

Norwegian
University of
Life Sciences

Master's Thesis 2020 30 ECTS

Faculty of Landscape and Society

Main supervisor: Mina Di Marino

Secondary supervisor: Ramzi Hassan

Computer Games as a Tool in Public Participation Processes in Spatial Planning

Andreas Bjørne Jacobsen & Martin Reigstad

Master in Urban and regional planning

Preface

This thesis concludes our master's degree in Urban and Regional Planning at the Norwegian University of Life Sciences (NMBU). City-building computer games sparked an interest in spatial planning for both of us and are one of the things that made us want to write our thesis together. We are grateful for being able to write about it as our finishing master thesis as it sums up our interests while also providing knowledge to a field we care about.

We would like to express our gratitude to our supervisor, Mina Di Marino, for guiding us along the way and giving us valuable input. Thank you, Mina. We would also like to thank our co-supervisor, Ramzi Hassan, for lending an extra hand. Our thesis would also not be the same without the participants who attended the interviews. Thank you for providing us with valuable information.

Due to the COVID-19 pandemic, our five years as students did not end as we imagined. Though we did not get to finish our time as students the way we were planning to, our thesis was relatively unharmed by the consequences. We express our gratitude to those who have kept Norway running during the weeks of lockdown.

We have had five great years as students at NMBU. Thank you to all our professors who have inspired us and taught us so much about spatial planning.

A special thanks goes out to our classmates, friends, and significant others. Thank you for five wonderful years as students, thank you for life-long friendships, and thank you for supporting us in writing our master thesis. Additionally, we want to thank Ås for being such a wonderful place to be a student.

We also want to thank our parents for supporting and encouraging us through the five years as students and the five months of writing this master thesis.

Last but not least, we want to thank each other for great companionship.

Abstract

Public participation is an important aspect of spatial planning. Involving the citizens in a development process will benefit all involved parties. However, many developments do not exercise an effective public participation process, and the methods deployed in the process are not engaging enough for the citizens to be adequately involved. Even though technological advancements and new techniques have lowered the threshold for citizens to participate, it is still challenging to get the public engaged.

Little research has been conducted on the topic of using computer games as a method to increase public engagement. We hypothesize that computer games can be a good alternative to existing methods for visualizing development projects, and can be a helpful tool for increasing the public's understanding of urban development.

This thesis aims to increase the knowledge of how simulation and visualization with the use of computer games can be used in spatial planning to increase the degree of public participation. We wanted to find out if and how computer games can be used as a method in spatial planning. We used the city-building computer game *Cities: Skylines* to build a virtual model of Fornebu, which is a development area outside Oslo, Norway. We then arranged two types of interviews: action research interviews, where the participants played *Cities: Skylines* and experienced the model, and; semi-structured interviews with citizens and professionals involved in the development of Fornebu, where we presented the model over Skype. The results from the interviews were then categorized and coded before being discussed with the input from the literature review as well as our own thoughts.

Our findings suggest that computer games can be used as a method in spatial planning to increase engagement from the public and understanding of urban development. As the public will be able to understand more of a development through using computer games, they will likely be more interested in engaging in the planning process. The realism and simulation attributes of *Cities: Skylines* makes it superior as a tool to be used in public participation processes compared to traditional methods for visualization, as it offers an interactive and entertaining way to engage citizens in spatial planning. Computer games should be considered as a serious alternative to existing methods for engaging the public in planning processes. Public participation is important for both developers and citizens, and should therefore be further improved upon.

Sammendrag

Medvirkning er en viktig del av arealplanlegging. Å involvere innbyggerne i planleggingen og utviklingen av et sted kommer alle involverte parter til gode. I mange planprosesser utøves det imidlertid ikke en effektiv medvirkningsprosess, og metodene som brukes i medvirkningsprosesser er ikke engasjerende nok til at innbyggerne kan bli tilstrekkelig involvert. Selv om teknologiske fremskritt og nye metoder har senket terskelen for deltakelse fra innbyggerne er det fremdeles vanskelig å engasjere dem.

Bruk av dataspill som en metode for å øke innbyggernes engasjement i medvirkningsprosesser er et tema som det er gjort lite forskning på. Dataspill kan være et godt alternativ til eksisterende metoder for visualisering av planforslag, og kan være et nyttig verktøy for å øke befolkningens forståelse av områdeutvikling.

Denne masteroppgaven har som mål å øke kunnskapen om hvordan simulering og visualisering ved bruk av dataspill kan øke graden av medvirkning i arealplanlegging. Vi ønsket å finne ut hvorvidt dataspill kan brukes som en metode i arealplanlegging. Vi brukte dataspillet *Cities: Skylines* til å bygge opp en virtuell modell av Fornebu, som er et utviklingsområde i Bærum kommune utenfor Oslo. Vi arrangerte deretter to typer intervjuer: deltakerbaserte forskningsintervjuer, der deltakerne spilte *Cities: Skylines* og utforsket modellen, og; semistrukturerte intervjuer med innbyggere og profesjonelle som har vært involvert i utviklingen på Fornebu, hvor vi viste frem modellen over Skype. Resultatene fra intervjuene ble deretter kategorisert og kodet, før de ble diskutert sammen med funnene fra litteraturen samt våre egne tanker.

Funnene våre tilsier at dataspill kan brukes som en metode i arealplanlegging for å øke engasjement fra innbyggere og deres forståelse for områdeutvikling. Ettersom innbyggerne vil kunne få en bedre forståelse av et utbyggingsprosjekt gjennom bruk av dataspill, vil de sannsynligvis også få en større interesse for å delta i planprosessen. Realismen og simuleringen som *Cities: Skylines* tilbyr gjør det til et overlegent verktøy for bruk i medvirkningsprosesser sammenlignet med tradisjonelle metoder for visualisering, ettersom det er en interaktiv og underholdende måte å engasjere innbyggere i arealplanlegging. Dataspill bør anses som et seriøst alternativ til eksisterende metoder for å engasjere innbyggere i planleggingsprosesser. Medvirkning er viktig for både utviklere og innbyggere og bør dermed forbedres ytterligere.

Table of contents

Preface	1
Abstract	2
Table of contents.....	4
1 Introduction	6
1.1 Background	7
1.2 Implications of the master thesis	9
2 Theory	12
2.1 The public participation process	13
2.1.1 Different levels of public participation.....	13
2.1.2 The citizens' power in public participation.....	15
2.1.3 Effective public participation processes	16
2.1.4 The challenges of public participation.....	18
2.2 Technology in public participation.....	20
2.2.1 Web 2.0 platforms.....	20
2.2.2 GIS, map-based data collection.....	21
2.2.3 Smartphone apps	21
2.2.4 Virtual 3D models.....	22
2.3 New areas of application for games	23
2.3.1 Gamification	24
2.3.2 Serious games	25
2.3.3 Our definition of gamification	25
2.3.4 Computer games in public participation within spatial planning.....	26
3 Methods	28
3.1 Data collection.....	29
3.2 The study area of Fornebu	30
3.3 The use and development of the game Cities: Skylines.....	34
3.4 Creating the model with Cities: Skylines.....	35
3.5 Action research.....	48
3.5.1 Selecting the participants	49
3.5.2 Structering the questions.....	49
3.6 Semi-structured interviews.....	50
3.6.1 Selecting the participants	50
3.6.2 Structering the interviews.....	50
3.7 Data analysis	51
4 Results	52
4.1 Citizens and professional planners' perspectives on public participation, visualization, and gamification in spatial planning	54
4.1.1 Public participation: involvement, communication, and problems.....	54
4.1.2 Visualization: the importance of a correct presentation	58
4.1.3 Computer games: possibilities, main challenges, and comparisons to traditional methods	60
4.2 Cities: Skylines as a method for increasing public engagement	64
4.2.1 Planning students and the use of Cities: Skylines	67
4.2.2 Our experience from interviewing the students	73

5 Discussion	74
5.1 The literature review and the perspectives from the interviews	76
5.1.1 Involving the citizens in public participation processes	76
5.1.2 The strengths and shortcomings of today’s visualizations	76
5.1.3 Implementing new technology in spatial planning	77
5.1.4 Using computer games to improve public participation	77
5.2 The respondents’ and the authors’ perspectives on using Cities: Skylines in spatial planning	78
5.2.1 Creating the model in Cities: Skylines	78
5.2.2 The opportunities and obstacles of using Cities: Skylines in public participation processes	81
5.3 How our main findings answer to our research questions	84
5.3.1 Achieving an effective public participation process	84
5.3.2 Increasing the public’s understanding by using simulation and visualization in a game	85
5.3.3 Increasing engagement from the public by using computer games	86
5.3.4 Improving public participation processes by using computer games for simulation and visualization	87
5.4 Critique of methodology	88
5.4.1 Our relation to Cities: Skylines	88
5.4.2 The study’s validity and reliability	88
6 Conclusion	90

7 References	94
7.1 References in text	95
7.1 Figures	98
Attachment 1: Question sheet for interviews with professionals and citizens	100
Attachment 2: Question sheet for action research interview with planning students	102
Attachment 3: Mods and assets used when making the model in Cities: Skylines	103

1

Introduction

1.1 Background

This master thesis aims to explore how public participation processes in spatial planning can be improved by using computer games as a method for involving citizens. For years, we have been interested in the use of computer games in spatial planning as we have spent a lot of time playing city-building computer games. We believe that computer games can help people to better understand the cityscape, built volumes, and the general layout of an area. Thus, we wanted to do further research on how computer games can be implemented in spatial planning and public participation processes.

Public participation is one of the core elements of modern, democratic spatial planning. Today's public participation processes struggle to involve citizens at the early stage of planning processes (Regjeringen, 2014; Falleth & Hanssen, 2017), with marginalized groups being especially challenging (Innes & Booher, 2004). Inadequate tools are often used to involve citizens (Innes & Booher, 2004; Hanssen, 2013), and the presented illustrations might give the citizens a wrong impression on what is to come (Slettholm, 2019; Hem, 2019). Additionally, plans are often misinterpreted because they are not adequately explained to the public (Irvin & Stansbury, 2004).

Cities: Skylines is a city-building computer game that is used to visualize and simulate a city that you can build and control. This computer game allows the player to administer a virtual city and act as a 'mayor,' with full control over certain aspects like finances, policies, public services, and zoning. However, this master thesis will focus on how the game can be used as a tool for visualizing future development and simulating urban vitality.

Public participation is also known as public involvement/citizen participation. A process in which the public can participate in government decision making. This thesis will use public participation to describe citizen involvement in spatial planning. Public participation is further explained in chapter 2.1.

Cities: Skylines is a city-building computer game developed by Colossal Order and released by Paradox Interactive in March 2015. The game is defined as a «modern take on the classic city simulation» (Paradox Interactive, n.d.). The game is single-player, and you get to develop and manage the city of your dreams. It has great visual effects, which, with the right tools, can make it look quite realistic - on par with many visualizations used in planning initiatives. The user can control the development of the city, deciding where to place homes, businesses, industry, schools, police stations, hospitals, roads, and much more.

The creators of *Cities: Skylines* released some numbers on the game's 5th anniversary in March, 2020, showing how popular the game has become. The game has over 11 million unique players, over 70 million unique cities, and a total of over 500 million hours (about 60,000 years) of total playtime (Cities: Skylines, 2020). As of March 10, 2020, the game had 106,860 reviews on *Steam*, the service provider that is normally used to purchase and launch the game, whereas 98,650 users have given positive feedback (Steam, n.d.).

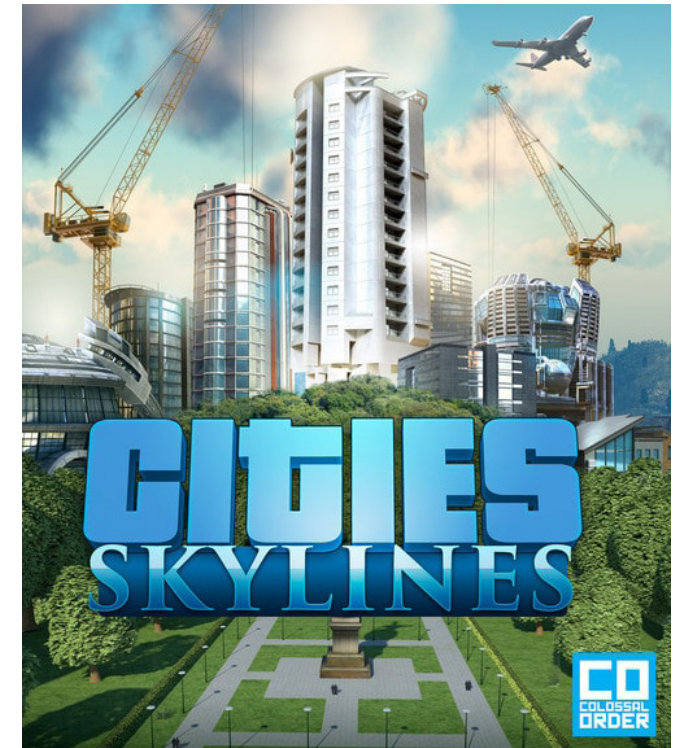


Figure 1.1: Cities: Skylines (Paradox Interactive, 2015).

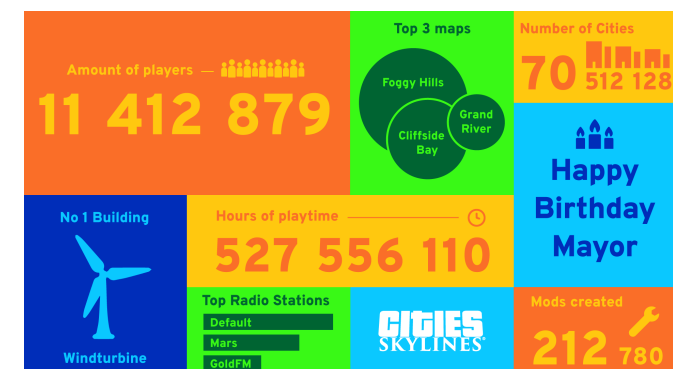


Figure 1.2: Statistics (Cities: Skylines, 2020).

The thesis emphasizes the need for public participation in spatial planning and the need for innovative methods to involve a wide range of people. By creating a model of a development project in a computer game, such as *Cities: Skylines*, we believe that the public will gain a better understanding of the development. The game can visualize and simulate future development and gives the public the ability to interact with a virtual model of the project. *Cities: Skylines* can enable planners to get feedback from the citizens through their interaction with the computer game. The thesis examines the advantages and disadvantages of using computer games in real-life planning, and whether or not it will be realistic to implement it.

Thus, the master thesis addresses the following research question and sub-questions:

Research question:

How can simulation and visualization with the use of computer games be used in spatial planning to increase the degree of public participation?

Sub-questions:

How can we achieve an effective public participation process?

How can a computer game's simulation and visualization increase the public's understanding of urban development?

How can computer games increase engagement in public participation processes?

Visualization is a way to show something with the help of one or more illustrations of 3D models. Usually animated or fixed in some sense.

Simulation is used to describe a method to show off how the mechanics of a model would work in real life, such as the movement of the environment, citizens, and traffic.

As an extra emphasis on its technological topic, this thesis is intended to be read digitally. Some of the figures found throughout the thesis can be clicked, which will bring you to a YouTube video showcasing an animation of the area along with the game's simulation. Alternatively, some figures have QR codes that can be scanned with your smartphone. Additionally, various terms and all references to literature and chapters can be clicked to jump to its respective place in the thesis.



Figure 1.3: Renderings and real life: Munch museum (estudio Herreros & Steinar Dyrnes, 2009 & 2019).

1.2 Implications of the master thesis

This thesis contributes to the current knowledge of the combination of the computer game *Cities: Skylines* and public participation. The findings will also help to further understand the relevance and need for public participation in spatial planning.

Although we are fully aware that technological advancements might make our thesis outdated within few years, we want to emphasize that this thesis has the potential to pioneer and motivate new studies in the field.

The outcomes of our thesis can contribute to a better understanding of public participation amongst planning scholars, politicians, and spatial planners. We hope that this thesis can contribute to further studies on involving the public in spatial planning processes. We decided that the thesis should be written in English rather than Norwegian in order to have a broader audience as well as larger scientific and societal impacts. Many countries struggle to understand the full potentials of public participation and to achieve effective public participation in spatial planning (see Wilson, Tewdwr-Jones & Comber, 2019). Even though the case study, the interviews, and the examples we used in this thesis are Norwegian-based, we believe that some of the problems we face with public participation in Norway can be met in several other contexts that present characteristics similar to the planning context in Norway, such as Ireland, Finland, Germany, and the United Kingdom. We believe that our approach can also be experimented with and applied internationally. We hope that the thesis will further develop the knowledge of using games in spatial planning.

The need for public participation is perhaps more prominent now than ever before. It is argued that the local democracy is decreasing as municipalities are becoming larger (Toppe, 2013), and expansions of cities mainly focus on urban densification. Additionally, new technology can mislead the public in different ways (e.g., by using glorified visualizations). The requirements for public participation processes have increased over time. In Norwegian planning, one of the latest examples can be found in the new Norwegian Planning and Building Act of 2008. However, this law has been criticized for its minimal potential for early participation from citizens (Hanssen, 2013).

In Norwegian planning, a variety of technologies is used to make the planning processes more effective. All zoning plans are now created using GIS, making them georeferenced and accurate down to the centimeter. The visualizations used to illustrate development projects are made with professional 3D modeling software. Additionally, every development project is publicly available online, either on an inter-municipal platform or on a municipal website.

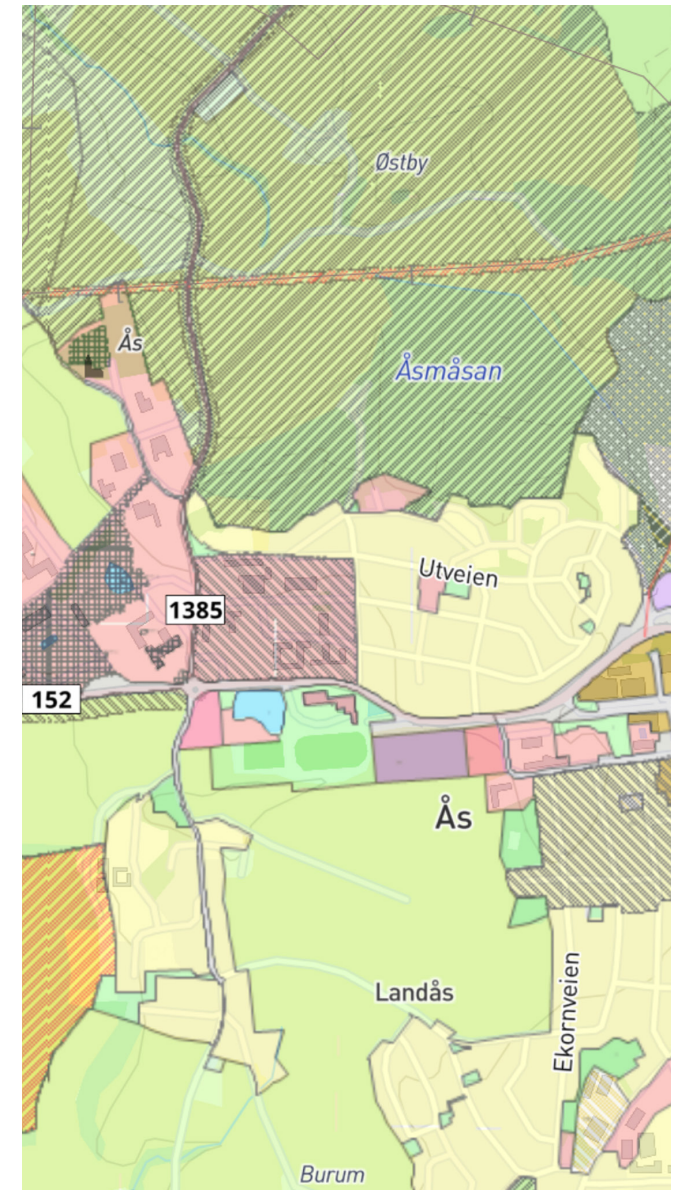


Figure 1.4: GIS zoning map of Ås (screenshot from kommunekart.com).

Computer games are increasingly becoming more realistic, which enables opportunities for using them in different settings than before. ‘Gamification’ has become a concept for using game mechanics in non-game settings to make different activities more attractive to the public (e.g., getting bonuses for staying off your phone at work; frequent flyer points for flying more) (Vanolo, 2018). We see the potential for using actual games in traditional non-game settings to make the activities in spatial planning more attractive to the public.

The combination of public participation and computer games in spatial planning is a field that has little research. There exists some literature on using game mechanics in governance, ‘gamification’ of government (see chapter 2.3.1; Lastowka & Steinkuehler, 2014; Vanolo, 2018). However, they focus on using game mechanics and not actual games. One of the most recent and interesting approaches has been described by Ampatzidou et al. (2018), where they have studied both gamification and actual games in spatial planning.

Another recent approach is by LÉVA Urban Design, a Norwegian firm specializing in public participation, which is currently testing the use of *Minecraft* to engage youth (see LÉVA Urban Design, 2020). The results of this experiment have not yet become available.

Our thesis contributes to filling the knowledge gap between spatial planning and the use of games in serious settings. By focusing on public participation, we can build up our knowledge and concentrate our attention on public participation in spatial planning, which needs improvement. We hope this can support future improvements to public participation processes.

We propose that more studies should be conducted on the field before implementing our findings in spatial planning. We hypothesize that there will be both positive and negative side effects of implementing computer games in public participation, and these must be investigated and evaluated further in later studies.



Figure 1.5: The portal to the Minecraft server made by LÉVA Urban Design (screenshot from <https://www.fp-digitalnabolab.no/nabolab-jr>).



Figure 1.6: A city made in Minecraft (PCGamesN, n.d.).

2

Theory

2.1 The public participation process

Public participation is one of the founding elements of today's democratic societies and is an integrated concept in most levels of government. It is widely argued that the results emerging from such governance will be more democratic and effective (Irvin & Stansbury, 2004). In 2014, the Norwegian government published a guidance document about public participation, setting four goals for public participation: securing good solutions that consider everyone; facilitating for all affected and interested parties to speak up; promoting creativity and commitment, and be an arena for democratic participation in local communities, and; providing a sound basis for decision-making (Regjeringen, 2014, p. 8, translated by the authors of this thesis).

Public participation covers a wide range of activities, e.g., from participating in elections to attending demonstrations. This thesis focuses on the citizens' involvement in spatial planning. The principle of public participation in spatial planning is enshrined as a form of formal participation in many countries (Falleth & Hanssen, 2017). Public participation in spatial planning seeks to involve the citizens in shaping their future built environment.

Innes and Booher (2004) argue that there are five main claims or principles for why public participation processes are important (see also Regjeringen 2014; Falleth & Hanssen, 2017 for similar principles):

Firstly, the decision-makers will be able to pinpoint the priorities of the public more precisely and can use these in their determination;

Secondly, the public participation process could improve the results of the final product of the plan by incorporating the citizens' local knowledge;

Thirdly, public participation increases fairness and justice for the public. The needs of the least advantaged groups, often ignored through typical information sources, may surface in an open participation process;

Fourthly, to get legitimacy for public decisions - to get the backing of the public so that the plan is, or at least viewed as, democratic and legitimate;

Fifth and finally, the law simply requires public participation in the planning process.

The first two principles serve as important democratic aspects. As local governments are facing several changes (e.g., municipal mergers, moving decision-making up to higher levels of government), the public can experience loss of contact between themselves and their elected representatives (Innes & Booher, 2004). Therefore, the public participation process is a unique opportunity for citizens to influence their future directly.

2.1.1 Different levels of public participation

Public participation gives democratic legitimacy to plans. When politicians decide on whether to accept or refuse a plan, they will often base their decisions on the grounds of their impressions of the plan. However, public participation can steer the politicians into making decisions based on how the public wants the development to be. This is debated by Falleth and Hanssen (2017). They argue that it might also be a negative contribution to democracy, as public participation processes can make the politicians vote for something other than what they were elected for.

Falleth and Hanssen (2017) have made a ladder of public participation, going from minimal influence to maximal influence (Fig. 2.1).

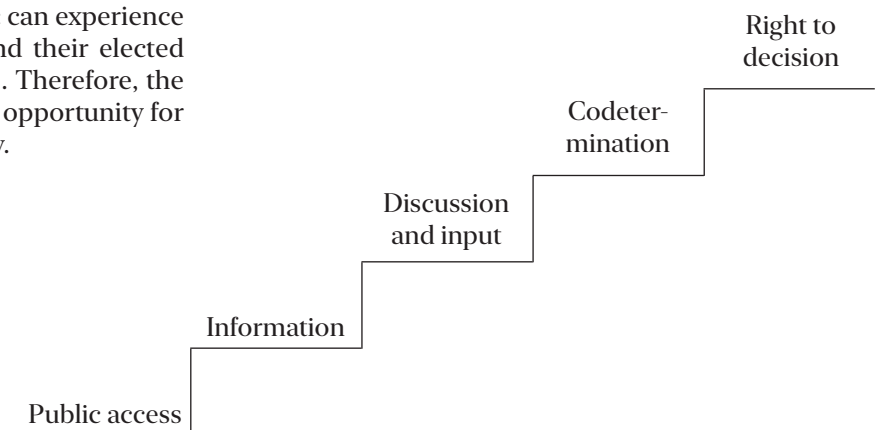


Figure 2.1: Ladder of participation (Falleth & Hanssen, 2017).

The approach by Falleth and Hanssen (2017) is based on the ladder developed by Sherry Arnstein in 1969. The same ladder was reproduced in Lane (2005) (Fig. 2.2).

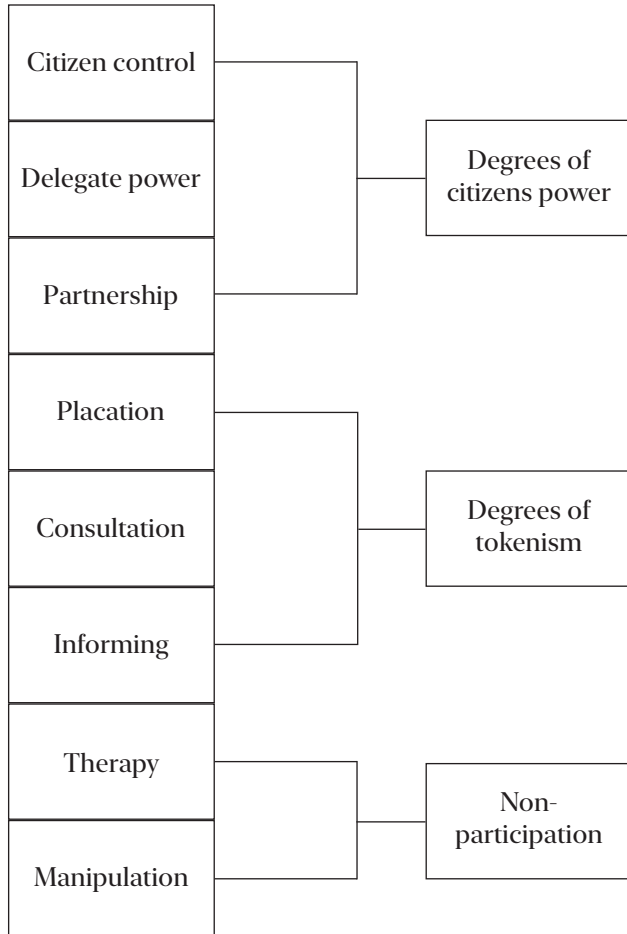


Figure 2.2: Ladder of participation (Lane, 2005).

Brown and Chin (2013) have also developed a ladder of participation by using the following categories (Fig. 2.3):



Figure 2.3: Ladder of participation (Brown & Chin, 2013).

The idea of figures 2.1-2.3 is to visualize how public influence (high on the right or on the top) is affected by the different methods used in public participation. All three figures show a correlation between having more citizen involvement and getting more citizen influence. Giving the citizens power and the right to decide generates the largest influence. The lowest form of involvement is to make information available, but taking no further steps. A bit higher on the 'ladder of participation,' we find different forms of consultation, which gives the plan initiators a better basis for their development.

Further, there are steps where dialogue and engaging methods are used to increase the involvement from the public. The highest steps on 'the ladder of participation' is cooperation and collaboration between the public and the plan initiators. It is not typical for a public participation process to be confined to one of these steps, and the process will often fluctuate between the different categories (Regjeringen, 2014).

A plan initiator is a person, an organization, or a company that is responsible for a spatial plan and/or an urban development project.

Public participation is a term used when the public is given a chance to be involved in government practices. There are two main types of principles in public participation: direct and indirect involvement (Falleth & Hanssen, 2017). The indirect participation is through electing representatives who will make the decisions for the citizens. The direct participation is through citizens directly involving in planning processes, such as by attending hearings or writing letters. This makes public participation one of the most direct, influential, and important forms of democracy today. It facilitates an equal arena for all citizens to be heard, and it can strengthen community involvement, social learning, and political skills (Falleth & Hanssen, 2017).

Public participation has also been criticized by Falleth and Hansen (2017) for being unnecessary and only for the already influential citizens. They argue that the way public participation is set up at the moment competes with the indirect participation and that the extra time and resources spent on discussing a plan with the elected representatives could be used to improve other parts of the democracy.

2.1.2 The citizens' power in public participation

«The idea of citizen participation is a little like eating spinach: no one is against it in principle because it is good for you.» (Arnstein, 1969, p. 216)

Sherry Arnstein criticized how public participation was being implemented in United States governance. She argued that public participation is lacking substance and meaningfulness - an argument supported by researchers who criticized public participation for its failure to generate social change (Lane, 2005). The central point of the criticism was that the public participation processes often lacked a redistribution of power. Without this redistribution, the only purpose of public participation was to manipulate citizens. This criticism is still relevant today. One can argue that citizens have gained more power through public participation over the years - at least on paper through acts and laws requiring public involvement. The problem, however, is that the involvement occurs very late in the planning process. As Innes and Booher (2004) explain when discussing public participation in the United States: «The citizens' role is to react» (p. 423). This issue is not unique to the United States: Hanssen (2013) argues that when the citizens are involved too late in the process, they are labeled as 'party poopers' or mistaken for NIMBYs.

NIMBY: Not In My Back Yard, used to describe a protest where a group of people opposes a project that will negatively impact their quality of life and/or property values. (Kinder, 2019)

The reason is that the process has proceeded too far, and citizens who are opposed to the plan are labeled as scapegoats for delaying it. The consequences can be that private developers will hesitate to bring new development, and thus, business and growth to the neighborhood in the future. A study by Falleth and Hanssen (2017) showed that many public actors experience a lack of ways to participate and that the formal methods of participation come too late in the process.

The reasons why public participation is being carried out can be divided into two main reasons: it is smart, and it is the law. It is beneficial to receive the public inputs as locals know more about the area than most planners and developers. By collecting this knowledge as soon as possible, the citizens of the area will view the facilitators as serious and accommodating, and the developers could save time and money by getting valuable background information. However, only one-third of private initiators say that they find public participation important to achieve a good result - a stark contrast to the 80% of politicians and municipal planners who say that public participation is important to achieve a good result (Falleth & Hanssen, 2017). The same study showed that 45% of the private initiators use public participation strategically to secure political acceptance for their plans.

The municipality of Oslo highlights four important reasons for using public participation in the early stages of a planning process in order to improve the plan: The case becomes more enlightened and understandable; better background assessments make for added framework for good solutions; more knowledge provides better grounds for a good holistic approach, and; we get a more democratic and righteous urban development (Oslo kommune, 2019, p. 9). These statements contain several similarities to the five points by Innes and Booher (2004) previously listed: to gather data on the public's preferences; to improve the decisions by incorporating citizens' local knowledge; to advance fairness and justice; to acquire legitimacy for public decisions, and; to meet the requirements of the law (see chapter 2.1 for further elaboration on these points). Additionally, public participation is often presented as a way of balancing out the short-term and long-term perspectives as well as the public's common interests and private interests (Falleth & Hanssen, 2017).

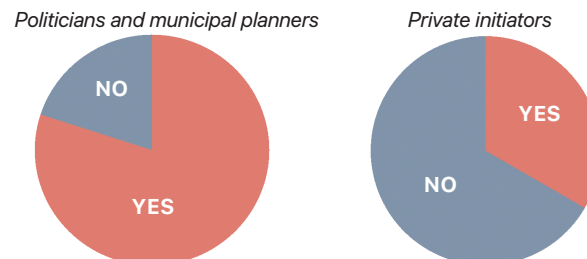


Figure 2.4 & 2.5: Is public participation important to achieve a good result?

In the Norwegian planning system, public participation is required by the Planning and Building Act of 2008. The law states in its purpose clause that public participation should be secured throughout the planning and the decision-making (Plan- og bygningsloven, 2008, § 1). The law also dedicates a whole chapter to public participation and how it should be conceived and developed. Even though the law focuses on public participation, it is argued that its statutes only comprise the three lower levels of Arnstein's ladder of participation (Falleth & Hanssen, 2017). In other words, the law does not require active participation from the citizens, and the citizens cannot be considered to have a practical influence that is protected by law.

Furthermore, only 5 out of 100 randomly selected plans studied by Falleth and Hanssen (2017) had a public participation process that supplemented what the law has required. The five plans that did anything supplementary chose to organize public hearings, a method that Hanssen (2013) described as «unfortunate» (p. 19). A study by Wøhni (2007) shows that initiators of larger plans do more to engage the public than initiators of smaller plans (Hanssen, 2013).

2.1.3 Effective public participation processes

It is hard to determine the criteria for the effectiveness of a public participation process. Within the literature, there are several suggestions on how to conduct an effective public participation process (see Innes & Booher, 2004; Hanssen, 2013; Brown & Chin, 2013). Our master thesis refers to the latter of the three, in which the effectiveness of public participation is assessed. Brown and Chin (2013) present a comprehensive list of criteria, considering several inputs from different authors, giving the list academic emphasis. They point out that public participation has rarely been evaluated, as it is hard to set specific benchmarks to reach, and that the government has been reluctant to spend their funds on evaluation. In their research, Brown and Chin (2013) found indications that the participants relate their satisfaction/dissatisfaction to the public participation process to whether or not they are satisfied with the plan's outcome.

To enhance the public participation's effectiveness, Brown and Chin (2013) suggest applying some measures to the process: strive to involve the citizens affected by the plan; use methods where citizens can express their thoughts and opinions, and; the technical terms and information need to be understandable to the public. Brown and Chin (2013) also developed a list of the criteria for effective public participation by referring to several references. This list provides a comprehensive overview of the criteria that can be considered to improve public participation. However, they point out that some of the criteria cannot be transferred to every planning situation and socio-political setting (Brown & Chin, 2013). Every public participation process is unique in some way. Therefore, the assessment of its success should not be based purely on one list of criteria. However, the list is intended as an instrument for aiding planners in making the decisions that may end in a successful public participation process.

Criteria for an effective public participation process	Description
Representativeness	«The public participants should comprise a broadly representative sample of the population of the affected public». (Crosby et al., 1986; Blahna & Yonts-Shepard, 1989; Petts, 1995; Carnes et al., 1998; Lauber, 1999; Rowe & Frewer, 2000, p. 12)
Independence	«The participation process should be conducted in an independent, unbiased way». (Crosby et al., 1986; Lauber, 1999; Rowe & Frewer, 2000, p. 13)
Early involvement	«The public should be involved as early as possible in the process as soon as value judgments become salient». (Blahna & Yonts-Shepard, 1989; Rowe & Frewer, 2000, p. 14)
Transparency	«The process should be transparent so that the public can see what is going on and how decisions are being made». (Lauber, 1999; Rowe & Frewer, 2000, p. 15)
Resource accessibility	«Public participants should have access to the appropriate resources to enable them to successfully fulfil their brief». (Rowe & Frewer, 2000, p. 15)
Seeking out and involving those affected by decisions	«Public participation seeks out and facilitates the involvement of those potentially affected by interested in a decision». (IAP2, 2007b, p. 1; Godschalk & Stiftel, 1981; Blahna & Yonts-Shepard, 1989)
Comfort and convenience	«The timing and place of meeting should be convenient to the participants' schedule. They should also feel comfortable during consultation sessions». (Halvorsen, 2001)
Deliberative quality	All participants should be given the chance to speak and provide their opinions. (Lauber, 1999; Halvorsen, 2001)
Level of conflict	Public participation process should avoid or mitigate conflict. (Laurian & Shaw, 2009)
Seek input from participants in how they participate	«Public participation seeks input from participants in designing how they participate». (IAP2, 2007b, p. 1)
Task definition	The nature and scope of the participation task should be clearly defined. (Rowe & Frewer, 2000, p. 16)
Non-technical information	The information provided to participants must be easy to understand and contain minimal technical language to prevent confusion. (Chakraborty & Stratton, 1993)
Communicates influence on decision	«Public participation communicates to participants how their input affected the decision». (IAP2, 2007b, p. 1)
Influence	«The output of the procedure should have a genuine impact on policy». (Petts, 1995; Carnes et al., 1998; Lauber, 1999; Rowe & Frewer, 2000, p. 14; Butterfoss, 2006)
Increased understanding	Public participation should build mutual understanding between stakeholders and commit to the public good identified. (Petts, 1995; Carnes et al., 1998; Laurian & Shaw, 2009)
Consensus reached	Decisions made as a result of public participation were based on consensus and mutual understanding. (Twight & Carroll, 1983; Innes & Booher, 1999)
Increased trust	Public participation should build trust and lasting relationships. (Laurian & Shaw, 2009)
Workable solutions.	Public participation should create a compromise and acceptable solution. (Laurian & Shaw, 2009)
Satisfaction	Good public participation should result in high satisfaction amongst participants. (Halvorsen, 2001; Butterfoss, 2006; Laurian & Shaw, 2009)

Table 2.1 (Brown & Chin, 2013).

2.1.4 The challenges of public participation

The use of computer games can support the public participation processes and tackle several challenges that we have identified and developed as follows:

Firstly, the public's role has become to react. The public is involved too late to have a real impact. According to a study by Hanssen (2013), the public is ready to become more engaged, yet planners seem to struggle to get the public involved in spatial planning. In Norway, the Planning and Building Act of 2008 requires public participation and involvement to a certain degree. However, stakeholders experience that the requirements set by law are not enough for the public to be adequately involved and that the formal ways to influence a plan occur too late in the planning process (Regjeringen, 2014; Falleth & Hanssen, 2017). Stakeholders' opinions and suggestions are involved too late to be able to affect the proposed plan (Hanssen, 2013).

Secondly, planning maps and illustrations give the public a wrong impression of how the area will be developed in the future. On the one hand, a planning map can be very hard to read for the untrained eye. If that is the only illustration you are given as a citizen, it will be hard to imagine what will be developed from looking at the map and its different zoning colors. As Rooth (2018) discovered in her research, it was hard for people without background or knowledge in planning to understand what kind of development could fit in the area based on just the planning maps and documents. On the other hand, it is common for plans to have highly professional visualizations for showcasing the project's potential. These can, of course, help in visualizing the project to the public, but they have also been criticized for being utopian, showing scenes that do not correspond to the finished project (see debates by Slettholm, 2019; Hem, 2019). The point of these visualizations is not always to showcase the most realistic illustrations, but to give associations and spark emotions (Schwencke, 2019). Many people cannot recognize the difference between images that are 'official' and 'real,' and images that are meant for selling a project. Some of the reason for this is also to blame on the media, which contributes to spreading the 'promotion images' as if they were 'official.'

An unrealistic visualization is a depiction of a development project that does not reflect how the project is likely to end up looking.

Thirdly, most of the public participation processes use the wrong tools or use the tools incorrectly. Public hearings or meetings have been criticized (see Innes & Booher, 2004 and Hanssen, 2013), with the argument being that large public meetings are contributing to alienating the different stakeholders. Many people will have difficulties with standing up and speaking their minds at a large gathering (Hanssen, 2013). Additionally, such methods might create conflicts amongst citizens instead of uniting them to discuss and find shared opinions (Innes & Booher, 2004). Many of the tools that are used in public participation today will be centered around monologue rather than dialogue. A monologue from the public to the plan initiator, and vice versa, implies that there are few opportunities for dialogue.

However, if the plan initiator properly listens to the public, the result can be better than the alternative. If the public properly listens to the plan initiator, they can more clearly understand the purpose of the project. According to the guidance document on public participation developed by the Norwegian government, the citizens who are involved in public participation processes might feel that they are not informed sufficiently on what is happening and how their inputs are taken into consideration in the final results (Regjeringen, 2014).

Fourthly, marginalized groups are difficult to involve. With marginalized groups, we mean the poor, the elderly, youths and children, immigrants, and the disabled. Even though these groups of people are not necessarily overlooked on purpose, they have traditionally had difficulties with participating in the process. The reasons for this exclusion are varied. Some find it difficult to physically attend the public meeting (the elderly; the disabled). Some are unable to understand what is being said because the terms in use are very technical (youths and children; immigrants). Some prioritize other activities (the poor; youths and children). These groups require a different kind of attention and help from the facilitators, which is not necessarily given. All groups must be equally involved, and thus, all involved parties should have the opportunity to express their opinions (Regjeringen, 2014). Innes and Booher (2004) quote research done in an anonymous article published in *Environment and Planning A*, which found that disadvantaged groups were not equally represented and had not even been properly notified about the proposed development. By including the marginalized groups in the public participation process, we will also lead to further improvements in design for universal accessibility in the society (Regjeringen, 2014).

Finally, if the policies in a plan have not been explained properly to the public, the intentions of such policies can be misinterpreted, and the changes to their community can be interpreted as negative (Irvin & Stansbury, 2004). Often a plan can be quite technical, and thus, some citizens cannot understand its full context. Therefore, experts should assist them to solve any concerns and doubts they might have. This is especially important when the plan makes significant changes to a community. Without sufficient involvement of the citizens at the early stage of the planning process and urban development, the plan can acquire such a negative reputation that the planners, politicians, and citizens do not reach an agreement. The whole process can take a much longer time, and the cost could grow unexpectedly. Irvin and Stansbury (2004) have made a list of advantages and disadvantages of public participation, where 'time-consuming' is disadvantaging to both the public and the government. Additionally, it is being identified as being 'costly' for the government (Irvin & Stansbury, 2004). This is because litigation costs can increase substantially if the parties do not reach an agreement.

2.2.2 GIS, map-based data collection

For nearly 20 years now, research has been conducted on the implementation of geographic information systems (GIS) in public participation. (Haklay, Jankowski & Zwolinski, 2018). Marketta Kytä, a Finnish scholar at Aalto University, started working on something called softGIS in 2003 but had trouble with weak technology. As the development progressed, the result was a service called Maptionnaire, which allows cities to buy and collect map-based data for use in public participation. The service aims to reduce barriers for citizens to get involved, which in turn will engage more citizens. Such methods of GIS-based data collection has been applauded for collecting large quantities of data and raising collaborative participation. However, the method has problems with digital exclusion, data quality, and how the planners should use the information they gather. Additionally, GIS systems were found to «require high level of proficiency of users and thus they are not the most suitable form for planning with public participation» (Hanzl, 2007, p. 290). As digital tools should have the purpose of lowering the barriers for citizens to get engaged in planning, by using a method



Figure 2.8: Municipal zoning map (Kommunekart.com, n.d.).

that does not require a high level of proficiency. One study also found that GIS methods were primarily used by young people with higher education, potentially skewing the collected data towards their preferences (Haklay, Jankowski & Zwolinski, 2018).

2.2.3 Smartphone apps

Several smartphone apps have been released to engage citizens in the physical development of their society. However, many of these are aimed at having the citizens report problems such as potholes or broken light bulbs (Wilson, Tewdwr-Jones & Comber, 2019). There have been other attempts to move beyond that purpose and involve citizens in the development of an area as well. Wilson, Tewdwr-Jones, and Comber (2019) developed an app for both iPhone and Apple Watch, where the citizens got notifications as they entered the area where the development would happen, allowing the users to give feedback on what they would like to develop in the area. The results from that app showed that the users got a better understanding of what kind of feedback the project was asking for. However, they missed the additional opportunity to leave visual feedback on how they want an area to look like (Wilson, Tewdwr-Jones & Comber, 2019).



Figure 2.9: With the smartphone app 'Bymelding', citizens can report issues with public spaces in Oslo (screenshot of Bymelding).

2.2.4 Virtual 3D models

For a long time, physical 3D models have been used to visualize projects. Through advancements in computer technology in the past few decades, virtual models have become more common. The use of such models provides a new dimension to understanding plans and their consequences. According to Guhathakurta (2002), the aim of building city models is «to understand and to represent the processes which take place in the city and to support discussion» (Hanzl, 2007, p. 290). Additionally, 3D models are easy to read compared to, for example, traditional zoning maps, and «assist non-professional addresses in understanding complex planning issues» (Hanzl, 2007, p. 290).

In a study conducted by Laing et al. (2007), a cultural heritage site in Torshavn, Faroe Islands, was modeled in 3D and presented using different methods within virtual reality (VR). The study compared the showing of walkthrough videos, maps, and photographic stills to the ability for users to navigate the model by themselves. The results showed that the participants appreciated and understood the site more by navigating it by themselves rather than analyzing drawings, plans, and photographs. The participants also perceived navigating the model as more pleasant and less threatening than viewing walkthrough videos (Laing et al., 2007). By actively exploring the model, the feeling of motivation, attentiveness, and engagement was higher, and the «active participants overall felt as if they had explored rather than watched a presentation, and felt more like they had been to the place depicted, when compared to

the passive group» (Laing et al., 2007, p. 839). Allowing citizens to navigate a model by themselves increases their understanding of the relation of spaces compared to limiting them to viewing predetermined walkthrough videos and presentations.

In a more recent study by Lombardo (2018), the method of using VR technology in landscape architecture was explored. The study researched how various aspects of using VR technology affect the design process in landscape architecture. The findings revealed that the method can provide improvements to the design process if implemented correctly, but that it can also lead to complications and increased costs and time consumption.



Figure 2.10: Screenshot of a project in Lumion (made by the authors).



Figure 2.11: VR can be a useful method in public participation (NMBU, 2019).

2.3 New areas of application for games

A game is such a common word in our daily language that it is quite hard to conceptualize - it is used in so many forms, meanings, and situations. Therefore, we have decided to narrow the understanding of it in our thesis, based on the Oxford definition: a game is a physical activity you can do for fun, and that has a certain set of rules. You can divide games into two types: serious and unserious games. Serious games will have an impact on society in real life, such as playing the lottery. Unserious games will not, and are purely for entertainment, such as playing *Monopoly*. In our thesis, we have tried to use an unserious game in a serious setting.

A game is a structured form of play. A game manages the playing by making different settings for playing. Oxford dictionary defines a game as «an activity that you do to have fun, often one that has rules and that you can win or lose; the equipment for a game.» (Game, n.d.)

Games have gone through significant change due to technological advancements. They are no longer conformed to dice, cards, or boards, but electricity, screens, and keyboards. The advancements made in the last couple of years have been exponential, making computer games more realistic for every new launch. This kind of realism is what makes it possible to use computer games for more than just having fun. Hanzl (2007) argues that games can have a «great educational potential» (p. 295) and highlights the ability to generate 3D graphics in real-time as well as manipulating an object within a scene.

The simulation that computer games can provide is what separates them from the traditional methods described in the previous chapter.

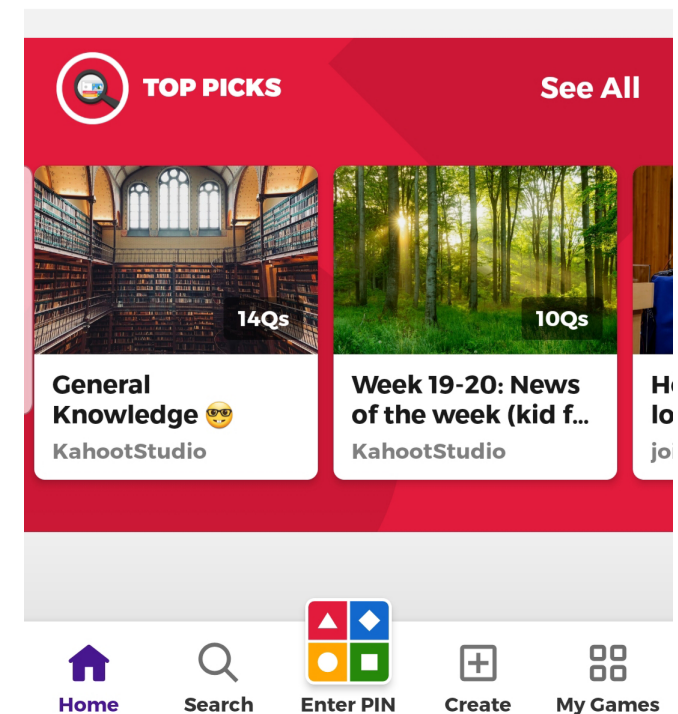
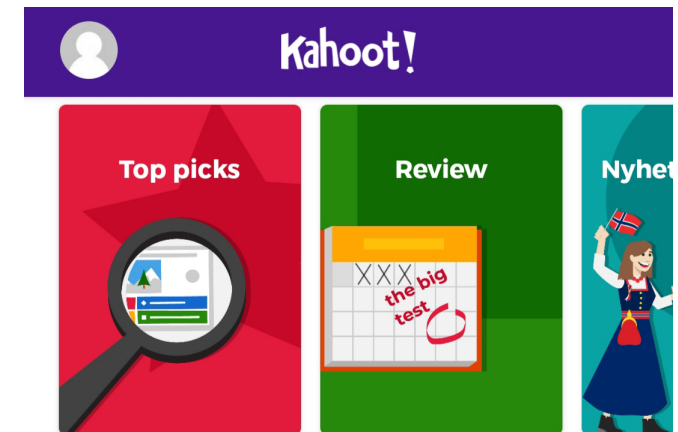


Figure 2.12: Kahoot is a popular app that mixes the entertainment of games with education (screenshot of Kahoot).

2.3.1 Gamification

The term ‘gamification’ aims to describe how the boundary between games and reality is being faded out. The term was first presented as ‘gameification’ by the blogger Brett Terrill (see Deterding et al., 2011; Huotari & Hamari, 2012), who described it as such: «The basic idea is taking game mechanics and applying to other web properties to increase engagement» (Terrill, 2008). The current term of ‘gamification’ did not become widespread until the gaming industry started using it in 2010 (Huotari & Hamari, 2012). Deterding et al. (2011, p. 9) defined gamification as «the use of game design elements in non-game contexts.» This definition is the most widely known definition of gamification today. Previously, few existing games faded out the boundary between games and the real world. With the invention of more efficient computers and mobile phones, game mechanics could be used in a much more efficient way and on a day-to-day basis: With a few clicks on your smartphone, you could collect points from buying coffee, for example. This increased implementation of game mechanics into real-world actions is what has made gamification such a popular subject of discussion in the later years.

Different kinds of gamified software have been applied to the consumer markets with great success, thanks to its entertainment values. However, it is still being withheld from being fully implemented in public governance. The playfulness and the fun of games are both a positive and a negative attribute to gamification.

Games are (often incorrectly) considered juvenile, wasteful, and solitary - especially computer- and video games (Lastowka & Steinkuehler, 2014). This perception has kept games from being used in a serious situation, even though research conducted in the last two decades tells us that computer- and video games are creating significant public benefits (Lastowka & Steinkuehler, 2014). One of the benefits mentioned is bringing people of different backgrounds together. If games can bring people of different ages, different races, and different social backgrounds together in a harmonious way, they will be able to understand each other better.

The use of *Cities: Skylines* as a method for education in real estate and land use planning studies was researched in a report by Haahtela et al. (2015). The game’s functions and features were considered in relation to the possibilities and challenges for its use in education. The research found that *Cities: Skylines* has the potential to increase students’ motivation and understanding of the implications of spatial planning. The abilities to easily visualize projects and to simulate the consequences of various decisions were praised. However, it was also pointed out that the game cannot simulate every aspect of spatial planning, such as politics, costs, and land ownership (Haahtela et al., 2015).

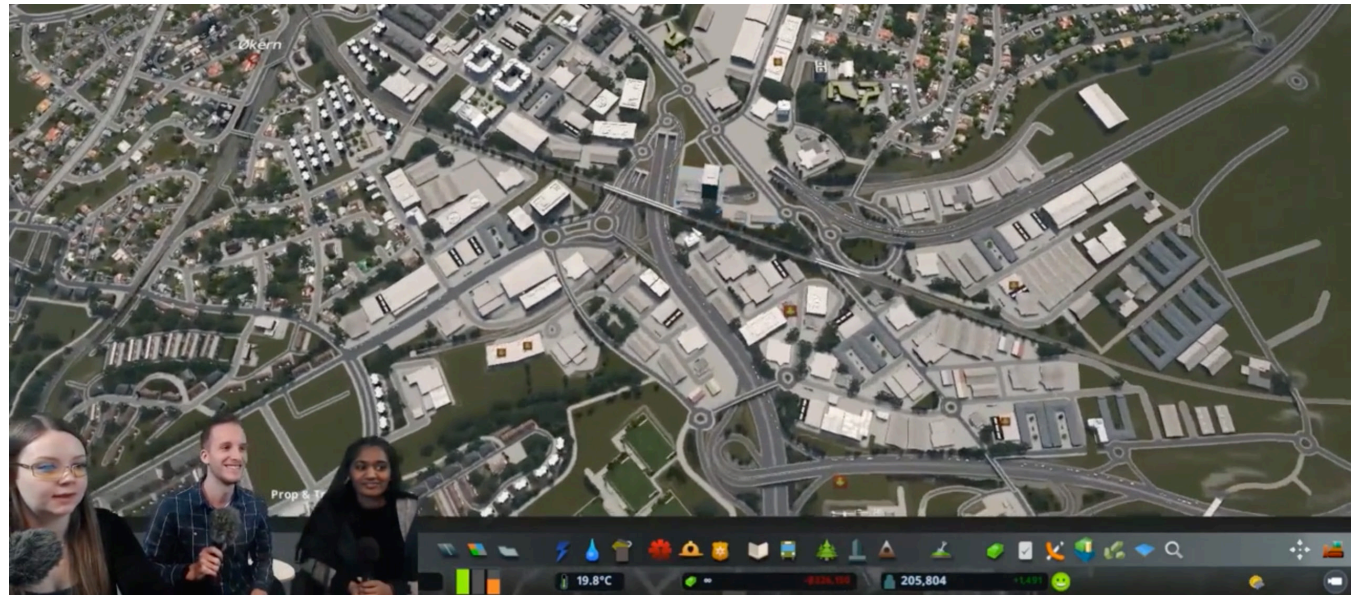


Figure 2.13: Students at NMBU playing *Cities: Skylines* to visualize how entertaining the studyprogrammes are at faculty Landsam (screenshot from YouTube.com).

2.3.2 Serious games

‘Serious games’ is another term frequently used in the scientific debate concerning gamification and the use of games in serious settings. It is defined as «(digital) games used for purposes other than mere entertainment» (Susi, Johannesson & Backlund, 2007, p. 1). The objective of this term is to describe how games are used in settings where it would be nearly impossible for the user to experience something similar in real life due to safety, cost, or time. It is argued that such games can have a positive impact on the skill development of the user (Susi et al., 2007). Susi (et al., 2007) developed a table to showcase the differences between serious games and entertainment games.

A survey conducted by Antle, Tanenbaum, Bevans, Seaborn, and Wang, which used a multiplayer simulation game to enable public engagement, found that «most participants gained a somewhat better understanding of the importance of making sustainable land-use decisions over time [...] and gained a better understanding of how difficult it is to make sustainable land use choices over time.» (Antle et al., 2011, p. 203)

	Serious Games	Entertainment Games
Task vs. rich experience	Problem-solving in focus	Rich experiences preferred
Focus	Important elements of learning	To have fun
Simulations	Assumptions necessary for workable simulations	Simplified simulation processes
Communication	Should reflect normal (i.e. non-perfect) communication	Communication is often perfect

Table 2.2. (Susi et al., 2007).

2.3.3 Our definition of gamification

Neither gamification nor serious games cover our topic completely. They both offer similarities to our method, but neither is adequate to define the use of a game (here: *Cities: Skylines*) in improving public engagement in governance (here: planning). Our method is using an actual game (thereby excluding ‘gamification,’ see also Vanolo, 2018, p. 322 for a similar exclusion) in a serious setting to make the engaging citizens have more fun (thereby excluding ‘serious games,’ see table 2.2). We wish to expand on the ideas of gamification and serious games. To do this, we think it is important to define our aim. The topic of games in governance has been little examined.

We limit the term ‘games’ to ‘computer games’ and ‘governance’ to ‘spatial planning.’ Thus, a clear definition of our thoughts should allow everyone to have a common understanding of the topic. This definition will be related to our arguments and discussion later on. In order to avoid the introduction of new terms in such a narrow field of study, we are enrolling ‘gamification’ as our preferred term in this thesis, as it best explains our aim. We choose to look past the definition of gamification as something which does not use actual games and instead focus on the motive of the definition: describing the fading out between games and real life. Therefore, we expand the definition of gamification and use it to describe *the use of unserious games to improve on the methods in public participation deployed by the government.*

2.3.4 Computer games in public participation within spatial planning

According to Lastowka and Steinkuehler (2014), computer- and video games have been proven to give several benefits to a wide variety of people. Utilizing games in planning could improve participation in general - perhaps especially from the younger generations. The use of games to visualize how planning is conducted can increase interest in planning. The playfulness and enjoyment of games are both a positive and a negative attribute. As previously mentioned, games have been accused of being juvenile, wasteful, and solitary. This accusation is perhaps even stronger towards computer- and video games. This perception has kept games from being used as a method in serious settings (Lastowka & Steinkuehler, 2014).

This old perception of video games should be left aside if computer games have the potential to increase participation from youth. A project conducted by the United Nations showed that youth increased their civil engagement when given Information and Communication Technology tools. The project used the game *Minecraft*, developed by Mojang. The results showed that, by using *Minecraft*, the younger participants became more interested in urban design and planning (UN-Habitat, 2015). Additionally, the project showed how computer games can be used in political processes to engage youth on their terms. Using computer games in spatial planning can be a good tool for increasing youth participation and, thereby, meet the demands set by law.



Figure 2.14: Teenager playing Minecraft (UN-Habitat, 2015).



Figure 2.15: A model in Minecraft (UN-Habitat, 2015).

There is a need for including citizens and community groups at the early stage of planning processes. In Norway, the municipalities have the responsibility to oversee that public involvement is secured in the projects that require participation. At the same time, studies have shown that even though the public wants to be more involved, they are not given the opportunities to actually affect the plan (Hanssen, 2013). Therefore, the municipalities need to make sure that the plan initiators incorporate public participation at the early stage of the planning process. This will benefit both the facilitator and the public, as an earlier dialogue between the two will yield more local knowledge from the public as well as more information about the project's background to the public.

As visualizations become even more complex and realistic, the public can feel fooled when the finished project does not correspond with them. Studies have shown that three-dimensional visualizations are easier for the untrained eye to understand than two-dimensional zoning maps (Hassan, 2014). Therefore, these visualizations gain more attention. However, as 3D visualizations can be misleading, it is important that the public fully understands the consequences of the plan. The municipality or the facilitators can also arrange both physical and virtual 3D models in different scales, which is a good method for depicting the proposed development. We propose using *Cities: Skylines* as a tool to build such a model. This can be done on a realistic scale, where the engaged citizens can wander around in the area and see the impact of the proposed plan properly. As mentioned in chapter 2.2.4, the technology for this is already being used. However, *Cities: Skylines* offers the opportunity for the public to alter the proposed project to their liking. This way, the plan initiators can receive useful input from the public,

both directly and indirectly. Through *Cities: Skylines*, the plan initiators have the ability to showcase different scenarios of a development area very easily. This can be done through importing different models in the exact same area.

Cities: Skylines has been used in pilot projects in Hämeenlinna, Finland and Stockholm, Sweden (Hallikainen, n.d.). Most people are interested in how their neighborhood is developed, but are normally not engaged in the development process because it is long and complex. The results from these projects showed that computer games such as *Cities: Skylines* can be used as a method for improving engagement in public participation processes.

The method of using *Cities: Skylines* can also be preferred over large public meetings. Even though public meetings and *Cities: Skylines* can be combined, using *Cities: Skylines* provides new possibilities for planners who want to engage the public. Instead of showing up at an exact time for a meeting, the planners can arrange an open meeting throughout the day, where people are invited to interact with the model in *Cities: Skylines*. This will give the citizens more time to experiment with alternatives for the development of a selected area. The facilitators have the opportunity to discuss with the citizens about their ideas and choices, give them suggestions, or listening to their concerns.

By arranging an open meeting throughout the day, the planners will also facilitate the engagement of different groups of people. Not everyone can meet up physically at an exact time, and this method can provide some flexibility, which would be good for marginalized groups who often struggle to be represented. The game also offers the possibility of making videos of the different

suggestions and receiving comments on it on social platforms, such as YouTube. This will be particularly useful for involving the youth. Additionally, we have seen the need for such methods presented on digital platforms during the COVID-19 pandemic, where it was no longer possible to arrange public hearings and physical meetings.

Lastowka and Steinkuehler (2014) raise the question of implementing the use of games in governance. They state that not everyone will accept bringing games into serious settings. To make the implementation as smooth as possible for the public and to avoid protests from the citizens who are not capable of keeping up, Lastowka and Steinkuehler (2014) highlight three elements needed to make the transition a success:

Firstly, it must be voluntary, as forcing someone to play a game would contradict the purpose of making the process.

Secondly, the participants should be active.

Thirdly, the results have to provide significant public benefits, like collaboration, time management, and self-expression (Lastowka & Steinkuehler, 2014).

3

Methods

3.1 Data collection

In the master thesis, we used three methods to collect the data:

- 1) The use of the computer game *Cities: Skylines* to create a 3D model of a case area (see chapter 3.4). The aim is to experiment with new methods of developing 3D models of a real area. We created the model in *Cities: Skylines* as an alternative to existing methods of planning, such as building physical models or using 3D modeling software like *SketchUp* or *Rhinoceros 3D*. We argue that our model in *Cities: Skylines* as a visualization tool has the same potential as many existing programs. However, *Cities: Skylines* has the advantage of simulation, which adds an extra dimension of realism to the model. Additionally, it is very easy to show different project alternatives in *Cities: Skylines* within a short timeframe and make individual changes to these.
- 2) Action research was used to interview planning students at NMBU while we played *Cities: Skylines* together (see chapter 3.5 and tables 4.11-4.15). The planning students were asked to create their own proposal for an area of Fornebu. They had the ability to choose from a selection of buildings and other assets that they could place wherever they wanted within the area. The action research aimed to gather information on how the participants interact with the game, the thought process behind their actions, and what information they took into account when they performed actions in the game. Another aim was to let the participants understand how the game can be implemented into an actual planning process. We also analyzed the level of comprehension of the technical aspects of using the game amongst the planning students.

- 3) Semi-structured interviews with citizens at Fornebu and planning practitioners from the municipality and private firms (see chapter 3.6 and tables 4.1-4.10). The aim of the interviews was for the participants to discuss their ideas and opinions with us. We wanted the participants to share their experiences with public participation: which methods they preferred to use; what methods they thought were more effective; their opinion about the development process of Fornebu; the feelings

about their effective influence on the process, and; what parts of the process they felt could be improved. Even more important was the aim to gather information on the participants' perspectives on future methods in public participation, such as the use of *Cities: Skylines*. We showed them our model by using screen-sharing on Skype. This way, we could collect their initial responses on their perceptions of the model, how they liked this method compared to traditional ones, and their immediate concerns about using this method.



Figure 3.1: The area at Fornebu the participants were asked to develop during the action research (screenshot of *Cities: Skylines*, made by the authors).

3.2 The study area of Fornebu

We have been using *Cities: Skylines* to make a recreation of Fornebu in Bærum municipality - a transformation project from an airport to a new suburb of Oslo. The reason for choosing Fornebu was that it is a newly developed area that is still under both planning and development. This gave us the benefit of easy data collection and relevant analyses about the development and planning in the area.

Fornebu is a peninsular area in Bærum municipality, just west of the border to Oslo municipality. The area is

centered between Lysaker, a transportation hub at the edge of Oslo, and Snarøya, a suburban area. Fornebu is perhaps most known as the location of Oslo's main airport from 1939 to 1998. On October 7, 1998, the airport was closed and moved overnight to its current location, Gardermoen.

Since the airport operations were shut down, Fornebu has been and still is subject to comprehensive redevelopment. The planning started already in 1994, but it encountered several difficulties and much

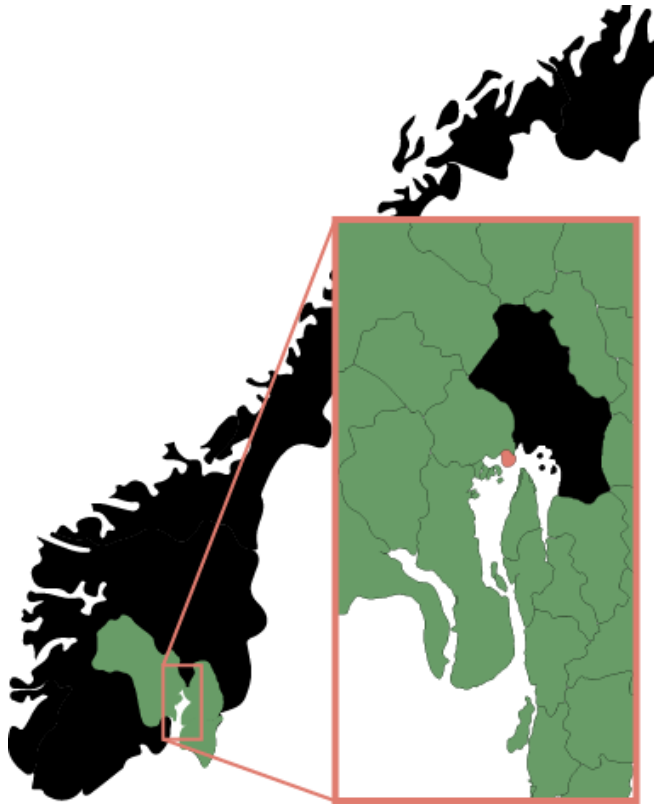


Figure 3.2: Fornebu's location in Norway.



Figure 3.3: Fornebu in 1956 (Norgebilder.no).

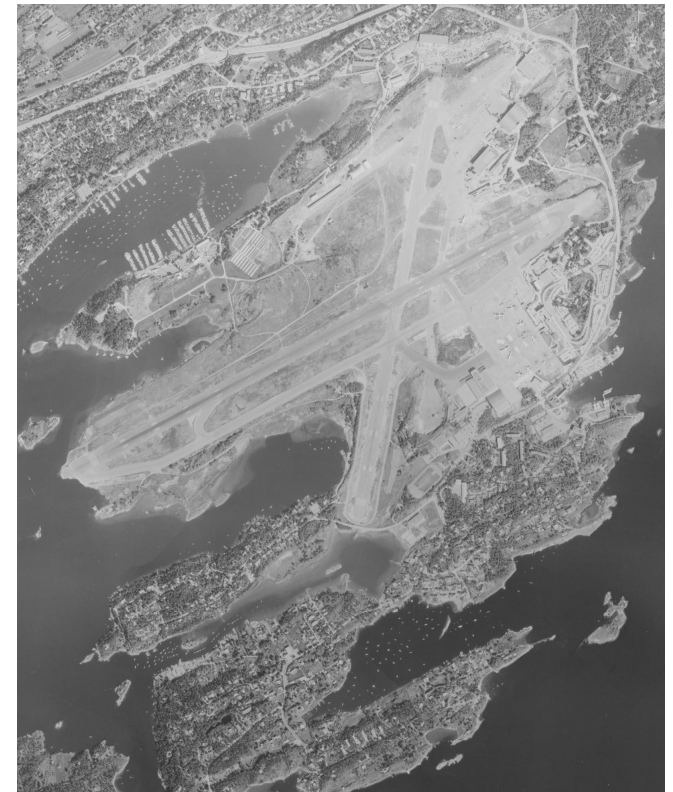


Figure 3.4: Fornebu in 1980 (Norgebilder.no).

resistance (Lingsom, 2008), leading to several delays. The municipal plan for Fornebu has dramatically changed since it was first approved in 1996. Even in the second plan, which was approved already in 1999, the municipality of Bærum did not want an urban development in the area (Miljøverndepartementet, 2000). Meanwhile, in the final plan from 2019, about half of the buildable area is reserved for urban development (Bærum kommune, 2019). The area is, therefore, subject to the densification and transformation of existing areas, in addition to the areas which are not yet developed.

Today, Fornebu is home to 7,500 inhabitants and 25,000 workers, while the existing plans call for 25,000 inhabitants and 30,000 workers (Bærum kommune, 2018, p. 34). Therefore, it is an interesting area for using *Cities: Skylines* to generate a model of the future development. The development of large portions of Fornebu and the placement of dwellings have not yet been determined. Thus, the case is interesting for us to look at in a new and different way - by using computer games to visualize and simulate proposals. Additionally, proposals for the densification of relatively

newly developed areas have recently been presented, increasing the potential for an even denser city (Rønne, 2016). Since Fornebu is a peninsula, and thus a confined area, it is easier to build a model of in *Cities: Skylines* without compromising the time spent on the realism of the case. Additionally, the study area was also selected because it is close to Oslo, making it easy for us to reach the involved parties for interviews. Other areas were initially considered (e.g., Bodø Airport and Filipstad in Oslo), but they did not meet all the criteria, and thus were not selected for our study.



Figure 3.5: Fornebu in 2008 (Norgebilder.no).



Figure 3.6: Fornebu in 2014 (Norgebilder.no).

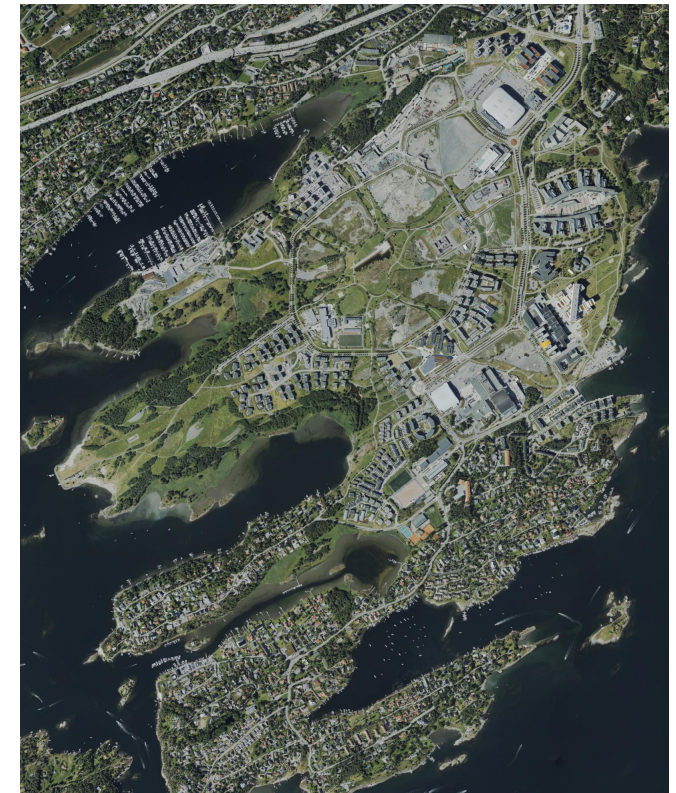


Figure 3.7: Fornebu in 2019 (Norgebilder.no).



Figure 3.9: Oslo airport, Fornebu (clipperarctic, 1971).



Figure 3.10: Office development at Fornebu (Hogne, 2018).

3.3 The use and development of the game *Cities: Skylines*

Cities: Skylines was chosen because we consider it to be the most realistic city-building game on the market as of spring 2020. The realism is superior both in the visualization of the model and the simulation of the movement by citizens (or 'cims') in-game. There are several popular existing computer games which we believe can be used for modeling of urban areas. Examples are *Minecraft*, *Cities XL*, *SimCity*, and *Cities: Skylines*. With *Cities: Skylines*, you can have a library of additions to the game, which is most easily done through the game client *Steam*. As we have spent a lot of time playing the game for fun, our library of mods and assets already consists of about 3,000 items. The time used to locate and download mods and assets, which we needed to make the model as realistic as possible, was therefore minimal for us. For someone without such a library, the time spent gathering mods and assets would likely be more substantial.

'Mods' is an abbreviation of 'modifications.' Used in computer game terminology as an addition to the game's original functionality and/or features. They usually add new features or elements to the game.

The game can be played on most computers with a dedicated graphics card. However, with the addition of large quantities of mods, including both graphics mods, functionality mods, and assets, the game requires higher computer specifications to run smoothly and not risk crashing. Perhaps the most essential specification is RAM (random-access memory), which is what handles the loading of assets, amongst other things.

For our project, we used a custom-built desktop computer with the following specifications:

Processor: AMD Ryzen 5 3600X 3.8/4.4GHz

Motherboard: MSI B450 TOMAHAWK MAX

RAM: Corsair Vengeance LPX DDR4 3200MHz CL16 32GB (2x16GB)

Graphics card: MSI GeForce GTX 970 Gaming 4GB

Storage: Crucial BX100 250GB 2.5» SSD



Figure 3.11: A city built in *Cities: Skylines* (TazerHere, 2019).

3.4 Creating the model with *Cities: Skylines*

The process of recreating a real-life area in *Cities: Skylines* is time-consuming and consists of several steps. The amount of time we spent building the model of Fornebu is estimated to be about 80 hours.

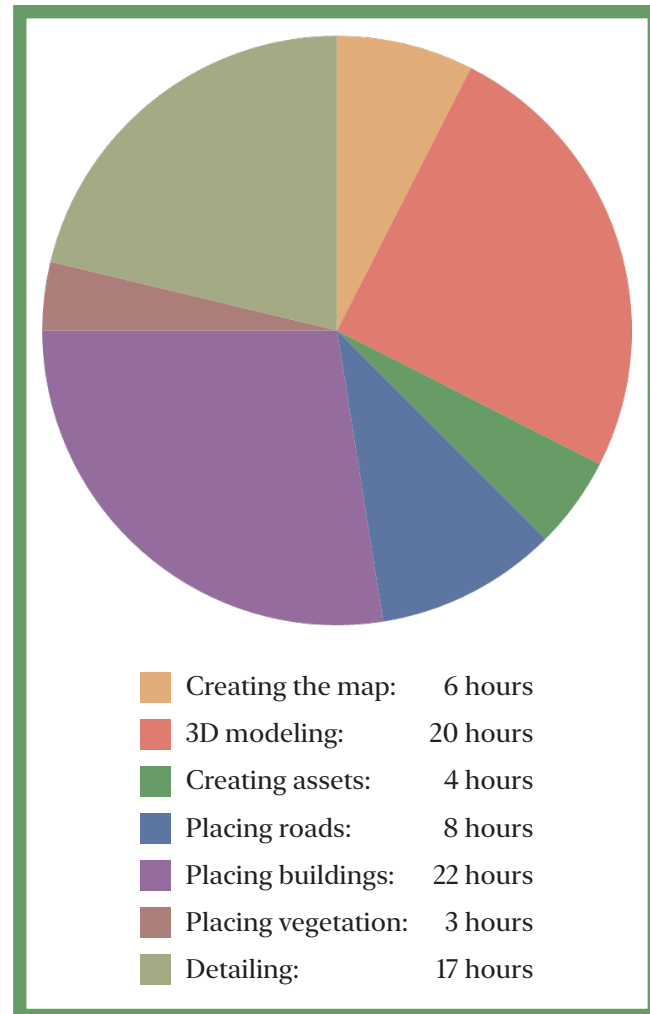


Figure 3.12: Time spent creating Fornebu in *Cities: Skylines*.

Despite the extensive functionality and possibilities of the game, it is also heavily reliant on mods. These are usually created by the player community and uploaded to the *Steam Workshop*, where one can simply subscribe to any mod to add it to the game.

Steam Workshop is an online platform where the players of different games upload their individual creations (such as mods and assets like trees, buildings, and roads) for other players to download to their game.

As of March 4, 2020, there are 213,548 contributions on the *Workshop*, including 1,383 mods (for adding or changing features of the game), 31,855 buildings, 11,223 props (smaller objects), and 2,969 networks (such as roads, railways, and fences). Additionally, there are several different LUTs (Lookup Table) for color correction and map themes for modifying landscape textures, both allowing to change the look of the game for increased realism or to one's personal preference.

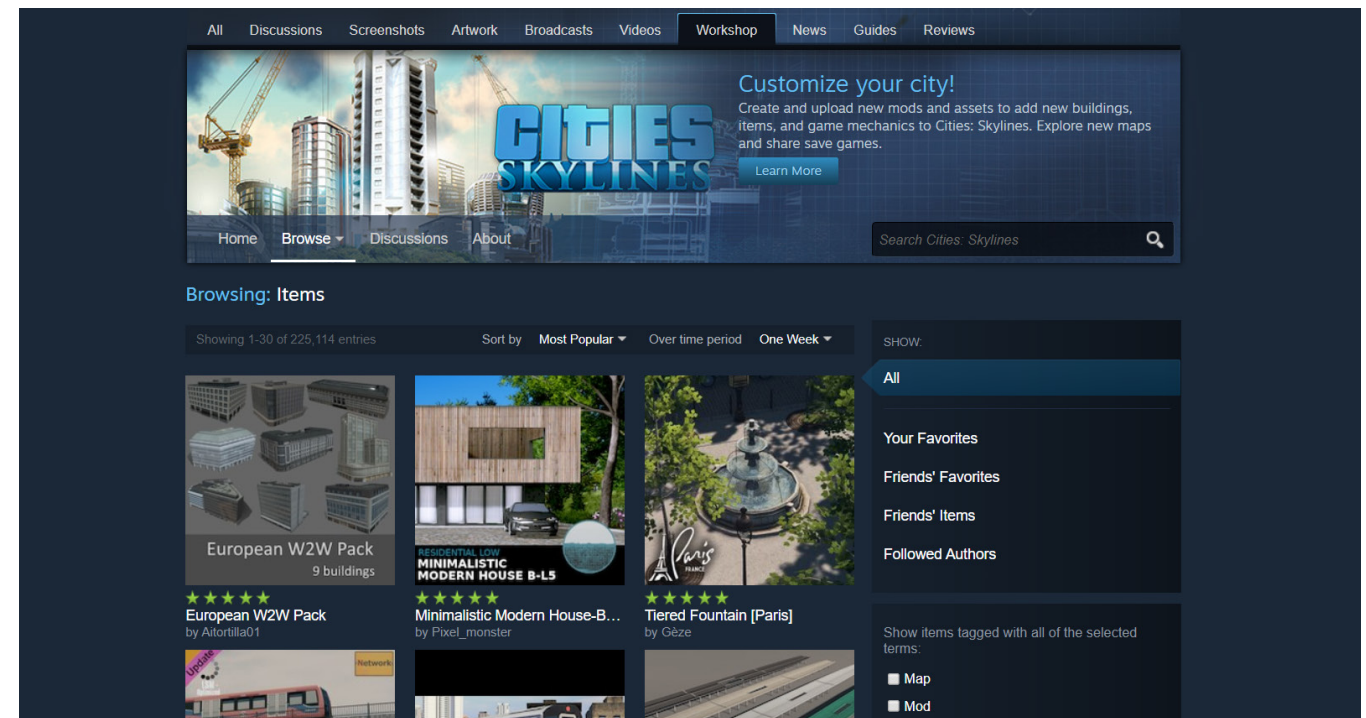


Figure 3.13: Steam Workshop page for *Cities: Skylines* (screenshot of Steam).

The software and websites used in this method, in addition to *Cities: Skylines* itself, are as follows:

Google Chrome (web browser)

OpenStreetMap (website; collaborative mapping service)

terrain.party (a website for generating and downloading heightmaps based on data from OpenStreetMap)

Kommunekart.com (website; mapping service with high accuracy in Norway)

Adobe Photoshop (image editor)

Google Earth (a program which renders Earth in 3D based on aerial imagery)

Trimble SketchUp (a program for 3D modeling)

Autodesk 3ds Max (a program for 3D modeling)

Cities: Skylines consists of three main modes: the normal game, a map editor, and an asset editor. Before we could begin building Fornebu in-game, we needed to create a map. In *Cities: Skylines*, the map has a size of 18x18 km divided into 81 tiles of 2x2 km. Originally, only the nine tiles in the middle of the map are playable, but the mod *81 tiles* bypasses this restriction.

The map editor allows the creation of a map with terrain, including plains, mountains, oceans, rivers, lakes, etc. While it is possible to create a terrain from scratch, it is also possible to import a heightmap to automatically generate the terrain. The heightmap

can be created with GIS software, but to save time, we decided to use the website *terrain.party*, created by Reddit user willglynn. *terrain.party* mainly uses NASA's *ASTER* dataset, which has a resolution of 30 meters, to generate a downloadable heightmap (Glynn, 2015). In the map editor, there is a dedicated button for importing heightmaps, and the terrain is then generated automatically. The accuracy of the heightmap is low in most countries, so it was still necessary to edit the generated terrain. Bodies of water are not rendered in these heightmaps, and hills can be either exaggerated or wrongly represented.

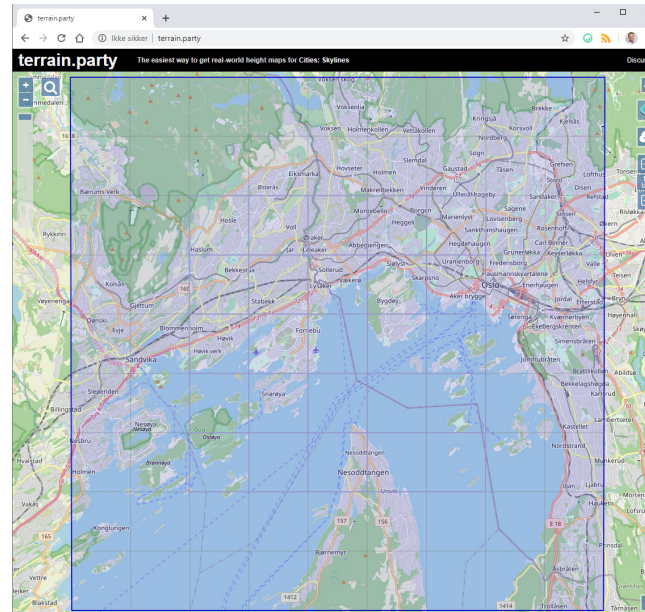


Figure 3.14: Screenshot of terrain.party.

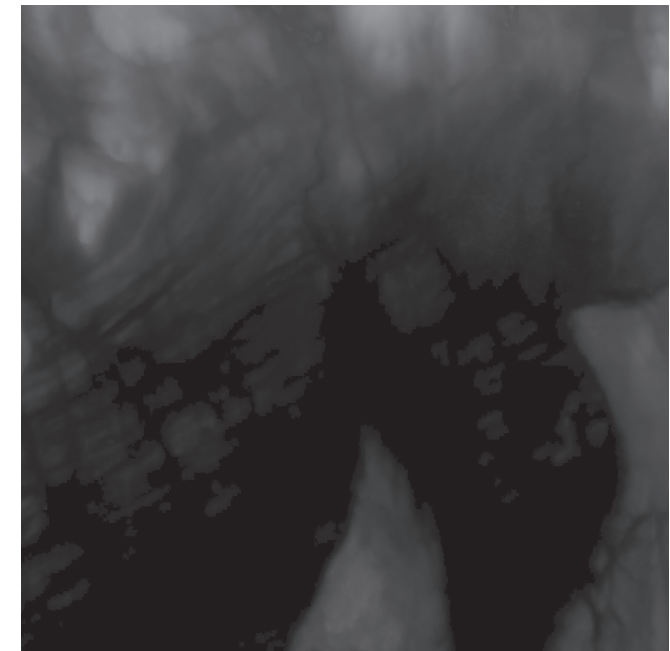


Figure 3.15: Screenshot of the heightmap generated by terrain.party.



Figure 3.16: Fornebu with terrain and roads (screenshot of *Cities: Skylines*, made by the authors).

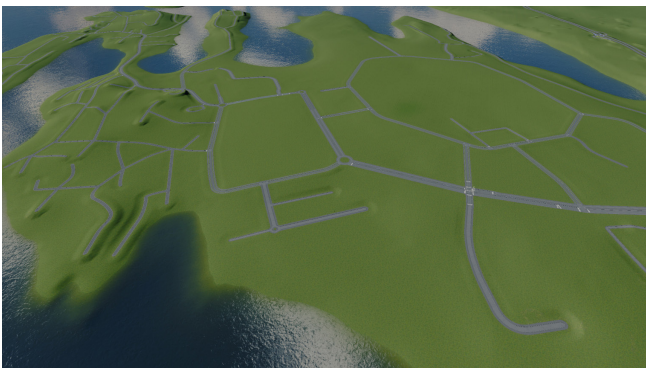


Figure 3.17: Fornebu with terrain and roads (screenshot of *Cities: Skylines*, made by the authors).

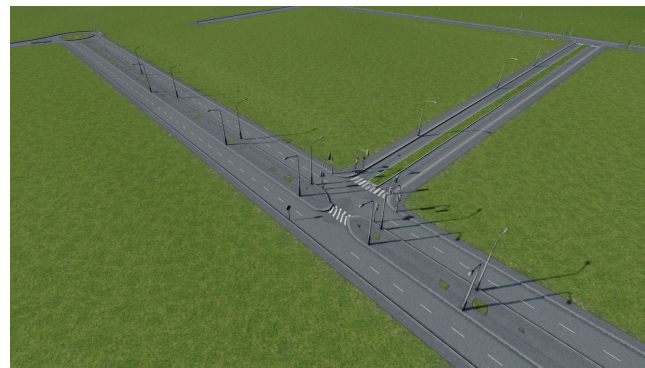


Figure 3.18: Fornebu with terrain and roads (screenshot of *Cities: Skylines*, made by the authors).

The next step was to modify the terrain and start placing roads and other infrastructure. Here we used the mod *Image Overlay*, which allows draping an image as an overlay on the terrain. We created the image by taking several screenshots of the whole area piece by piece in *OpenStreetMap*. Then, using *Adobe Photoshop*, each screenshot was combined into a larger image covering the whole area of the map. The resolution of the image was 7,857x7,857 pixels, leading to a margin of error of about ± 2 meters. After importing the image to *Cities: Skylines* and enabling the overlay, we could then modify the terrain to show coastlines and lakes, as well as placing roads and other infrastructure. In our case, only roads within the Fornebu-Snarøya area were placed, except for E18 passing Fornebu to allow traffic into and out of the area. To compensate for the margin of error, distances were also measured on high-detailed maps and used when placing roads. Therefore, the accuracy of distances is not perfect, and the margin of error is estimated to be about ± 1 meter.

To increase the accuracy of the terrain, we made sure each road and intersection was at the same height above sea level as in real life. All networks in *Cities: Skylines* consist of two elements: nodes and segments. A segment is the network itself and has a maximum length of twelve in-game units (so-called ‘cells,’ which are squares of 8x8 meters) equaling 96 meters. At the end of each segment, there is a node. Where two networks intersect, the node is converted into an intersection. Using the mod *Move It*, each node can be moved individually or as a group, either horizontally or vertically. In this case, we moved each node vertically with one-meter steps to their real-life height. To find out what height each node should be at, we used *Kommunekart.com*, where you can click at any point on the map and see its height above the sea level.

Due to the abundance of unique buildings at Fornebu, we considered it to be necessary to model some of these buildings ourselves. In some cases, the buildings needed for recreating an area are already 3D modeled and published online for download. In our case, however, none of the buildings were available. Thus, we had to do it by ourselves. We decided to model seven of the largest and most prominent buildings at Fornebu:

- Fornebu S (24,000 m² shopping center with 9,900 m² of apartments)
- The Portal Building, *Portalbygget* (28,000 m² office building)
- The Profile Building, *Profilbygget* (5,000 m² office building)
- The Terminal Building, *Terminalbygget* (21,000 m² office building)
- The Equinor Building, *Equinor-bygget* (66,000 m² office building)
- Fornebu Works (58,000 m² office building)
- Telenor Fornebu (200,000 m² office building)



Figure 3.19: Fornebu S (Google Earth, 2018).



Figure 3.20: The Portal Building, Portalbygget (Google Earth, 2018).



Figure 3.21: The Profile Building, Profilbygget (Google Earth, 2018).



Figure 3.22: The Terminal Building, Terminalbygget (Google Earth, 2018).



Figure 3.24: Fornebu Works (Google Earth, 2018).



Figure 3.23: The Equinor Building, Equinor-bygget (Google Earth, 2018).



Figure 3.25: Telenor Fornebu (Google Earth, 2018).

The models were first modeled using *SketchUp*. To get the dimensions as accurate as possible, footprints were measured in *Kommunekart.com*, while various heights were measured in *Google Earth*. The buildings were modeled with varying levels of detail according to their significance to our project. Initially, the 3D models are simply white boxes and thus need textures to look realistic. Some of the facades were colored using *SketchUp*'s tool for that, while others were painted with photorealistic textures. These textures were copied from photos or aerial imagery, edited in *Photoshop*, and then projected onto each surface of the 3D model. This method is recommended for detailed facades, like the Equinor Building and the roof of Fornebu S, as it saves time compared to drawing them manually.

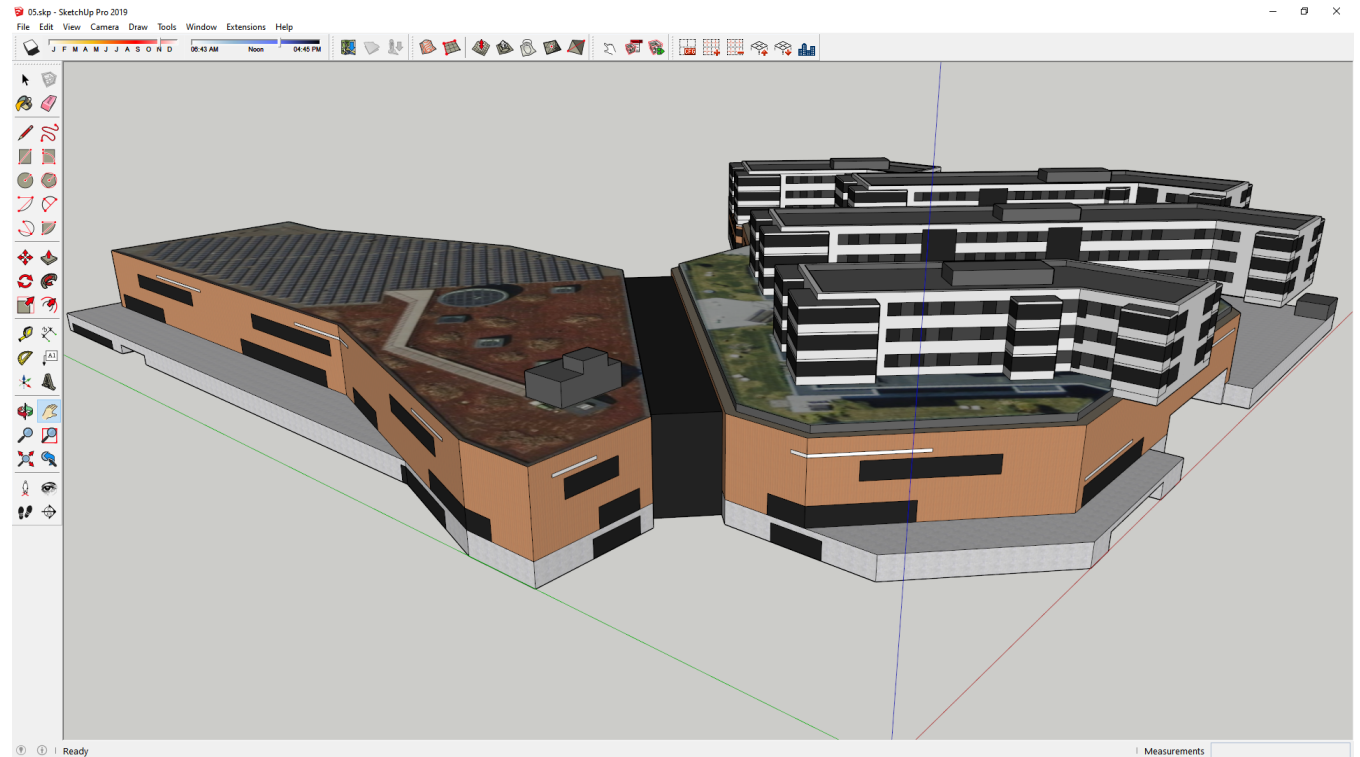


Figure 3.26: 3D model of Fornebu S (screenshot of SketchUp, made by the authors).

After finishing each model in *SketchUp*, they were imported into 3ds Max, which allows converting them into the required file format for use in *Cities: Skylines*. As we had never used *3ds Max* before, it was initially challenging to get it to work properly, but it eventually worked out. As a step in the process, all facade textures are projected onto a flat image and exported. This is known as a ‘diffuse map.’ Additionally, it generated

a ‘specular map’ (mapping the model’s degrees of reflection, used for windows and other reflective surfaces) and a ‘lighting map’ (mapping the model’s degrees of illumination, used for windows and other light sources). These were all edited in *Photoshop* to make glass and metals reflective, as well as making windows and lights illuminate when the in-game simulation turns to nighttime.

Furthermore, each model was imported into the game’s previously mentioned asset editor, which converts and combines the 3D model and its texture files into an asset that can be placed in-game. The asset editor allows choosing what type of asset you want to create, for example: residential, commercial, or office buildings; unique buildings (tourist attractions); or various public services, such as schools, hospitals, and police stations. Each building has a set of properties, like the number of residential units or workers, noise accumulation, water consumption, and entertainment accumulation. These properties contribute to creating a feeling of realism when playing the game by providing the city with activity, traffic, and management needs. We set the relevant properties of each building to match any numbers we found for their real-life counterpart.

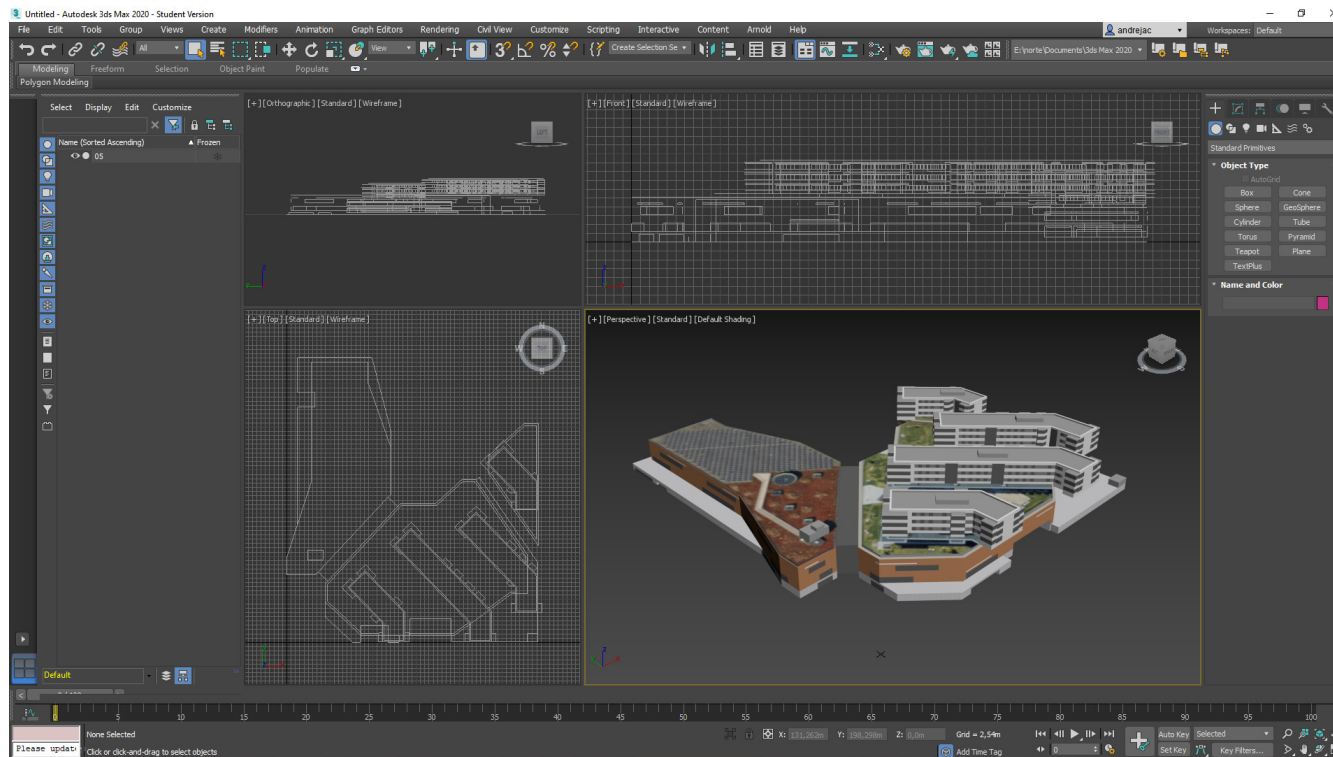


Figure 3.27: 3D model of Fornebu S (screenshot of 3ds Max, made by the authors).

Back in the normal game mode, the buildings were placed in their respective locations based on the overlaid map. Usually, when buildings are placed, they completely flatten a square-shaped area of the terrain underneath. We wanted some of the buildings to instead clip into the terrain without creating steep cliffs around them. For this, we used the mod *Procedural Objects*, which converts assets into 'dead' objects without the previously mentioned properties. These objects can then be moved, scaled, recolored, or edited by moving polygons. To accommodate for the lost properties, other buildings were placed inside the objects, in a way that they were not visible, to allow simulation of traffic to and from them.

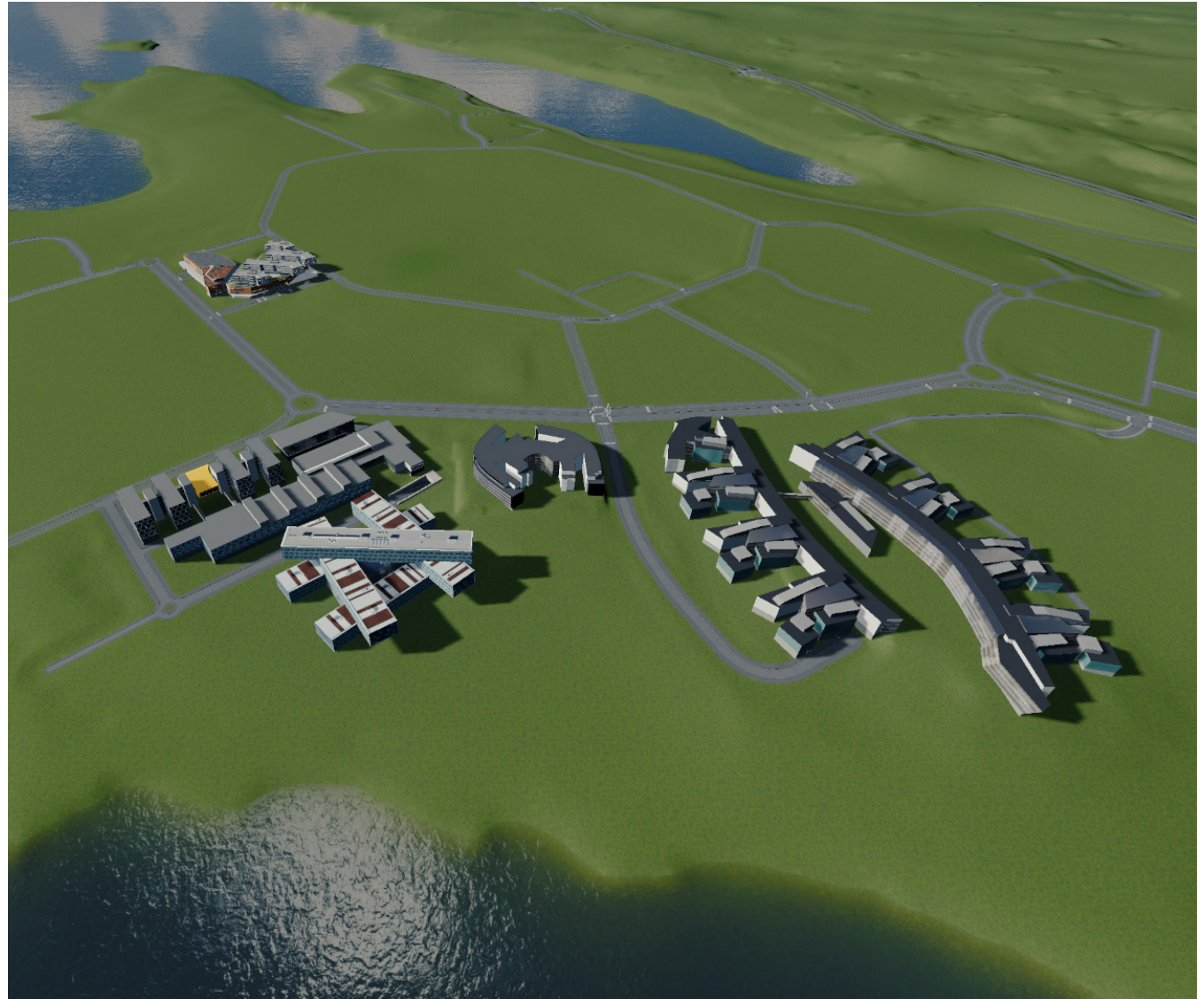


Figure 3.28: Fornebu with custom-made buildings (screenshot of Cities: Skylines, made by the authors).

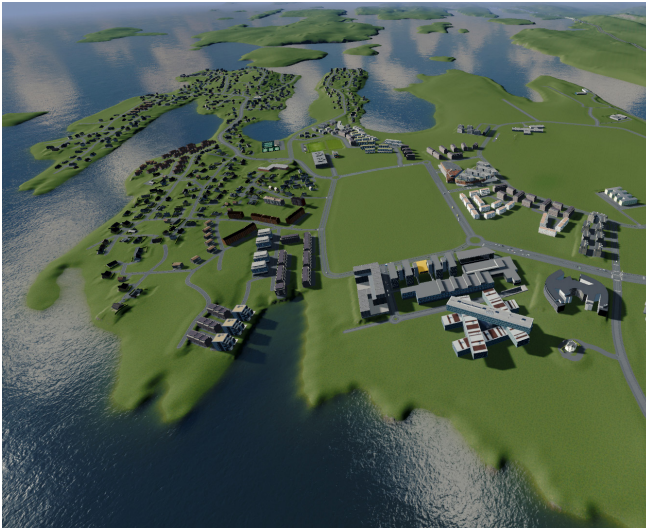


Figure 3.29: Fornebu with buildings (screenshot of Cities: Skylines, made by the authors).

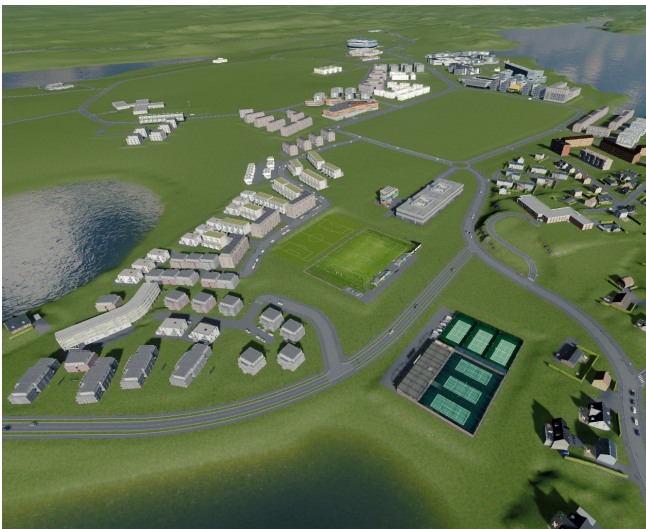


Figure 3.30: Fornebu with buildings (screenshot of Cities: Skylines, made by the authors).

Regarding other buildings - those that we did not model ourselves - we used already existing buildings that look similar to the real buildings. In a project with less of a time constraint, it would most likely be better to model every building to represent its real-life counterpart accurately, as it is crucial to create an environment that is as recognizable as possible. It is also possible to extract building data from GIS and convert them into

buildings that can be used in *Cities: Skylines*. In this project, however, we decided not to spend more time than necessary on these models. For areas even farther away from our focus area, namely the detached housing areas of Snarøya, we mostly placed various random houses in approximately the correct locations to create an illusion of the real place and simulate more realistic traffic.



Figure 3.31: Fornebu with buildings (screenshot of Cities: Skylines, made by the authors).

Up until this step, the landscape consisted only of open, empty areas with infrastructure and buildings. There was no vegetation except for the grassy ground cover. With the use of a tree brush, we added different tree types representing the actual vegetation diversity of Fornebu. According to a report from Statsbygg (2008), the most common trees at Fornebu are scots pine, grey alder, Norway maple, white willow, silver birch,

common oak, littleleaf linden, white birch, ash, and aspen. Most of these were available from the *Steam Workshop*. For accurate placement of forests, we used the overlaid map as well as *Google Earth*. Additionally, individual trees were placed in areas with sparse and/or planned vegetation, including rows of linden trees along most roads and streets.



Figure 3.32: Fornebu with vegetation and paths (screenshot of Cities: Skylines, made by the authors).



Figure 3.33: Fornebu with vegetation and paths (screenshot of Cities: Skylines, made by the authors).

At this point, we also placed an extensive network of pedestrian paths that go along roads and through the green spaces of Fornebu. Most of the paved paths at Fornebu are about 3 meters wide. However, since we could not find any paths on the *Steam Workshop* that looked realistic enough, we used an 8-meter wide path that is already included in the game.

To further increase the experienced realism of the area, we spent extra time in some areas adding props (smaller objects like furniture and decorations) and decals (small images to add ground cover, visualize road wear, etc.). Examples of these are benches, street lighting, zebra crossings, and lane markings.



Figure 3.34: Fornebu with details (screenshot of Cities: Skylines, made by the authors).

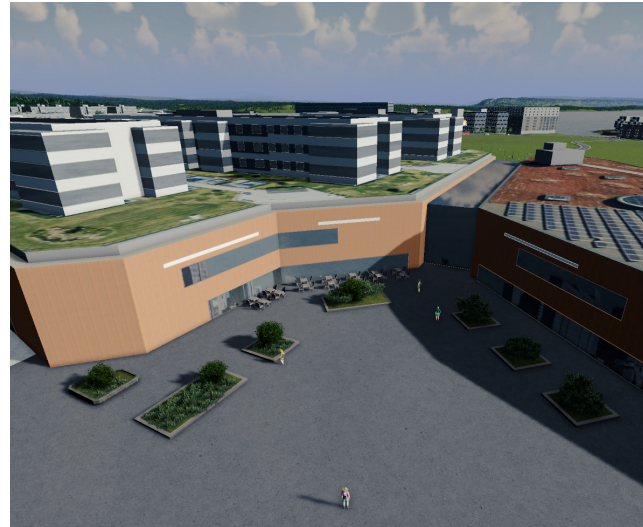


Figure 3.35: Fornebu with details (screenshot of Cities: Skylines, made by the authors).

An essential part of the feeling of realism in the game is the flow of traffic. The traffic within the Fornebu area itself is contributing to this, but commuters also make up a large portion of the traffic. To simulate commuters, we built a simple area with office, commercial, and industrial buildings in the location representing downtown Oslo. Two bus lines were also added going from Oslo to Fornebu, representing the two branches of Ruter's bus line 31. One branch terminates at Fornebu S, while the other terminates at Snarøya. While Fornebu does have a fire station, there was also a need for other public services like police, healthcare, deathcare, garbage, and higher education. Each of these services was placed in either Sandvika or Oslo according to the location of their closest real-life counterpart.

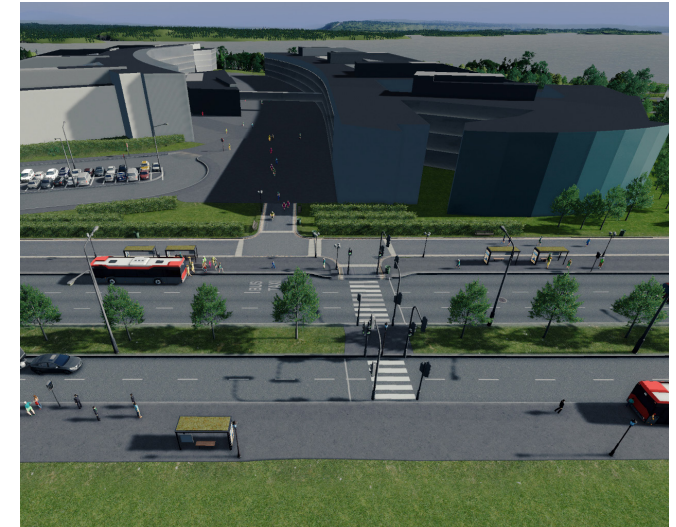


Figure 3.36: Fornebu with details (screenshot of Cities: Skylines, made by the authors).



Figure 3.37: Fornebu with bus lines (screenshot of Cities: Skylines, made by the authors).



Figure 3.38: The finished model of Fornebu (screenshot of Cities: Skylines, made by the authors).



Figure 3.39: The finished model of Fornebu (screenshot of Cities: Skylines, made by the authors).

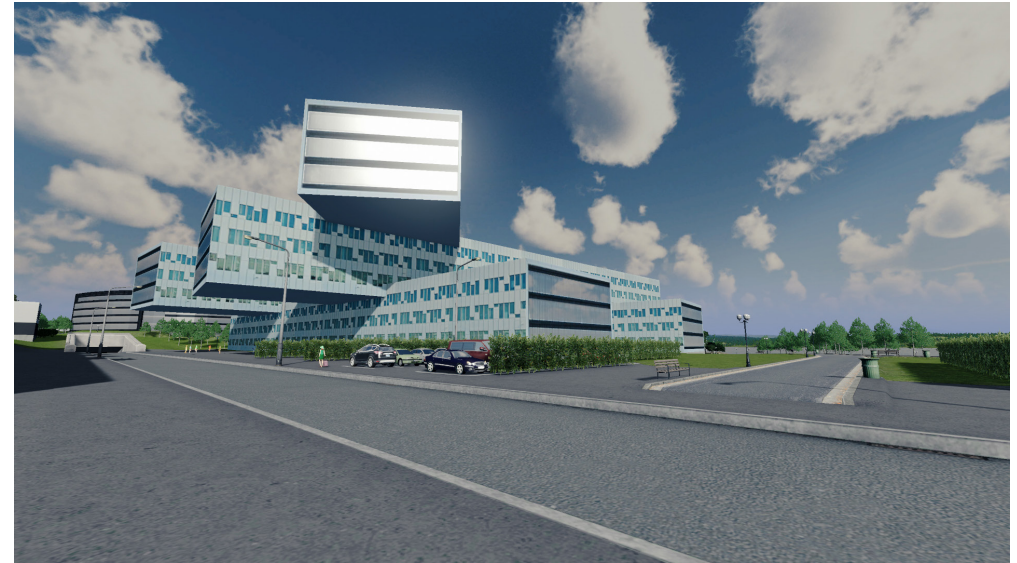


Figure 3.41: The finished model of Fornebu (screenshot of Cities: Skylines, made by the authors).

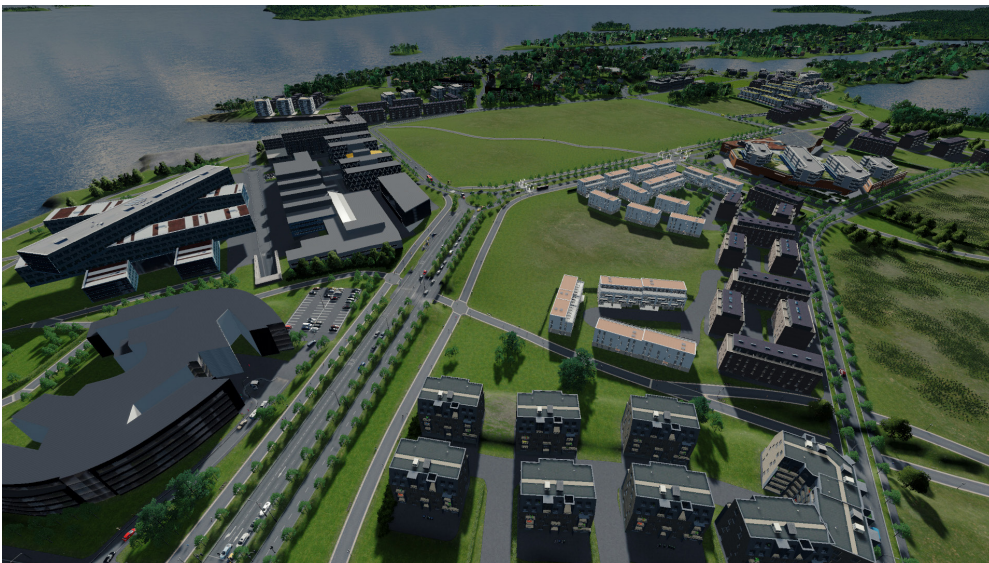


Figure 3.40: The finished model of Fornebu (screenshot of Cities: Skylines, made by the authors).



Figure 3.42: The finished model of Fornebu (screenshot of Cities: Skylines, made by the authors).

3.5 Action research

Ernest T. Stringer defines action research as:

«a systematic approach to investigation that enables people to find effective solutions to problems they confront in their everyday lives» (Stringer, 2013, p. 1).

The purpose of the method is to allow the participants to conduct much of the research on their own actions. Thus, the participants evaluate and reflect on their actions as they take them. Through this method, they must think about their actions and revise them if necessary. When interviewing them through this process, we are then able to collect data that reflect this thought-process. Our role as researchers was to assist the participants in understanding the problems they are facing and support them as they are working towards finding a solution (Stringer, 1999).

The method is traditionally often used in organizational and industrial contexts, where an outside observer could facilitate it. Because of this, action research has been criticized for having a facilitator who may provoke an action to be performed, but who do not have to handle the consequences of that action (Kemmis, McTaggart & Nixon, 2013). However, this criticism cannot be said to apply to our studies, as our research has no consequences for the participants after conducting the interviews. We had two main reasons for choosing action research. Firstly, through this method, we had the opportunity to interact with the participants, while they reflect on the action they are performing. Secondly, through action research, we can create conditions the conditions necessary for the participants to get engaged and enthusiastic (Stringer, 1999). Involving the participants and asking them to reflect on selected topics allows us to collect data that, to some degree, represent how planners can use *Cities: Skylines* to build models.

Central to the action research method is 'look-think-act.' The look-think-act procedure allows the participants to deal with the issue straightforward at first, then bringing more perspectives into the issue as the complexity increases (Stringer, 2013). Stringer describes this procedure as a continuous recycling set of activities (Stringer, 2013), see figure 3.43. The point of the figure is to help the participants track their thought process. To conceptualize this in our study, we ask the participants to explain their actions. The participants had to look at the model, think of what they feel could be changed, and then perform the change. After the initial stage, they would have to reflect on the actions they took and re-plan if they were not satisfied. We understood this process as a system of trial and error, where the participants can «improve» their actions as a result.

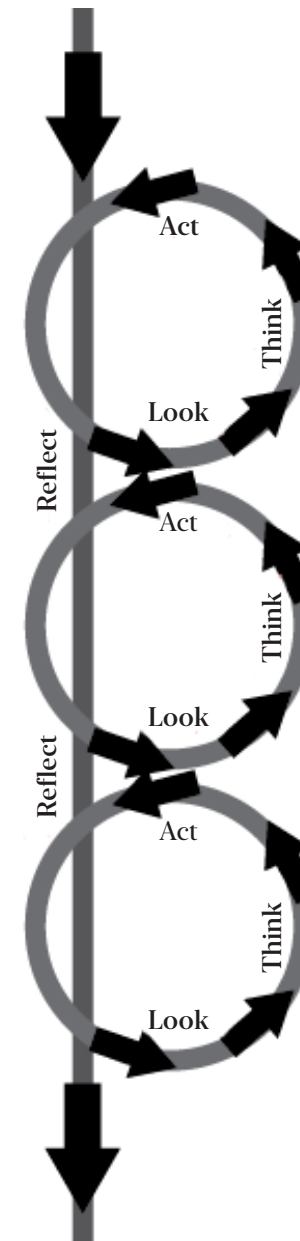


Figure 3.43: Look-Think-Act (Stringer, 1999).

3.5.1 Selecting the participants

The participants were selected for the action research based on their background in urban and regional planning and whether they had experience with playing city-building computer games. All the participants are currently students in Urban and Regional Planning at NMBU. We selected a total of six participants for playing the game and being interviewed. Of the six, three had never played any city-building computer game, and three were quite regular players.

The participants were first asked if they would be interested in participating in exploring the method of using *Cities: Skylines* in the planning process. Those who were interested were then asked to give us their preferred time for participating. We then invited them to play in the time they selected. Finding room in the calendar for participating in the survey was not a problem for any of the participants. Each participant played for about one hour.

3.5.2 Structuring the questions

During the interviews, we followed a question sheet (see attachment 2) in order to lead the discussion with the participants. Then we asked the participants to reflect on the action they took and ask them to perform another action to compare with. We also asked more generalized questions in which the participants could then relate to what action they were performing at the time. The questions to the students with some experience in using city-building games focused on the technical aspects of the game and the difficulty of understanding these mechanics for those who have not yet played. The questions to the students without experience focused on the use of the game and whether they found some difficulties in maneuvering the game.

As the participants are acquaintances of us, we did not find it necessary to establish a connection between the participants and us. We had a trial interview before conducting the real interviews. This was done to find flaws in our question sheet and to try out the dynamics between us, and between the participant and us. After the trial interview, we made some changes to our question sheet to have good dynamics. In this case, having a trial interview was important. As we have few participants in the actual study, this first step was necessary for comparing the answers from the different participants.

3.6 Semi-structured interviews

We originally planned to conduct group interviews. However, we had to change our plan after we had sent out the invitations due to the COVID-19 pandemic that hit Norway in March. We decided to cancel the planned workshop and instead gather the information from the participants individually, as this would be easier to do over Skype than a group workshop. We sent out invitations and got quick and mostly positive replies. We kept the same number of participants as we would have had in the workshop, to get approximately the same range of views as we had planned. The recommended number of participants is 10-15, according to Johannessen, Tufte, and Kristoffersen (2004). However, as we also had six participants in our action research, and considering the time available, we did not involve more than six participants for the semi-structured interviews.

Semi-structured interviews are based on an interview guide, but the questions can, and will, slightly vary in form and order for each interview, if needed (Johannessen, Tufte, & Kristoffersen, 2004).

3.6.1 Selecting the participants

The participants were selected because they had a connection to the development at Fornebu. The participants were divided into two groups: professionals (n = 4) and citizens (n = 2). We had two different approaches to finding the participants. For the planners, we researched newspapers, catalogs published by private developers, and websites to first find the people we thought could be interested. Those we considered as potential participants were written down on a list before we searched for their contact information. The planners were from both private firms and the municipality. A few firms are behind most of the future expansion of Fornebu, such as OBOS and Selvaag Bolig. Planners from these firms were, therefore, on the list. Furthermore, a firm called LÉVA Urban design was listed up due to their competence in working with public participation processes.

Amongst the participants, the citizens were selected because of their engagement in the two largest residents' associations in the area. These were selected first and foremost because we imagined they would have a lot of information and experience from the public participation processes that have occurred at Fornebu. Additionally, they would most likely know about the experiences of other citizens at Fornebu and their thoughts on the participation process. Therefore, they could act as representatives for the citizens at Fornebu, supplementing their views and opinions.

3.6.2 Structuring the interviews

We made a question sheet on beforehand, as is usual in a semi-structured interview (see attachment 1). The questions were categorized into three different parts: public participation, visualization, and computer games.

The first part focused on gathering information from the participants regarding public participation, such as their experience, their views on public participation, and their knowledge of it.

To have some transition between the parts regarding public participation and computer games, the second part focused on the participants' viewpoints on how plans are currently presented in the planning documents and in visualizations. This second group of questions also helped the participants to reflect on the value of visualization in planning and how it correlates with public participation.

The last part was about the use of computer games in serious contexts. We wanted to gather information about the general attitude of the participants towards gaming before we showed them our model and method. After showing the computer game *Cities: Skylines* to the participants, we asked them questions relating to both public participation, visualization, and simulation. The final item on the agenda was to ask them if they had anything extra to add.

3.7 Data analysis

The data we collected from the action research and the semi-structured interviews were analyzed and presented in two tables, respectively. For analyzing the data from the action research and interviews, we used qualitative content analysis. Qualitative content analysis is described as «[...] a research technique for the objective, systematic, and quantitative and qualitative description of the manifest content of communication» (Berelson, 1952, p. 18). The purpose of the qualitative content analysis is to analyze the data we have collected through our interviews. When analyzing our findings, we have used coding to classify the results.

The data in the tables (4.1-4.15) were analyzed through a qualitative content analysis, which is structured around four columns: category, code, excerpts from the interviews, and preliminary argumentations. Alongside the tables, the main results are summarized as text.

There are three categories - one for each of the three main parts of the semi-structured interviews. While the action research interviews focused only on the topic of 'Computer games' (and related themes), the semi-structured interviews also focused on 'Public participation processes' and 'Visualization.' Each of the categories contains multiple codes, which describe what each excerpt and argument is about. The codes are numbered to distinguish each excerpt. The column marked 'Excerpts from the interviews' contains a selection of quotes from the interviewed participants. In some cases, several people gave quite similar answers to the questions. In such cases, we included only one excerpt which had the most useful information. The preliminary argumentations are our own hypotheses based on literature review and observations and are verified by the excerpts.

PpInv: Involvement from citizens during public participation processes: thoughts and arguments surrounding why involvement is low and how it can be increased.

PpCom: Communication during public participation processes: Addresses input on communication and dialogue between the different parties in a public participation process.

PpPrT: Problems with today's public participation processes: Highlights issues the respondents have encountered when they have been a part of a public participation process

PpCofG: Characteristics of a good public participation process: Identifies what the respondents recognize as qualities in a public participation process.

PpSIm: Suggested improvements for public participation processes: are examples of improvements the participants suggested in public participation processes.

ViFln: The use of visualizations to give false information: The respondents' thoughts on the debate of how visualizations are used to give false information about a project to the public.

ViImp: The importance of visualizations in spatial planning: Why visualizations are used, and who benefits from using them.

CgUSP: Possibilities for using computer games in spatial planning: How the respondents imagine computer games could be implemented in planning.

CgUPp: Possibilities for using computer games in public participation processes: The respondents' input on how public participation could benefit from using computer games

CgPoU: Positive sides of using computer games in public participation processes: What positive side effects the respondents thought computer games would have on the public participation process.

CgMCh: Main challenges when using computer games in public participation processes: What the respondents pointed out as challenges.

CgIUn: The possibility for computer games to help improve the citizens' understanding of projects: The respondents' thoughts on how the citizen's understanding of a project can be increased by using computer games.

CgRea: Perception of the computer game as realistic: The respondents' reaction to whether or not the computer game *Cities: Skylines* is realistic.

CgCTM: Computer games versus traditional methods for visualization: The respondents' opinion on how a computer game compares to traditional visualizations.

4

Results

In this chapter, we present the main outcomes from the analysis of the data collected through: 1) building the model in *Cities: Skylines*; 2) the action research with planning students, and; 3) the interviews with professional planners (from Bærum municipality and real estate developers) and citizens involved in the participation processes at Fornebu. To achieve a better structure of our results, the data from making the model in *Cities: Skylines* and from the action research are combined (see chapter 4.2.1). We found these results to be closely related since the model we made was used to gather data from the action research. First, we present the results from the semi-structured interviews, which are interpreted in consideration of the outcomes from the literature review. These results confirm other results from modeling and action research.

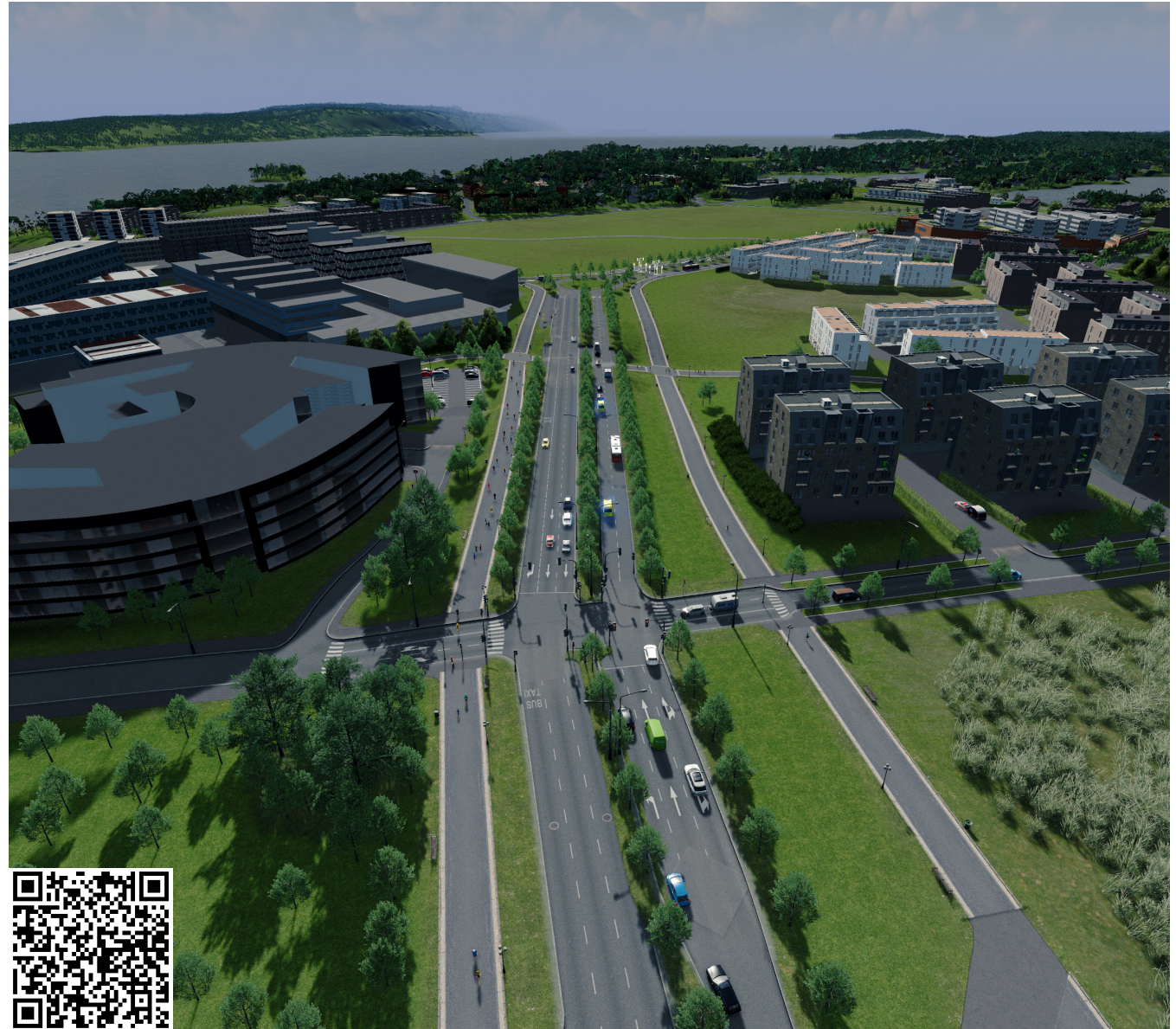


Figure 4.1: The main street at Fornebu (screenshot of *Cities: Skylines*, made by the authors).

4.1 Citizens and professional planners' perspectives on public participation, visualization, and gamification in spatial planning

4.1.1 Public participation: involvement, communication, and problems.

We conducted a small sample of interviews, and thus, we cannot overgeneralize. However, the results can depict some challenges faced by both professionals and citizens. These challenges are also debated in the literature, as the outcomes from the literature review show in chapter 2. Most of the results in this thesis reaffirm these debates. Some results, however, present issues not yet debated. These new debates are discussed in chapter 5.

There are differences concerning the methods and reasons to involve citizens in the planning process. As one respondent points out [PpInv1], the issues of involving citizens are due to a lack of engagement (Professional 4, April 3, 2020). The importance of having a proper public participation process should not be underestimated, and even the smallest involvement can yield results. As the 'ladder of participation' (see chapter 2.1.1) shows, the more involved the public is, the stronger their influence on the project will be. It is challenging to engage the citizens if they are not able to reach the higher levels of the 'ladder of participation.' One of the respondents told us that the best and most successful public processes are when the citizens can decide for themselves when they want to contribute. The interviewee had experience with setting up a CityLab for the public to come by and share their thoughts and opinions. Such a method is high up on the 'ladder of participation,' as citizens can take more control over the process.

Category	Code	Excerpts from the interviews	Preliminary argumentations
PUBLIC PARTICIPATION PROCESSES	PpInv1 Involvement from citizens during public participation processes.	«I do not think it is about citizens not wanting to participate, but rather that many projects do not create enough engagement for citizens to feel like they want to be involved.» (Professional 4, April 3, 2020)	Many projects today are not able to create enough hype around the development, which makes the citizens less likely to involve themselves in the public participation process.
PUBLIC PARTICIPATION PROCESSES	PpInv2	«We cannot do much on the volumes of the projects, that is already decided on the municipal level. We, therefore, steer the public participation towards what should be in the first floors, the outdoor areas, and so on.» (Professional 2, March 27, 2020)	Citizen involvement should be focused on the aspects of the development that are easy to shape to their liking.
PUBLIC PARTICIPATION PROCESSES	PpInv3	«It is very important for the citizens living out there to have a proper public participation process.» (Professional 1, March 23, 2020)	Citizens must have a voice in the development of their neighborhoods. The more they are involved, the more they can influence.
PUBLIC PARTICIPATION PROCESSES	PpCom1 Communication during public participation processes.	«My impression is that those who have spent a lot of time addressing their concerns are very rarely heard.» (Citizen 1, March 23, 2020)	The citizens do not feel as if the initiators hear their concerns.
PUBLIC PARTICIPATION PROCESSES	PpCom2	«There is mostly monologue, rather than dialogue. When there is a public meeting, it is more like an information meeting than a public hearing.» (Citizen 1, March 23, 2020)	There has been a poor dialogue between the citizens and the initiators.
PUBLIC PARTICIPATION PROCESSES	PpPrT1 Problems with today's public participation processes.	«The Planning and Building Act could be even clearer on the need for early public participation and how it should be conducted.» (Professional 3, March 30, 2020)	The planning and Building Act should have legal provisions specifying the need for early participation from the public.

Table 4.1: Results 1-6

As one participant pointed out [PpInv2], the success of a public participation process depends on what the citizens can actually participate in deciding on (Professional 2, March 27, 2020). The Norwegian planning system is based on one or more municipal plans to set the ground rules. Plans developed by private actors must stay within these municipal plan policies to be approved. Thus, developers will rarely focus on volumes and size in the public participation processes conducted in the detailed plan, but rather on the contents of the buildings and surrounding areas. The municipal plans where the groundworks are laid can be several years old, and the public can, therefore, feel as they have not been heard if they were not involved at that time. However, as the detailed plans have to focus the citizen involvement towards the contents of the buildings, such as greenery and bike racks, the opportunity for the public to have actual participation increases. Allowing citizens to take near full control over what can be a 'small issue' for a large development company will yield benefits for both the company (improved reputation) and the citizens (right to decide).

As the planners will sometimes have to steer the public participation in the right direction to avoid wasting time and resources, it is even more crucial that a good dialogue between the public and the planners is established. If no dialogue is established, the citizens can perceive the 'steering' as a way to avoid the citizens' ideas and opinions. The argument made by Citizen 1 (March 23, 2020) in PpCom1 can be the result of such a mistake. If a clear line of communication is established, the developers can communicate to the citizens what they want feedback on and why. Our interviews showed a clear distinction between how the communication in the public participation processes at Fornebu has been perceived. The interviewed citizens pointed to poor

Category	Code	Excerpts from the interviews	Preliminary argumentations
PUBLIC PARTICIPATION PROCESSES	PpPrT2	«There is no doubt that municipal plans are an outcome of public participation, but in private initiatives, the impact public participation has on the plan depends on how early the public was involved.» (Professional 4, April 3, 2020)	The earlier the public is involved in the planning process, the more impact it will have on the outcome.
PUBLIC PARTICIPATION PROCESSES	PpPrT3	«I think vulnerable groups have difficulties with getting involved in public participation processes. Even though it is required to listen to children and youths, their voices often come in the end. Also, elders, where some have a strong voice while others are not heard.» (Citizen 1, March 23, 2020)	It is hard for marginalized groups to get involved in the public participation process.
PUBLIC PARTICIPATION PROCESSES	PpPrT4	«There have been public meetings where thousands of post-it notes have been used, but those who have participated in several of those meetings feel exploited.» (Citizen 1, March 23, 2020)	Most of the public participation processes use the wrong tools or use the tools incorrectly.
PUBLIC PARTICIPATION PROCESSES	PpPrT5	«It would always help if citizens could get a proper explanation because you are rarely able to quickly understand something like that by yourself. It is important to think about how to formulate, and not use heavy bureaucratic terminology. Most things can be said simpler.» (Professional 3, March 30, 2020)	Citizens struggle to understand bureaucratic terminology. Thus, when it is used, the public can misinterpret the meaning of a policy.
PUBLIC PARTICIPATION PROCESSES	PpPrT6	«I would say it is almost impossible for someone without the proper competence to read drawings and understand the important parts, such as distances and heights. You need a proper education to do that.» (Citizen 1, March 23, 2020)	Planning maps and illustrations give the public a wrong impression of how the area will look like in the future.

Table 4.2: Results 7-11

dialogue and said that the ideas and opinions from the public were rarely acknowledged. The professional participants pointed to their experience with public participation processes as good. They said that the citizens had been heard and that there was good communication between the developers and the public. This gap in experience could be explained by what expectations the different parties had for the public participation process, and what they would deem a successful process.

In chapter 2.1.4, we identified five main problems with public participation processes: The public’s role has become to react; planning maps and illustrations give the public wrong impressions of how the area will look in the future; most of the public participation processes use the wrong tools, or the use the tools incorrectly; marginalized groups are difficult to involve, and; planning policies are misinterpreted due to lack of proper explanation. Our participants identify the same five problems as problems and challenges they have faced themselves. If the public is involved too late in the process, there will not be enough time for them to climb the ‘participation ladders.’ One of the respondents [PpPrT1] pointed to the lack of early involvement in the Norwegian Planning and Build Act of 2008 (Professional 3, March 30, 2020). This correlates with the studies presented in Falleth and Hanssen (2017) and Hanssen (2013). According to research by Innes and Booher (2004) and Hanssen (2013), the methods applied in public participation processes are often not optimal. This is reaffirmed by one of the respondents, who felt that the methods they are being exposed to can be exploitative (Citizen 1, March 23, 2020).

The methods used in public participation are also important to give the citizens a proper explanation of

Category	Code	Excerpts from the interviews	Preliminary argumentations
PUBLIC PARTICIPATION PROCESSES	PpPrT7	«Most people do not get a proper impression of how tall buildings are when they see an illustration. They first see it when the buildings are there, and then it is too late. I, therefore, think 3D models are very important.» (Citizen 1, March 23, 2020)	Using models to present a development project will give the public a more precise understanding of the development than regular zoning maps and illustrations.
PUBLIC PARTICIPATION PROCESSES	PpCofG1 Characteristics of a good public participation process.	«You need to have multiple parallel methods for reaching out to different age groups and people with different needs.» (Professional 3, March 30, 2020)	A good public participation process is characterized by getting pinpointed opinions from the citizens.
PUBLIC PARTICIPATION PROCESSES	PpCofG2	«Public participation is important to create the urban floor. Architects and planners cannot remember everything, and the locals have important information to bring up.» (Professional 1, March 23, 2020)	A good public participation process is characterized by incorporating citizen knowledge.
PUBLIC PARTICIPATION PROCESSES	PpCofG3	«We are being very transparent in what we are doing, revealing everything in reports, and we had an open exhibition.» (Professional 2, March 27, 2020)	A good public participation process is characterized by increasing fairness and justice.
PUBLIC PARTICIPATION PROCESSES	PpCofG4	«It is about building trust. And I think we have managed that.» (Professional 2, March 27, 2020)	A good public participation process is characterized by getting public backing.
PUBLIC PARTICIPATION PROCESSES	PpCofG5	«It needs to be planned well. It is also important to start early, not postpone the public participation until a proposal is ready for a public hearing. The earlier stakeholders can voice their opinions, the more they can influence and present important information for the development of a plan.» (Professional 3, March 30, 2020)	A good public participation process is characterized by early involvement from the citizens.

Table 4.3: Results 12-17

what the development will entail. Planning terminology, zoning maps, and technical drawings can be hard for ‘the man in the street’ to fully comprehend. The citizens who struggle to grasp the contents of a plan may misinterpret it, which in turn may lead to bad relations between the citizens and the plan initiator. Presenting the public with 3D models early on was suggested by one of the respondents [PpPrT8] as a method for reducing confusion amongst the public (Citizen 1, March 23, 2020). The plan initiators also lose valuable information if the public does not understand certain aspects of the plan they are presenting. One of the characteristics of effective public participation is incorporating citizen knowledge (Innes & Booher, 2004; see chapter 2.1.3). This will yield benefits for both the public and the plan initiators, as reaffirmed by Professional 2 (March 27, 2020) [PpCofG3].

A plan initiator is a person who is behind a spatial plan and/or an urban development project.

Plan initiators also struggle to involve marginalized groups in public participation processes. These groups have different backgrounds, which makes them less likely to involve themselves in a public participation process voluntarily. One of the respondents [PpPrT3] told us that even though these marginalized groups are specifically mentioned in the Norwegian Planning and Building Act, their voices might not be taken into consideration until the very end (Citizen 1, March 23, 2020). This also relates to which methods are applied to the public participation process. If the public participation process does not use a method specifically aimed to involve marginalized groups, these groups will not be able to get involved as much as they have the right

Category	Code	Excerpts from the interviews	Preliminary argumentations
PUBLIC PARTICIPATION PROCESSES	PpSIml Suggested improvements for public participation processes.	«I must say that the Coronavirus has shown us that we can become even better in doing public participation digitally.» (Professional 2, March 27, 2020)	There should be more digitized methods in public participation to increase public access, as not everyone can contribute by physically showing up at a location for, e.g., a public hearing.
PUBLIC PARTICIPATION PROCESSES	PpSIIm2	«We need to try our best to create an engaging process, and even themes that are not as engaging just need the right packaging to become engaging.» (Professional 4, April 3, 2020)	Using other methods than what is commonly used today can increase the involvement from the public.
PUBLIC PARTICIPATION PROCESSES	PpSIIm3	«We have to make sure that the platforms we use are as available as possible to a variety of users.» (Professional 4, April 3, 2020)	Public participation should use different platforms to be able to involve all the citizens affected by the plan, no matter what precondition the citizens have.
PUBLIC PARTICIPATION PROCESSES	PpSIIm4	«I think there should be used several different methods for public participation for all groups to be included, and to help them express their needs.» (Citizen 1, March 23, 2020)	Public participation should use methods where citizens can express their individual thoughts and opinions.
PUBLIC PARTICIPATION PROCESSES	PpSIIm5	«The best public participation happens on the citizens’ premises. That is why we now have City Labs, where municipalities have a staffed office that is available for a longer period.» (Professional 3, March 30, 2020)	It is possible to achieve the best results from public participation when the citizens themselves can decide when they feel like contributing.
VISUALIZATION	ViFIIn1 The use of visualizations to give false information.	«I don’t think anyone uses illustrations to deliberately lie, but I think it is easy to use illustrations as an advertisement. In the illustrations I have seen for this area, there are no cars, and everything is very green and lively, but that is not how it is in practice. I much prefer 3D models that try to be more realistic.» (Citizen 1, March 23, 2020)	As visualizations get even more complex and real, the public can feel fooled when the finished project does not look like the visualizations.

Table 4.4: Results 18-23

to be. The public participation process will, therefore, end up not being as democratic as it could have been. One of the respondents [PpCofG1] called for a solution where several methods are being used for engaging citizens of different backgrounds (Professional 3, March 30, 2020). The plan initiators can, for instance, map out what citizens in the area are interested in and use methods where these interests can be combined with their own development. As Professional 4 (April 3, 2020) said [PpSIIm2], you «just need the right packaging.» To make sure that the plan initiators do their part in involving the public, the process needs to stay as open and transparent as possible. This will make the planning process more democratic and will build trust between the public and the developers, which again can increase public backing of the development.

4.1.2 Visualization: the importance of a correct presentation

Visualization is a significant part of presenting new projects today - both for developers to show the citizens what will be built and for citizens to provide feedback during the project's planning stages. As one respondent [Vilmp] said, illustrations might be used in public participation processes to show a concept for a development (Professional 4, April 3, 2020). The illustrations can enhance what the developer wants to focus on in the process, and that way, steer the feedback on the issues they want to be discussed and answered in the public participation process.

Category	Code	Excerpts from the interviews	Preliminary argumentations
VISUALIZATION	ViFIn2	«We make sure that our illustrations are 'subject to mistakes,' but we always strive to have true illustrations.» (Professional 1, March 23, 2020)	Visualizations need to be as realistic as possible. If the visualizations contain items that are uncertain to be in the real project, that needs to be clearly stated.
VISUALIZATION	ViFIn3	«I don't think it is a very big problem. We are not blinded by it, kind of. But I have seen the debate about the new Munch Museum. I think Oslo has even increased the requirements for submitted material so that the illustrations more clearly show volumes and are not glorified.» (Professional 3, March 30, 2020)	The municipality has a responsibility in making sure that the visualizations are used to increase the public's understanding of a project, not to glorify the development.
VISUALIZATION	Vilmp The importance of visualizations in spatial planning.	«We might use illustrations in a public participation process to enhance what we want to focus on in the process so that we get the answers we are looking for.» (Professional 4, April 3, 2020)	Visualizations can be used to aim the public attention to certain aspects of a project, but it needs to be clearly stated what those aspects are and why the illustrations are aimed that way.
COMPUTER GAMES	CgUSP1 Possibilities with the use of computer games in spatial planning.	«Maybe it can be used to reach out to citizens for public participation.» (Professional 1, March 23, 2020)	Computer games can be used as a new method for involving citizens.
COMPUTER GAMES	CgUSP2	«You can just as easily make a model in a computer game as with LEGO or cut wooden blocks.» (Professional 2, March 27, 2020)	Creating a model in a computer game is as easy as or easier than traditional methods.
COMPUTER GAMES	CgUSP3	«It can be useful for a dialogue between municipality and developer to test out something. You often develop several alternatives in the early stage of a planning process, and this could be used for reviewing the consequences and possibilities for the different alternatives.» (Professional 3, March 30, 2020)	Computer games can be used as a tool for communication between municipalities and developers during the planning stage.

Table 4.5: Results 24-29

Regarding the debate about whether such illustrations can be used to give false information, there are quite different answers. One respondent [ViFIIn2], who works for a private developer, said that they always strive to have truthful illustrations, while also making sure that the illustrations are ‘subject to mistakes’ (Professional 1, March 23, 2020). Even though illustrations might give citizens an expectation of what a project will look like when finished, not all aspects of the illustrations are realistic, and changes might happen. Another respondent [ViFIIn1] emphasized that it is easy to use illustrations for advertisement, where a project is presented as very green and lively, but that is not necessarily how it ends up in practice (Citizen 1, March 23, 2020). This respondent also said that more realistic 3D models are preferred. A third respondent [ViFIIn3] did not consider unrealistic illustrations to be a big problem, as it is usually possible to identify whether the different aspects of an illustration are realistic or not (Professional 3, March 30, 2020). It was also mentioned that Oslo municipality now has stricter requirements for submitted illustrations to more clearly show volumes and to not be too glorified. One example is the guidelines made by the Agency for Planning and Building Services that set demands for what the visualizations are allowed to show (Plan- og bygningsetaten, n.d.).

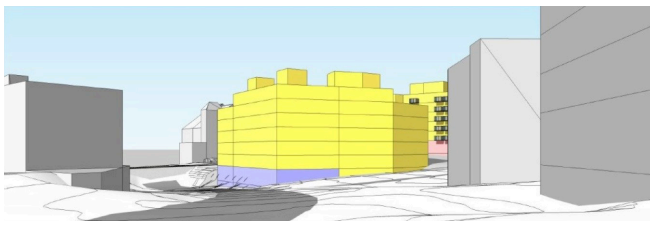


Figure 4.2: Visualization guidelines (Plan- og bygningsetaten, n.d.).

Category	Code	Excerpts from the interviews	Preliminary argumentations
COMPUTER GAMES	CgUSP4	«I think that if we manage to make it accessible, both as a tool for us to design, but also for people to observe and participate, then we can make something interesting.» (Professional 4, April 3, 2020)	Computer games can be used as a tool both for developing proposals and for public participation.
COMPUTER GAMES	CgUPp1 Possibilities with the use of computer games in public participation processes.	«I think some, those who are particularly interested, think it is fun. Especially adding or subtracting heights.» (Citizen 1, March 23, 2020)	Computer games are an entertaining way to experiment with small changes to a plan.
COMPUTER GAMES	CgUPp2	« <i>Minecraft</i> or something similar could be used for engaging certain groups. It is a low threshold method that many groups know about already.» (Professional 3, March 30, 2020)	Computer games are a low-threshold method for engaging more people in public participation.
COMPUTER GAMES	CgUPp3	«There shouldn't always only be one method which should work for everyone. Our experience is that you need to have several parallel tools to get the desired input. Elderly groups might prefer to attend public meetings, while children and youths might need to be approached where they are. This could definitely be used to reach those.» (Professional 3, March 30, 2020)	As an addition to traditional methods within public participation, computer games can be used to reach a broader audience.
COMPUTER GAMES	CgUPp4	«You can, for example, see how volumes will be in practice, how heights are to be distributed, the sizes of urban spaces, and how it will be to roam and stay between the buildings. This can be used in several rounds, like in the early stages to look at rough volumes, and then in the more detailed stages to look at the design and contents of the buildings.» (Professional 3, March 30, 2020)	Making a model of an area in <i>Cities: Skylines</i> allows the citizens to experience the proposed development.

Table 4.6: Results 30-34

4.1.3 Computer games: possibilities, main challenges, and comparisons to traditional methods

The perception of how computer games can be used in spatial planning and public participation processes is somewhat varying but mostly positive. Professional 3 (March 30, 2020) [CgUSP3] said that a computer game could be used as a communication tool between municipalities and private developers during the planning process of a project. It can be used as a simple and easy-to-understand way of visualizing different alternatives and the consequences they will have on the surrounding areas. As Professional 2 (March 27, 2020) [CgUSP2] pointed out, you can just as easily use computer games to do this as you can with Lego or wooden blocks, which is seemingly a quite common method in planning today. Furthermore, Professional 4 (April 3, 2020) [CgUSP4] argued that it can be used to reach out to the public, and for them to observe and participate in the planning process.

Professional 3 (March 30, 2020) [CgUPp3] stated that it is important not to have only one tool available during a public participation process, but rather a spectrum of different tools for reaching out to the different groups of the population. While the elderly might prefer public meetings, youths and children might prefer a more digital method for participation, such as a computer game. Some respondents also considered the use of computer games as a entertaining and exciting new method, which could further encourage the involvement of groups who are usually not interested in engaging in public participation. Here, one respondent mentioned

Category	Code	Excerpts from the interviews	Preliminary argumentations
COMPUTER GAMES	CgUPp5	«It would be exciting [if people could come up with their own proposals]. It depends on which stage, though. There needs to be set some premises about the technical guidelines, such as density, but the digital possibilities are definitely there.» (Professional 3, March 30, 2020)	Professionals need to be in charge of the process when using <i>Cities: Skylines</i> , to make sure that rules and policies are upheld as realistic as possible in the model.
COMPUTER GAMES	CgUPp6	«I think they would find it exciting, especially those who are interested and engaged in it. And others can probably become engaged in it if you just help them with getting started.» (Professional 3, March 30, 2020)	Using computer games in public participation can help to engage people who are interested in computer games.
COMPUTER GAMES	CgUPp7	«Gamification and computer games can engage the public in a participation process.» (Professional 4, April 3, 2020)	A model in <i>Cities: Skylines</i> will increase engagement from the public because it is entertaining to play a game that resembles the real-life area.
COMPUTER GAMES	CgPoU1 Positive sides of using computer games in public participation processes.	«It is like looking at Google Maps really, as it is built up in the same way. This is very visual. Very good.» (Citizen 1, March 23, 2020)	<i>Cities: Skylines</i> is easy to understand and is perceived as photorealistic.
COMPUTER GAMES	CgPoU2	«I think it looks pretty user-friendly and low threshold.» (Professional 3, March 30, 2020)	<i>Cities: Skylines</i> is easy to use.
COMPUTER GAMES	CgPoU3	«Some groups might find this very appealing, especially among youths and others, and you might get a huge engagement from some whom you don't usually hear from as much.» (Professional 3, March 30, 2020)	<i>Cities: Skylines</i> can increase the engagement from young citizens.

Table 4.7: Results 35-40

Minecraft as an example of a low-threshold and well-known program which could be used in such cases. Professional 3 (March 30, 2020) [CgUPp4] remarked that a computer game could be used in several different stages of a planning and/or public participation process. The user's ability to see the result before it is built, with volumes, heights, and experience of urban spaces, is a positive addition to public participation. In the early stages, the game could be used to look at rough volumes, while in later stages, it could be used for designing the details of buildings and urban spaces.

The use of computer games in public participation processes can also help citizens understand the contents of a project more quickly, as Professional 2 (March 27, 2020) mentioned [CgIUn2]. By using an interactive and user-friendly method, the citizens can see how a project will look without having to interpret zoning maps or the provided illustrations. Furthermore, both Citizen 1 (March 23, 2020) and Professional 3 (March 30, 2020) argued that the ability for the user to control camera angles can improve the citizens' interpretation of an area and understanding of remote effects, as well as giving them more ownership of it [CgIUn1 & CgIUn3].

All the respondents regarded the computer game as adequately realistic for the proposed use. Most of them immediately recognized the presented area, and some even pointed out where they lived or worked. One respondent [CgRea1] was surprised by the realism of the game and said it is almost like looking at a video (Citizen 1, March 23, 2020). Another respondent [CgRea2] praised the ability to easily change the weather or the time of day, as opposed to most illustrations only being shown in sunshine (Professional 3, March 30, 2020). This was also mentioned as a way for the user to 'get more ownership' of the visualization.

Category	Code	Excerpts from the interviews	Preliminary argumentations
COMPUTER GAMES	CgMCh1 Main challenges when using computer games in public participation processes.	«I think you are dependent on a lot of people to get engaged. You also need the competence and resources to analyze the results.» (Citizen 1, March 23, 2020)	The use of computer games requires additional resources for organizing the feedback and analyzing the results.
COMPUTER GAMES	CgMCh2	«I would be skeptical about launching a model like this early in the participation process, because it is too much, and you get feedback on all the things you do not want feedback on, which we have yet to decide on.» (Professional 1, March 23, 2020)	A model in <i>Cities: Skylines</i> should be used to highlight specific context you would want the public to contribute to.
COMPUTER GAMES	CgMCh3	«It might not be worth it if people have to spend an hour or so getting to know the game before they can contribute.» (Professional 2, March 27, 2020)	It will take some additional time for the citizens to learn the mechanics in <i>Cities: Skylines</i> before being able to participate.
COMPUTER GAMES	CgMCh4	«If OBOS, for example, wish to find out how to develop the seafront and develop an advanced program, and some people don't know how to use it, there is no point. There must be some form of training or demonstration.» (Citizen 2, March 31, 2020)	Not everyone can understand the full mechanics of computer games. It must be easy to use, and training must be facilitated.
COMPUTER GAMES	CgMCh5	«The dilemma is with professional knowledge. It is fun to build something in SimCity, but you can tear it down just as easily. Many things go into a development process, economy for instance.» (Professional 4, April 3, 2020)	The professionals must be able to control what people can and cannot alter.
COMPUTER GAMES	CgMCh6	«If the elderly get a quick guidance, I think they can handle many things.» (Professional 4, April 3, 2020)	The elderly need to get guidance to be adequately engaged.

Table 4.8: Results 41-46

The respondents also pointed out some concerns about using computer games in spatial planning and public participation processes. Citizen 1 (March 23, 2020) [CgMCh1] said that it is important to engage a lot of people to get adequate feedback. If there is too little feedback, the result can be altered in a way that only benefits the few who participated. This is arguably a challenge with today’s methods as well. To properly organize and analyze the feedback, there also needs to be sufficient knowledge and resources, which might require additional staffing compared to today. Another concern is the ability for citizens to utilize such programs. Citizen 2 (March 31, 2020) [CgMCh4] explained that if an advanced program is developed for use in public participation, some people might not know how to use it. There must be facilitated for sufficient training in using the program - or a presentation of it. Some of the other respondents also addressed their concerns regarding the elderly and the probability of a ‘digital barrier’ [CgMCh6]. However, they emphasized that also they can handle such a program if there is sufficient guidance (Professional 4, April 3, 2020). During the interviews, two of the professionals commented (Citizen 1, March 23, 2020; Professional 3, March 30, 2020) on the detailedness of the game, saying that if the method is launched too early in the planning process, it might stimulate feedback on irrelevant details which are not yet decided on. One example was the placement of trees, and another was the architectural details. Organizing and analyzing such feedback can be cumbersome if there is too much of it (Professional 1, March 23, 2020).

Compared to traditional methods for visualization, such as static illustrations, the respondents were consistently positive to our method. One respondent [CgCTM1] took notice of the simulated traffic, saying that car traffic is

Category	Code	Excerpts from the interviews	Preliminary argumentations
COMPUTER GAMES	CgIUn1 The possibility for computer games to help improve the citizens’ understanding of projects.	«It is very interesting that you can see things from different angles, especially if you are a neighbor. I think it gives a good visual impression.» (Citizen 1, March 23, 2020)	<i>Cities: Skylines</i> helps to improve the neighbors’ understanding of a project.
COMPUTER GAMES	CgIUn2	«I think the use of this game can make the public understand the development quicker.» (Professional 2, March 27, 2020)	<i>Cities: Skylines</i> helps citizens understand a project more quickly.
COMPUTER GAMES	CgIUn3	«It is very important [to be able to see a project from different angles]. It is required to illustrate remote effects, but with this, the user can get proper ownership of it. Also, that they can walk around and get an impression.» (Professional 3, March 30, 2020)	<i>Cities: Skylines</i> improves the illustration of remote effects, and gives the user control of what they want to see.
COMPUTER GAMES	CgIUn4	«When we sit down here, we see how uninviting it actually is, how wide the streets are, how much traffic there is. It is a good tool to visualize that, yes. [...] It does give a good understanding of volumes.»(Professional 4, April 3, 2020)	<i>Cities: Skylines</i> improves the citizens’ understanding of volumes and the human scale.
COMPUTER GAMES	CgRea1 Perception of the computer game as realistic.	«I think it is very realistic. I cycle and drive a lot in this area, and I was surprised. It is almost like looking at a video if you ask me. Very realistic.» (Citizen 1, March 23, 2020)	<i>Cities: Skylines</i> is a realistic recreation of the real area.
COMPUTER GAMES	CgRea2	«It does [give a good impression of volumes to be able to look around]. It is also very good that you can have different weather types. So that it is not always shown in sunshine, but that you can also have snowstorm and rainy weather. It can surely give them more ownership if they can control everything themselves.» (Professional 3, March 30, 2020)	<i>Cities: Skylines</i> is perceived as realistic because it gives a good impression of the surroundings and the atmosphere.

Table 4.9: Results 47-52

rarely included in project illustrations (Citizen 1, March 23, 2020). By having traffic movement, users can move around in an area and evaluate the perceived safety as a pedestrian, cyclist, or motorist. Another respondent [CgCTM2] argued that by using a computer game for visualization, more people will be able to understand the building volumes and distances in a proposal, as well as its connection to the surrounding areas (Professional 2, March 27, 2020). With the use of illustrations and zoning maps, this is difficult for anyone without the proper knowledge to interpret. Once again, the ability to move around and see a project from different angles was brought up by a respondent (Professional 3, March 30, 2020). This is a unique aspect of interactive 3D models and gives a new dimension to visualizations compared to illustrations. The comparison to *Minecraft* was also mentioned, with the respondent saying that although *Minecraft* is more well-known than *Cities: Skylines*, it is very abstract (Professional 4, April 3, 2020). *Cities: Skylines* provides the same level of detail as traditional 3D models, but the users can also control everything by themselves.

List of codes: n = number of references in the interviews.

PUBLIC PARTICIPATION PROCESSES

- PpInv = Involvement from citizens during public participation processes, n = 20
- PpCom = Communication during public participation processes, n = 17
- PpPrT = Problems with today’s public participation processes, n = 27
- PpCofG = Characteristics of a good public participation process, n = 20
- PpSIIm = Suggested improvements for public participation processes, n = 19

Category	Code	Excerpts from the interviews	Preliminary argumentations
COMPUTER GAMES	CgCTM1 Computer games versus traditional methods for visualization.	«Here you have living cars driving around, which you never find in any illustrations, as well as cycling paths and people getting on the bus. You can see dangerous areas and make up some thoughts around that, which I think is positive for both pedestrians and motorists.» (Citizen 1, March 23, 2020)	<i>Cities: Skylines</i> is more lively than illustrations, and makes it easier for citizens to interpret an area’s functions.
COMPUTER GAMES	CgCTM2	«More people can understand how different things are connected and understand the volume and distances.» (Professional 2, March 27, 2020)	<i>Cities: Skylines</i> is a better visualization tool to see how the city is interconnected.
COMPUTER GAMES	CgCTM3	«It is more detailed than <i>Minecraft</i> , which is very abstract. The advantage of <i>Minecraft</i> is that it is very well-known and feels sort of safe for some. This, however, has the same level of detail as the 3D modeling used today, but it being a game where you can control it yourself and be active is very exciting.» (Professional 3, March 30, 2020)	The level of detail in <i>Cities: Skylines</i> is higher and more realistic than in <i>Minecraft</i> , but the user-friendliness is lower.
COMPUTER GAMES	CgCTM4	«It is an interesting thought that you can see the project from wherever you want.» (Professional 4, April 3, 2020)	<i>Cities: Skylines</i> is a better visualization tool because the user can walk around in an area and see the simulation from any angle.

Table 4.10: Results 53-56

VISUALIZATION

- ViFIIn = The use of visualizations to give false information, n = 13
- ViImp = The importance of visualizations in spatial planning, n = 10

COMPUTER GAMES

- CgUSP = Possibilities with the use of computer games in spatial planning, n = 14
- CgUPp = Possibilities with the use of computer games in public participation processes, n = 18

- CgPoU = Positive sides of using computer games in public participation processes, n = 17
- CgMCh = Main challenges when using computer games in public participation processes, n = 23
- CgIUn = The possibility for computer games to help improve the citizens’ understanding of projects, n = 20
- CgRea = Perception of the computer game as realistic, n = 14
- CgCTM = Computer games versus traditional methods for visualization, n = 15

4.2 Cities: Skylines as a method for increasing public engagement

The finished model of Fornebu in *Cities: Skylines* is, in our opinion, adequately realistic for the intended use. The terrain, street layout, building placement, and vegetation give a clear indication of what the recreation is supposed to represent. The custom-made buildings help with providing a sense of recognition for those who are familiar with the area.

However, the model of Fornebu is not an accurate representation of reality. Most of the buildings are not similar in design to their real-life counterpart, and roads, including sidewalks, medians, and pedestrian paths, are not accurately represented due to limitations of the game. The game only provides a certain number of roads, and to compensate, we downloaded more from the *Steam Workshop*. However, none of them can adequately represent the real world. We chose the roads which we figured would best represent the actual conditions at Fornebu.

The point of the model is to give a representation of the surrounding building volumes. The custom-made landmark buildings are made to preserve the sense of place, which is essential for the public to understand their surroundings. In addition to modeling custom-made buildings, it is also possible to model custom roads. However, we decided not to do this, as it would increase the time consumption considerably. The roads function as they do in real life, with pedestrians and cyclists utilizing their dedicated walkways and bike lanes, buses driving in bus lanes, and cars choosing the correct lane according to where they are going.

It is possible to improve the accuracy of the in-game model by adding more vegetation and props. However, this impairs the game's ability to run smoothly without stuttering, especially in large areas such as in our case.

Category	Code	Excerpts from the interviews	Preliminary argumentations
COMPUTER GAMES	CgUSP1 Possibilities with the use of computer games in spatial planning.	«I imagine the game can be used as a communication method, either between the developer and the municipality or between the developer and the public.» (Student 1, March 11, 2020)	<i>Cities: Skylines</i> can be used as a method for communicating thoughts and ideas.
COMPUTER GAMES	CgUSP2	«Computer games are nice to unwind with, at the same time as it stimulates to learn more about urban planning.» (Student 5, March 13, 2020)	Computer games, such as <i>Cities: Skylines</i> , can inform the public on planning processes.
COMPUTER GAMES	CgUSP3	«When people can see their neighborhood in the game, it might make them more engaged in the process.» (Student 5, March 13, 2020)	<i>Cities: Skylines</i> can aid the affected citizens in visualizing the development.
COMPUTER GAMES	CgUSP4	«I think we will see an increased use of computer games in spatial planning in the future.» (Student 1, March 11, 2020)	Technological advancement will make computer games more relevant in spatial planning.
COMPUTER GAMES	CgUSP5	«It is a nice tool for seeing how things will actually look with lights and shadows and such.» (Student 4, March 12, 2020)	Games can be used in planning as an alternative method for planners to visualize the development.
COMPUTER GAMES	CgUSP6	«I do not think that computer games can replace any traditional methods, like the zoning maps, for instance.» (Student 5, March 13, 2020)	<i>Cities: Skylines</i> will be most useful as an additional method to existing practices.
COMPUTER GAMES	CgMCh1 Main challenges when using computer games in public participation processes.	«It does not take long to learn the basic functions of the game. Even I who have little experience with computers understand the basic mechanics.» (Student 1, March 11, 2020)	The controls of a game such as <i>Cities: Skylines</i> are quite easy to understand and get a hold of.
COMPUTER GAMES	CgMCh2	«Making the models in-game will be extra work.» (Student 1, March 11, 2020)	<i>Cities: Skylines</i> will require extra resources allocated for building a model.

Table 4.11: Results 1-8

This is most likely not favorable to the slightly increased feeling of realism but can be done when working on a smaller area. We decided on a balance between performance and realism that we thought was suitable for use in public participation processes.

As it is nearly photorealistic, we believe that *Cities: Skylines* can be used as an alternative or a new method in public participation. We argue that the most interesting aspect of the method is to showcase different development proposals. This will require a model that is realistic enough for the citizens to recognize the area.

We did experience some problems during the process of recreating Fornebu in *Cities: Skylines*. The game crashed a few times due to a lack of available RAM, but uninstalling some large and unnecessary assets helped with this problem. There were also some issues with mod compatibility where one mod would lead to unwanted behavior in another mod. This is, however, not surprising when considering that the mods are user-created instead of their features being integrated into the game by its developers. It is also worth mentioning that the game is already five years old, which is starting to show. Certain features and functions are visibly created for making the game compatible with older and less powerful computers and need renewal. The game also might not be fully optimized for newer computer components, which could lead to stuttering or crashes.

Our findings are largely confirmed by the outcomes from the interviews we conducted with planning students.

Category	Code	Excerpts from the interviews	Preliminary argumentations
COMPUTER GAMES	CgMCh3	«I think [the elderly] can be a bigger challenge, but that is mostly because they might not have computers or do not understand such programs. It would be easier, as an example, to have an area and a selection of buildings, and then ask them what looks best and how they would do it.» (Student 2, March 11, 2020)	Elderly citizens who have little knowledge with computers might struggle with the method of using <i>Cities: Skylines</i> .
COMPUTER GAMES	CgMCh4	«It would be harder for people to learn how to play the game rather than just watching someone play it, everyone can understand that.» (Student 3, March 12, 2020)	Not everyone can understand the full mechanics of computer games. The facilitators need to be experts in the game to be able to teach those who struggle to understand how the game works.
COMPUTER GAMES	CgMCh5	«All the buildings are glorified, they are too beautiful, it looks artificial. Not very realistic.» (Student 5, March 13, 2020)	The method of using <i>Cities: Skylines</i> can glorify a project.
COMPUTER GAMES	CgMCh6	«It is not like you can use the game to make a zoning plan.» (Student 6, March 13, 2020)	<i>Cities: Skylines</i> is not accurate enough for creating something that can be implemented directly in real life.
COMPUTER GAMES	CgUPp1 Possibilities with the use of computer games in public participation processes.	«I can imagine that by saying it is a computer game, people who usually are not interested will become interested. I also think that anyone interested in urban development and planning would find this very interesting.» (Student 2, March 11, 2020)	Computer games open up for new possibilities for planners to involve the public in a new way.
COMPUTER GAMES	CgUPp2	«I think that anyone can use it if they get guidance.» (Student 1, March 11, 2020)	It is important to have someone professional present if using the game during public participation events.

Table 4.12: Results 9-14



Figure 4.3: Apartment buildings at Fornebu (screenshot of Cities: Skylines, made by the authors).

4.2.1 Planning students and the use of *Cities: Skylines*

Our research shows that planning students are mostly positive towards implementing *Cities: Skylines* as a method in spatial planning. The arguments and reasonings vary, but the possibility of using the game as a method in public participation is frequently mentioned.

One of the arguments for using *Cities: Skylines* is its simple communicative approach. In the respondents' opinions, the game's visualization capability makes it a good tool for communicating different approaches to the development, it stimulates people to learn more about spatial planning, and it makes it easier for citizens to understand the proposed plan. Even though *Cities: Skylines* is a good visualization tool, some planning students argue that it cannot replace the traditional methods of planning. Instead, the game should be considered as an additional method for planning to showcase the proposed development better.

We interviewed both gamers and non-gamers when gathering data for our research. While they were playing the game, the difference in their experiences with it was not very obvious. The gamers adjusted more quickly to the game mechanics, while the non-gamers had to ask a bit more about the controls. Neither group experienced any significant difficulties with maneuvering the game, and neither had much trouble finding the items (such as buildings and roads) they wanted to place [CgMCh1]. They all liked how the game had a reasonably simple user interface with symbols for each category. However, they also argued that user interface could be even simpler, with fewer buttons

Category	Code	Excerpts from the interviews	Preliminary argumentations
COMPUTER GAMES	CgUPp3	«Maybe they can also submit their own proposals in a more visual way. It is very hard to use words to explain, but it can be more understandable if you can show it visually.» (Student 2, March 11, 2020)	<i>Cities: Skylines</i> can be used for the public to make suggestions that are hard to explain.
COMPUTER GAMES	CgUPp4	«I think it is very important that it is fun.» (Student 5, March 13, 2020)	A crucial factor in using computer games in spatial planning is to make the planning process engaging.
COMPUTER GAMES	CgUPp5	«I do not think that this is something you should shove down anyone's throat. It has to be voluntary.» (Student 5, March 13, 2020)	It is important to implement the method gradually to not frighten unexperienced citizens with methods they do not understand.
COMPUTER GAMES	CgUPp6	«Perhaps you would get more engagement around planning. I personally got interested in planning through games.» (Student 6, March 13, 2020)	City building computer games, such as <i>Cities: Skylines</i> , can spark an interest in planning.
COMPUTER GAMES	CgPoU1 Positive sides of using computer games in public participation processes.	«You get respect for the dimensions and understand the scale of buildings and undeveloped areas. It is easy to navigate.» (Student 2, March 11, 2020)	<i>Cities: Skylines</i> can be a good method for visualizing the proposed development.
COMPUTER GAMES	CgPoU2	«I think citizens would be more positive to different projects if they could use this game to actually see what the development will look like.» (Student 3, March 12, 2020)	<i>Cities: Skylines</i> can improve citizens' perception of a project.
COMPUTER GAMES	CgPoU3	«I think that it is easier for people to imagine how it will be in the future with the use of this game rather than 2D maps.» (Student 6, March 13, 2020)	<i>Cities: Skylines</i> is more understandable than traditional methods of visualization: zoning maps.

Table 4.13: Results 15-21

and options. The participants pointed out that elderly citizens who are inexperienced with computers can be excluded. A solution some respondents mentioned was that the citizens who find computer troublesome could watch someone more experienced play it instead, or that they could get guidance from professionals.

An important aspect of using *Cities: Skylines* as a method in spatial planning is that it should be entertaining to use. If so, the public might be more eager to be engaged in public participation processes. Additionally, it could create a positive reputation for participating in planning processes, which could further engage more citizens. One of the students told us that city-building games, such as *Cities: Skylines*, is one of the reasons why he became interested in spatial planning. If *Cities: Skylines* can make more people interested in the processes surrounding spatial planning, you could end up with more successful public participation processes and thus better plans for development. However, it is important to remember that not everyone is purely positive towards such a method. It is, as one of the respondents [CgUPp5] pointed out, important that people have enough time to process the technological development. Also, using *Cities: Skylines* as a method in planning should be voluntary. If such methods are applied without public backing, it can backfire, leaving the public participation process with even less citizen involvement.

Creating a model of an area in *Cities: Skylines* gives the users, whether they are planners or part of the public, a better understanding of volumes and distances. In our research, several respondents [CgPoU2 and CgPoU3] pointed out that it would be easier to understand the development in a 3D model, such as the one we made in *Cities: Skylines*, than with traditional maps and

Category	Code	Excerpts from the interviews	Preliminary argumentations
COMPUTER GAMES	CgIUn1 The possibility of computer games to help improve the citizens' understanding of projects.	«For example, a planner can make the proposal in the game and then show it as a 3D-model at different hearings instead of drawings which citizens often do not have enough knowledge about to understand fully.» (Student 1, March 11, 2020)	<i>Cities: Skylines</i> can help improve the citizens' understanding of a project in a public participation process.
COMPUTER GAMES	CgIUn2	«It is very easy to understand the different scales in the model because you know how big a truck is and can compare the other things to that.» (Student 1, March 11, 2020)	<i>Cities: Skylines</i> can give its users a better understanding of the scales of an area.
COMPUTER GAMES	CgIUn3	«You can visualize different concepts. People can walk between the buildings and experience the spaces and how they will look. If they live in a house nearby, they can view the project from their house and see how it would affect them. I often feel like the lack of visualization and people not knowing what will happen is the biggest disadvantage, and often a reason for why people are negative towards dense development.» (Student 2, March 11, 2020)	As you can 'walk around' in-game, you get a new view of how the project will turn out.
COMPUTER GAMES	CgRea1 Perception of the computer game as realistic.	«I am not very familiar with how Fornebu looks in real life, but it looks very realistic.» (Student 4, March 12, 2020)	<i>Cities: Skylines</i> is a realistic recreation of the real area.
COMPUTER GAMES	CgRea2	«It is kind of realistic, because how the different services work and such, you get a sense of how the city itself works.» (Student 1, March 11, 2020)	The simulation of normal city life makes the game more realistic.
COMPUTER GAMES	CgRea3	«I think the game can be very effective in getting people interested in planning because it is so realistic.» (Student 1, March 11, 2020)	The game can make people interested in planning because it can recreate a real-life area realistically.

Table 4.14: Results 22-27



Figure 4.4: An intersection at Fornebu (screenshot of Cities: Skylines, made by the authors).

illustrations. This correlates with the findings by Rooth (2018), as mentioned in chapter 2.1.4. One respondent [CgIU1] voiced that a model in *Cities: Skylines* could be used as an alternative to traditional visualizations shown at public hearings, which could potentially improve citizens' understanding of a development. The model in *Cities: Skylines* can also bring a personal perspective into the process by allowing the citizens to choose their point of view, such as from their backyard or their favorite hiking trail.

Making the model is not problem-free. It requires that the initiator allocates extra resources for creating an additional visualization method. Regarding whether or not the model was perceived as realistic, the respondents generally gave positive responses. However, one student voiced that the model was too glorified and that the model looked artificial. When asked why, he elaborated that there was too little dirt, too few stains, and not enough imperfection. This is, however, not unlike the usual visualizations used in planning today. *Cities: Skylines* provides a simulation, which the respondents [CgRea2] found to add realism to the model. They argued that it makes it easier to see the relations between the different elements, as well as seeing the city services at work.

Compared to other visualization methods used in spatial planning today, our research finds that *Cities: Skylines* is superior to many of them. The respondents identify the combination of simulation, realism, control of movement, and a simple user interface as the key elements making *Cities: Skylines* a worthy contestant as a method to engage more people in public participation.

Category	Code	Excerpts from the interviews	Preliminary argumentations
COMPUTER GAMES	CgRea4	«The combination of visualization and simulation makes it look realistic, which then makes the game more fun to play.» (Student 6, March 13, 2020)	The realism makes the game more entertaining to play.
COMPUTER GAMES	CgCTM1 Computer games versus traditional methods for visualization.	«It is a positive attribution that you can go down on the ground level and see what the development will look like from your own garden.» (Student 1, March 11, 2020)	<i>Cities: Skylines</i> is a better visualization tool because you can walk around and see the simulation as if it was real life.
COMPUTER GAMES	CgCTM2	«It is kind of like flying in Google Earth with VR-glasses.» (Student 1, March 11, 2020)	<i>Cities: Skylines</i> resembles technology that uses real-life images.
COMPUTER GAMES	CgCTM3	«The simulation illustrates how cities flow, something you might not think about when just looking at a map.» (Student 3, March 12, 2020)	<i>Cities: Skylines</i> is more user friendly and quicker to learn than some professional software might be.
COMPUTER GAMES	CgCTM4	It is easier to use than <i>SketchUp</i> .» (Student 3, March 12, 2020)	<i>Cities: Skylines</i> is more user friendly and quicker to learn than some professional software might be.
COMPUTER GAMES	CgCTM5	«I think it is fun to try out different scenarios in the game, and it costs nothing but time.» (Student 5, March 13, 2020)	You can try out complete scenarios of everything from small to large areas in <i>Cities: Skylines</i> .
COMPUTER GAMES	CgCTM6	« <i>Cities: Skylines</i> can show a much more realistic illustration than today's visualization methods can because you can change factors such as the weather and the sun yourself.» (Student 6, March 13, 2020)	The model can, through its simulation, show the development in different contexts.

Table 4.15: Results 28-34



Figure 4.5: Overview of Fornebu with the game's user interface (screenshot of Cities: Skylines, made by the authors).



Figure 4.6: The area at Fornebu the participants were asked to develop during the action research (screenshot of Cities: Skylines, made by the authors).

4.2.2 Our experience from interviewing the students

Our experience from the action research was mainly positive. The participants all had a positive tone towards using the game and went into the project with an open mind. The participants asked questions and based their actions on their own thoughts, the feedback they received from us, and what the game allowed. The participants seemed genuinely interested in the game. Some of the participants who had never played the game before thought that the hour we had set aside for the gameplay was too short and wanted additional time. We experienced participants who became so engaged in the game that they forgot to answer some questions in the interview. Some of the participants were not familiar with the case area, Fornebu. However, that did not seem to be stopping their engagement as they were generally interested in how the area would be developed.



Figure 4.7: Development scenario by a student (screenshot of Cities: Skylines, made by the authors).



Figure 4.8: Development scenario by a student (screenshot of Cities: Skylines, made by the authors).



Figure 4.9: Development scenario by a student (screenshot of Cities: Skylines, made by the authors).



Figure 4.10: Development scenario by a student (screenshot of Cities: Skylines, made by the authors).

5

Discussion

In this chapter, we will discuss the results we have presented. Our research shows that some of the problems faced by public participation can possibly be improved upon by using *Cities: Skylines*. Our findings suggest that using *Cities: Skylines* in a planning context can increase the public's understanding of a project and can be a good method for increasing involvement from citizens in a public participation process. We will discuss our findings thematically and combined before discussing them in relation to our research question. Our research question is as follows: How can simulation and visualization with the use of computer games be used in spatial planning to increase the degree of public participation?

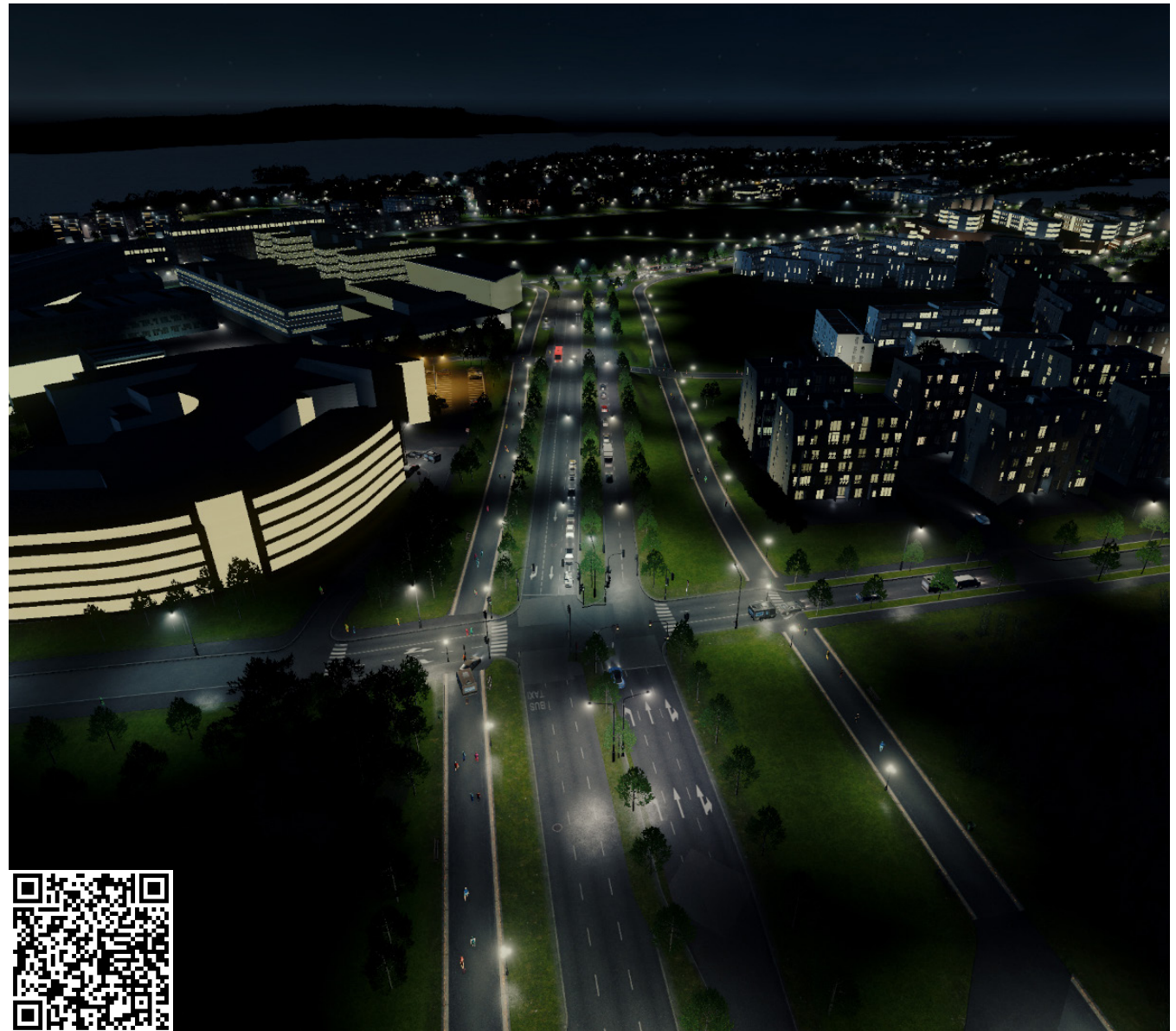


Figure 5.1: The main street at Fornebu at night (screenshot of *Cities: Skylines*, made by the authors).

5.1 The literature review and the perspectives from the interviews

5.1.1 Involving the citizens in public participation processes

An effective public participation process needs to engage citizens who are affected by urban development. To do this properly, the methods used in public participation must be engaging enough for the citizens to want to be involved. The methods should be entertaining and interesting, they should be relatable for the citizens participating, and they should be including the variety of people who are affected by the development. Perhaps most importantly, planners need to secure the public's right to decide. However, if the result does not reflect the process and does not embrace the public's concerns, ideas, and input, then the public participation process has failed. The public needs to see that the time and resources they put into the process are reflected in the outcome of the development.

Which methods are deployed in the public participation process reflects how much influence the citizens have. If the plan initiators want a high degree of public involvement, they should deploy methods that delegate power to the citizens to make the decisions. If the developers want little influence from the citizens, they might stick to informing and consulting with them, as the law does not require any further involvement than that (Falleth & Hanssen, 2017). The municipalities can set higher standards for a development than what the law requires. By doing so, they can increase the involvement from the public, which will benefit all stakeholders. The larger municipalities and cities have begun setting higher demands for plan initiators to involve the public in the early stages of planning processes. Additionally, some large private developers have begun to cooperate

with experts in public participation to conduct more effective public participation.

When involving the citizens, the plan initiators must establish a clear line of communication. That way, misunderstandings can be avoided and will not affect the rest of the public participation process. Misunderstandings are also problematic when it comes to the methods deployed to involve the citizens, especially regarding how the public should interpret an urban development. Not everyone can read a map, let alone a zoning map with codes and colors, which could confuse even some planners. Therefore, it has become customary to make visualizations of the development, so that the public can more easily understand what it will look like when finished.

5.1.2 The strengths and shortcomings of today's visualizations

As mentioned in the literature review, there is an ongoing debate on whether or not developers make unrealistic visualizations to 'sell' projects to the public (Slettholm, 2019; Hem, 2019; Schwencke, 2019). The debate raises issues regarding what the visualizations should depict. During our interviews, private developers stated that they might make unrealistic visualizations to steer the focus in a public participation process. It was also admitted that, even though they aim to be as realistic as possible, the visualizations could be renderings of how the project would look several years into the future. The question is whether or not they should continue doing this, and what could be improved to satisfy all parties.

An unrealistic visualization is a depiction of a development project that does not reflect how the project is likely to end up looking.

As visualizations are important for informing the public, it should still be customary to use them. However, it should be more evident that they are depictions. The plan initiator will often be honest that the visualizations are not necessarily 100% realistic or correct. The problem is, for example, when newspapers use the visualizations on a debated issue without clearly pointing out that they can be unrealistic. When that is what the citizens imagine the area will look like, they can be quite disappointed when the development is finished and does not look like the visualizations.



Figure 5.2: Renderings and real life: Munch museum (estudio Herreros & Steinar Dyrnes, 2009 & 2019).

5.1.3 Implementing new technology in spatial planning

To offer an alternative to traditional methods for visualizing development projects, we believe that new technologies will offer the public a more realistic picture while also increasing their understanding of a development. Web 2.0 platforms, GIS-based data collection, smartphone apps, and digital 3D models can aid in collecting information from traditional methods in public participation. These methods are: Public meetings, which through Web 2.0 platforms can be held online; surveying areas, which GIS can help to structure and present, and mobile apps can help to gather, and; making three-dimensional models, which digital 3D modeling has made quicker, easier, and more accessible.

The advancements in computer technology during the past decades have facilitated new methods to be used in spatial planning. Both GIS and 3D models are commonly used for illustrating and visualizing plans and projects today. However, it is difficult for citizens to understand such methods properly, and they might not produce the most realistic or best visualizations. Computer games can be an alternative to such methods, increasing the public's understanding of projects through interaction and simulation, as opposed to the static illustrations usually presented today. Our respondents were mostly positive towards this technological advancement.

5.1.4 Using computer games to improve public participation

Computer games can play a vital role in combining the methods used in public participation. As city-building computer games have become faster, better, and more realistic in the last few years, it is now possible to replicate an area in great detail. However, some of the professional respondents were not entirely convinced that they would use the game in public participation, as the realism of it would make the participants focus on every aspect of the model and not only what they want to steer the involvement towards. This is a challenge for not only the initiators but also the citizens. Public participation would be more effective if the citizens could spend more time on the aspects that they actually have a say in. Because of how the Norwegian laws and the planning system currently are, developers could ignore much of the feedback, especially if the municipality and the politicians are positive towards their proposal.

The adoption of computer games in spatial planning will be a new and entertaining way for planners to both develop and present proposals. Our research shows that computer games are easier to use than many traditional 3D modeling programs, making them more low-threshold to learn and to utilize in spatial planning. Simple menus, symbols, and icons contribute to making a user-friendly interface, as opposed to the plethora of menus with text and options commonly seen in computer software.

However, some concerns were also raised regarding increased demand for training for planners, which will increase expenditures. By implementing an additional

program, planning might take even more time than by only using today's methods, requiring more time and resources during the process. A possible solution to this is to replace one of the programs used today. However, there is not much point in replacing one method with another if they produce the same results. There needs to be sufficient training in the use of the computer game for both planners and citizens to be able to take full advantage of it.



Figure 5.3: Minecraft being used as a method in public participation (Block by Block, n.d.).

5.2 The respondents' and the authors' perspectives on using *Cities: Skylines* in spatial planning

5.2.1 Creating the model in *Cities: Skylines*

The automatic generation of the base map resulted in a low level of accuracy for the terrain, while coastlines and underwater terrain features were not represented whatsoever. Thus, extensive manual modification was needed, consuming some additional hours. This step could be simplified by using a GIS application to generate a heightmap based on official terrain data from the appropriate mapping authority. However, we decided not to do this due to limited knowledge and resources. With access to high-resolution terrain data and proper GIS knowledge, it is possible to achieve higher accuracy for the initially imported terrain. However, we are not sure how much the model would benefit from this, as the terrain is rarely a focus area in a public participation process.

Cities: Skylines contains a certain selection of roads, streets, paths, and other networks to choose from. However, these networks are not necessarily similar to the infrastructure you want them to represent, which was the case for us. Fortunately, a vast number of additional networks can be downloaded from the *Steam Workshop*, of which we downloaded the ones that most closely represent the different types of infrastructure at Fornebu. These networks are user-created, meaning it is possible to create accurate 3D models of the real-life infrastructure and use them in the game. However, this was also a matter of knowledge, and the time needed for learning how to do it was considered to be too much for this project.



Figure 5.4: The model of Fornebu with terrain and road layout (screenshot of *Cities: Skylines*, made by the authors).



Figure 5.5: The road selection menu of the game's user interface, showing some of the available road types (screenshot of *Cities: Skylines*, made by the authors).

We argue that anyone with 3D modeling experience can recreate buildings from real life for use in *Cities: Skylines*, if given instructions. Although finished in-game buildings are not as detailed as most traditional 3D visualizations, they are adequately detailed for the overall realism of the game. Additionally, if the developer of a project provides 3D models, they can easily be converted for use in the game.

Compared to other methods for 3D modeling, it can be relatively quick and easy to make a model of an area in *Cities: Skylines*. This model can then be used at a public hearing to collect data from the public by conducting a virtual survey of an area. *Cities: Skylines* brings additional ways to improve on the methods deployed in the public participation process. By allowing citizens to control the mechanics of the game, they can act as urban planners in their own neighborhoods. They can decide for themselves where they want to place various items, such as buildings, roads, and parks, which the planners can then gather as feedback.

In our opinion, it is hardly manageable to recreate an area realistically in *Cities: Skylines* without downloading additional user-created items from the *Steam Workshop*, as the included vanilla buildings are far too few to replicate many real-life buildings. On the one hand, having such few buildings compromises the game's realism, as finding the necessary buildings, roads, and other assets and modifications for making an area as realistic as possible requires additional time and knowledge. On the other hand, having certain limitations in the game makes it more widely available, as people with a slower computer can also play the game. Meanwhile, those who aim for perfect realism have the ability to create mods and assets themselves, thus increasing creativity while also providing more assets to the game than its original developers can.



Figure 5.6: The Portal Building (Portalbygget) and simulation of traffic (screenshot of *Cities: Skylines*, made by the authors).



Figure 5.7: A residential area with row houses at Fornebu (screenshot of *Cities: Skylines*, made by the authors).

The overall level of detail in *Cities: Skylines* is lower than what is usually seen in 3D illustrations, with buildings, vegetation, and furniture being more low-poly. This is mostly because of restrictions in computer power, as the game needs to do a lot more calculations due to the simulation. We believe that with further advancements in computer technology, it will be possible to create models of even higher levels of detail, eventually leading to it being fully photorealistic.

The model in *Cities: Skylines* was created with the simulation in mind. Speed limits, traffic lanes, and walking paths were mostly modeled after the real area, but with slight differences to accommodate the game's functionality. This resulted in a functioning simulation of traffic volumes and patterns without any major congestion. However, the simulation of traffic volumes and patterns does not necessarily mirror reality, which can lead to people being distracted by it. It is also important to not base decisions on the virtual citizens' routines and preferences, but instead on what the real citizens would do and like.



Figure 5.8: A residential area at Fornebu as seen from ground level (screenshot of *Cities: Skylines*, made by the authors).

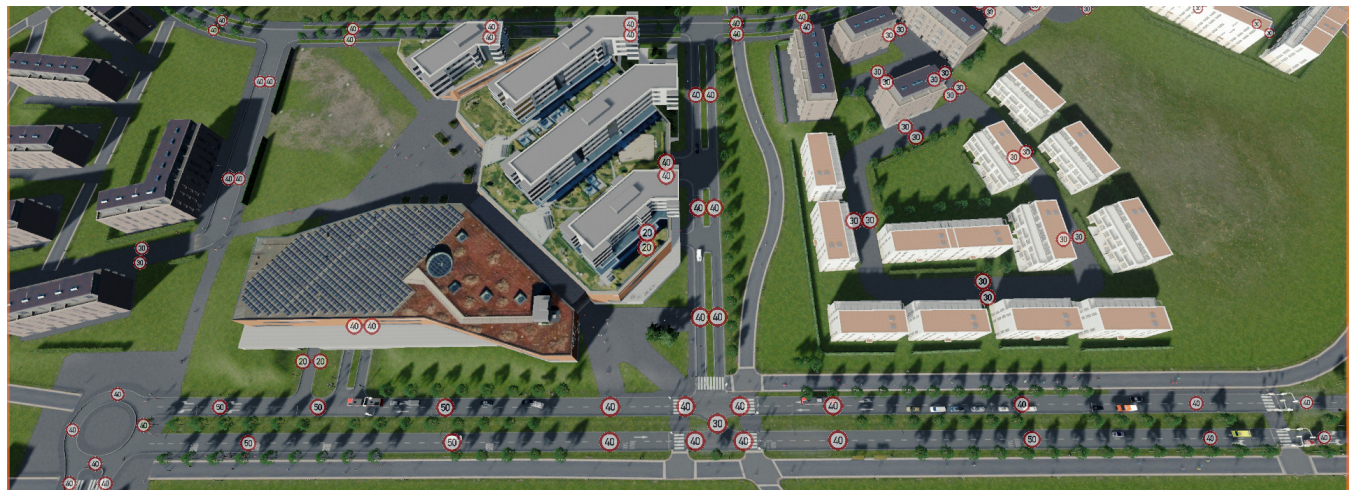


Figure 5.9: The speed limits are set using the mod Traffic Manager: President's Edition (TM:PE) (screenshot of *Cities: Skylines*, made by the authors).

5.2.2 The opportunities and obstacles of using *Cities: Skylines* in public participation processes

We believe that *Cities: Skylines* is the most realistic city-building computer game on the market as of spring 2020. We therefore also believe that it is the most suitable computer game for use in spatial planning. The game has a simple user interface, which we argue will allow all groups of the public to engage in this method, though they will require varying guidance depending on their technical competence. We also argue that *Cities: Skylines* will make urban developments much more understandable for the general public, and will engage younger citizens much more than today's methods can. The game has the opportunity to engage citizens in every category in the 'ladder of participation': it can act solely as a model for informing the citizens; plan initiators can use it for consulting the public about projects; it can be used to create dialogue and initiate engagement with the public, and; citizens can be allowed to design an area by themselves with advice from planners. However, all of this depends on the professionals' capability of understanding all aspects of the game, making them available as guides for citizens wanting to either maneuver the model or develop their own proposals.



Figure 5.10: Fornebu S, a shopping center with apartments (screenshot of *Cities: Skylines*, made by the authors).



Figure 5.11: Soccer fields and apartment buildings (screenshot of *Cities: Skylines*, made by the authors).

CHAPTER 5 - Discussion

Even though *Cities: Skylines* is not completely photorealistic, it is arguably more true-to-life than the majority of traditional 3D visualizations used in spatial planning today. This is because the game's real-time visual features, such as sunlight, shadows, and illumination, as well as the ability to adjust the time of day and the weather, give *Cities: Skylines* a unique potential for visualizing areas in a user-friendly, interactive, and realistic way. Such opportunities already exist in traditional visualization programs, but what makes *Cities: Skylines* unique compared to those is the user's ability to interact.

The interaction is done through controlling not only camera angles, but also the time of day and the weather. By giving the user control over camera angles, they can view a project from wherever they want, such as their own house. Thus, some of the developers' power over project visualizations is distributed back to the citizens, who are no longer limited to the predetermined perspectives. By adjusting the time of day, the user can experience shadow- and daylight conditions. This is usually not visualized in project illustrations, except for simple shadow analyses, and can shed light on various new aspects of a proposed project. Experiencing a simulation of an area at night can help the users get a perception of its feeling of safety or danger, and might contribute to improving a proposal. Changing the weather type can also provide a more realistic and honest presentation of a project, showing how it will look not only on days with clear skies in the summer but also on days with rain or fog or in the winter.

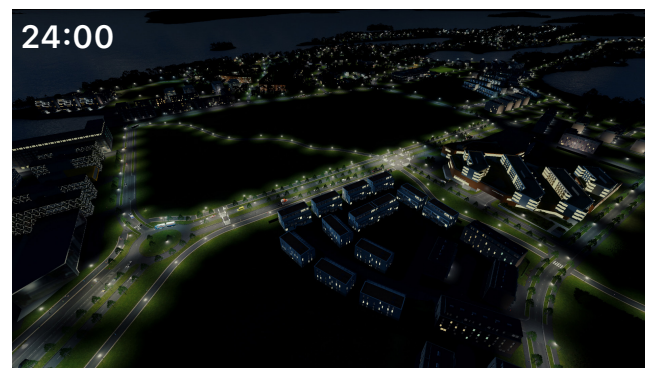
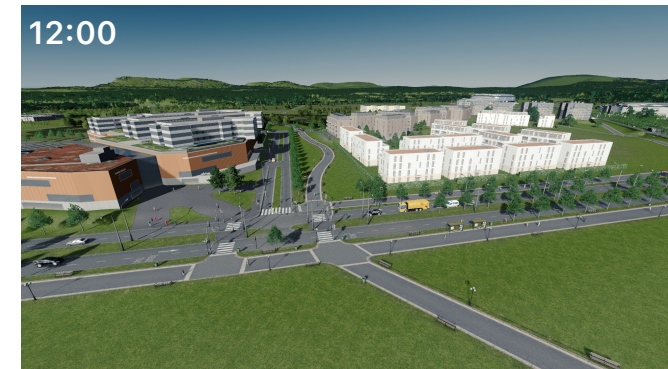


Figure 5.12: The model of Fornebu at different times of day (screenshots of *Cities: Skylines*, made by the authors).

In the interviews, the respondents found *Cities: Skylines* to have interesting properties, and could imagine its implementation in spatial planning and public participation processes. *Cities: Skylines* adds another perspective to spatial planning by allowing a model of an area to be made and easily changed - possibly giving citizens more power in urban development.

Two of the professionals in our research were concerned about the use of a nearly photorealistic model in public participation. It could lead to citizens focusing their feedback on the wrong aspects of a plan, such as the size of a walking path or the placement of a tree, and not on the aspects they can actually have a say in.

Although it is crucial to involve citizens in the development, which will reap benefits for all involved parties, it is important to remember who the experts are. The planners, engineers, and architects have the expertise for determining where and how the physical structures should be placed. Most citizens are not aware of the considerations that form the foundation for decisions, and these considerations should be adequately communicated by the experts for the citizens to understand the background of their decision.



Figure 5.13: The square behind Fornebu S (screenshot of *Cities: Skylines*, made by the authors).

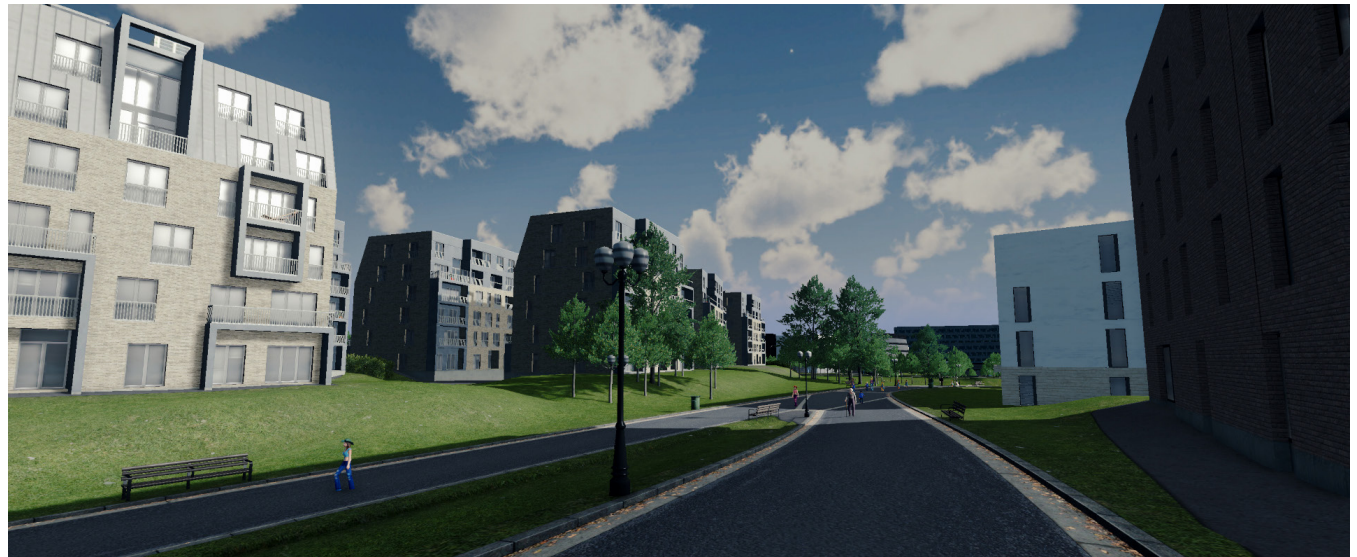


Figure 5.14: Pedestrian paths going between apartment buildings (screenshot of *Cities: Skylines*, made by the authors).

5.3 How our main findings answer to our research questions

5.3.1 Achieving an effective public participation process

Sub-question 1: How can we achieve an effective public participation process?

As the literature review suggests, characterizing the effectiveness of a public participation process is difficult, and the research is limited (Brown & Chin, 2013). However, we found that increasing the effectiveness relies on striving for the involvement of the public, using engaging methods that allow for the expression of opinions, and using understandable methods and language for presenting information. Additionally, the three examples of the 'ladder of participation' (see Falleth & Hanssen, 2017; Lane, 2005; Brown & Chin, 2013) tell us that more citizen involvement yields more influence for the citizens. If the effectiveness of a public participation process is to be determined by how much influence the public has, an effective public participation process would be one that manages to involve citizens as much as possible.

The Norwegian Planning and Building Act of 2008 requires public participation to be secured throughout the planning process (Plan- og bygningsloven, 2008, § 5-1). However, it does not require active involvement from the public, and it can thus be argued that the current law is not sufficient for securing effective and democratic public participation processes. Not actively involving citizens any further than what the law requires will, therefore, not make for an effective public participation process.

Citizens without knowledge in spatial planning will have trouble understanding the development just by

viewing zoning maps, as they are hard to interpret (Rooth, 2018). Using visualizations to showcase the proposal is a helpful tool for helping citizens understand the proposed project. However, the realism of such illustrations has been up for debate. If projects are not presented truthfully, the public is given a false impression of the plan they are supposed to give feedback on. Even if they are satisfied with what the illustrations show, the finalized project might not meet their expectations. This can lead to the public feeling ignored and thus being less willing to engage in other public participation processes. To reduce this problem, the actual expected outcome of a project needs to be communicated clearly and honestly in a way that the citizens can understand. Clear communication will increase the citizens' trust in the process and make them feel more involved, thus increasing the effectiveness of the public participation process.

Public participation processes are criticized for being mostly about monologue rather than dialogue, where citizens do not feel like they can ask questions or raise concerns. Various methods are sometimes used in such meetings, such as workshops with post-it notes, but our research showed that this is not considered to be enough. Additionally, not all groups of people can attend public meetings, or they feel that the method is not suitable for them. An effective public participation process must utilize several different methods to involve a broader spectrum of people. Marginalized groups, such as the elderly, youths and children, immigrants, and disabled, need to be reached in different ways that better suit them. Introducing more methods for involvement can potentially increase the time and money spent on public participation. However, we argue that it will also increase the engagement from citizens and, thus, improve the effectiveness of the public participation process.

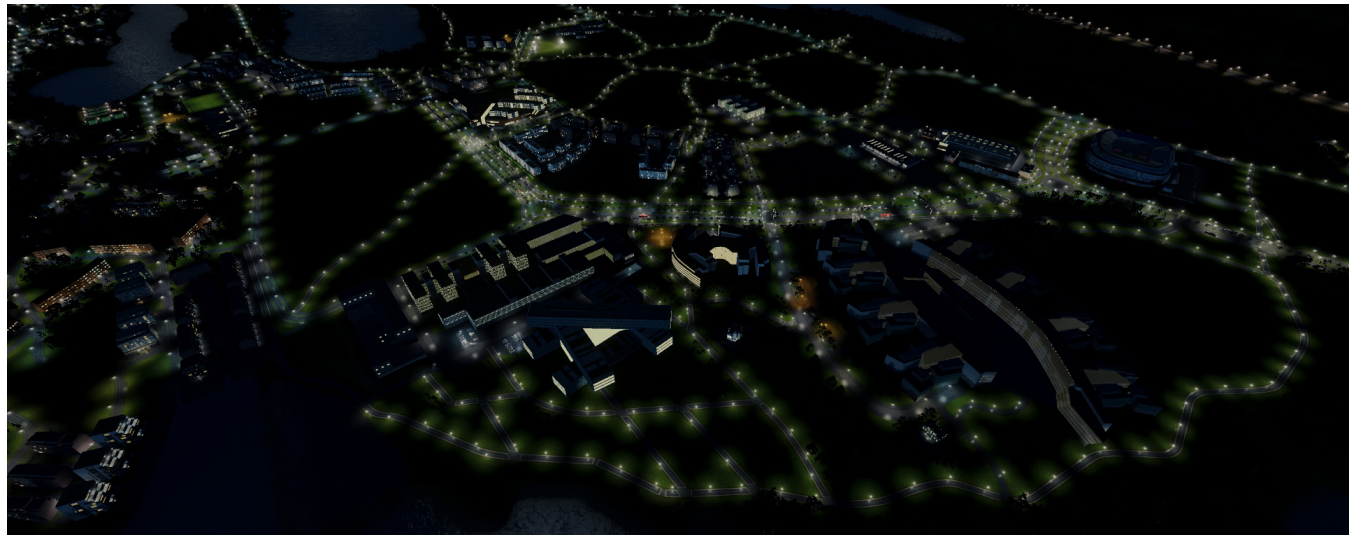


Figure 5.15: Bird's-eye view of Fornebu at night (screenshot of Cities: Skylines, made by the authors).

5.3.2 Increasing the public's understanding by using simulation and visualization in a game

Sub-question 2: How can a computer game's simulation and visualization increase the public's understanding of an urban development?

Unlike the traditional methods for visualization that are currently being used in public participation, computer games provide the ability for interaction. The ability to control certain aspects is a much-desired addition to visualizations in public participation processes, and it is argued in our research that it would increase the citizens' understanding of projects. By controlling camera angles, users can move around in an area and view proposed projects in relation to their desired locations. This can help to improve the perception of the human scale in an area, leading to an emergence of new opinions on a development's volumes and distances.

In addition to simulating the environment, *Cities: Skylines* also simulates the lives of its virtual citizens. The movement of pedestrians, cyclists, cars, buses, and emergency vehicles adds to the game's perception as realistic. Such a simulation is also an important aspect of how visualizations are perceived. When users interact with the in-game model, they can get an impression of how the surrounding areas will be experienced in real-life. If a change is made, such as adding a building or changing a traffic pattern, the simulation immediately adapts. This can increase the public's understanding of why things are done in a certain way.

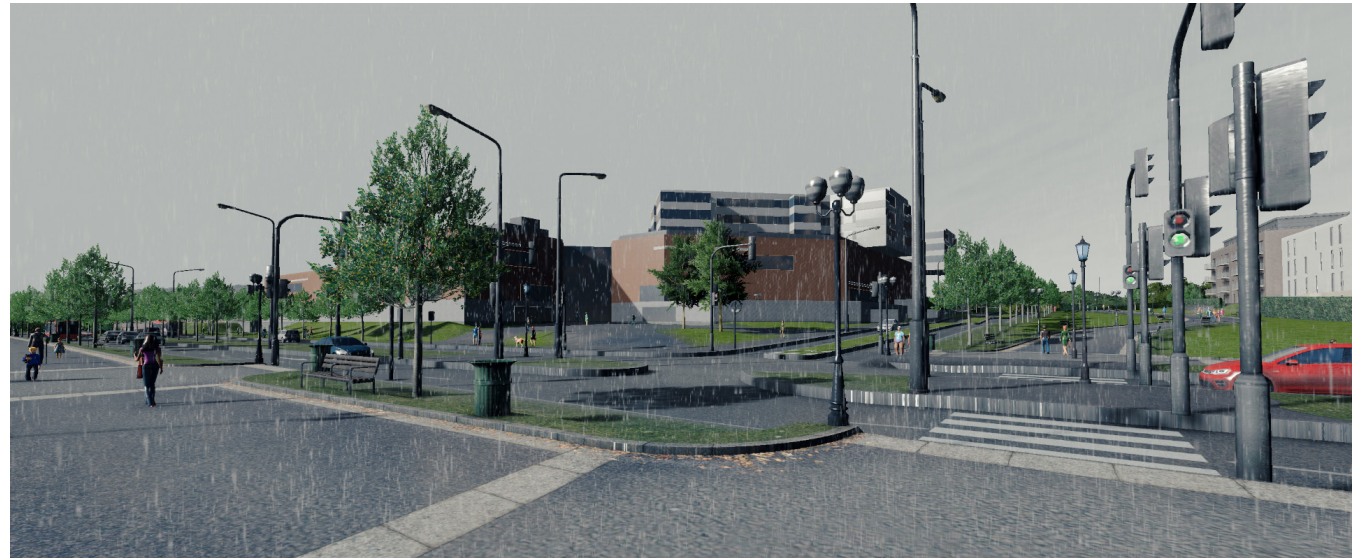


Figure 5.16: Daytime and rain outside Fornebu S (screenshot of *Cities: Skylines*, made by the authors).



Figure 5.17: Nighttime and rain outside Fornebu S (screenshot of *Cities: Skylines*, made by the authors).

5.3.3 Increasing engagement from the public by using computer games

Sub-question 3: How can computer games increase engagement in public participation processes?

Using computer games as a new method in public participation processes has a great potential for increasing engagement from citizens. Perhaps the most relevant category is city-building computer games such as *Cities: Skylines*. As our research suggests, this can be used as a new and entertaining way for planners to develop and present proposals and for citizens to view and interact with proposals. For planners, creating a model of an area in *Cities: Skylines* is not presumed to be any more problematic or time-consuming than creating traditional 3D illustrations, and it has several advantages for the citizens.

If a proposed project, along with its surroundings, is modeled in *Cities: Skylines*, it can be presented in other ways than just public hearings; it can also be used at City Labs, presented online, or downloaded to one's own computer. This way, citizens will have more ways of engaging in the process, and it can be done on their own terms. The game can be used by the citizens to develop their opinions on a proposal and give feedback or to modify the model by themselves and present an alternative proposal. It is often easier to present thoughts and input visually than with words, making it less complicated for the citizens to engage in the public participation process.

The population group that might benefit the most from the use of computer games in public participation is the younger generation. These are often difficult to involve in planning processes as they rarely find it interesting or worthwhile. However, introducing a more entertaining method can help to involve them in a way that they find interesting. We believe that many younger citizens will be interested in using a computer game in a public participation process, as it is something they are familiar with and experienced with.

One issue is regarding the elderly, of which some might be capable of using such technology, while others have a 'digital barrier' preventing them from using the computer game. Although the elderly are not the primary target group of this method, we argue that the introduction of computer games in public participation processes will not decrease the involvement from the elderly. This is because other methods of public involvement would still exist. Additionally, with the right guidance, the elderly will also be able to engage by using computer games.



Figure 5.18: The main street at Fornebu with the simulation of traffic (screenshot of *Cities: Skylines*, made by the authors).

5.3.4 Improving public participation processes by using computer games for simulation and visualization

Main research question: How can simulation and visualization with the use of computer games be used in spatial planning to increase the degree of public participation?

Visualizing projects is an essential part of public participation and is directly related to the first categories of the ‘ladder of participation,’ where both public access and informing the public are important in public participation. Having good visualizations of a development will increase the public’s understanding of it, leading to more involvement from the public. The more the public is involved, the higher their influence on the development will be.

However, most visualization methods used in spatial planning today are static and have no movement or ability for interaction. Adding simulation can make the visualizations more realistic, as it can better depict the urban vitality of an area. It also gives the viewer a reference point in the visualization, making it easier to comprehend the volumes of the project. The simulation can lead to a better understanding of the presented visualizations, providing the public with more knowledge about the development and making it easier for them to contribute with feedback for the plan initiator.

We argue that computer games can increase the degree of public participation in spatial planning. Computer games have the possibility to engage more people in public participation processes, as it is a new and entertaining way of contributing to the development of their neighborhood. When we talk about increasing the ‘degree’ of public participation, we do not just mean to increase the number of citizens who participate but also to increase the engagement from the citizens who do participate. Using computer games to simulate and visualize a development will make the public participation process more effective, thus increasing the degree of public participation.



Figure 5.19: A pedestrian path going along a main street at Fornebu (screenshot of Cities: Skylines, made by the authors).

5.4 Critique of methodology

We want to emphasize that every public participation process connected to each different plan is unique. The challenges in public participation and the contributions of the computer games that we have identified cannot be overgeneralized and applied to all planning settings. Little research has been done on the use of city-building computer games in public participation processes within spatial planning. We have compiled literature from public participation in planning, the use of technology in planning, and the use of games in serious settings. However, the study conducted in this master thesis should be further elaborated on and extended to other planning contexts. That means that our results and conclusion do not apply to other international situations.

5.4.1 Our relation to *Cities: Skylines*

As we have much experience with playing *Cities: Skylines*, it is natural that we have a more positive attitude towards using it in spatial planning than other planners might have. We have both played it for more than a thousand hours, which has given us invaluable knowledge of the game and its mechanics. This experience is one of the reasons why we have chosen to write our thesis about the game, and even though we have a bond to it, we have tried to stay as neutral as possible. Our experience also gives us the knowledge of the negative sides of *Cities: Skylines*, making us able to discuss the consequences of using it better.

5.4.2 The study's validity and reliability

For the thesis to be replicated, we have explained the process of getting our results as detailed as possible in the methods chapter. As we had a low number of participants in our research, there is a substantial possibility that similar studies conducted later will yield different results. The results will also vary depending on who the participants are, as well as the technological advancements that are being made after our thesis is published. This thesis' validity should be measured on whether or not the research questions presented were answered with the results we gathered, and if those results were accurate with the data we collected in our interviews. The data should also be somewhat consistent between the respondents. Additionally, it needs to be noted that the data from the interviews could be different if the case area were different. As Fornebu is a naturally closed off area, it was relatively easy to build the model. A model made of another area might not be as easy to understand if the surrounding areas are left out.

The thesis is written in with foundations in the Norwegian planning context. As mentioned previously, however, we believe that it can be transferred to other countries, but it needs to be further elaborated on. As for comparability within Norway, we believe this thesis does not only show that *Cities: Skylines* can be used in projects like the development at Fornebu but also in projects with similar scales and challenges.

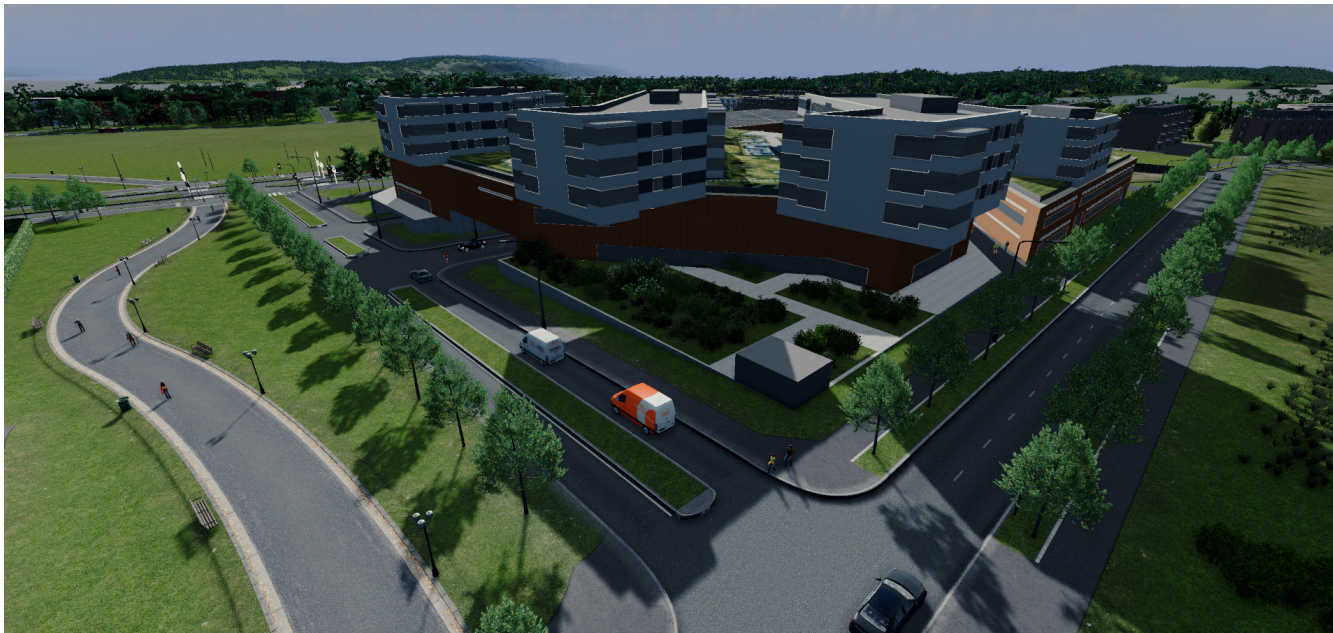


Figure 5.20: Fornebu S (screenshot of *Cities: Skylines*, made by the authors).



Figure 5.21: Fornebu a rainy night (screenshot of Cities: Skylines, made by the authors).

6

Conclusion

This thesis contributes to the small number of studies that have already been conducted on the use of computer games as a method in public participation processes within spatial planning. We believe that this field has much potential and that more research should be conducted to explore its possibilities further. This thesis is only a start of something that needs to be researched further. We recommend more studies to be conducted on the topic, to increase the acceptance of such methods in spatial planning.

Technology is evolving spatial planning at record speed, providing new methods and techniques that can be used in public participation processes. The results from the interviews we have conducted clearly show that increased public participation is desired by citizens, private developers, and municipalities. As our action research was focused on planning students, we recommend that more such studies are conducted on different population groups to increase the reliability of the method.

In order to involve citizens in public participation processes, the methods used should be more engaging. As citizens will need to allocate their own time and resources to contribute to a project, they should feel that the outcome is worth the time and resources they put into it. In addition to securing the public's right to affect the plan, the plan initiators should make sure that it is fun to be engaged in the public participation process, as this will make it more lucrative for the citizens to get involved. The more involved the citizens

are, the more influence they will have on the plan. By increasing the involvement of citizens as well as their influence, the public participation process will become more effective.

Computer games are fun to use and often have a simple and understandable user interface, which makes them easy to use for most citizens. On the one hand, using them will likely increase the engagement from youths as they are familiar with such technologies. On the other hand, a digital barrier might leave the elderly feeling excluded from such methods, but this issue can be resolved by providing guidance in using the computer game. Additionally, continuing to have the traditional methods available will ensure that everyone is still able to engage. The transition of implementing computer games in public participation processes must also be smooth so that the citizens feel like the method is voluntary.

Visualizations are important for increasing the public's understanding of urban development. A computer game like *Cities: Skylines* can further build on that understanding by simulating a model of a development project and its surroundings. *Cities: Skylines* allows for the user to walk around in the model, experience the proposed development from any angle, and witness a simulation of the area's natural and built features. *Cities: Skylines* offers the creation of a realistic model that can easily be maneuvered. We believe *Cities: Skylines* can be used as a new tool in planning today, especially in public participation processes.





Figure 6.1: Details (screenshot of Cities: Skylines, made by the authors).

7

References

7.1 References in text

Ampatzidou, C., Gugerell, K., Constantinescu, T., Devisch, O., Jauschneg, M. & Berger, M. (2018). All Work and No Play? Facilitating Serious Games and Gamified Applications in Participatory Urban Planning and Governance. *Urban Planning*, 3(1), 34-46.

Antle A. N., Tanenbaum, J., Bevans A., Seaborn, K. & Wang, S. (2011). *Balancing Act - Enabling Public Engagement with Sustainability Issues through a Multi-touch Tabletop Collaborative Game*. In: Campos P., Graham N., Jorge J., Nunes N., Palanque P., Winckler M. (eds) *Human-Computer Interaction – INTERACT 2011*. Available from: https://doi.org/10.1007/978-3-642-23771-3_16

Arnstein, S. R. (1969). Ladder of citizen participation. *Journal of American Institute of Planners*, 35, 216-224.

Berelson, B. (1952). *Content analysis in communication research*. Free Press.

Brown, G. & Chin, W. S. Y. (2013). Assessing the Effectiveness of Public Participation in Neighbourhood Planning. *Planning Practice & Research*, 28(5), 563-588. Available from: <https://doi.org/10.1080/02697459.2013.820037>

Bærum kommune. (2019, April 1). Fornebu: Byen - parken - landet. Retrieved 03.04.2020 from: <https://www.baerum.kommune.no/politikk-og-samfunn/samfunnsutvikling/stedsutvikling-i-barum/nye-fornebu/>

Bærum kommune. (2018). *Kommunedelplan 3 Fornebu - Planbeskrivelse*. Vedlegg til politisk sak J Post ID 18/16946. Available from: <https://www.baerum.kommune.no/globalassets/politikk-og-samfunn/barum-2035/stedsutvikling/fornebu/dokumenter/planbeskrivelse---1.gangsbehandling.pdf>

Cities: Skylines. (2020). March 10. Retrieved 10.03.2020 from: <https://www.facebook.com/CitiesSkylines/posts/1526618620847178>

Deterding, S., Dixon, D., Khalad, R. & Nacke, L. (2011). From game design elements to gamefulness: defining «gamification». In: *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments (MindTrek '11)*. Association for Computing Machinery, New York, NY, USA, 9-15. Available from: <http://doi.acm.org/10.1145/2181037.2181040>

Falleth, E. & Hanssen, G. S. (2017). Medvirkning i planlegging. Aarsæther, N., Falleth, E., Nyseth, T., Kristiansen R. (Red.) *Utfordringer for norsk planlegging: Kunnskap. Bærekraft. Demokrati*, 187-203. Kristiansand: Cappelen Damm Høyskoleforlaget.

Game. (n.d.). In Oxford Learner's Dictionaries. Retrieved 02.03.2020 from: https://www.oxfordlearnersdictionaries.com/definition/english/game_1?q=Game.

Glynn, W. [willglynn]. (2015, March 7). *It's a terrain.party and you're invited! Web app to generate height maps for use in game*. [Online forum post]. Reddit. Retrieved 09.05.2020 from: https://www.reddit.com/r/CitiesSkylines/comments/2y6yr4/its_a_terrainparty_and_youre_invited_web_app_to/

Guhathakurta, S. (2002). Urban modeling as storytelling: using simulation models as a narrative. *Environment and Planning B: Planning and Design*, 29, 895-911

Haahtela, P., Vuorinen, T., Kontturi, A., Silfvast, H., Väisänen, M. & Onali, J. (2015). *Gamification of Education: Cities Skylines as an Educational Tool for Real Estate and Land Use Planning Studies*. Available from: <https://aaltodoc.aalto.fi/handle/123456789/17843>

Haklay, M., Jankowski, P., and Zwolinski, Z. (2018). Selected modern methods and tools for public participation in urban planning - A review. *Quaestiones Geographicae*, 37(3).

Hallikainen, M. (n.d.). Is the gaming approach a possible tool for citizen inclusion?. *KA-AU*. Retrieved 26.05.2020 from: <http://ka-au.net/is-the-gaming-approach-a-possible-tool-for-citizen-inclusion/>

Hanssen, G. S. (2013). Medvirkning - med virkning? *Plan*, 45(3), 18-23. Available from: <https://www.idunn.no/plan/2013/03>

Hanzl, M. (2007). Information technology as a tool for public participation in urban planning: a review of experiments and potentials. *Design Studies*, 28, 289-307

- Hassan, R. (2014). Toward a 3D digital platform for collaborative planning and design. *Kart og plan*, (4), 300-308.
- Hem, M. (2019, March 18). Slik blir du lurt av arkitekttegninger. VG. Retrieved 09.03.2020 from: <https://www.vg.no/nyheter/innenriks/i/RxJ4qA/slik-blir-du-lurt-av-arkitekttegninger>
- Huotari, K. & Hamari, J. (2012). *Defining Gamification - A Service Marketing Perspective*. Association for Computing Machinery. Available from: <https://doi.org/10.1145/2393132.2393137>
- Innes, J. E. & Booher, D. E. (2004). Reframing public participation: Strategies for the 21st century. *Planning Theory and Practice*, 5(4), 419-436. Available from: <https://doi.org/10.1080/1464935042000293170>
- Irvin, R. and Stansbury, J. (2004). Citizen Participation in Decision Making: Is it Worth the Effort? *Public Administration Review*, 64(1), 55-65.
- Johannessen, A., Tufte, P. A. & Kristoffersen, L. (2004). *Introduksjon til Samfunnsvitenskapelige metode*. Oslo: Abstrakt Forlag.
- Kemmis, S., McTaggart, R., & Nixon, R. (2013). *The Action Research Planner: Doing Critical Participatory Action Research*. Singapore: Springer Science & Business Media.
- Kinder, P. D. (2019). Not In My Backyard Phenomenon. *Encyclopædia Britannica*. Retrieved 20.05.2020 from: <https://www.britannica.com/topic/Not-in-My-Backyard-Phenomenon>
- Laing, R., Conniff, A., Craig, T., Diaz, C. G., Scott, S. (2007). Design and use of a virtual heritage model to enable a comparison of active navigation of buildings and spaces with passive observation. *Automation in Construction*, 16, 830-841.
- Lane, M. B. (2005). Public Participation in Planning: An intellectual history. *Australian Geographer*, 36(3), 283-299.
- Lapintie, K. & Di Marino, M. (2015, July). *Planning In The Age Of Web 2.0*. [Conference paper]. Annual AESOP Congress 2015, Prague, Czech Republic.
- Lastowka, G. & Steinkuehler, C. (2014). Game state? Gamification and governance. *The gameful world: approaches, issues and applications*. MIT Press: Cambridge, Massachusetts, 501-512.
- LÉVA Urban Design. (2020). Nabolab Jr. Digital Nabolab Fornebuporten. Retrieved 19.05.2020 from: <https://www.fp-digitalnabolab.no/nabolab-jr>
- Lingsom, H. K. (2008). *Kampen om Fornebu*. Lysaker: Dinamo Forlag.
- Lombardo, A. E. (2018). *Virtual Reality and the Landscape Architecture Design Process*. Master thesis. Ås: Norwegian University of Life Sciences. Available from: <http://hdl.handle.net/11250/2567417>
- Miljøverndepartementet. (2000). *Bærum - Bolig, Fornebu (RPR-ATP)*. Retrieved 06.03.2020 from: <https://www.regjeringen.no/no/dokumenter/barum-bolig-fornebu-rpr-atp/id448089/>
- Oslo kommune. (2019). *Medvirkning i innsendte reguleringsplaner. En veileder for forslagsstillere og fagkyndige*. Available from: <https://www.kommunalteknikk.no/medvirkning-i-innsendte-reguleringsplaner.6275917-40825.html>
- Paradox Interactive. (n.d.) Cities: Skylines. Retrieved 25.02.2020 from: <https://www.paradoxplaza.com/cities-skylines/CSCS00GSK-MASTER.html>
- Plan- og bygningsetaten. (n.d.). *Standardiserte illustrasjoner av maksimal utnyttelse innenfor planforslaget. Plan- og bygningsetaten nye standardkrav til illustrasjoner i alle planforslag*. Available from: <https://www.oslo.kommune.no/plan-bygg-og-eiendom/planforslag-og-planendring/send-inn-planforslag-eller-planendring/utarbeid-planforslaget/dokumenter-til-ny-reguleringsplan>
- Plan- og bygningsloven. (2008). Lov om planlegging og byggesaksbehandling. (LOV-2008-06-27-71). Retrieved 09.04.2020 from: <https://lovdata.no/dokument/NL/lov/2008-06-27-71>

- Regjeringen. (2014). *Medvirkning i planlegging. Hvordan legge til rette for økt deltakelse og innflytelse i kommunal og regional planlegging etter plan- og bygningsloven*. Available from: https://www.regjeringen.no/globalassets/upload/kmd/plan/medvirkningsveileder/h2302b_veileder_medvirkning.pdf
- Rooth, V. L. (2018). *Visualiseringer i reguleringsplan*. Master thesis. Ås: Norwegian University of Life Sciences. Available from: <http://hdl.handle.net/11250/2558103>
- Rønne, S. (2016). Har store planer på Fornebu. *Estate Nyheter*. Retrieved 07.04.2020 from: <https://www.estatenyheter.no/2016/09/29/har-store-planer-pa-fornebu/>
- Schwencke, M. (2019). Føler du deg lurt av illustrasjonene? Slik har «rendering» endret arkitekturen. *Aftenposten*. Retrieved 15.04.2020 from: <https://www.aftenposten.no/kultur/i/1k1RvJ/foeler-du-deg-lurt-av-illustrasjonene-slik-har-rendering-endret-arkitekturen>
- Slettholm, A. (2019, 18.03). Munch Avkledd i Autovern. *Aftenposten*. Retrieved 09.03.2020 from: <https://www.aftenposten.no/meninger/kommentar/i/4dPmaV/munch-kledd-i-autovern-andreas-slettholm>
- Statsbygg. (2008). *Grøntstruktur for Fornebu: Beskrivelse av vegetasjonsbruk. Sentralparken - Storøya - Kokså*. Available from: <https://www.arkitektur.no/grontstruktur-for-fornebu?pid=NAL-EcoPublication-Attachment>
- Steam. (n.d.). Cities: Skylines. Retrieved 10.03.2020 from: https://store.steampowered.com/app/255710/Cities_Skylines/
- Stringer, E. T. (1999). *Action Research* (2nd edition). Thousand Oaks: SAGE publications.
- Stringer, E. T. (2013). *Action Research* (4th edition). Thousand Oaks: SAGE publications.
- Susi, T., Johannesson, M. & Backlund, P. (2007). Serious Games - An Overview. (IKI) *Technical Report*. Skövde: Institutionen för kommunikation och information. Available from: <http://urn.kb.se/resolve?urn=urn:nbn:se:his:diva-1279>
- Terrill, B. (2008, June 16). My Coverage of Lobby of the Social Gaming Summit. [Blogg]. Retrieved 30.01.2020 from: <http://www.bretterill.com/2008/06/my-coverage-of-lobby-of-social-gaming.html>
- Toppe, K. (2013). Større kommunar gjer mindre demokrati. *Bergens Tidende*. Retrieved 29.03.2020 from: <https://www.bt.no/btmeninger/debatt/i/J6y86/stoerre-kommunar-gjer-mindre-demokrati>
- Vanolo, A. (2018). Cities and the politics of gamification. *Cities*, 74, 320-326.
- UN-Habitat. (2015). *Using Minecraft for Youth Participation in Urban Design and Governance*. Available from: <https://www.un.org/youthenvoy/2016/01/using-minecraft-4-youth-participation-urban-design-governance/>
- Wilson, A., Tewdwr-Jones, M., and Comber, R. (2019). Urban planning, public participation and digital technology: App development as a method of generating citizen involvement in local planning processes. *Environment and Planning B: Urban Analytics and City Science*, 46(2), 286-302.
- Wöhni, A. (2007). *Virker medvirkning virkelig? Sluttrapport av evaluering av planmedvirkning i storbyene*. Asplan Viak AS.

7.1 Figures

Note: Every figure not cited in this chapter is made by the authors.

Figure 1.1: Paradox Interactive. (2015). [Picture] Available from: <https://cdon.no/spill/spill-downloads/cities-skylines-32813688>

Figure 1.2: Cities: Skylines. (2020). [Picture] Available from: <https://www.facebook.com/CitiesSkylines/photos/a.334225733419812/1526618384180535/>

Figure 1.3: estudio Herreros & Steinar Dyrnes. (2019). [Picture] Available from: <https://www.aftenposten.no/kultur/i/1k1RvJ/foeler-du-deg-lurt-av-illustrasjonene-slik-har-rendering-endret-arkitekturen>

Figure 1.4: Screenshot of Kommunekart.com. (2020). [Picture] Available from: <https://kommunekart.com>

Figure 1.5: Screenshot of fp-digitalnabolab.no. (2020). [Picture] Available from: <https://www.fp-digitalnabolab.no/nabolab-jr>

Figure 1.6: PCGamesN. (n.d.). The best Minecraft cities. [Picture] Available from: <https://www.pcgamesn.com/minecraft/best-minecraft-cities>

Figure 2.1: Made by the authors, based on Falleth, E. & Hansen, G. S. (2017). Ladder of participation. [Illustration]

Figure 2.2: Made by the authors, based on Lane, M. B. (2005). Ladder of participation. [Illustration]

Figure 2.3: Made by the authors, based on Brown, G. & Chin, W. S. Y. (2013). Ladder of participation. [Illustration]

Figure 2.6: Kjelstrup, K. A. (2017). Bordet med flere av lokalpolitikkerne i Nordre Aker. [Picture] Available from: <https://nab.no/fortetting-kan-vare-mange-ulike-ting/19.14516>

Figure 2.7: Angermeier, M. (2007). Web 2.0 tag cloud. [Illustration] Available from: https://commons.wikimedia.org/wiki/File:Web_2.0_Map.svg

Figure 2.8: Screenshot of Kommunekart.com. (2020). [Picture] Available from: <https://kommunekart.com>

Figure 2.9: Screenshot of Bymelding. [Picture] Available from: <https://play.google.com/store/apps/details?id=no.ok.it.bym.melding>

Figure 2.11: NMBU. (2019). Virtuell vandring i verdens kulturarv. [Picture] Available from: <https://www.nmbu.no/fakultet/landsam/aktuelt/node/38196>

Figure 2.12: Screenshot of Kahoot. [Picture] Available from: <https://play.google.com/store/apps/details?id=no.mobitroll.kahoot.android>

Figure 2.13: Screenshot of YouTube. Ep.01: Planleggingsfasen. [Picture] Available from: <https://www.youtube.com/watch?v=-Lp4pH317aM>

Figure 2.14: UN-Habitat. (2015). A participant at Aldea Digital redesigning Plaza Tlaxcoaque in Minecraft. [Picture] Available from: <https://www.un.org/youthenvoy/2016/01/using-minecraft-4-youth-participation-urban-design-governance/>

Figure 2.15: Gamesforcities.com. (n.d). Block by Block (2012). [Picture] Available from: <http://gamesforcities.com/database/block-by-block/>

Figure 3.3: Norgebilder.no. (2018). [Search Fornebu with selection of historic photo]. [Picture] Available from: <https://www.norgebilder.no/?x=254609&y=6647235&level=12&utm=33&projects=2691&layers=&plannedOmlop=0&plannedGeovekst=0>

Figure 3.4: Norgebilder.no. (2018). [Search Fornebu with selection of historic photo]. [Picture] Available from: <https://www.norgebilder.no/?x=254609&y=6647235&level=12&utm=33&projects=2713&layers=&plannedOmlop=0&plannedGeovekst=0>

Figure 3.5: Norgebilder.no. (2015). [Search Fornebu with selection of historic photo]. [Picture] Available from: <https://www.norgebilder.no/?x=254641&y=6647188&level=12&utm=33&projects=588&layers=&plannedOmlop=0&plannedGeovekst=0>

Figure 3.6: Norgebilder.no. (2015). [Search Fornebu with selection of historic photo]. [Picture] Available from: <https://www.norgebilder.no/?x=254641&y=6647188&level=12&utm=33&projects=316&layers=&plannedOmlop=0&plannedGeovekst=0>

Figure 3.7: Norgebilder.no. (2019). [Search Fornebu with selection of historic photo]. [Picture] Available from: <https://www.norgebilder.no/?x=254165&y=6647315&level=12&utm=33&projects=3059&layers=&plannedOmlop=0&plannedGeovekst=0>

Figure 3.8: Bærum kommune. (2018.) Kommunedelplan 3 Fornebu. (Plan-ID 2016-014, dokumentnr: 4231093) [Illustration]

Figure 3.9: clipperarctic. (1971). Oslo Fornebu. [Picture] Available from: <https://www.flickr.com/photos/23344035@N03/5990013136/>

Figure 3.10: Hogne. (2018). Statoilbygget Fornebu (8. juni 2018) [Picture] Available from: [https://commons.wikimedia.org/wiki/File:Statoilbygget_Fornebu_\(8._juni_2018\).jpg](https://commons.wikimedia.org/wiki/File:Statoilbygget_Fornebu_(8._juni_2018).jpg)

Figure 3.11: TazerHere. (2019, December 28). City Tour of Brunswald is up on the channel, go check it out! [Tweet] Available from: <https://twitter.com/heretazer>

Figure 3.13: Screenshot of Steam. [Picture] Available from: <https://steamcommunity.com/app/255710/workshop/>

Figure 3.14: Screenshot of terrain.party. [Picture] Available from: <https://terrain.party>

Figure 3.15: Heightmap from terrain.party. [Picture] Available from: <https://terrain.party>

Figure 3.19: Google Earth. (2018). Snarøyveien 55, 1364 Fornebu.

Figure 3.20: Google Earth. (2018). Rolfsbuktveien 4, 1364 Fornebu

Figure 3.21: Google Earth. (2018). Rolfsbuktveien 2, 1364 Fornebu

Figure 3.22: Google Earth. (2018). Martin Linges vei 25, 1364 Fornebu

Figure 3.23: Google Earth. (2018). Martin Linges vei 33, 1364 Fornebu

Figure 3.24: Google Earth. (2018). Snarøyveien 36, 1364 Fornebu

Figure 3.25: Google Earth. (2018). Snarøyveien 30, 1360 Fornebu

Figure 3.43: Think-Look-Act. From Action Research (2nd edition) by Stringer, E. T., 1999. Thousand Oaks: SAGE publications.

Figure 4.2: Plan- og bygningsetaten. (n.d.). Standardiserte illustrasjoner av maksimal utnyttelse innenfor planforslaget. Plan- og bygningsetaten nye standardkrav til illustrasjoner i alle planforslag. [Illustration] Available from: <https://www.oslo.kommune.no/plan-bygg-og-eiendom/planforslag-og-planendring/send-inn-planforslag-eller-planendring/utarbeid-planforslaget/dokumenter-til-ny-reguleringsplan>

Figure 5.2: estudio Herreros & Steinar Dyrnes. (2019). [Picture] Available from: <https://www.aftenposten.no/kultur/i/1klRvJ/foeler-du-deg-lurt-av-illustrasjonene-slik-har-rendering-endret-arkitekturen>

Figure 5.3: Block by Block. (n.d.). Building A New Model For Refugee Resettlement In Kalobeyei. [Picture] Available from: <https://www.blockbyblock.org/projects/kalobeyei>

Attachment 1: Question sheet for interviews with professionals and citizens

The questions were asked in Norwegian. The attachment is not translated.

1) Hva er en god medvirkningsprosess?

Har du selv vært ansvarlig/deltaker for medvirkningsprosesser?

a) Dersom ja:

Hvilke(n) plansak(er)?

Hvorfor tok du på deg det ansvaret?

Hvordan synes du det var? Hvorfor?

Hva føler du om medvirkningsprosesser sånn helhetlig? Har du et generelt godt eller dårlig inntrykk av de?

b) Dersom nei:

Har du fått sjansen? Hvorfor takket du isåfall nei?

Har du vært involvert på andre måter? Hvilke? Hvordan var det å se på en slik prosess utenfra og inn?

Tror du at resultatet av prosessen hadde vært den samme dersom det var du som ledet den?

Hvis ja: Hvordan?

Hvis nei: Hvorfor ikke?

2) Hvilke inntrykk sitter du igjen med etter å ha deltatt i en medvirkningsprosess?

a) Føler du at det var god kommunikasjon mellom deg og innbyggerne

b) Føler du at du fikk gitt ut nok informasjon om prosjektet til de berørte?

c) Følte du at du fikk gitt riktig informasjon? Eventuelt: Hvorfor ikke? Var det i så fall med vilje fra din/utbyggers side å informere / ikke informere?

f) Hvordan synes du resultatet av planen ble? Synes du det reflekterer det du presenterte i medvirkningsprosessen? Hvor mange ulike alternativer ble presentert? Ble det presentert eventuelle endringer? Hvorfor, hvorfor ikke?

g) Følte du at du gav innbyggerne en stemme i prosessen? Følte du at de ble hørt? Hvordan mener du at de ble / ikke ble hørt? Dersom ikke: Hvilke tiltak ble satt i gang for å bedre dette? Hvilke tiltak burde ha blitt satt i gang?

h) Hvem tror du har vanskeligheter med å involvere seg i medvirkning slik det blir gjort i dag? Hva gjorde du for å involvere innbyggerne? Hva tror du skal til for at flere skal engasjere seg i plansaker?

i) Synes du det er viktigere å involvere noen grupper enn andre? Hvorfor synes du dette / hvorfor synes du ikke dette?

3) Hvordan mener du resultatet av planen ble?

a) I hvor stor grad mener du at planen ble påvirket av innspill fra innbyggerne?

b) Hva tror du veier mest i plansaker: innbyggernes ønsker, politikernes ønsker eller utbyggernes ønsker?

c) Føler du at innbyggerne på Fornebu er sånn ca enig om hvilken type utvikling de vil ha her? Føler du at planleggere og utbyggere snakker nok sammen i planleggingen av Fornebu? Forstår de innbyggernes behov/ønsker?

d) Mener du at innbyggernes ønsker har blitt tilstrekkelig ivare tatt?

Alt i alt, hva mener du er en god medvirkningsprosess?

4) Hvordan kan medvirkningsprosessene forbedres?

a) Plan- og bygningsloven skal jo ivareta medvirkning. Føler du at loven i tilstrekkelig grad ivaretar medvirkning i planprosesser?

b) Mener du at det er viktigere å ivareta medvirkning i store prosjekter, versus i små prosjekter?

c) Synes du at metodene som brukes i dag er gode nok?

d) Eventuelt: hva mangler?

e) Hva gjør, og hva kan du og din bedrift gjøre for å øke graden av medvirkning fra befolkningen, altså naboer og andre berørte?

f) Når i planprosessen mener du at det er viktigst å involvere innbyggerne?

Alt i alt, forklar med korte trekk hvordan du mener medvirkningsprosessen kan forbedres.

5) Hvorfor er visualisering en viktig del av planlegging?

a) Det har blitt mye fokus på visualisering av planforslag i det siste. Hvordan forholder du deg til debatten? Hva mener du om at illustrasjonene ofte blir beskyldt for å lyve?

b) Tror du private utbyggere er mer villig til å pynte på et prosjekt enn det offentlige er?

c) Tror du det er vanskelig for vanlige innbyggere å se hva som skal bygges ut fra et plankart?

d) Tror det du er vanskelig for vanlige innbyggere å få et reelt inntrykk av hva som kommer i prosjektet, basert på de illustrasjonene som er mest vanlig?

Alt i alt, tror visualisering en viktig del av planleggingen, og hvorfor?

Over på noe litt annet. Som du sikkert har fått med deg handler masteren vår om bruk av dataspill i planlegging.

6) Har du noen erfaring med å bruke dataspill i «seriøse» sammenhenger?

a) Klarer du å se for deg noen måter dataspill kan brukes i planlegging?

b) Mener du dataspill kan være nyttig? I hvilke settinger da?

c) Tror du dataspill vil ha en stor innvirkning på hvordan vi som planleggere og prosjektledere jobber?

d) Tror du planleggere er villige til å bruke tid på å lære seg å bygge en slik modell?

e) Hva tror du er hovedutfordringen med å bruke dataspill i planlegging?

f) Teknologiske nyvinninger kommer hele tiden, også til planlegging. Hvilke hensyn mener du er viktigst å ta i en slik utvikling?

Vise frem vår nye metode her?

7) Hvordan kan dataspill øke graden av medvirkning fra befolkningen?

a) Hva tror du om å bruke et dataspill til å kunne simulere og visualisere hvordan et utbyggingsprosjekt kan bli?

b) Dersom medvirkningsprosessen blir mer basert på dataspill og den type teknologi i fremtiden, tror du befolkningen hadde slitt med å tilpasse seg den type teknologi?

c) Hvem andre tror du vil ha problemer med å tilpasse seg slik teknologi?

d) Hvordan tror du innbyggerne hadde reagert dersom de ble presentert for en slik måte å påvirke på? Tror du de hadde synes det var bra eller dårlig?

e) Hva ser du på som de mest positive, og de mest negative konsekvensene ved å bruke dataspill i slike settinger?

8) Kan visualisering ved dataspill bedre forståelsen befolkningen har til et prosjekt?

a) Hva tenker du om at man kan se prosjektet i så mange ulike vinkler?

b) Føler du at du får en god forståelse for bygningsvolum i denne projeksjonen?

c) Hvordan mener du denne metoden står seg opp mot tradisjonelle måter å visualisere prosjekter på?

9) Spillet har jo en fordel ved at det automatisk simulerer en verden rundt prosjektet. Hvordan tror du simulering kan bedre forståelsen til befolkningen for et prosjekt?

a) Hva tror du simuleringen fra spillet kan tilføre en medvirkningsprosess, som for eksempel dagens illustrasjoner sliter med å fremstille?

b) Tror du det er enklere å forstå bygningsvolum når spillet simulerer bevegelser?

c) Tilfører simuleringen realisme? Eller gir det en motsatt effekt?

Oppsummere funn

Er det noe du vil legge til?

Har du noen tilbakemeldinger til oss?

Attachment 2: Question sheet for action research interview with planning students

The questions were asked in Norwegian. The attachment is not translated.

1. Presentasjon

- Ønske deltakerne velkommen.
- Gjøre kort rede for hva de skal gjøre: at de skal spille *Cities: Skylines*, og at vi skal ha en samtale med dem mens de spiller - dataen vi får ut av det skal brukes til å diskutere hvor enkelt/vanskelig det vil være å implementere *Cities: Skylines* i planlegging.

2. Åpningsfasen

- Spiller du mye dataspill?
- Har du spilt *Cities: Skylines* før?

3. Introduksjonsfasen

- Hvilke inntrykk har du av dataspill?
- Hva tenker du om å bruke dataspill i planlegging?
- Hva mener du om den generelle teknologiske utviklingen innenfor planlegging?
- Hvilke konsekvenser tror du man vil oppleve dersom man bruker dataspill i medvirkningsprosessen?

4. Overgangsfasen

- Tror du dataspill vil være en større del av vår jobb som planleggere fremover?
- Hva føler du om å bruke dataspill som en del av jobben i fremtiden?
- Hva tror du befolkningen generelt vil tenke om en slik metode?

5. Hovedfasen

- Hva tror du at du kommer til å ha størst vansker med ved implementeringen av dataspill?
- Hva tror du den generelle befolkningen kommer til å ha størst vansker med ved implementeringen av dataspill?
- Forklar oss hvorfor du mener at denne metoden er et steg i enten riktig eller feil retning.
- Hva skal til for at du blir mer positiv/mer negativ til å bruke dataspill i planleggingen?
- Hvilke egenskaper med dagens medvirknings- og planleggingsprosess mener du det ikke er mulig å gjenskape i *Cities: Skylines*?
- Hvilke aspekter innenfor planlegging tror du *Cities: Skylines* egner seg best til?
- Hva tenker du om simuleringen så langt? Er det et positivt tilskudd til visualiseringen av et område tror du?

6. Avrundingsfasen

Oppsummere diskusjonene.

- Alt i alt, hva tenker dere om bruk av dataspill i arealplanlegging?
- Kan dere kort oppsummere hva dere tenker om temaet?
- Stemmer oppsummeringen med dere dere har sagt og deres synspunkter?

7. Avslutningsfasen

- Har vi glemt noe?
- Er det noe mer vi burde diskutert?
- Har dere noen siste kommentarer som burde tas med?

Attachment 3: Mods and assets used when making the model in *Cities: Skylines*

The mods and assets are clickable and will take you to the Steam Workshop where they can be downloaded.

Buildings and parks

1x1 Parking Lot	Brush 12x12 Concrete	Joak's Apartments #4
2x2 Parking Lot	Brush 1x4 Concrete	K146
3x2 Parking Lot	Brush 2x2 Concrete	L1_industrycorner_2x2_1
4x1 Parking Lot Plain	Brush 4x4 Concrete	L1_industrycorner_3x3_1
4x2 Parking Lot	Brush 8x8 Concrete	Large Water Pumping Station
4x4 Parking Lot Plain	Bureaucratic Building	Media Markt
4x5 Parking Lot plain	CARGLASS car work shop unique	Mid-sized Elementary School
5x4 Parking Lot Plain	Clay Brick Apartments #1	Mixed-Use Corner Base
AK_no59_Hedwig_L2	Clay Brick Apartments #2	Modern european house #10
BB Office 1B	Contemporary Apartments 2 A L3	Modern Lowrise Condo
Block Services - Cemetery	Contemporary Low-Rise Flat	Modern Rowhouse 3
Block Services - Death	Contemporary Midrise 1	Modular building: Apartment 1
Block Services - Electricity	Contemporary Midrise 1 (corner)	Modular building: Bottom 7
Block Services - Elementary	DHHa	Modular buildings: Bottom 9
Block Services - Garbage	FantoftStudentFlats#1	Modular buildings: Office top 5
Block Services - Health	Fire Station 2	Old brick warehouse
Block Services - High School	Football field	Pashka's RICO tenement 1447C4
Block Services - Police	Football Pitch Small	PPG INVISIBLE 1x1
Block Services - University	Green bus stop	PPG INVISIBLE 2x2
BlockA	HF Gym	PPG INVISIBLE 3x3
	Joak's Apartments #3	saalstein_warehouse_fix

Sov-LT 5fl Tenement W2W Red
Standard Parking Garage
Stockholm Bagarmossen RL3
Stockholm Kalvesta RL1 Left
Stockholm Kalvesta RL1 Right
Stockholm Molna RL4
Stockholm Solna RL5
Tennis Clubhouse
Toyota car dealership no cars
UK Industrial - Anopol
UK Industrial - Magnet Express
UK Industrial Unit - G Security
UK Park Football Pitch
Urban Park B2
Victorian second empire house
Wahroonga Elementary School
Warehouse 2 - colors

Props

Crossing decal
Football Soccer Goal ?+White
grass patch 3
Hedge Tall 3 C long
lane line l (faded)
lane line s (faded)
metal wood table set low
Mountain Grass
Planter (corner)
Planter 400x400cm Grass Raised
Planter 400x800cm Grass Raised
R69 Big Decal Dirt
R69 Big Decal More Stains 1
R69 Big Decal More Stains 2
R69 Big Decal More Stains 3
R69 Big Decal Road Wear 2
R69 Big Decal Road Wear 3
R69 Big Decal Rocks
R69 Big Decal Tire Marks 3
R69 Ploppable Asphalt SSquare16

R69 Ploppable Asphalt SSquare8
R69 Ploppable Grass Square4
R69 Ploppable Grass Square8
R69 Ploppable Pavement Square32
R69 Theme Decal Cliff 32
rattan table and chair set
Spanish Arrow Forward
Spanish Arrow Forward Left
Spanish Arrow Forward Right
Spanish Arrow Left
Spanish Arrow Left Right
Spanish Arrow Right
Tufts Dark Green
white line mark bus v2

Trees

Wild Small Bushes
Ash Tree pd
Aspen
Cluster of bushes
Garden Bush

Generic Tree Large 2

Generic Tree Small

Grass Cluster 2

Green Savannah Grass

Large regular bush green

LeafyBush

Linden Tree

Linden Tree Young

Little Leafy Bush.

Live Oak Tree

Lp5 full canopy

lp7 extra full

Norfolk Island Pine Young

Regular bush broad

Regular bush green

Regular Tree Columnar

Scots Pine 2

Silver Birch 2

Small Trees Cluster

Stone Pine Medium

Sugar Maple

The Shady Bush [Lighter]

Tree Cluster Low Poly

White Willow

Vehicles

2010 BMW M5

2011 Chevrolet Volt Electric

2014 Toyota Camry

2015 Aston Martin DB9 Civilian

2016 Audi A3 eTron Electric

2016 Ford C-Max Energi

2016 Ford Escape Kuga

2016 Ford Fusion Mondeo

2017 BMW i3

2017 Fiat 500e

2017 Ford Focus Electric

2017 Ford Transit

2017 Honda Civic

2017 Land Rover Range Rover

2017 Lexus NX 300h

2017 Mitsubishi MieV Electric

2017 Nissan Leaf Electric

2017 Skoda Superb

2017 Toyota Rav4

2017 Volkswagen eGolf Electric

2017 Volkswagen Golf

2018 Toyota Prius

ALFA 147 Ti V

AUDI A1 V

AUDI A4 V

Audi RS6 C5 (1)

BMW 325i (2002)

BMW E34 (1)

BMW E34 (2)

BMW E39 M5 [1]

BMW E39 M5 [2]

Citroen C1 (1)

Citroen C1 (2)

D3S MB Actros MP IV '11 (BDFI)

D3S MB Actros MP IV '11 (I)

D3S MB Actros MP IV '11 (II)

D3S MB Actros MP IV '11 (III)

D3S MB Citaro C '11	Ford Transit Connect Posten	Peugeot 406 [1]
D3S MB Citaro K '11	MAN Lions City 12	Peugeot 406 [2]
D3S MB Citaro L Concept	MAZDA CX 7 V	Range Rover Evoque
D3S MB Econic 2635 FAUN '13	MB Sprinter Ambulanse	Renault Laguna I [1]
D3S MB Sprinter (W906) '06	MB Sprinter Bjørgs Transport	Renault Laguna I [2]
D3S MB Sprinter TNT '06	MB Sprinter Bring	Renault Megane II [1]
D3S MB Sprinter TNT New '06	MB Sprinter DHL	Renault Megane II [2]
D3S MB Vito (W447) '14	MB Sprinter Postnord	Scania R Streamline (Ore)
D3S MB Vito Panel Van (W447) '15	MB Vito Politi	Scania R Streamline, agri
D3S MB V-Klasse (W447) '14	Mercedes-Benz C Class(W203)	Škoda Yeti [1]
D3S Solaris Urbino 12 '15	Mercedes-Benz C63 AMG	Škoda Yeti [2]
D3S Solaris Urbino 12 '15 Promo	Mercedes-Benz E Class(W211)	Tesla Model 3
D3S Solaris Urbino 12 '15 Promo2	Mercedes-Benz G63 AMG	Tesla Model S
D3S Solaris Urbino 12 '15 Promo3	Mercedes-Benz W210 [1]	Tesla Model X
D3S Solaris Urbino 12 '15 Promo4	Mercedes-Benz W210 [2]	Toyota Prius [EV]
D3S Volvo 7900 Hybrid '11	Mercedes-Benz W212 E63 AMG (1)	Truck - (VolvoFE): NOR CARGO
Fiat 500 2008	Mercedes-Benz W212 E63 AMG (2)	Volkswagen Golf GTI 2010
FIAT SCUDO PASSENGER V	Opel Astra J Sports Tourer [1]	Volkswagen Passat B5 [1]
FIAT SCUDO V	Opel Astra J Sports Tourer [2]	Volkswagen Passat B5 [2]
Ford Focus AD update	PEUGEOT 207 V	Volkswagen VW T6 Kasten v1.2
Ford Transit Connect	PEUGEOT 308-5p V	Volkswagen VW T6 MonoColor

Volvo 850 T-5R
Volvo FE (2015)
Volvo S60 II T6 (1)
Volvo S60 II T6 (2)
VW Passat B8 Alltrack
VW Passat B8 Variant
VW POLO 5p V
VW Transporter AF update

Networks

16m Parking Lot Service Road
22m Parking Lot
DX Shore Profiles Steep 2
Narrow Two Lane-One Way Road
R69 Terraforming Network
SC-Alley2L
SC-AlleyOneway
SC-Basic
SC-BasicWide
SC-BasicWideOneway
Traceable Objects: Hedge

Props in buildings, parks, and networks

Bollard
brickwallend4m
Concrete Bollard Cube
Football Soccer Floodlight
Football Soccer High Fence
Garden Grass
Garden Grass 16x16
Joak's Sun Lounger
Joak's Table
Joak's Wicker Chair (for one)
Joak's Wicker Chair (for three)
lane line 1 (faded)
light weight packaging container
ligpaper recycling container
Long ladder w platform
parking sign
Portable Office
R69 Antenna 2
Round Brick Planter (Bench)

rubbish container BSR
Semi Truck Trailer Prop
SKF Theme Decal - Pavement #3
UK House Alarm - Yale
UK Park Football Posts
UK Park Football Posts
Vent prop2
Vent prop3
Trees in buildings, parks and nets
Lantana 2
Little Leafy Bush.
Pineplant1
Regular bush green
Small Juniper
Washingtonia Robusta Palm Short

Mods

[Legacy] Segment Slope Smoother
81 Tiles (Fixed for 1.2+)
Automatic Emptying
Camera Positions Utility

Cinematic Camera Extended	Network Skins (Park Life Compatible)	Realistic Walking Speed
Clouds & Fog Toggler	Network Tiling	Relight
Crossings	No Abandonment	Remove Street Arrows
Customize It!	No Problem Notifications	Resilient Owners (Make Historical)
Daylight Classic	No Seagulls	Shadow Strengths Adjuster
Decal Prop Fix	Painter	Sharp Textures
Disable Zone Check	Parking Lot Roads	SimpleClock
Emergency Light Changer	Plop the Growables	Surface Painter
Extra Landscaping Tools	Ploppable Asphalt +	Theme Decals
Find It!	Ploppable RICO Revisited 2.1	Theme Mixer 2
Fine Road Anarchy 2.0.2	PostProcessFX v1.9.0	Tiny Segments
Fine Road Tool 2.0.4	Precision Engineering	TM:PE V11 STABLE (Traffic Manager: President Edition)
First Person Camera: Updated	Prefab Hook (Mod Dependency)	Transparency LODs Fix
Forest Brush v1.3	Procedural Objects	Tree LOD Fix
Harmony 2.0.1 (Mod Dependency)	Prop & Tree Anarchy	Ultimate Eyecandy v1.5.2
Hide It!	Prop it Up! 1.4.4	Ultimate Level Of Detail (ULOD)
Image Overlay	Prop Line Tool [PLT] (vAlpha)	Unlimited Trees Mod v1.12
Loading Screen Mod	Prop Precision	Vanilla Trees Remover
More Beautification	Prop Remover	Zoom It!
Move It	Quay Anarchy	
Network Extensions 2 (Updated for Sunset Harbor)	Random Tree Rotation	



Norges miljø- og biovitenskapelige universitet
Noregs miljø- og biovitenskapelige universitet
Norwegian University of Life Sciences

Postboks 5003
NO-1432 Ås
Norway