic choices are the base of game theory model. Game theory typically assumes that the desired outcomes are clear to the players, and well defined. (Kelly, 2003; Lord, 2012).

Lord (2012, 63) argues that despite titled a theory, game theory does not provide a understanding of the world in the most typical sense. Instead, game theory should be seen as a methodological approach, a tool to examine social settings and interdependent rationality. Game theory assumes that the players, the individual decision-makers form

their decisions on the base of what they perceive to be most desirable, minimizing the losses while maximizing benefits. In other words, the individuals are assumed to be rational (Vesperman & Clark, 2016). The assumption of the rational choice-maker, homoeconomicus has been widely challenged in the past decades (see e.g. Thaler, 2000). However, the definition of rational behaviour is typically based on two assumptions: i) the players are only self-interested and ii) the players make judgements on the decisions of the other players on the base on what a rational player would do (Camerer, 2003). In reality people are not only self-concerned, but instead consider also the other players payoffs and often prefer a fair outcome for both. Players might also make decisions without judgements on the other players decisions at all. The players are making decisions that could be perceived as irrational, but they still are made for the same purpose: to reach a goal. The goal is typically an agreement. Therefore, with a behavioural approach to game theory we can learn to understand the decision-making that deviates from the assumptions of rationality. (Camerer, 2003).

2.2.1 Why game theory?

While taking into account the limitations related to rationality and the need to make a simplification of a complex real-life situation, game theory can offer some relevant benefits into studies in city planning, decision-making and sustainability (Samsura et al., 2010). The context of this thesis, negotiations in city planning and residential development, are surely complex situations, with multiple actors and a possibly long timespan. By simplifying this kind of situation, we may gain important insights of the most significant conflicts and reveal needs for further studies within these conflicts. Game theoretic simulation and problem structuring may help us in the following ways:

First, game theory serves as a formal model which enables to compare the decisions to the underlining assumptions and the outcome of the experiment can be expressed clearly. Secondly, by using traditional game theoretic methods, the situations studied are steered to be framed in a simple and clear way. Simplicity helps to reveal the most crucial decision-making problems and conflicts. Third, a great benefit from game theoretic approach is that empirical results can be tested and validated afterwards. (Samsura et al., 2010).

2.2.2 Cooperative and Non-cooperative game theory

Two different branches of game theory can be distinguished, non-cooperative and cooperative game theory. The former relies on competitive individualism and the latter on cooperation. Both of these can provide logical Nash equilibria, which highlights that two different perfectly logical alternatives might occur in decision making situations (Lord, 2012, 72). In non-cooperative game theory, the decision-makers cannot make agreements with each other, in order to secure some kind of results. Since coalitions are not possible, it is assumed that every participant acts fully independently, without communication or binding agreement. In cooperative games, communication and agreements are allowed and the analysis is based in the relationships of these coalitions. Distinction is well-grounded, since the decision-makers' possibilities to act as group makes a significant difference in resulting decisions (Fujiwara, 2015, 2). Cooperative theory is interested in the formation and effects of coalition, voting problems or optimal resource allocation (Hipel & Walker, 2011) whereas non-cooperative game theory focuses on the strategies guiding the game in a competitive situation. It is notable that in reality planning processes include a mix of cooperative and non-cooperative decision-making. Prevailing institutions serve as the rules of the planning game (Lord, 2012, 72). It is reasonable to assume this from the decision-making in the city planning process examined in this thesis as well, since there are institutions that guide the decisions, but also the possibility to communicate and make agreements with some of the stakeholders included. The empirical experiment in this thesis is a simulation of negotiations with two participants with a cooperative nature, but with some non-cooperative traits: The players main goal in the game is to reach an agreement, and we can perceive this as a cooperative decision-making situation, an application of a resource allocation problem. Still, there is a competitive side of the game: the players act as individuals and one's improvement in the result of the negotiation causes a decrease in the others end result. In other words, the game is a characterized by a mixed motive. This kind of game might be perceived as non-cooperative, but they still qualify as a setting to examine the way actors interact, when they need to share a resource fairly with each other (Hipel & Walker, 2011). Therefore, we recognize that the setting may have features of non-cooperative bargaining, but we can expect the players to use cooperative ways to reach an agreement. Most importantly, every planning project is different in some terms, as they are complex and long-termed, with varying stages of cooperation (Lord, 2012, 84).

Hipel and Walker, (2011) divides game theoretic models into two fields: quantitative and non-quantitative models. Non-quantitative models simulate situations where individual preferences makes a difference: an individual actor might prefer certain states. In contrast, in quantitative models the outcomes and preferences are expressed in clear and numerical, often monetary values. In the experiment of this thesis, participants bargain for a clear numerical value: they have to cooperatively divide a shared pool of resources. More precisely, they bargain for the surplus of making an agreement of the division of the resource. They negotiate on numbers of roofs, but their gain in the negotiations is in fact non-quantitative, since it means different things for different participants. Success in negotiations for the developer results in greater profits, but success for the planner results in possibly better state of biodiversity, which is problematic to express in monetary numbers. This is in line with the argument by Hipel & Walker, (2011): non-quantitative and quantitative models can be identified, but they are much related to each other and both have been used in studies related to environmental conflicts.

2.2.3   Game theory, negotiations and planning

Negotiations are a fundamental part of almost any planning practice: Negotiation can be described as the needed process of finding an agreement and the matter organized, while taking into account the other parties viewpoints, or as a contributory means to handle conflicts (Claydon & Smith, 1997). Negotiations are relevant in planning studies also because the outcome of these negotiations is dependent on the participants involved and their abilities (Lord, 2012, 113), and due to the nature of negotiations being present in all stages of planning process (Glasson & Booth, 1992, 67-68). Therefore, game theory can provide us a highly valuable perspective to examine negotiations in city planning, since explaining negotiations and bargaining is a key objective of game theory (Lord, 2012, 113). Traditional game theory examines negotiations and bargaining through the concept of equilibrium. A situation where a player cannot improve their outcome by changing their strategy, if the other players strategies remain the same, the Nash equilibrium, is one of the most established equilibrium concepts. While equilibrium concepts provide a beneficial way to analyse suggestions, reactions and effects in negotiation, the game-theoretic assumptions within equilibriums are strict. To study some specific interactions within real-life negotiations, such as ones related to biodiversity, an approach that is more

descriptive and more loosely bounded with traditional game-theory could be useful (Samsura et al., 2015).

Suitable game theoretical approach to negotiations and bargaining is introduced by Howard Raiffa, (1982). He argues that the traditional approach to game theory is truly normative, assuming rational and self-interested decision-making that enables to advanced mathematical solutions. However, when the focus is to understand specific situations and gain practical insights relevant for the success of negotiations, it is useful to 'relax' the classical assumptions of game theory. For example, the equilibrium concept faces problems when a game can include multiple equilibria, or when the order of making decisions brings an advantage. (Raiffa, 2003, 53). Raiffa introduces two different viewpoints on the nature of negotiations: distributive and integrative negotiations. The former, described as a win-lose situation by the author, is a bargaining situation of the division of a single good, whereas the latter is about integrating the resources of the negotiators to create even more value than in the original setting (a win-win situation). Distributive negotiation is therefore about bargaining on who gets the bigger share of the gain, whereas integrative negotiation is about collectively making the gain bigger, before sharing. (Raiffa, 2003, 97)

For this thesis, a distributive bargaining situation is selected, in order to create a clear conflicting situation in the experiment. As I seek to examine, how information availability influences the negotiations related to biodiversity, the distributive nature of the bargaining game also enables us to easily evaluate how the level of information changes the end-results of negotiations, and the strategies leading to them. However the bargaining situation cannot be described as fully distributive, since finding an agreement increases the pay-offs from zero to positive for both players, therefore the situation includes also an integrative nature. In a distributive bargaining problem, money is a classical issue of negotiation, but it can be any commodity (Raiffa, 2003, p. 97). This enables the creation of a scenario where the participants are bargaining for the division of a single sample of commodity, but the gains are different nature for the different participants.

2.2.4   Negotiations and bargaining

As an introduction to the games of bargaining, it is necessary to mention players attitudes towards risk as a constraint for conflict and cooperation. Conflicts are likely in complex decision-making processes and the power relations influence how the conflicts are solved (Lord, 2012, 113). If the consequences of the bargaining situation are greater for an actor, they might be more risk averse. For example, if the actor is poor, they might be more willing to settle for any agreement to avoid the risk of ending without reward. When to actors in a decision-making process has conflicting desires, negotiation and bargaining comes into the picture. Negotiation and bargaining are a central feature in environmental planning in most of occasions and the power relations should be considered (Lord, 2012, 113).

Negotiation theory commonly divides two separate approaches to negotiations and bargaining: A negotiator may take a *positional* or a *principled* stand. The former is described as taking a position and holding on to it as much as possible: the participants make arguments defending their selected position and agreements are reached by making concessions (Fisher et al., 2011, 7). This approach to negotiations have not gained support within negotiation and planning literature (Lord, 2012, 114), due to its tendency to be unable to provide a 'wise agreement' in an efficient and amicable way (Fisher et al., 2011, 4). These three represent core benefits of principled negotiation: a wise agreement means an agreement that meets both parties' interests and resolves conflicts to the extent that is possible. Efficiency means that the no better outcome could be pictured. Amicability means that a negotiation should find an agreement without damaging the relationships between those involved. Principled negotiation therefore presents a more cooperative negotiation culture, but it requires some objective facts relevant for the negotiation, that the participants agree on, e.g. market value and expert opinion. There is disagreement on the needed objective facts, but in general planning theorists support principled negotiation over positional (Lord, 2012, 115-116)

Despite the popularity of principled bargaining in planning and negotiation literature, game theory doesn't take a normative stance to support one style of bargaining, and provides therefore methods to understand characteristics of positional bargaining as well. Which provides us valuable tools to examine planning and negotiations of environmental

planning. Even if principled negotiations would be the most desirable way for all parties to approach negotiations, it doesn't mean that it takes place in real-world. It is just likely that positional bargaining takes place in environmental planning, a world full of conflicts (Lord, 2012, 117). Baccaro (2006) states that positional bargaining is more business-as-usual in planning, than deliberate negotiation.

Negotiations can occur at different stages of planning process, before a formal application for a development process is submitted, while it is processed or after the application has been agreed and decision has been made. Due to the fact that discussion might be more open-ended in the former two, the significance of the post-application bargaining might be highlighted, since then the final outcomes of the process are discussed (Glasson & Booth, 1992, 67). The stage of the process matters because it influences to the power relations of the negotiators: later in the process, the planners position becomes stronger, as it gains more information about the proposal and the characteristics of the ones giving the proposal, for example developers (Lord, 2012). However, particularly before the possibility of learning throughout the process, the games in planning are often characterized by *incomplete information*. In the case of complete information all information related to the scenario and the other players would be accessible. In the case of incomplete information, the access to information is limited or asymmetrical: the players are not completely aware of the other players type as actors and the payoffs of the different possible decisions, or even how the other players see the situation. In other words, the players don't know for certain the consequences of their decisions and the decisions other players have made. In a case of imperfect information, the evaluation of other players type and position comes in a crucial role (Lord, 2012, 123–134).

2.2.5   Information in negotiations

Information is an essential part of negotiations and planning: information is needed in order for the planners to understand the entity they are trying to have an input in. Information is needed to understand how different actors see the situation and how they interact (Shmueli et al., 2008). In game theoretic analysis, it is needed to specify what information the participants have when they make decisions. This information is needed to gain insights on why a player chooses a certain strategy (Lord, 2012, 98-99). In other words, information is needed in game theory to model decision-making.

Information is also useful in many ways for actors in decision-making processes. Shmueli et al., (2008) states that information is at the core of making 'sound, implementable planning decisions', and refer information as the currency of negotiations. Due to its strategic nature, information is used, and unfortunately abused, as a means to excel in negotiations: information tends to be incomplete, contradictory or misunderstood due to being selected to suit a certain agenda or even strategically manipulated (Shmueli et al., 2008).

The nature and level of information in negotiations can vary a lot, and the information level in negotiations can be divided in complete and incomplete information. A situation with complete information means that the participants of the negotiation possess all relevant information that is required to form a rational strategy. In a bargaining game, this can mean simply mean the lowest amount both participants can accept as an outcome of the negotiation (Samsura et al., 2015). Simply put, in a situation with perfect information, the negotiators know exactly how their decisions would affect the pay-offs for all the players, and they also know what the other negotiators have decided (Samsura et al., 2010). Incomplete information represents a setting where not all information about the strategies or pay-offs is available and there are almost infinite ways in which the information may be incomplete (Lord, 2012, 100). Therefore, it's natural that almost any negotiation situation in real life is charactarized with incomplete information to some extent. Information may be mutually incomplete for both parties or asymmetrically incomplete, meaning that the other party knows more than their counterpart (Samsura et al., 2010). Information within decision-making and negotiations can be also divided into two categories: First, outcome information, that is releveant for the results, pay-offs and the final settlement of the negotiation. Second type is percieved to to be more useful to improve negotiation performance: process information, meaning information related to individual preferences, strategies and the surrounding envirnoment (Stuhlmacher & Champagne, 2000).

It has been shown that an increase in information availability has an positive effect for understanding the counterpart and reaching agreements, that are beneficial for both parties (Thompson, 1991), and for the success and efficiency of the negotiations (Samsura et al., 2015). Butler (1999) has investigated the relationships of trust, information sharing and outcomes of negotiations. He finds that negotiation efficiency is associated with the

quantity of information, rather than trust: when level of information increases, the time required to reach an agreement decreases.

However, when acknowledging that in many cases it is more likely that information is incomplete, the participants' relation to uncertainty plays a significant role: how will they process the uncertain information, is a sum of the individuals cognitive reasoning and behaviour, in addition to the context of the negotiation itself (Tversky & Kahneman, 1974). Therefore, even if the participants should be careful on the accuracy of the information they can access, in a case of uncertianty and incomplete information it should be beneficial not to ignore relevant information that can yield from various sources (Shmueli et al., 2008). Informations influence on the performance on the negotiations depends on the area of relevance of the information (Stuhlmacher & Champagne, 2000): Information that is focused to the task at hand increases efficiency of negotiations, but information with attention to participants own performance in the negotiation, may have even negative results (Kluger & DeNisi, 1996). It has been found that when negotiators reveal their preferences and position, it enables them to negotiate in more efficient and less biased manner, but it's important to acknowledge that negotiators also often fail to understand and use the information about the other participants perspective (Keltner & Robinson, 1993; Stuhlmacher & Champagne, 2000.; L. Thompson & Hastie, 1990). More information can be percieved also as a disadvantage: With more information about the other participant negotiators may use the information to try to reach an agreement that is fair for both, instead of abusing the information for their own benefit. Therefore, with less information the negotiator could use a different, more self-concerned startegy and gain better results for themselves (Stuhlmacher & Champagne, 2000). However, these viewpoints of information as a disadvantage are quite much in contradiction with the viewpoints of the benefits of integrative and principled negotiation, that percieve that with cooperative negotiation both parties may gain a better result (Raiffa, 2003, p. 97).

When it comes to information, traditional game theory would not provide the best perspective to study information in negotiations, due to its fundamental assumptions of rational behaviour and choice making. It is critizised that because of this, traditional game theory practically assumes that people would have complete infromation. However, more novel applications of game theoretic models have been able to create more realistic simulations by incorporating incomplete information into the models. This way, game

theory can be applied more towards understanding the behaviour related to decision making, than explaining utlility maximising decision making in conflicts (Samsura et al., 2010).

Interesting studies with experimental approaches on the role of information in negotiations exist. Thompson (1991) tested the relationship of information and the participants ability to judge the other participants' interests. Two different means to exchange information was examined, seeking and providing information with both symmetrical and asymmetrical settings. The study revealed that information sharing led to success in negotiations, regardless of whether it was both of the players who shared information or not. The study also supported the assumption that better judgement of other players' interests leads to more succesful and integrative agreements. Stuhlmacher & Champagne, (2000) experimented how time pressure and information influences negotiations, finding that higher time pressure leads to less ambitious bargaining strategies with more consistent concessions, than with low time pressure. On informations effect, the authors find contradicing results: with more information of the other participant, the negotiators are more likely to make offers that the counterpart could accept. Meanwhile, this might lead the negotiator to set less ambitious strategies and targets to themselves, leading to decreased result for an individual. Therefore, the advantage of more information on the counterparts preferences depends on the viewpoint: the same information might be beneficial for the success of the whole negotiation, but disadvantageous for the outcomes of an individual negotiator.

In a study much inspiring and relevant for this thesis, Samsura et al., (2015) have studied the role of information in negotiations with an game-theoretic approach. They simulate a land and property development negotiation situation with a role-playing game, and compare games with complete, incomplete and asymmetric information. They find that information availability related to financial conditions makes a significant differnece in the succes-rate and the equality of the end result of the negotiations. Their results are in line with the findings of Stuhlmacher & Champagne (2000) in which negotiators do not always try to achieve the highest possible gain, even if the provided type of information would grant them an opportunity to do so. Players tried to reach a fair agreement that would both take account their opponents' interests and maximise their own profit. These arguably contradicting aims for a negotiator support the argument that the utility that

rational negotiators seek to maximize, shouldn't be measured just in financial terms. This is consistent with a wider share of behavoural game theoretic literature, including Camerer (2003) who describes the desire towards fairness through an *ultimatum game.* In an ultimatum game a resource is shared between two players in the following way: The first player propses a division of the resource. The second player may accept the offer and the both players gain the proposed amount. The second player may also reject the proposal, leading to zero gain for both. Therefore a rational second player would accept any offer and a rational first player would propose almost all of the resource to themself. However, according to Camerer (2003, 314-315), players tend to offer a more fair share to their counterpart, and the accepting part tend to reject offers that are not percieved as fair. These notions are relevant for the bargaining experiment of this thesis: it is possible that the players prefer a fair outcome instead of trying to maximize their gain.

3   Research design, methods & research questions

This research was carried out as an experimental study, combining a game theory inspired simulation with qualitative analysis. In the following chapters I will present the design of the research and the methods for data collection used. First, chapter 3.1 introduces role-playing games as a research and data collection method, discussing also its benefits and limitations. Next, chapter 3.2 provides a brief description of bargaining game as a game model, followed by a review of the concept of the zone of possible agreement in negotiations. Chapter 3.3 reviews the urban area and city planning processes in Finland to explain the environment, where the scenario of the experiment takes place. Chapter 3.4 introduces the research questions and discusses the choice of experimental approach in this study. The final chapter of this section explains how a role-playing game was applied to a data collection method in this study and describes the game scenario and its rules.

3.1   Role-Playing Games as a research method

Role playing games (RPG) are a method for participatory modeling that aims to exchange knowledge and study the roles and behaviour of its players in a specific context. The context of the game is an hypothetical setting that replicates a real-life situation in a simplified way, enabling collection of information and understand the concept and it's conditions. But most importantly, RPGs enable players to collectively affect the game and develop solutions for possible issues. (Adamatti et al., 2005; Voinov, 2018). In this study, the context of the game is the city planning process related to the decisions considering biodiversity in urban aquatic ecosystems.

RPGs have been used in sustainability sciences mostly in natural resource and land-use management studies, helping to understand the complexity of these multi-stakeholder processes. Typically, in decision making processes with multiple actors, the individual stakeholders are not able to understand the problems from the point of view of others. All the stakeholders have their own representation, the mental model of the context, and the RPGs provide a tool to understand these mental models and to understand the other stakeholders in the processes. Therefore, RPGs provide a way to share perceptions and collectively develop coordination and negotiation processes (Vieira Pak & Castillo Brieva, 2010). In addition, RPGs can overcome issues that are related to conducting

interviews or surveys that affects the trust between researcher and participants of the study, since in the RPG the participants are in interaction with each other, not the researcher (Castella et al., 2005).

Castella et al., (2005) state that RPGs can be used for three purposes: training, research and policy making. This highlights the usefulness of this study: as we can learn from the decision-making itself and the suitability of participatory modeling for this process, this study can also serve as a training tool for the city planners, considering future workshops. RPG offers multiple benefits as a tool: First, it helps to reveal realities of problems. When the problem construction is done collectively, by actors sharing their knowledge among others, RPGs can reveal problems not evident to other actors. Secondly, RPGs offer a tool to observe behaviour, in the sense that we can reveal knowledge of how the actors behave in the city planning processes (Castella et al., 2005). Particularly in conflict situations, this should be highly valuable information for the city regarding the implementation of its guidelines and policies. Third, RPGs enable the collection of information about the decisions, but also creates a space for discussion between the actors. As the actors share their knowledge and perspective of the problems, they can also collectively identify solutions for the problems constructed in the game. Via RPG, we can also learn from the interactions between the actors, institutions and economic aspects related to the context. (Castella et al., 2005; Vieira Pak & Castillo Brieva, 2010)

3.1.1 Methods of RPGs

A RPG can be designed by a researcher based on their analysis and understanding of the issue and form a setting and rules that guide the players to give feedback and improve the game. Interactions and discussion in the game gives information on their behaviour, the formation of the problem and possible solutions, as presented by Barreteau et al., (2001) in a study to validate a multi-agent system model with RPG. D'Aquino, (2003) presents and alternative way to approach the formation of RPGs: The designer of an RPG confronts a difficult task to reproduce the impacts of stakeholder's decisions, including all the dynamics and effects between the environmental and socio-economic elements. In addition, the game should be designed to help the players find solutions in the game in a limited timeframe. In order to succeed in all this, the game is difficult to build in a way that it would be similar with the reality, as complex as it is. Therefore, a RPG can be also

self-designed by the players. In this approach, the game setting is constructed on the base of researcher's diagnosis, but the game has very simplified or no prior rules. The players co-design the game on the base of their own analysis of the situation in the setting. (D'Aquino, 2003.)

3.1.2   Benefits and Limitations of RPGs

As mentioned, RPGs can provide data on behaviour, reveal conflicts and help in problem formation, as well as help to find solutions to the conflicts occurred in the game. In the context of this thesis, RPGs can provide a suitable method not only to identify the conflict situations in city planning, but also the behaviour and decisions in these situations. Green (2002) compared unguided judgement, role-playing and game theory as methods to predict decisions in conflict situations. The empirical findings provide encouraging support for RPG as a method. In 5 out of 6 conflict scenarios tested role-playing was the most accurate method for decision prediction. In all of the conflicts, role-games exceeded chance in accuracy (Green, 2002). These results are supported by earlier research by Armstrong, (2001), who argues that a role-play can enable a realistic simulation of the interactions between stakeholders of the conflict situation and can provide more accurate forecasts of decisions, than expert opinions or other traditional methods. RPGs were accurate in 56% of the cases whereas expert opinions in 16%. In addition, game theory was as well proven to be more accurate than unguided judgement (Green, 2002). In these regards it is useful to build on game theory methods and use RPG as a method for data collection in this study.

Role-playing games hold also some limitations, which should be taken into account. Simplification of a complex situation is needed and even if it provides benefits for problem identification, creating a game model that is simple enough to be played might be demanding for the researcher (Bousquet & Barreteau, 2002). Another difficulty with role-playing games is that since they serve as a tool to collect information of problem structuring, behaviour and decision making, but also serves as a space for discussion, the data generated can easily be overwhelming and difficult to be documented and reported (Vieira Pak & Castillo Brieva, 2010). Many role-playing game experiments have been designed in a way that the players report information themselves (Samsura et al., 2015; Vieira Pak & Castillo Brieva, 2010), which may limit the congruence of information with

the actual interaction in the game (Vieira Pak & Castillo Brieva, 2010). These issues are addressed in this research in two ways: first, the game sessions are organized online, which enables recording of the session, that captures all interaction possible for the players in the game. Second, the researcher acts as a facilitator in the game sessions, recording relevant information on behalf of the players. However, the aforementioned notions highlight the importance of a simplified game setting. Therefore, we aim for a very simple game theoretic game model, a bargaining game, which can then be supplemented with qualitative analysis, in order to gain even richer information to answer the research questions.

3.2 Introduction to urban area and city planning in Finland and in Helsinki

To illuminate the context of the simulation scenario, the following section will review how urban area development is structured in Finland.

Environmental and spatial planning in Finland is based on a planning system that is guided by the Land-use and Building Act. The system is structured by starting from wide, general plans that are guiding more detailed city plans. The widest, nation level plans sets targets for land-use in general, including the plans for sustainable development. The targets set the guidelines for provincial plans. Confirmed provincial plans act as guidelines to municipal plans, that determine the land-use and the structure of communities in the municipality. Eventually, the municipal plans are divided and specified in city plans, which are the most detailed level of planning. The city plans determine the purposes of the land areas and guide the actual means of construction and development. (Jääskeläinen, 2010, 89).

3.2.1 City planning in Finland

City plans or detailed city plans serve as the most detailed level of planning. They describe the purpose of the used lands. The city plans must include a map of the plan, that defines the exact location, size and purpose of buildings, but also what should be preserved in the areas of the city plan. City plan also includes a statement that describes the planning process of the plan and the most important features included. (Ministry of

the Environment, 2013.) The city plan is conducted by the municipality, suit to the needs of the development of the municipality or the city. Therefore, city plans can be conducted, and older city plans can be changed and updated. In order to create functional structures in cities, the scope of city plans can vary from a a wider residential area to just a single plot or property. (Jääskeläinen, 2010, 91). The Land Use and Construction Act determines that the city plan must create conditions for a healthy, safe and comfortable living environment, regional access to services and the organisation of transport. The natural environment must be preserved and the special values associated with it must not be devastated. A sufficient amount of parks and other recreational areas should be in the nearby environments. More detailed ecological viewpoints for construction are stated in the section § 55 of the Land-use and Building Act. (MRL 5.2.1999 / 132). The targets for land use stated in this act helps decision-makers and city planners to pursue the overall goal of good environments and sustainable values. However, in every level the plans include their own, specific targets and goals. It is therefore notable that the targets in Land-use and Building Act are not necessarily the same as in city plans, but the act is designed to leave room for variation in city plans to include own, detailed targets. (Jääskeläinen, 2010, 131)

3.2.2   City planning in Helsinki

City planning in Helsinki is divided into general city plans, which covers wider areas and detailed city plans, that represents the most detailed level of city plans. The process of making city plans is the following: Opening of the plan, draft plan, plan proposal, approval and implementation of the plan.

The logic in this multi-stage and multi-actor process is that those that are interested or affected by the plan will have an opportunity to participate. Initiative to start a plan can come from the landowner or actors from the city. In the first drafts the purpose of the use of land is described. Plans in Helsinki are prepared by the City Planning Department.

The official draft plan should include the description of the purposes of the different parts of the area under planning, the scope of construction and the placement of structures. Participation in the draft is open to those concerned: landowners, housing companies, businesses, residents and resident and housing organisations and societies. After stakeholders have taken part in the plan, a plan proposal is published. The proposal

includes a map of the plan with plan markings and plan regulations as well as a plan review. If stakeholders are unsatisfied with the plan, they have the right to protest the plan within the display period of the proposal.

After the display period, the planner responds to the possible comments and the City Planning Committee deals with the plan once more on the basis of the comments. Eventually the plan will be approved by the City Council. Small revisions to existing plans are approved by the Urban Environment Committee or the City Planning Committee. (City of Helsinki, 2021).

As mentioned above, all stakeholders are included in the making of detailed city plans. This makes a setting for negotiations: naturally, every stakeholder would want the detailed plan to be planned in a way that suits them the most. The context of this thesis is negotiations between developers, example construction companies, and representatives of the City's planning department.

A relevant feature for this experiment should be presented: The City of Helsinki has two ways to create residential buildings and apartments: Via regulated and unregulated production. Especially within the unregulated production, the plots are granted for rent mostly with design and quality competitions, or other application measures. In the case of competitions, the planning of the detailed city plan takes place after the winner of the competition has been selected. Since the developer has already been granted with the building plot, this creates an interesting setting for negotiations in detailed city planning. This setting often leads to the situation in which after winning the competition, the developer starts to negotiate and try to get rid of expensive features in the plan, in order to make the project more profitable. This information is based on preliminary interviews that were conducted in order to create the experiment scenario. Three city planning professionals were interviewed: two city planners working for the city of Helsinki and one representative of a Finnish construction company. The scenario for the experiment for this study, described below, aims to simulate this kind of practice and is also relevant taking into account recognition of post-application bargaining as the most impactful phase for negotiations (Glasson & Booth, 1992, 97).

3.3 Bargaining game

Game theory investigates behaviour and decision making with game-like models. A bargaining game is a game which is played to solve a distribution problem (Güth et al 1982). The framework for the experiment in this study is inspired by existing game models.

Two-person zero-sum game represents one of the simplest applications of game theory (Chen & Larbani, 2006), and is a crucial part of game theory in general (Luce, 1957, 56). Luce, (1957, 158-159) defines the zero-sum game as such in which it is "always *possible to choose the zeros and units of the player's utility functions in such a manner that the sum of the two utility functions for any strategy choices is zero."* What this means is, that these games are of pure conflict, the pay-offs to both participants in any outcome sum to zero (Lord, 2012, 90). Simply put, an increase in one participant's payoff results in a decrease for the counter partner. Negotiations with a zero-sum nature are distributive, they are concerned on the division of a single good and both parties incentive is to get a bigger share of the "fixed-pie" (Raiffa, 2003, 97).

Ultimatum game is a bargaining game where one player can restrict the set of possible agreements to one single proposal which the other player may accept or reject (Güth et al 1982). In other words, in a two-player ultimatum game the first player makes a proposal of how the fixed amount of resource is divided between the players, and if the second player accepts, both players get their share according to the proposal. If the second player rejects, both players are left with nothing. Therefore, in an ultimatum bargaining game after the first choice is made, the set of possible outcomes is narrowed down to only two (Güth et al 1982).

As we want to study city planning negotiations with conflicting interests, a bargaining game suite our purposes well, and provides a setting that supports simplification in addition. The framework for this experiment is inspired by zero-sum games and ultimatum games but deviates from them in following ways.

First, this experiment shares the framework from an ultimatum game, but allows the participants to make multiple proposals in order to reach a proposal. Proposals are

rejected by making a counteroffer and the negotiation continues. Second, it is noteworthy that unlike zero-sum games, in real-life planning practise the games are seldom characterised by pure conflict (Lord, 2012, 90, 115), the size "pie" to be shared is not explicit (Raiffa, 2003, p. 111) and that games might vary in the degree of cooperation (Chen & Larbani, 2006). As game theory is often divided into cooperative and non-cooperative models, in planning the reality is often a mix of both (Lord, 2012, p. 72). Our experiment addresses this: The participants are jointly aiming for a shared goal, are allowed to discuss openly to find a solution and are allowed to make counter offers if they are not satisfied. But despite the shared goal to reach an agreement, in the end they bargain in a competitive manner, given that the pie is fixed.

The bargaining game in this thesis deviates from the formal construction of a zero-sum game in another way worth mentioning: It is possible that the negotiation ends with no agreement, which is a negative result for both players. Even if there would be a possible solution for both players, they don't inevitably succeed in making an agreement. Due to this, Raiffa (2003, p. 111) describes a two-person bargaining problem as a quasi-zero-sum game. The range of possible agreements for both of the negotiators, *the zone of possible agreements* is described in the following section.

3.3.1   Reservation values and Zone Of Possible Agreement

In a game of bargaining, or any form of negotiations with a distributive nature, the sphere of possible outcomes can be described as the zone of possible agreement (ZOPA) (Raiffa, 2003, 110-112). This represents the zone of outcomes that are acceptable by both of the negotiators, therefore ZOPA defines the range of options where the negotiations can successfully end, pictured in Figure 1. In this set of possible agreements, all options are perceived better for both participants than no agreement at all (Sebenius, 1992). ZOPA is the range of outcomes between the *reservation values* of the negotiators. A player's reservation value is based on their perception of the outcomes if they do not reach an agreement: the reservation value is the least favourable outcome that the player is willing to accept. The negotiators analyse what is the best alternative to a negotiated agreement (BATNA), and seek to gain a better outcome of the negotiation. Therefore, the reservation value is the minimum outcome of the negotiation that is better than no agreement, the minimum outcome that the negotiator will be willing to accept (Raiffa, 2003, 110).
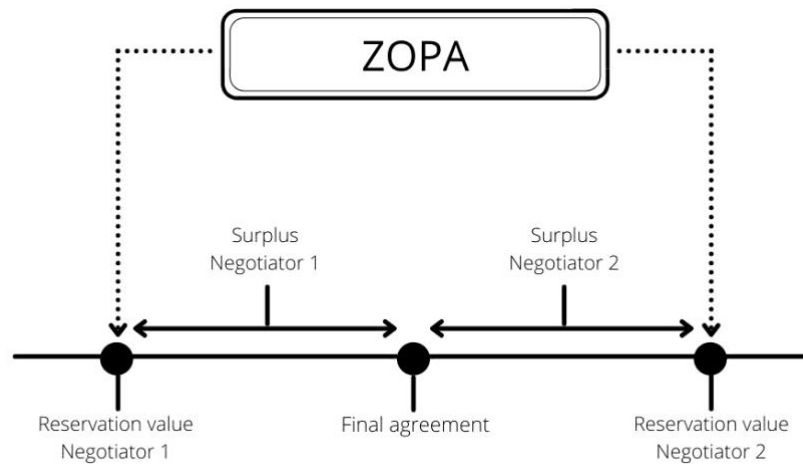
Figure 1. The geometry of distributive bargaining. Based on Raiffa, (2003, 111)

ZOPA is the set of agreements between the negotiator's reservation values. The core of distributive bargaining situations is to divide the value of ZOPA. An equal division, an agreement in the middle point of ZOPA can be seen as a fair outcome. However, considering the assumption of rational players as utility maximizers, the negotiators may try to gain an agreement that is better for them than the fair distribution, but it might cause a risk of not reaching an agreement at all (Raiffa, 2003, 110–111; Samsura et al., 2015). The distance between a negotiators reservation value and the final agreement of the negotiations can be seen as the negotiators surplus and a rational player aims for a surplus as big as possible (Raiffa, 2003, 110-111). Information can also have an effect on the reservation value during negotiations: perceptions of utility, costs of delay or costs of no agreement might change if players gain new information (Stuhlmacher & Champagne, 2000).

Samsura et al., (2015) state, that a distributive bargaining game, where the players know each other's reservation values and therefore can identify the ZOPA -range, is a game with complete information. In a game like this, the players can set their strategies in order to try to achieve a possible and fair agreement. It is nonetheless likely that the negotiators do not have access to this information. The level of information might be incomplete or asymmetrical in the sense that the players cannot identify a clear reservation value or

doesn't know the reservation value of other players. Even if it might be beneficial for the success of negotiations to reveal this information to the other player, we cannot assume that a player would aim for a fair agreement (middle point of ZOPA) even if they would have complete information. This is because the players might perceive what is fair and what is a good outcome in a different way, or have different motives for the negotiation (Samsura et al., 2015). In our experiment, the subject of distribution is the number of roof types, which represents different types of utility for the players: for the developers, gaining more than a fair agreement means more profit, while for planners it would mean more secure means of biodiversity protection. The two gains are not directly comparable, and therefore the players might perceive a fair outcome differently, even if they knew what the ZOPA -range is. In addition, the "history" in the game scenario may influence the perception of fairness: in the scenario the developer is seeking to deviate from its original proposal, which may limit the city planners perception of a fair outcome.

3.4   Introduction to research questions

Recognizing, that negotiations play a crucial role in planning, this thesis seek to contribute to sustainable urban planning by answering the following research questions:

1) How does information availability influence biodiversity-related negotiations in city planning?
2) Can we identify a useful theoretical framework through game-theory based problem structuring and participatory simulation?

The first research question includes the analysis of behaviour: what kinds of strategies and arguments are used; do they change with different sets of information. The experimental setting can also incorporate reflections of real-life negotiations relevant for this research question. By answering the second research question I examine, whether the selected framework is useful for investigating behaviour and decisions in negotiations and what are the implications for sustainability sciences.

Post hoc case studies are a common approach to study negotiations, also within a variety of sustainability concepts (see in ex. (Petrescu-Mag et al., 2016; Soltani et al., 2016;

Theurillat & Crevoisier, 2014). Case studies might be resource wise, and provide a great understanding of a phenomenon or subject (Gustafsson, 2017), but might lack the means of identifying the influence of specific factors (Samsura et al., 2015). This thesis is interested in the influence of information into biodiversity related negotiations, and therefore an experimental approach is chosen. An experiment enables the analysis of behaviour and responses to controlled stimuli (Samsura et al., 2015). In this experiment, the stimulus is the set of information that is available for the participants. With the experimental approach, that is based on a simple game-theoretic framework, negotiations are analysed, with focus on how specific characteristics (information availability, biodiversity context) is in relation to actors' behavior in the negotiations.

Experimental approach can be seen as a laboratory method to study behaviour and Davis & Holt, (2021, 14-16) frame that the greatest advantages of these kinds of methods are replicability and control. Replicability means that the research is possible for other researchers to reproduce and therefore verify. This thesis serves as an example of this: the experiment setting is a simplified application of the research conducted by Samsura et al., (2015), although with a slightly different context. Control refers to the ability to manipulate the conditions in the experiment in a way that would not be possible when examining real-life events or cases (Davis & Holt, 2021,15). Another thing that experimental approaches can help with, is generalisation of results (Camerer, 2011; Samsura et al., 2015), although contradicting viewpoints on this also arises from existing literature (Levitt & List, 2007). However, it has to be acknowledged that this study cannot provide statistical results strong enough for generalisations. However, in further research this framework can be replicated and implemented with a greater sample size to provide results more credible for generalisations.

A typical criticism that experimental approaches face is related to the participants of the experiment: Typical subjects of an experimental study might be university students or other participants who do not have experience of the specific context of the experiment. Therefore, it's criticised, experiments are limited as a method since real decision makers within the context would be more sophisticated than the experiment subjects (Davis & Holt, 2021, 17). This kind of experiment with a "sterile" environment that is in the control of the researcher is called a laboratory experiment (Harrison & List, 2004). In the

experiment of this thesis, this criticism can be dodged, due to the fact that all participants are

in fact professionals in the field of city planning. In fact, despite that our experiment is taking place in a controlled and possibly not normal environment for city planning negotiations (a video call), this experiment includes characteristics of what Harrison & List (2004) describe as a *field experiment:* an investigation or a study carried out in the natural environment of the given subject. The authors determine factors that deviate from field experiments from lab experiments: the nature of the subject pool, information, the task in the experiment, the commodity, the stakes and the environment of the experiment. The authors point out, characteristics of field experiment are not found *only* in field experiments and the line between field and lab experiments is not explicit. Our experiment deviates from the description of a field experiment through the nature of stakes: monetary incentives are not used in this study. Monetary incentives are used in experimental studies in order to create stakes for the players and steer their role-playing behaviour to be as close as their behaviour in real life. This experiment is a part of a master's thesis and did not have a budget to include monetary incentives. However, neither in real-life the individual negotiators are necessarily rewarded financially for success in the negotiations.

This research is conducted in the context of city planning in Helsinki, but with the experimental approach the results could be useful for understanding negotiations in other contexts as well. However, the insights on behaviour in negotiations with conflicting interests can also provide practical advice for planning authorities in designing future workshops and negotiation processes. In general, this approach was chosen to broaden the set of approaches to study behaviour in sustainability sciences by adding game-theoretic and experimental approaches and especially in research with the aim of preventing biodiversity loss.

3.5   Data collection: description of the experiment and analysis

The data collection method in this research is a role-playing game. The game is a bargaining game with two participants. The game is a bargaining game with a fixed pie: the basic logic of the game is that the players have a fixed amount of resources and they

have to negotiate how it is shared. In order to replicate a real city planning negotiation and gain relevant insights based on experience, representatives from main construction companies in Finland and representatives from the city of Helsinki and city of Espoo were invited to participate in the negotiation simulation. In total 11 professionals from the field of city planning took part in the experiment. Every participant played 2 versions of the game, one with complete and one with incomplete information with the same counterpart. One of the game sessions was organised with three participants, who all played against each other, resulting in 14 games in total. The game sessions were organised through a videoconferencing service Zoom, in order to enable participants to join the experiments without physically meeting each other. This method was chosen due to safety reasons related to the prevalent Covid-19 pandemic.

During a game session, first the rules and the scenario of the game were explained. The participants also received the description of the game in advance in written form. Second, the two rounds of games were played. After the games, followed a discussion about the game scenario and the context of biodiversity in city planning in general. The discussion took the form of a semi-structured group discussion, where the researcher steered the discussion towards a direction relevant for the research questions, if needed. A role-playing game should be designed in a way that the players have a limited time frame to achieve an agreement (D'Aquino, 2003). The time limit creates the possibility of the game ending with no agreement, and is beneficial for our context, since it replicates the pressure of getting projects further that exists in city planning. A time limit of 3 minutes of the game was chosen to highlight this pressure and due to the simple form of the game.

Two types of data are collected from the experiment. First set of data consists of the direct outcomes and decisions in the game. Focus is on: was an agreement achieved, where did the agreements take place in the ZOPA -range, what was the first offer made and how many rounds of bargaining it required to reach an agreement. By analysing these aspects, I seek to gain understanding of the effects of different levels of information to the behaviour and decisions in the game. Due to the limited sample size of data no statistically significant findings or conclusions can be made from this data, but the findings are supported with qualitative analysis. The second set of data consists of qualitative content: the discussion and arguments made during the game and in the discussion afterwards. A

thematic analysis is used to understand the behaviour in the game and to reveal perceptions of biodiversity in city planning.

In the following chapter, the description of the game and its rules are explained.

3.5.1 The experiment scenario and the rules of the game

Following is the description of the scenario of the role-playing game. The scenario is hypothetical but is informed by real city planning projects that have taken place in Helsinki. In order to create this scenario, a relatively wide background work was needed, that consisted of three interviews and review of reports of city planning projects and confirmed city plans. Three city planning professionals were interviewed, two of them worked in different planning departments for the city of Helsinki and one of them for a Finnish construction company. These interviews played a significant role in mapping out what kinds of features actually take place in the complex city planning processes and negotiations. Feedback from the participants about the scenario was generally positive: Even if it is evident that game setting simplifies the nature of a negotiation and negotiations do not take a form of pure bargaining in real-life, the participants stated that the scenario could take place in a real development project. The participants were given this description in advance to be read (in finnish), and it was also explained orally in the beginning of the experiment session.

The following is the description of the game scenario that was provided to the participants in advance and explained in the beginning of each game session.

The scenario in the role-playing game

City of Helsinki is developing a new residential area. The soil is mainly solid rock, which is really good for building, but its water absorbing abilities are low. Therefore, there is a higher risk that runoff waters from residential buildings will increase, causing increase in the speed of discharge and flooding in the close by stream, which is a threat for the aquatic biodiversity.

To address this and other ecological impact in the development process, the city established a quality competition to find a developer with the best plan to be granted the right to build on the plot. The winning developer, the other player of the game, is a consortium of companies, whose proposal included great plans for run-off waters, which positively affected their success.

In the plan to manage run-off waters, green roofs play an important role. The proposed idea was to build a green roof on top of every residential building. Green roofs can absorb up to 75% of rainwaters, resulting in significant reduction in run-off waters in the development area. As the green roofs absorb rainwater, it reduces the amount of run-off waters and prevents discharges and flooding in the nearby streams and other aquatic environments. Green roofs serve also as carbon sinks, but in this experiment the main focus is in effects in run-off waters and biodiversity.

After the competition, the development is now in the stage of planning the detailed city plan of the area. The developer (the representatives of the companies in the winning consortium) and the planner are negotiating about the specifics of the detailed plan. In the original plan, there was a green roof in all of the residential buildings. After winning the competition and the planning has progressed further, the developer has reassessed the costs of the project, and reduced the number of planned green roofs: They have proposed, that the runoff-waters could be controlled sufficiently with less green roofs, and some space of the roofs could be replaced with solar panels. The construction costs of the roofs affect the overall profit for the developer of the project: building solar panels would be more profitable for the developer than building green roofs. The developer is confident that smaller amount of green roofs will be efficient enough to control the runoff- waters and avoid biodiversity loss in the close-by aquatic ecosystems, but the city planners are skeptical. Although it is difficult to differentiate pollutions from numerous sites, the negative impact of increasing residential buildings in the city on its aquatic ecosystems is becoming clear. The city wants to follow the precautionary principle and keep as much green roofs as possible.

The following is the description of the rules of the game in the experiment, in the form that it was explained for the participants.

Rules of the game

The players bargain about the total number of green roofs in the residential buildings. The players are offered information on lowest number of their preferred roof type they can accept, in order to avoid losses. This can be perceived as their reservation price in the game.

When the game starts, any player can start by suggesting a number of green roofs and solar panel roofs. The other player can either accept it or reject it and propose a counteroffer. If an agreement is made, the game ends. If an agreement is not reached in the time limit, the city plan will not be completed, and the construction can't start, which will cause costs for both. For the city, the delay creates costs as more negotiations will take place, and in the worst scenario, a completely new quality competition has to be established to find a new developer. For the developer, the costs are formed as in lost opportunity to make profit, costs of new negotiations and the possible revenues will be gained further in the future.

This results in the situation, where the aim for both of the players is to find an agreement and there's room for both players to accept the deal, but they have certain limits (maximum acceptable number of green roofs for the developer, maximum number of solar panels for the city). In other words, even if both players are primarily driving their own agenda; the planner prefers as much preservation capacity as possible, and the developer prefers as much profit as possible, both prefer any deal that is within their limits to no deal. If the deal would go beyond their limits, they prefer a delay or even start the planning process from the scratch. Each player plays two versions of the game, with different amount of information: with complete information and incomplete information. Two rounds is played per game per player, resulting in four rounds of games for every player .

In the original proposal, the there was a green roof on every building, 100 roofs in total. Green roofs have significant benefits for controlling the run-off waters, but they don't provide financial benefits for the developer. The solar panels on the other hand are not only lower in immediate construction costs, but they will also turn into a profitable investment in 10-15 years. The developer is interested in solar panels not only because they lower immediate costs, but because they help the project to meet the carbon neutrality target. Solar panels do not have any effect on run-off waters, except that they compete with the green roofs, thereby reducing the benefits to the nearby aquatic biodiversity.

In the game, the planner and the developer negotiate about the division of the roof space between green roofs and solar panels. Every additional roof with solar panels will make the project more profitable for the developer. The most desirable situation for the developer would then to have only solar panels for every roof. Vice versa, more there will be green roofs, the more will the city be satisfied. They have a time limit of 3 minutes per game and either one can start by offering any number of green roofs, ranging from 0 to 100. The other player either accepts the offer or denies it and makes a counteroffer. The players are allowed to discuss as much as they like between their offers. When an offer is accepted, agreement is made and the game ends. If they don't find an agreement within the time limit, the project delays which is worse for both than any distribution of space of green roof and solar panels within the players limits.

3.5.2 Game types

The game sessions consisted of two different plays for each player. The scenario was the same, but the level of information

Game 1, incomplete information.

In this game, a minimum level of green roofs / solar panels are set for the players, that they cannot go under. This amount of the roof space serves as the reservation price for the players. For the planner, it's the minimum level of green roof they can accept, in order to preserve biodiversity. For the developer, it is the highest cost that they can afford, in order for the project to be profitable. In other words, the developers' reservation value is the maximum number of green roofs that they can accept. The players know that a reservation value exists for both of the players, but in the game of incomplete information they only know their own reservation value.

Game 2, complete information

In this game, both players know each other's limits. The game is otherwise similar to the former, but the players are granted with the information of what is the reservation value of the other player: Both players know, what is the minimum amount of the preferred roof type, that the other player is able to accept. Therefore, they know what the ZOPA -range is.

The players report all the offers that have been made. Seeking answer to the question, how does transparency affect the negotiation, following aspects are analysed:

1. Did the players find an agreement?
2. What was the first offer in the game?
3. If an agreement was made, in what point of the ZOPA-range did it take place?
4. How many rounds of proposals were made before an agreement?

4   Results

Following section will present the results of the experiment. The empirical data consists of direct quantitative results of the game, and qualitative content that is collected during the experiments and the post-hoc discussion. Due to the different nature of the two sets of data, the results are presented in their own chapters.

4.1   Quantitative results: Direct results of the game

The experiment gives us direct results: what is the end result of the game. These results will give us insights on the role of the transparency of the information in the negotiations, and reveal strategies that are used in bargaining situations. Therefore, the direct results of the game will provide us information relevant for the research questions on how transparency of information influences the negotiations, how do actors behave in conflicting situations and what kind of strategies can be identified in the bargaining situation of the game.

The game data is analysed by comparing the games with complete and incomplete information, and the focus will be the following four aspects: 1.Did the players find an agreement?; 2. What was the first offer in the game?; 3. At what point of the ZOPA-range was an agreement made?; 4. How many rounds of proposals were made before an agreement?

This section holds some limitations that are important to acknowledge. The sample size is, the number of played games is not big enough for strong statistical inference. The quantitative results will therefore be interpreted as insights that guide the qualitative analysis and lead in the direction of possible future research.

	Incomplete	Complete	Total
1. Agreement reached	3/7	7/7	10/14
2. Distance: First offer - ZOPA	2,194	0,451	1.323
3. Distance: Agreement - ZOPA	0,137	0,130	0,133
4.Rounds	2,7	1,7	2,2

Figure 2. Quantitative results.

Figure 2 summarises the results mentioned above. First column displays the number of games that ended successfully within the time limit. The second column expresses the distance between the first offer and the middle point of the ZOPA -range. A smaller value means closer to the middle point. In a similar manner, the third column expresses the distance between an agreement to the middle point of ZOPA. In the fourth column is listed how many rounds of proposals did it take to reach an agreement on average. The results are analysed in the next chapters.

4.1.1 Did the players find an agreement?

This question gives us the most straight-forward insights on the role of information in the negotiations. It is important to take into account that first of all, the players had a shared goal to reach an agreement: If they manage to make an agreement within the ZOPA range within the given time limit, they both win. Second, the information in this experiment that varies between the games of complete and incomplete information, is related directly to what is possible for the other player: in the game with complete information, the players know exactly what kinds of offers the other can accept.

Therefore, a logical hypothesis would be that more transparent information would help the players to reach an agreement. In the context of this game, when the players know what kinds of distribution between the two roof types are acceptable for the other player, it should be easier for them to reach an agreement which suits both, despite the fact that they both try to reach the best possible result for themselves.

The results of the experiment support this hypothesis: all the seven games with complete information ended with an agreement. The games with incomplete information were not as successful: in four out of seven games with incomplete information, the players did not manage to reach an agreement before the time ended. This can be interpreted that when the player knew what was possible for the other player to accept, they didn't make that many impossible offers for the other player. In games with complete information, the players were less likely to waste time on bluffing, instead they made proposals that could be easy to accept. The effects on the bargaining strategies are discussed in the following chapter.

4.1.2   What was the first offer in the game?

Analysis of the first offers of the game will reveal information on the bargaining and negotiation strategies in use. Also, we can compare, if the strategies used changed, when more information was provided.

For the opening offer, we could expect that in games with complete information, the opening offers should be closer to the possible ZOPA-range, than in the games with incomplete information. In the game with incomplete information, the players do not know what is possible to accept for the other and may therefore have the strategy of making an opening offer much above their own limit, in order to have a strong starting point for the bargaining.

In order to make some comparisons between the game types, the distance between the opening offer and the middle point of the ZOPA-range is calculated. The distance was calculated in the number of the green roofs in the offer. Middle point was chosen because one could assume, that at least in the games with complete information, the games would quite likely end in the middle of the ZOPA -range, since that can be considered a fair outcome for both. The distance of the opening offer gives us an idea of did the player try to reach an agreement as fast as possible, or try to obtain the highest possible gain.

Figure 2. showcases the average distance between the first offer and the middle point of the ZOPA range. The values are in proportion to the size of the ZOPA range: distance

from the middle point is divided with the size of the ZOPA -range. In result, a first offer that would be positioned right in the middle point of the ZOPA would give the value of 0. For example, if the ZOPA range was between 45 and 65 green roofs, the ZOPA -range would then be 20 (roofs). If the first offer included 50 green roofs, the distance from the middle point would be 5. The distance divided with the size of ZOPA would then give us $5/20 = 0,25$ as a value. Games with incomplete information, complete information and total amount are compared. The results show that in the games with complete information the first offers land much closer to the middle point of ZOPA (0,451) than in the games with incomplete information (2,194). Expressed directly in the number of roofs, average distance between the opening offer and the middle part of the ZOPA-range in games with incomplete information was 24.9 green roofs, whereas in games with complete information only 6.07 green roofs. This showcases, how the information on what is possible for the counterpart made the participants clearly change their starting point for the negotiation. This can be interpreted that in the games with incomplete information, the players offered something further away from their own minimum, in order to secure a better gain. When they knew the other players' possibilities, in games with complete information knowing what the ZOPA-range is, they were more confident offering something closer to their own limit as well. In other words, they offered something more fair.

Another interesting viewpoint of the opening offers is, whether the opening offer was inside the ZOPA-range or not. In the games with incomplete information, 4/7 of the opening offers were outside the ZOPA -range, which is reasonable due to the lack of knowledge of the other players' constraints. Then again, in the games of complete information all except one game started with an offer that was already in the ZOPA-range. This may tell us that when the limits of the players were transparent, only one player took the strategy to still offer something that they knew that the other player could not accept, probably in order to secure a strong starting point in the bargaining. The majority of the players decided to start the game with something fair, by anchoring the ZOPA-range when the information was available.

Out of all games that ended up with an agreement, 8 out of 10 started with an offer that was already in the ZOPA -range. Within the games that ended with no agreement, in 3 out of 4 cases the first offer was outside the ZOPA -range. On the base of this limited

sample of games, bargaining situations were more likely to end up with a successful agreement when the ZOPA -range is transparent and the bargaining starts with a possible proposal. This result is supported by the average distance between the opening offer and the middle point of ZOPA -range: In the successful games, the games that ended with an agreement, the distance was way below average, 7,5 green roofs. In the unsuccessful games that ended with no agreement, the average distance was significantly higher than the total average of the games, 35,5 green roofs.

4.1.3 In what point of the ZOPA-range an agreement took place?

In this section the end results of successful negotiations are analysed. A rational player tries to make their surplus as big as possible in a bargaining situation (Raiffa, 2003, p. 111). All points in the ZOPA range are pareto optimum, neither of the players position can't get better without the others getting worse. Since the players should have equal negotiation powers in this setting, we can predict that the games would end at an agreement in the middle of the ZOPA (Samsura et al., 2015). Although we have to acknowledge that the games have a time limit, and the players don't necessarily have enough time to organically end up in the middle of the ZOPA. In the games with complete information, since the players know what the ZOPA is, it is logical to expect the middle of the ZOPA as the end result.

The results are expressed in a similar manner as in the previous chapter: the distance between the agreement is divided with the size of the ZOPA. The average values are presented in Figure 2, comparing the games with complete and incomplete information. As the results show, we don't see much difference with the successful agreements in the two different information types: Games with incomplete gets the value of 0,137 and games with complete information 0,130, when the value 0 presents the middle point of ZOPA and 1 would present the whole size of ZOPA.

It is important to acknowledge that the sample size is very limited and therefore the averages of results are not reliable. We can still interpret these results as a cautious support for the predictions. It seems that the negotiations are likely to end up in an agreement, when the proposals are quite close to the middle point of ZOPA, in other words a "fair" result, regardless of players knowing the other negotiators' reservation

value or not. Preceding research by Samsura et al. (2015) found that with complete information ends closer to an equal outcome. This happened also in this experiment, but the difference was not significant.

4.1.4 How many rounds of proposals was made before an agreement?

The number of rounds that the players require to go through, gives us an idea how demanding the negotiation process was. We can perceive the number of rounds as the efficiency of the negotiation: the less rounds that the participants have to go through to reach an agreement, the more efficient the negotiation can be seen. Inefficiency in negotiations means more time and resources used in the negotiation process. In other words, costs for all participants of the negotiations.

The total average of rounds in all games were 2,21 rounds. This can be found a bit surprising, since the game setting could have led to a situation, where the participants would just have thrown counter offers at each other. Instead, the participants used their time more on argument-backed proposals, which is great for qualitative analysis. The results are consistent with predictions: with complete information, the games required clearly less rounds than in games with incomplete information. For complete information, the average number of rounds were 1,71, whereas with incomplete information 2,71 rounds. These averages are calculated considering all games, also the ones that did not end in an agreement. The average for only the games that ended up with an agreement, the average is 1,7 and there is no difference in the games with complete and incomplete information. Interestingly, the average of the rounds within the games that did not reach an agreement is much higher, 3,5 rounds. We can interpret that there was effort in these games, the participants tried to make an agreement, but did not succeed to find a solution that pleased both. All of these games were incomplete information. On the contrary, a significant majority, 5/7 of the games with complete information, ended with one proposal only that was accepted without presenting a counteroffer. Meaning that often when the information about possibilities were transparent, bargaining did not even take place.

4.1.5   Limitations for the data driven directly from the games

This research holds some limitations that need to be acknowledged and taken into account in further applications. Even though the experiment of this thesis is not even aiming for statistical significance, and despite being inspired by experimental economics, is leaning more towards a participatory method, it is still necessary to admit that the study would benefit from more participants. In addition to simply adding more participants, it would be useful to increase the rounds played among the participants and incorporate more actors in the game to achieve a greater understanding of the interactions and dynamics between the actors in planning processes (Barreteau et al., 2001; Vieira Pak & Castillo Brieva, 2010). Urban planning in reality is not a process of two actors. However, including multiple actors would require more advanced modelling methods like the Multiple Actor System model (Bousquet & Barreteau, 2002), challenging this framework.

Typically, experimental studies include monetary compensation for the participants. This thesis had no budget for the participants. In further studies the experiment could include a reward that is based on the participants success in the game, to influence on the behaviour and negotiation approach.

Another limitation lies in the order of the games played. The participants played a game of incomplete information first, followed up by a game with complete information. This structure was chosen to enable the players to have the same reservation values in different games, therefore minimising the ambiguity for the participants. The time frame for the whole experiment sessions was relatively limited due to the fact that the participants were a) professionals participating in the study during their working hours and b) participating voluntarily without financial compensation. Therefore, there was a reason to have no changing variables that the players would need to grasp and remember. However, we cannot neglect the fact that the participants have the possibility to learn while playing the game. It is possible that after the first game, the participants understand the game better, pay more attention to the time limit or especially after failing to reach an agreement in the first game, the players had a desire to "do better" in the next one. The possibility of learning might therefore affect the results when the games with complete and incomplete are compared. In this study, the emphasis is on qualitative analysis, but some control

games with a different game order would still be needed to validate the quantitative results.

Finally, the tight time limit of the games should be discussed: a time limit of 3 minutes only was chosen to highlight the threat of not reaching an agreement in the negotiations. This can be interpreted as an appropriate choice since some games were unsuccessful, but the time limit was sufficient to reach an agreement in some games. However, naturally, the short time limit also limits the possibility to collect qualitative data. A longer time limit and also repetitive games would allow the participants to adjust their strategies to the strategies of their counter partner (Samsura et al., 2010). In the context of investigating planning negotiations with conflicting interests, we may reflect, though, is it reasonable: in real-life planning, the negotiators may neither have unlimited time or a possibility to repeat negotiations until they find an 'equilibrium' of interests.

4.2 Qualitative results: arguments and discussion during and after the game

This chapter presents the results of the qualitative analysis on the arguments and discussion during and after the game. The qualitative analysis aims to deepen understanding on the behaviour in the game and reveal perceptions on biodiversity in city planning processes. The data was collected by recording the video call where the experiment session took place. Present in the game sessions were the participants and the researcher. The games were followed by an interview with the participants together, where they could also discuss with each other. In the games the focus was on the behaviour and arguments they made and the post hoc discussion was interested in their perceptions on the scenario and the real-life planning negotiations. The information that the participants reveal might be delicate, related to for example negotiation or corporate strategies. It would be unfavourable to the participants if they, or the organisations they represent, could be associated with the quotations presented in this thesis. Anonymity was promised to the participants to create a safe environment and gain more credible and authentic insights. Therefore, the role of the person quoted is described, but not personal details. Note that in the game sessions, the participants appeared as themselves, so they were not anonymous towards each other.

 The qualitative content is analysed with an thematic analysis approach. As a framework of the analysis, a six-step approach was used, introduced by Braun & Clarke (2006). The steps used as a structure of the analysis were:

1. Familiarisation with data
2. Generation of initial codes
3. Search for themes
4. Review of themes
5. Definition of themes
6. Reporting

Already during the games and the transcription of data, some initial ideas of themes were evident. Further analysis and structuring of the data led to the definition of the main themes that are relevant for the research questions: 1) Strategies and arguments 2) games in real life planning 3) role of biodiversity and 4) role of information. The following chapters will review the identified themes in turn.

4.2.1   Strategies and arguments

The direct arguments made during the game reveals some relevant information on the behaviour and the strategies of the actors in a conflict situation in the negotiations. Arguments and strategies are partly overlapping themes: Some arguments support a certain strategy, but some arguments can be seen as a strategy as themselves. First, strategies that were identified are presented, followed by arguments that stood out on their own.

Since the participants are experts in the field, we may assume that they are able to use fact-based arguments that could be used in real-life negotiations. The arguments narrate how the situation and biodiversity in general are perceived by the participants, and how they try to reach an agreement, meanwhile trying to reach the highest possible utility for the organisation they represent.

First, all arguments during the negotiations were identified and coded. Then the arguments were analysed again in order to identify recurring themes within the

arguments. Finally, reviewing the themes within the arguments enabled us to define some main themes that were present in arguments that were made. Similar treatment was made for coding's associated with strategies. The themes identified within the arguments, it clarified the identification of strategies. The interest in the analysis was not only strategies used in the experiment, but the participants perceptions of strategies in real-life negotiations.

4.2.1.1   Strategies

Compromising and compensatory solutions

One of the most evident theme that could be identified in the analysis of the qualitative content is compensatory solutions. These solutions can take various different forms and serve different purposes in the negotiation strategies, but they all share some elements that are seeking for a compromise or offer something as compensation if the other player concedes. It is notable that the game setting and its rules did not allow these kinds of solutions: The rules allowed the players only to bargain with numbers of the roof types. They were advised and encouraged to argue using their expertise in the field as a support for their proposals, but the offers they made had to be in a form of distribution of the roof types only. Still, clearly the most common way to seek progress in the negotiations was through integrative bargaining, even if it would require players to bend the rules. Instead of just dividing the fixed value, the participants were trying to create more value (cf. Raiffa, 2003, p. 97).

Different types of compensatory solutions and purposes behind them could be identified.

Biodiversity compensated elsewhere

The most common way to seek an agreement in this experiment is to argue that the wanted level of biodiversity conservation can be done in another way than the options in the scenario. In the context of the game, this meant that since there is a conflict on the roof types, there could be another way to absorb water and control the run-off waters in the area. Most commonly this proposal came from the developers' side, stating that since they would want to build less green roofs than was originally planned, they could build some other elements in different parts of the project that would serve the same benefit for biodiversity.

> *"I am thinking that there could be another solution for these green surfaces in the project. Could we solve this in another way than in the roofs? For example, we could reduce the number of parking slots a bit and get more green surface on the courtyards."*
>
> *Developer*

The purpose behind these kinds of suggestions is therefore to reach an agreement that the other participant would not otherwise seem to be willing to make. This kind of compensatory solutions were proposed also by the planners' side. Then, vice versa, the planner stated that they would not go below some limit in the negotiations when it comes to the green types, but the developers' interest in the solar panels could be compensated in other ways.

> *"The city acknowledges that carbon neutrality is an important matter, but we can think of some ways to compensate for this need: Could we produce solar energy in other spaces in the area or in some other ways support local energy production, in order retain as much as possible absorbent surface (on the roofs).*
>
> *Planner*

In addition to compensating methods to preserve biodiversity as proposals, they did also take place as demands. The planners could demand that if the original means of biodiversity protection would be reduced on the roofs, how would the developer compensate for this, in order to ensure the protection of biodiversity.

> *"These solar panels would of course need to be justified by developing some other solutions related specifically to this biodiversity topic. Do you have something in mind that could be done in a feasible way in this project?"*
>
> *Planner*

Best of both worlds: A modification of the original solution trying to combine the interests of both participants

Another way to search agreement with a compensatory solution was to propose a modification of the initial proposal, that could fulfil the desires of both participants. This was neither actually possible within the presented rules of the game, but the players were

not interrupted during a game in order to get rich qualitative insights. Within the scenario of this experiment, this meant building roofs that would enable both a green roof and solar panels on the same roof.

"These two solutions do not mutually exclude each other. Instead, combining green roofs and solar panels is recommended, and it increases the efficiency of the solar panels. It is the best solution also related to carbon neutrality. Therefore, we would need to get to at least 70% of green roofs and solar panels could be combined to the same roof surfaces."

City planner

The participants did not have to take account on if the suggestions they proposed would be actually possible or not, since this was a hypothetical scenario in the first place. However, it was evident that even if this was a bargaining game, and the rules steered the players into that direction, they were not satisfied with just plain bargaining on the number of roof types, but tried to reach an agreement in applied ways.

"I would argue that, in order to this be justified, the majority of these roofs should clearly be a green roof, Or, it could go in some other direction, for example, by seeking vegetation that would work with both green and these solar panel roofs. I believe they exist."

City Planner

Participants call for cooperation and claim that a principled approach would be ideal for both participants and particularly for future work. This is supported also by the behaviour in the games and the prevalence of compromising suggestions in the negotiation situations. However, the interviews reveal that positional bargaining does take place quite widely in planning practice in Helsinki.

I often represent the kindest type of city planners, perhaps because I solve issues with creativity and compromises. I accept that there are different goals and different ways of interpreting. I don't consider a single solution to be right, but there are often several solutions. I have also been in situations where I've acted as a mediator in conflict between different divisions of the city. Many of my co-workers are

*also known to use more unpleasant strategies: refusal of conversation
or constant insisting.*

City Planner

Positional approach is perceived to be a result of the individual negotiator, but also be related to city's regulation and plans. Some developers perceive that the city planners don't even have the choice but to take a positional approach to some issues, due to the regulations that leave no room for compromises. In example the Green Factor tool, one of City of Helsinki's means to ensure sufficient green infrastructure when building new lots in a dense urban environment, is perceived to lead in a plausibly unwilling, positional stand in the negotiations.

*The city locks its own position with the green factor tool, which at
some sites may be almost impossible to implement. If you view things
through a pipe, it can be difficult to find alternative solutions.*

Developer

Arguments not related to compensatory are solutions described in following chapter.

4.2.2   Arguments

Arguments on the level of (environmental) impact

At some level, the possible impact from the solutions described in the scenario was questioned. This was used as an argument especially in defending the stand to have more solar panels than green roofs, by arguing that will the green roof solution actually have an significant impact on biodiversity, especially if it takes a broader scope to analyse biodiversity than the individual project area.

*When it's like a permille or less what a new building or block
deprives of the whole of nature in Helsinki. So, is it really necessary
to protect nature right in that particular spot?*

Developer

These arguments were used mostly as support for an already given proposal, when the negotiation seemed to have reached a dead end. First, in the beginning of the game, not one of the players undervalued the importance of biodiversity protection or the means

presented in the scenario. Instead, they tried to use arguments that made the other option better. But when the negotiation reached a point, when the player did not want to bargain any further and wanted to stick with the proposal they had already made, they started to use these kinds of arguments.

> *Does it really make any difference anymore, is there 70 or 60 (green roofs)? I don't really understand the reasoning behind the green roofs, the surfaces are small in the end and so on, so what is their (impact) on biodiversity?*
>
> *Developer*

Arguments related to the efficiency for biodiversity protection in the scenario were often linked to some other argument related to environmental benefits. The players brought out that biodiversity protection should be more important than climate change mitigation in this case. The arguments related to the pressure of driving environmental efforts more to climate than biodiversity friendly means are presented in the following chapter.

Referring to public and political attention

Clearly one way to argue for both types of participants, was to refer to stakeholders outside this negotiation situation. For the planners, it was more referring to political bodies, while developers referred more to public attention and common targets. The planners used politics as an argument in order to support their own stand, with the logic that the original proposal cannot be changed too much, or it will not be accepted by higher authorities or decision makers. Making this argument, the planner seemed to try to take a consultative approach, based on their expertise, trying to make the impression that they are helping to get this plan through the system.

> *It is clear and understandable that we have a bit of cross-cutting goals here. After all, we had all the roofs as green roofs in the original plan. So, it would be very important to stick to that, in order to justify this decision to the policy makers.*
>
> *Planner*

The developers used a similar argument but used either public attention as a reference, or general targets made to tackle climate change. They argued that the original plan had to be changed in order to reach some targets related to emissions or just to get public acceptance of the plan.

The situation has gotten worse and people are already protesting on the street. Our climate targets have become stricter as well. Therefore, I would propose a solution that supports sustainable development: more solar panel roofs. It's extremely important that we get rid of all these energy sources that are harmful for the climate.

Developer

The fact that the option that the developer bargained for was also one with an environmentally friendly option, gave this argument almost as given. It would have been interesting to examine the arguments used, if the other option would have been business-as-usual without environmental benefits.

Arguments based on who's taking the risk

In these kinds of projects, the main economic risk, and therefore also possible return, lies on the developers' side. Developer is the one who invests their money in the project, and is therefore meticulous about the building costs, in order to ensure the feasibility of the project. Considering this, it is rational to assume that the developer would use this risk as an argument in the negotiations. In the end, both participants share the interest to build, but the developer is taking the greater economic risk. The experiments supported this assumption. Arguments related to risk taking were used, and they were bound together with the scenario in a way that supported their preferred roof type.

"Green roofs are a nice thing, but not terribly nice from the owners' point of view. We don't really know what happens to them. In 10 years, there will be green vegetation, but something else is growing than stonecrops. And when the roof starts to leak, it means that everything needs to be torn off and rebuilt. So not a very nice thing to the owners or the investors, who are the ones that are taking this great risk."

Developer

Participants from both groups expressed that, according to their experience, referring to costs is not a good argument in the negotiations and it will not steer the situation towards a negotiated agreement. They also admit that naturally the costs play an important part of the negotiations in city planning. Therefore, they stated that a better strategy than referring to costs, is to refer to the risks that are related to the project.

The quote above sheds light already a little to the other view-point into risk taking, that was used as an argument: the end-user perspective. Developers also referred to the end-user as the one that is paying for everything in the end, and it would be responsible to take into account the risks that the future owners of the apartments face. This argument was used to support the stand of having more solar panels than green roofs in the project, claiming that the green roofs might hold a potential economic risk. Without taking a position on if the developer is actually concerned of the risks for the end-user, or just their own financial performance, this argument seemed to be difficult to respond for the planners, since naturally the representative of the city is concerned with its residents' benefits. In general, some developers called for a more participatory approach to planning, with more inclusion of the end-user.

> *Well, in reality it is the residents that are paying for these solutions and both of these solutions are an additional cost for the future residents. The solar panels will pay back themselves in 15 years in apartment buildings like this and at that point they need to be renewed already. The use of renewable energy would be at least some kind of selling and marketing point for these consumers, unlike the green roofs.*
>
> *Developer*

4.2.3   What kind of games are present in real life negotiations?

With the qualitative analysis on the arguments made during the games and the interviews after the games, I seek to find insights to what kinds of games are perceived to take place in the real context of city planning and biodiversity. Content related to the theme of real-life planning practice was identified both during the games and in the post game discussion. The game-like setting helped to identify aspects that characterises behaviour inside the games of bargaining and negotiation.

The scenario created for the game in this experiment described an after-application bargaining situation: The negotiation took place after a developer had won a competition for a building project. The qualitative data indicates that after-application negotiations take place frequently in city-planning in Helsinki and they seem to be quite impactful for city planning as a whole. The participants speak of different kinds of situations of after-application bargaining, some related to detailed city plans, some to quality competitions,

some even to orally made agreements, but they all share the same feature of starting to negotiate on things that are previously already agreed. The viewpoints on this vary among the participants: some see after application bargaining as an inevitable and cooperative way of city planning, but some see this as unequal and problematic practice.

In detailed city planning, common utility for the city, residents and employers are against the developers' money. You would get more realism in this experiment by repeating the negotiation, with the goal for the developer to bargain even more. And this would be repeated multiple times: First at the stage of reference plan, then detailed city plan, and finally at the stage of construction permits.

City planner

"It is bad if someone prospers with a background idea, that we can promise this now and negotiate about it later. – – I am annoyed by the type of organisers for these competitions, who comply to that something completely different can be done after the competition has ended. Of course, it is possible to negotiate, but if biodiversity has been emphasised in the competition and a certain number of green roofs has been promised, deviating from it is quite a big deal. "

Developer

This leads us to a trait in planning practice with the most contradiction among the participants that were revealed in this experiment. Like the first quotation of this chapter showcases, city planners state that after-application bargaining takes place and it's happening on the behalf of the developer. After winning a competition and being granted permission to build a project, the developer starts to negotiate and cut costs of the project, aiming for a better return on investment. This was a commonly agreed perception among the city planners. On the contrary the developers state that in many cases cutting the costs is inevitable in order that the development project is feasible to continue. It was even stated that the competitions cannot be won with proposals that would actually be possible to implement in an economic sense. This is allegedly due the big size of the plots that are granted due to the competitions, which increases the incentive to over-promise in the competition entries.

"Plot price and quality competitions are a good starting point for the planner, they always want to stick to what is originally promised. But what the authorities are not willing to accept is that these competitions cannot be won with realistic plans. Bargaining is necessary in all of them."

Developer

This strategy was commonly mentioned in the interviews during the experiment sessions, but also in the preliminary interviews that were conducted in earlier stages, in order to support the creation of the scenario. Despite the fact that this seems to be a common practice in city planning, and one could assume that this setting gives an advantage for some actors in the field, none of the participants seems to like this strategy or the circumstances that lead to this strategy.

Another 'game' that can be identified through the experiment was a game of waiting. Waiting game refers to the planning authorities ability to delay projects in order to gain advantage in the negotiations, and is described to be one of the planners' best tools against developers (Lord, 2012, pp. 120–121). However, planners did not find delaying as a favourable strategy in Helsinki: There is an increasing pressure to grow and build new residential apartments. Still, the behaviour of both parties expressed that delay is more acceptable than undesirable concessions. This is supported by the result that many of the games also did end without agreement. Waiting was also used as a bluff: an offer was accepted at the very last second. Also developers often indicated in the negotiations, that they are perfectly willing to delay or even abandon the whole project, if they cannot reach an agreement that they perceive as acceptable.

4.2.4   The role of biodiversity in city planning negotiations

Qualitative analysis reveals biodiversity related insights on how biodiversity is perceived as a part of planning projects and negotiations in city planning. Within the theme of biodiversity specifics in the negotiations, three major findings can be identified as clearly separated contexts. First, city planners seem to be more concerned about biodiversity protection in residential building projects than the developers. Second, different environmental benefits, such as climate warming mitigation and biodiversity preservation, are quite commonly seen as competing features in planning projects. Third, discussion took place on where biodiversity related decisions should be made, which revealed that the participants perceive that decisions made in the detailed city plan -level are not significantly important for biodiversity in the bigger picture. Therefore, they call for decisions to be made in upper level in the hierarchy of urban area planning.

The concern of biodiversity protection seems to be quite solely on the planner's side. The participants from the developers' side stated surprisingly bluntly, that biodiversity is not concerned if it's not demanded from the City's side. Biodiversity protection is not perceived to have a significant role in the big picture of negotiations related to residential development.

> *"I don't recall that there would have even once been talking about biodiversity on the side of my former employer. Unfortunately, this is the case, the focus is on how to make the project profitable. – – The margins are not wild in this field, it can be a struggle to even make a project possible. In this case, these kinds of green roofs are the first red flag."*
>
> *Developer*

On the contrary, the city planners perceive that biodiversity protection has relevance in city planning and its importance is growing in a positive manner.

> *"Growing quite clearly. At least during my career here, its importance has been emphasised in a good way, because it has been and still is now present in the political debate. Though it gained minimal attention prior, it has now risen to the top agenda."*
>
> *City Planner*

In addition to the mismatch in the attitudes and perception of impact towards biodiversity in planning and negotiations, the experiment shows that planners and developers might have a misinformed perception on each other's values towards biodiversity. As presented above, the developers admit that if it's not a constraint for the success of the project, biodiversity related aspects do not gain a lot of interest. The planners have more optimistic beliefs of the level of interest. The participants representing city planners in this experiment tended to assume that biodiversity is commonly treated as an important matter and there would not even be a possibility not to do so, due to public attention and political or regulatory pressure.

"Almost everyone wants to support biodiversity. And those who won't,
are so stubborn that they have problems in very basic building code
aspects."

City Planner

The second theme within the biodiversity specific characteristics in the negotiations, is the perception of different environmentally friendly actions as compensatory, substitutable towards each other. In the case of this experiment, this meant mostly actions designed for biodiversity protection versus actions designed for decarbonization or climate change mitigation. The scenario of the experiment naturally leads into a discussion about these kinds of actions, since the topic of negotiation was the distribution between the two roof types that serve different environmental benefits. However, it stood out in an alarming way, how the participants talked about these two options during the game or commented on the scenario as a whole afterwards. Some of the participants were confused about the setting of the scenario, since both of the solutions in the game would provide environmental benefits. They did not see why there would be a reason to negotiate, if both participants want positive things, even if the wanted solutions would be different. Due to the feature of negotiating between two environmentally friendly solutions, the likelihood of this kind of negotiation in real-life planning was doubted.

"The scenario was odd in the sense that both options were
worthwhile. Both green roofs and solar panels would be a better
option for business-as-usual, from the perspective of sustainable
development. There would probably never be a situation like this."

Planner

This comment is significant, because it was explicitly stated out in the description in the scenario, that a) biodiversity is the top priority for the city in this scenario and b) that the solar panels would not have a positive effect on biodiversity. Vice versa, more solar panels would mean less benefits for biodiversity via green roofs, therefore the solar panels would have a negative impact on local biodiversity in this scenario. Still, despite the two options being framed like this, they were put in the same 'basket' of environmentally beneficial solutions. Even if it was explained in the scenario, some of the participants did not see the difference in the two. This may represent a serious threat to the goal of halting biodiversity loss in city planning. If actions and solutions with different environmental agenda are treated as substitutes, there is a risk that more resources are steered from

biodiversity conservation to other issues, in example climate change mitigation. Especially, if the actors involved perceive that the decisions made have been beneficial for the environment, biodiversity conservation may lose support as if unnoticed. This concern is consolidated by finding that the participants from both sides state that climate change mitigation is much more emphasised in planning and negotiations, due to well-established targets, methods and attention.

> *At the moment, the emphasis is on carbon neutrality, because climate change is such a key issue, with good accounting practices and processes. Strategies and targets have been set in cities and even today. Nowadays also construction companies and other actors have set goals for themselves. – – I guess we should be just happy that some actions take place and not just talk. .*
>
> *Planner*

> *If you approach this from the investor's perspective, I would say that many of them already have their climate-targets existing. But preserving biodiversity, that is very difficult to measure numerically and set targets for it.*
>
> *Developer*

If halting biodiversity loss and halting climate change can be seen as competing missions and in addition, climate change is perceived as more timely and easier to measure, there could be a high risk of environmental resources allocating more towards climate change mitigation from biodiversity protection. As noted by Hipel & Walker (2011), even if two parties both want to protect the environment, conflicts are inevitable due to differing priorities in environmentalism.

The last theme of biodiversity specific features that stood out from the qualitative data, was the discussion on the possibilities to have an impact within detailed city plan -level and building of residential areas. The possibly small impact on biodiversity of the residential project, compared to in example the whole Helsinki area was a common argument used in the games. In interviews after the games the participants discussed that biodiversity protection should be led from greater urban plans and that residential building projects don't have a significant impact in the big picture.

> *The means to have an impact are small in individual construction projects. Biodiversity must be taken care of there at the level of*

general city planning zoning and in the design of entire urban structure in the first place. The measures that can be done at the construction project level are pretty cosmetic. I would see that it is primarily the city's responsibility to ensure decent local green areas, street trees etc in the urban structure. – – The protection of biodiversity must take place somewhere else, than at the level of individual construction projects.

Planner

This viewpoint raises also from the developers' side, more focused on the information level on biodiversity in the greater area planning, more detailed in the next chapter. However, this theme can tell something of the general approach to biodiversity and the scope of how it is considered. The participants referred to their possibilities to impact biodiversity on the whole city's scale, despite the scenario being interested only in the local project area. Fisher et al (2011) have found similar results on the individuals perceptions on the possibilities to impact on climate change: people tend to believe that a top-down approach and tight regulations are needed, instead of believing in collective action. The authors state that this is due peoples beliefs of generalised characteristics of humankind and societies. In our case the participants' beliefs of the characteristics of planning practice might limit their perceptions of ability to influence on the state of biodiversity.

4.2.5   The role of information in city planning negotiations

The qualitative results support the findings from the direct quantitative results of the experiment: The participants state that the negotiations were easier and more efficient with higher levels of information. Some of the participants could also reflect how their own behaviour changed between the games with different levels of information. Two types of information can be identified, of which transparency is especially relevant for the negotiations related to residential buildings: a) information on the financial constraints of the residential project and b) detailed information, reports and reviews of the state of biodiversity in the specific area. For the efficiency of the information, both of these are valuable especially in the early stages of planning and negotiation processes.

"When I don't know the target of the other player, I let them do the first proposal and then bargain, like I did here (in the experiment). Then again when I know (the limits), I take the whole situation in my

control right away. Apparently, it was worthwhile. It is exciting to see
how much time is saved when I know the other players' aims."

Planner

The participants felt that information availability and transparency make the negotiations more efficient, when they don't need to waste time and resources in trying to reach impossible things. In most cases, transparent information availability helps to find an agreement in an efficient way, but it might also lead to letting go of the project and ending negotiations before they even properly started. In these cases, the participants saw this as a good thing, not wasting resources in a dead-end situation.

When it comes to information transparency, the participants perceive that the city is more transparent about its goals and possibilities than the developers. The city's incentives come from broader goals and strategies, which already sets the stage for a more transparent and public nature of the city's aims. Like presented in the scenario of the game as well, in addition to the main strategies of the city, if the city organises a competition for a project, the aims for the city are stated out in the competition description. From both groups of participants, it was stated that the developers might not be as transparent with the information. It was stated even from the developers' side, that they might not provide as much information as the city of their possibilities and aims, and that veracity of the information provided can be questionable.

"If I compare these two scenarios, where in the first game we didn't
know the goals of each other, and in the second one we knew, perhaps
I find this second one more realistic. At least on the city's behalf,
because the goals that the city has are totally public, often stated in
some strategy or legislation. It is given by the regulations, that
usually everyone knows what the goal of the city is. – – Then again
from the developers' side, the information might not be as open
towards the city. For example, what are the limits for profitability. In
this sense, the positions in the negotiations are a bit different in real
life."

Planner

It (information availability) is a bit asymmetrical. The actors in the
field don't openly provide – or they might give the impression that
they are providing – this information, but veracity of this information
is not certain.

Developer

Previous literature highlights this two-sided nature of information in negotiations and planning. While Shmueli et al., (2008) describes information as the foundation of successful planning and the currency of negotiations, they also note that information is often selected and manipulated for strategic purposes. One of the most blatant examples that came up in my experiment is the strategy of purposely using outdated information as material in the starting point of negotiations, in order to present the up-to-date information as a finding in later stages.

This leads us to the findings of *where* in the planning process the information availability is valuable. Participants state that in the case of a competition for a project, like in the scenario of this experiment, the availability of particularly financial information is truly impactful. This is in line with previous literature by Samsura et al., (2015) who find that information availability on financial conditions is important for successful negotiations and ore reaching a fair outcome for participants. It is stated in the interviews, that information about financial conditions in negotiations and competitions are provided in form of stating what kinds of solutions are feasible or not, but they are not expressed in monetary values. The exact costs are perceived as trade secrets. Combined with the aforementioned pressure of trying to secure a win in competitions this may strengthen the possibility of the developers entering the competitions with plans that might not even be feasible to put in action in reality, and then bargain and negotiate the plan later to be feasible. This may hint that more demands on financial feasibility should be incorporated in the requirements of competitions. Regardless, it is commonly perceived that some negotiations and revisions of the plans will inevitably take place after the competition.

> *It depends on how much feasibility has been taken into account during the competition, how much will be negotiated after that. In any case, through the process, after more surveys, the plans need to be refined.*
>
> *Developer*

This feature might be impactful for the city's biodiversity protection efforts. The additional elements that serve a purpose of protecting biodiversity creates costs, and some costs have to be reduced of the plans that win the competitions, there is a clear risk that these biodiversity-friendly features are lost in the negotiations. It is stated that information

with inadequate nature can come from the city's side as well. In example, the requirements or goals might not be realistic or the information on the biodiversity specifics in the area can be incomplete.

> *It may be that the goals written the in the conditions of the competitions were unrealistic. It is possible to be flexible about these terms, but some sort of revision, calculations or estimates would be needed: what the actual amount of run-off water is, what is the ratio of that amount to that local aquatic environments, and how does it affect the species. So, if changes are made, what is its effect on these amounts.*
>
> *Planner*

Biodiversity related information is called on the behalf of both groups of participants. City planners demand information on how the developer will convince them that biodiversity will be protected during the negotiations, after the competition. In turn, developers express the need for more detailed information on the level of biodiversity in the specific area where the project is planned to take place. It is stated that many aspects related to biodiversity are not measured in advance, but they reveal in the stage of detailed city planning. New information on the state of biodiversity in the middle of the planning process might be a reason for conflicting interests and create the requirement for negotiations. For example, if rare species are found from the project area, it might provoke the need to negotiate the details of the project again.

The information that the player has influences the strategies they choose. This can be modelled with the game of "Follow the leader" (Rasmusen, 2003, pp. 1–8), where two players' pay-offs depend on if they choose the same strategy or not. The information available for the players plays a crucial role in choosing their strategy: if the strategies of other players are clear, it is easy to make a choice that enables greatest benefits for both of the players. Difficulties may occur, if planners have different conflicting policies. If the available information is different for different planning authorities, it affects the pay-offs of the whole development and planning "game", meaning gains and externalities of development (Lord, 2012, 98-99).

This experiment was a two-player game, but the multi-actor nature of planning practice and negotiations was evident. Some developers stated that there are cases, where different

planning authorities may have contradictory interests and policies, which makes it difficult for the developer to approach with a plan that pleases all.

> *I would often need the information, what are the truly important things for the city. Since, the detailed city plans tend to have a lot of conditions, and usually the feedback is that these should be followed strictly. In some cases, these conditions might be in conflict with the terms of land transfer. So, what is the real goal? The city has a lot of different departments: construction supervision, detailed city planning, plot department. Sometimes it remains obscure to me, whose idea I should follow.*
>
> *Developer*

This can be interpreted in a way that the planners have different information sets, when they decide their policies on the projects and city plans. The planners also recognized this difficulty: it was stated that one of the most challenging cases in negotiations are something is promised to a developer by another planning authority, that is in conflict in the planners own view with the best solution. The significance of the information set in the moment of decision making is brought up by Lord, (2012, p. 98): When planning authorities have conflicting policies, the gains and externalities of development are not divided equally. Planners could also identify situations, when the information set expands, when they get some detailed information about the practicalities of a project, which prolongs the negotiations.

5 Discussion

In this section, I discuss the results of the experiment in relation to existing literature. The discussion is divided into chapters that represent the main themes relevant to the research questions. First, I interpret information availability's influence on negotiations. Second, chapter 5.2. focuses on the biodiversity-related characteristics revealed in the experiment. Third, I discuss the implications of the selected game-theoretic framework in studying behaviour in decision making and negotiations in relation to urban planning and sustainability. Finally, I reflect on the limitations of the study.

5.1 Information availability and negotiations

The data collected in the form of a) results of the simulation and b) the qualitative analysis of discussions suggests that information availability can make a difference to the efficiency and success rate of negotiations. The participants played a game with the same scenario with two different sets of information: a game with complete information, knowing each other's reservation values, and a game with incomplete information, knowing only their own reservation value. Games with complete information were more successful and efficient, supporting earlier studies with a similar experimental approach (Samsura et al., 2015).

Consistently with negotiation and planning literature (Fisher et al., 2011), the participants favour an integrative and principled approach to negotiation instead of a positional and non-cooperative approach. This preference is evident not only in the interviews but also through the behaviour in the game: when the conflict of interests becomes evident in the negotiation, the participants are eager to propose and find new, cooperative solutions that could compensate for the others concession in a way or another. I find this interesting, considering that the game's rules did not allow other means than plain bargaining. Although it was clear and simple what the players were allowed to do in the game, they were trying to bend the rules and find a solution in a creative manner that satisfies both parties in the negotiation, a 'wise' agreement. This indicates that this style of integrative negotiation is common within urban planning.

However, it is likely that positional bargaining takes place in environmental planning (Lord, 2012, p. 117). This was evident in my experiment as well: games with incomplete information were not as successful and efficient as the ones with complete information. Limited information seemed to direct participants to take a more positional stand and make unacceptable offers for the other player. Without knowing the other players' reservation value, players made more exaggerated offers to secure a desired state after possible concessions. This resonates with existing literature that suggests that with more information, negotiators are more likely to lower their expectations and offer more reasonable suggestions for their counterpart in order to reach a fair agreement, while positional bargaining tends to lead to taking extreme positions and trying to minimise concessions (Fisher et al., 2011, pp. 4–9; Ennis, 1997; Lord, 2012, p. 117). Stuhlmacher & Champagne (2000) frame this as a disadvantage for the negotiator: with less information, a negotiator would take a more aggressive strategy and claim better results. Analysis experiment indicates that negotiators tend to behave in this way but also that this behaviour might be disadvantageous for both players. This leads us to the discussion on how success of a negotiation is framed: if negotiation or bargaining is perceived from the viewpoint of an individual, more complete information may indeed encourage a negotiator to make more restrained (and realistic) expectations of possible outcomes and therefore gain less than the ultimate maximum.

Nevertheless, especially in planning, is it feasible to investigate negotiations from the perspective of an individual? Success for choosing an aggressive and positional strategy depends a lot on the other player's type and may affect the relationship between the negotiators (Fisher et al., 2011, pp. 7–12; Lord, 2012, pp. 107–112). Lord (2012, P 117) notes that the nature of negotiations can be interpreted as interactions with others in order to reach an agreement, without excluding the possibility of no agreement as well. When the risk of not reaching an agreement is evident, and we may assume that in urban planning, there is a joint interest in negotiations to find an agreement, it could be feasible to investigate the success of negotiations from the perspective of a group, instead of an individual. Considering the negotiations as joint efforts to reach an agreement, my findings support the arguments by Raiffa (2003) and Samsura et al. (2015) that information sharing and availability should increase the success of negotiations.

The information that varied between the game with incomplete and complete information was information on the reservation values, representing the capabilities and constraints for the players. Especially information on the financial constraints came through as impactful also in the qualitative analysis. It seems that it is common that feasible solutions and proposals are stated out in early-stage plans and entries in development competitions, but they don't include detailed financial information. This may set the stage for negotiations and bargaining after the application of a project, since the information provided in beforehand doesn't submit proof on the profitability and feasibility of the project. The developer might need to start negotiations after application to reduce costs in order to secure a reasonable return of the project. Neither the planners nor the developers claim to support the practice of negotiating on already agreed plans, but a dissonant viewpoint from this yielded from the developers' side: It was stated that the development competitions that are organised by the city of Helsinki are framed in a way that encourages or even forces the developers to entry with plans that are groomed, ambitious and design-driven, but actually impossible to put into reality in an economic sense. These notions support Glasson & Booth (1992) argument that negotiations after application are the most impactful, since negotiating before application is more open-ended and less binding. The example of the competitions and information suggests that both participants would benefit from more information already in the early stage of the project or the negotiations, congruent with the findings by Raiffa, (2003); Samsura et al., (2010, 2015) and Thompson (1991). These notions also give practical advice for planning authorities: the results indicate that the requirements for development competitions leave perhaps too much room for after application negotiations, in order for the planning authorities to ensure that the projects are realised in the desired way. Two features arise that should be further investigated in development competitions: a) proof of feasibility – how precisely should the entrants prove the economic feasibility of their plan, and b) binding nature of the entries – should the entries in competitions be more binding agreements, if they win? More research would be needed to investigate specifically development competitions, information availability and the implications for sustainable urban development.

Information availability seems to be impactful in negotiations concerning biodiversity. Results indicate that more detailed information about biodiversity in urban areas is needed. Planners require reports and data on the effects on biodiversity in order to agree

on proposals. On the other hand, developers would want more detailed surveys and reports on the level of species in the areas planned to be developed. It is stated that it is not rare that information about species comes up after agreement on plans. If this information limits the planned means of building, there is a need for new negotiations. This can be interpreted as that limited information on the state of biodiversity can be a driver for post-application negotiations and bargaining. I discuss more findings relevant for information and biodiversity in negotiations in the next chapter.

5.2   Perceptions of biodiversity

This experiment indicates that there is a practice that the actual binding negotiations take place only after a permission for a project is granted for a developer. The final negotiated outcome might differ from the proposal that secured permission to the developer. From a biodiversity perspective, the risks of this practice should be considered in future development of city planning practice and in further research.

Earlier research shows that new sustainable building technologies are resisted due to the possible risks and costs resulting from changing processes (Häkkinen & Belloni, 2011). If the incentive to negotiate on changes in proposed plans is to reduce costs of a project, this indicates a risk of biodiversity or other sustainability agenda is undermined during the negotiations. On the basis of the qualitative analysis, it seems that the eagerness to take urban biodiversity into account in development plans lies much more on the planners' side, which supports this risk.

The experiment revealed another possible risk to get biodiversity strategies realised in urban development negotiations. The participants seemed to put biodiversity protection and climate change mitigation in the same 'basket' of environmentally friendly features in building and development. This is noteworthy considering that the scenario in the experiment stated that a) biodiversity protection was the top priority in the hypothetical project, and b) of the two solutions presented, the other provided benefits for biodiversity, and the other did not. Even if the two concepts were clearly separated from each other, participants perceived that with any kind of distribution between these two, it is already a win-win situation, and some of them were confused, why would they bargain between two environmental benefits. Taking into account that climate change is a more well-

known problem that gains more media attention than biodiversity loss (Legagneux et al., 2018), there might be a risk that climate change mitigation features are favoured over the types protecting local biodiversity if these two are perceived as complementary. Acknowledging that biodiversity loss and climate change are interlinked challenges that shouldn't be addressed separately (Pörtner et al., 2021), discussing these two together is certainly a positive trend, but it would be necessary for the actors to be able to identify the trade-offs and synergies in the mitigation of the two challenges. Framing all environmental problems and solutions into one set indicates that the measures for mitigation are seen as substitutable.

Measures exist that can contribute to the mitigation of biodiversity loss and climate change, but win-win solutions cannot be achieved in every instance (Pörtner et al., 2021). There is no reason to believe that sustainable urban planning would be an exception; locally, some means are needed to be aimed separately for different environmental issues. Therefore, I argue that it would be important that those issues would not be put in the same 'basket' in negotiations, and the finding that many participants behaved in this manner can be interpreted as alarming.

5.3 Discussion on the framework

This research was unique in the Finnish context in adopting an experimental approach in sustainability sciences to study sustainable urban planning. I wanted to examine if a useful game-theoretical framework can be identified to study negotiations with partly competing interests. The selected framework is a combination of quantitative and qualitative methods: a role-playing game, a game-like simulation with selected experts as participants that provide direct, quantitative results of the simulation. These results are not designed to provide strong statistical results that could be generalised but to provide insights that can be analysed with the support of the qualitative analysis. Discussion during and after the games is analysed qualitatively in order to gain rich information about the chosen decisions and perceptions of the subject matter, in this case, biodiversity, that the simulation results would not reveal. Therefore, this framework drives inspiration from experimental economics but aims to create a space for participatory problem-structuring.

I suggest that this kind of framework has potential for two reasons. First, it can help in understanding how actors perceive a negotiation with conflicting interests and how they solve the situation. Second, it can give insights on how to design efficient administrative processes taking into account the participants' preferences and wider public interests, such as biodiversity preservation. The usefulness of the framework is related to the mixed method of game-like simulation and qualitative analysis: it allows us to gain rich data, still using a simple setting for the simulation. A game-like simplification of reality is not only easy for the participants to comprehend, but it enables us to collect information, investigate the behaviour and identify decision-making problems in conflicting situations (Barreteau et al., 2001; Samsura et al., 2015; Voinov, 2018). In the experiment, I could easily change one constraint in the game setting, the level of information, and examine how it influenced behaviour and perception. In further applications, more complexity could be added in the game setting to make it more realistic. In fact, I received feedback from the participants that the scenario in the game was relatively simplifying and that real-life negotiations are seldom pure bargaining situations.

However, the benefit of simplified, game-like simulation is not limited only to the information on the decisions made: Role-playing games create a space for discussion among the participants and can serve as a tool to overcome trust issues between participants and researcher (Castella et al., 2005). Both of these benefits were evident in the experiment: despite that the participants represented parties that are negotiating against each other in real life, it did not seem to influence negatively in their interaction with each other. Instead, the game seemed to foster an open discussion that tended to flow outside the game scenario into the context of planning and biodiversity in general.

Qualitative analysis broadens our understanding of the behaviour, decisions and problems revealed in the game. It also allows us to consider how both the participants' individual preferences and their perceptions of wider public interests influence the negotiations.

The experimental approach allowed us to match participants from both sides of the planning negotiations, developers and city planners. With their experiences from their roles in real life, they bring in the game perceptions of how these interests influence their own decision making. This is highly beneficial since, in addition to identifying problems, a game-theory based game-like simulation can also set the stage for collective problem-

solving. As the actors share their knowledge and perspective of the problems, they can collectively also identify solutions for the conflicts that arise in the game. The behaviour in the experiment supported this notion: As discussed in chapter 5.1., the participants did not seem to be satisfied with pure bargaining. Despite the rules, they wanted to seek creative and compensatory solutions in conflicting situations, which indicates that the game-like simulation does provide a fruitful scene for collective problem-solving. This is referred to as team reasoning: in some interactive decisions, players are trying to maximise the utility of the group instead of their personal utility (Colman et al. 2007). Even if the predetermined rules of the game were maintained (agreements outside the rules were not accepted as successful), the qualitative analysis could capture the behaviour and desired options beyond the limits of the game.

It is proposed that since the reality is often too complex to be replicated with a game to a full extent, a role-playing game experiment can also be co-created by the participants (D'Aquino et al., 2002 & 2003). Then, the researcher constructs pre-setting but does not include binding rules, and players co-develop the setting while playing the game. This is exactly what the trend was among all the played sessions. Naturally, this indicates that the formation of the game setting can be useful. Still, since despite my game setting and its rules were limited, I gained insights on how the players would have solved the problems. We may interpret this also as that with qualitative analysis, we can bypass the need of structuring a complex game setting and still gain understanding of problem-solving and its dynamics. Therefore, this experiment indicates that a game-theoretic framework, implemented in game-like simulation and qualitative analysis of discussions, can hold potential for both understanding how decision-makers frame and solve problems in negotiations with conflicting interests and also how broader public interests, like biodiversity, is perceived by them and taken into account in administrative processes.

However, there are some underlying limitations in my setup. First, the sample size in this experiment was small, and instead of making statistical conclusions, it served more as an indicator for what to focus on in the qualitative analysis. Naturally, in further research, the framework could be implemented in a study with a greater number of games and participants. However, Vieira Pak & Castillo Brieva (2010) warns about the difficulty of handling the broad range of data generated by a role-playing experiment. This was evident with even this limited number of participants and increasing the number of players and

games could result in a challenging load of qualitative content. Therefore, a possible application would be a framework with a role-playing game experiment with a large number of participants combined with a combination of a selected set of follow-up interviews. In this case, the experiment results could inform the selection of the participants for the follow-up interviews.

5.4 Policy implications

The experiment reveals some policy implications. The most evident one is related to the setting of how development projects are granted from the city to the developers, which also serves as the starting point of the negotiations. When the building plots are granted though competitions, the actual binding negotiations take place after the competition. As a result, some of the features with high cost may be removed from the plan. If the city wants to ensure that biodiversity is protected, they should consider how the competitions are framed. I suggest that if a competition has an emphasis on biodiversity protection, the developer that wins the contest should be obliged to build the biodiversity-related features according to their original proposal. If the competition setting would be more binding, there would be less incentive to overpromise. Information of the economic feasibility of the proposals are also commonly missing in the early-stage negotiations. Therefore, I suggest that these competition entries should include a cost & feasibility analysis that proves that the suggested plan is actually possible to be developed.

Biodiversity loss and climate change are considered as substitutable environmental agendas among some of the participants. This is a clear signal for a policy implication: different environmental goals in city planning should be expressed even in a clearer way. The definition of goals could be included in the competitions and other means of granting permissions. With the focus on biodiversity, the city could also define project specific definitions on what is aimed at with biodiversity protection and preservation: What does biodiversity mean in the context of this building plot? How do we define a successful way to develop this are in respect of biodiversity? This could require more detailed information and surveys on the state of local biodiversity in before-hand, but via this the city could identify clear targets for the competitions that could not be negotiated later on. Defining local project level biodiversity targets could also drive the focus to local

biodiversity, instead of the city-level. This could encourage the individual's perception of their possibilities to have an impact.

The selected framework also rooted an idea for implication: this setting was not only a good way to study behaviour, but also to reveal how people really think about environmental concepts. A common argument in the negotiations were related to the preferences of the future residents of the development projects. The residents can be perceived as the end-users of these projects. With a game-like framework as in this experiment, the end-user could also be included in the planning process. This way, the city could also learn what are the residents' preferences and perceptions of biodiversity. The benefit would lie in the fact that the framework would also make explicit for the resident the alternatives and the choices that has to be made in planning processes. No one in the negotiation game is likely to end up with everything they wanted, and therefore the game reveals also to residents' true preferences and what the resident would be willing to pay for.

6   Conclusions

Previous literature and research findings suggest that: (1) negotiations are a crucial part of city planning (Claydon & Smith, 1997; Glasson & Booth, 1992, pp. 67–68; Lord, 2012, pp. 113, 138); (2) after-application negotiations and bargaining are more impactful than open-ended agreements earlier in the city-planning process (Glasson & Booth, 1992); and (3) information can alter behaviour in negotiations (Samsura et al., 2015; Shmueli et al., 2008). This study supports all of these fundamental arguments of negotiation studies: the participants in the experiment, experts in the field of city planning, recognize that a fair share of decision-making takes place in negotiations and that after-application bargaining is a common and impactful feature, and they also identify situations where the set of information they have influences to the process or their own decision and behaviour. I therefore conclude that negotiations in city planning should be studied to prevent biodiversity loss and contribute to sustainable urban design.

More specifically, this study indicates that information availability can significantly influence the success and efficiency of negotiations. Quantitatively this study cannot make this claim, but in combination with qualitative analysis, there is strong support for this finding. These results are also largely in line with preceding studies (Butler, 1999; Samsura et al., 2015). Participants favour principled and integrative negotiation, but incomplete information seems to push them to take a more positional stance. Two types of information that are distinctly relevant to biodiversity protection in urban planning emerge: information on (i) financial constraints of realisation of a project and (ii) detailed information on the level of biodiversity in planned areas of development. Type (i) has an indirect impact: the less information on the actual (financial) possibilities to realise a preliminary plan, the more is negotiated later on. If the original plan does not include information proving feasibility, it is likely that reductions in costs are needed later in the process, which might limit biodiversity protection means. In development projects, type (ii) information is sometimes revealed when the areas are surveyed before starting building. If unexpected information occurs, for example, endangered species are found, it might require changes in plans and additional negotiations.

My results indicate that lack of these types of information can be a driver for after-application bargaining, which is perceived as the most impactful form of negotiations

(Glasson & Booth, 1992). This study also points to the direction that information availability is not always on a desirable level in city planning negotiations in Helsinki context. Especially this stands out with the type (i) information in entries in development competitions that the City of Helsinki organizes, feasibility of plans in entries is not transparently expressed. Some policy implications can be driven out of this: There may be a need to determine that entries into development competitions are binding proposals. It would be useful to re-evaluate, should the competition winner be obligated to build the project in the way proposed in the entry to the competition. Lord (2012, 168) highly recommends auctions as an approach to planning: in auctions the financial commitments are built-in the process of negotiation. He states that auctions remove the risk of non-binding competitions, referring to development competitions as "beauty-competitions".

Another way to address this problem would be to divide the plots granted through the competitions into even smaller individual competitions, which could decrease the competition per plot, declining the incentive to over-promise in the competition entries. This way, the stakes of the "beauty contest" would be smaller and there would be less pressure for the developer to win a competition. When it comes to the information on the level of biodiversity, it is a difficult task to map out the entire city in a very detailed scope. However, given the developers tendency to underestimate the plot-level contributions and importance to biodiversity in a self-serving way, it is important to specify a required and spot specific state of biodiversity. This specification could take the form of a report of the species in the development plot.

However, in conclusion, more information and data are needed to support the negotiations, preferably in the early stages of planning projects.

As a tentative argument, I state that perceptions of biodiversity vary among actors in development in Helsinki, and it seems that preserving biodiversity loss does not attract the same attention as climate change mitigation in development projects. This is reflected in how the participants seem to put these two in the same category of environmental benefits as substitutes. As it has been found that climate change gains more public attention than biodiversity (Legagneux et al., 2018), I argue that biodiversity should be addressed with a special attention. Since the lack of information on the state of biodiversity is often used to justify self-serving decisions, the city could address this issue

by making specific biodiversity requirements precautionary. The requirements for local biodiversity in city areas opens up a bigger discussion on how the required level is defined: gains for human well-being are not depending on actual species richness only but also experienced level of biodiversity. Therefore, the question is about specifying a social cost of an externality, what is the social cost of lack of biodiversity in urban areas. In conclusion, it should be explicit for all participants in planning how biodiversity is specified, also for the developer whose understanding of the biodiversity rationale is important.

Finally, this research was aimed to test out a game theory-based, participatory framework to investigate negotiations in planning of urban areas. The framework is inspired by experimental economics, but the experiment as a data collection method takes a more participatory approach and relies more on qualitative analysis. A simple game-theoretic framework, a two-person bargaining game is implemented in a game-like simulation (a role-playing game) with quasi-experimental control and qualitative analysis of discussions. The role-playing game performed well in creating an area for discussion and enabling investigation of behaviour like presented in earlier studies (Barreteau et al., 2001; Vieira Pak & Castillo Brieva, 2010). The simple game model enables investigation on the effects of a changing level of information but still was sufficient to reveal relevant information within the context through qualitative analysis. This gives promising results that interactions and behaviour in complex planning processes can be implemented in a participatory way into more complex models. In conclusion, this framework holds potential for both understanding of a) how decision-makers frame and resolve the negotiation with conflicting interests and b) how to design efficient administrative processes taking into account not only the participants' preferences but also wider public interests, such as preventing biodiversity loss. This research adds a new application to the set of experimental studies in the context of biodiversity and urban development, suggesting that an approach combining experimental and participatory means could be elaborated on in other topics with conflicting interests in sustainability sciences. More participation cannot guarantee success in negotiations for the participants (Lord 2012) and we have to take into account that the general public does not participate in the negotiation process. Framing and structuring the participatory process on game theory and experimental approach provides a way to design policy-making, in order to be explicit for the participants about the gains and losses of different outcomes.

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Appendices

APPENDIX 1

Semi-structured interview questions, that led the post-hoc discussion, in English.

1. What are your first impressions of this experiment / of the game scenario?
2. How would you evaluate this game in relation to negotiations in real-life?
3. Do you find the scenario of the game realistic?
4. How would you make this game more realistic?
5. Do you think that real-life planning practice includes game-like situations?
6. What kinds of "games" do you think are played in planning?
7. How is biodiversity present in the negotiations in planning?
8. How would you describe these negotiations (related to biodiversity)?
9. How would you describe your negotiation strategies, in this game and in real life?
10. Can you identify different strategies with different actors?
11. What is the role of information in negotiations in city planning?
12. Do you have access to relevant information in negotiations?
13. What kind(s) of information would you need more?
14. Would more transparent information help your work?
15. Would you have tried to reach an agreement in some other way than the game allowed? How would you have solved this situation in real life?
16. What are the most crucial issues in negotiations in city planning?
17. Would this kind of role-game based simulations/workshops help in future planning projects and negotiations?