Engaging Employees in Green Change in Ülemiste City

MA Degree Project
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Abstract

In my thesis, I wanted to explore the concept of the smart city and figure out how to interpret the collected data from a user-centred perspective. During my project, I collaborated with Mainor Ülemiste which applies smart city concepts, practises, and experiments with the latest technologies in Ülemiste City.

ÜC faces several challenges. Since there are over 500 companies in ÜC, green thinking is given a high priority, but they do not know where to start or what to do. I decided to focus on the impact of the companies (in terms of energy consumption, waste separation and commuting) in ÜC campus by using the data which is being collected.

By observing the campus and interviewing the employees, I found that they are aware of the sustainable actions of their companies and ÜC' and willing to contribute, but unfortunately there is no way or medium for communication and sharing. After further research, I realised that all employees should get involved to bring about green change in the company. Finally, I understood that it is possible to engage employees in green change in ÜC through their commute, because employees' commute has a direct and large climate impact in their companies and ÜC. This relates not only to the impact on ÜC's car-free vision for the future and Estonia's climate neutrality goals for 2035, but also on employees' physical and mental health.

My design proposal is a tangible board that invites ÜC employees to think about the impact of their commute. The invitation is done through a tangible engagement in the office buildings and a direct link to an application (mobile and web version). This application helps employees track the impact of their commute and their contribution to company green goals. This application includes a dashboard that displays in real time the commuting and green report of the companies and the ÜC. It can be used by each company and the ÜC to monitor their climate impact and set green goals. My proposal engages and guides employees and creates communication between employees, sustainability/green officers and ÜC.

Kokkuvõte

Minu magistritöö eesmärgiks oli uurida targa linna kontseptsiooni ja mõista, kuidas kogutud andmeid kasutaja perspektiivist interpreteerida. Magistritöö käigus oli minu koostööpartneriks Mainor Ülemiste, Ülemiste City arendaja. Mainor Ülemiste rakendab targa linna kontseptsioone ja praktikaid ÜCs, kasutades uusimaid tehnoloogiaid.

ÜC seisab mitmete väljakutsete ees. Magistritöös otsustasin keskenduda ettevõtete keskkonna jalajälje uurimisele. See sisaldas eelnevalt kogutud andmete uurimist energia tarbimise, jäätmete sorteerimise ja inimeste liikumise kohta.

Linnaku vaatluste ja töötajate intervjueerimise käigus ilmnes, et teadlikkus ettevõtete rohelise mõtteviisi suunitlusest on suur ja paljud sooviksid ka oma panust anda. Kahjuks ei ole ühist platvormi või meediumit kogukonna siseseks kommunikeerimiseks. Peale edasist uurimist sai selgeks, et ainult inimeste võimalikult laiapõhjaline kaasamine toob kaasa ettevõtte rohelisemaks muutumise. Uuringu tulemusena leidsin, et ma saan töötajate kaasatust rohepöördesse uurida läbi nende liikumise. Liikumisvahendid omavad otsest ja märkimisväärset mõju ettevõtete ja ÜC keskkonna jalajäljele. Teema pole seotud mitte ainult ÜC autovabavisiooni ja Eesti kliima neutraalsus eesmärkidega aastal 2035, vaid ka töötajate vaimse ja füüsilise tervisega.

Minu pakutud disainilahendus on käegakatsutav tahvel, mis innustab ÜC töötajaid mõtlema oma valitud liikumisvahendite peale. Füüsilisel kujul tahvel asub kontorihoonetes ning seal on ka otselink rakendusele (mobiili ja veebi versioon). Rakendus võimaldab inimestel jälgida oma liikumisega tekitatud keskkonnajalajälge ja panustada ettevõtte roheeesmärkidesse kollektiivselt. ÜC saab seire andmete põhjal hinnata oma mõju keskkonnale ja püstitada rohelisi eesmärke. Rakendus sisaldab ka dashboard`i millele kuvatakse reaalajas ettevõtete ja ÜC greenreport´e ja infot liikumisega seotud jalajälje kohta. Seda võib kasutada nii ettevõtete siseselt, kui ka ÜC üleselt, et jälgida säästlikkust ja püstitada rohelisi eesmärke. Minu lahendus kaasab ja juhendab töötajaid, ning suurendab suhtlust töötajate, ametnike ja ÜC vahel.

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1. Introduction

1.1 Personal Interest

Last year I had a course that we curated a symposium. My team's theme was boundaries of the city, included topics such as: our public and private data, how much information we share or what information is shared without our knowledge, and how information from surveillance cameras is used in cities.

We invited Damiano Cerrone, a researcher with a background in urban design who works on smart city and data-related issues, to our symposium and he mentioned that in the smart city context, data is collected and used to develop the systems. However, he stated that such data is not employed to improve the user experience. The collected data is not used for people, but used for monitoring systems: for instance, the speed of buses or whether they are on time, but not to measure people's satisfaction or why they may prefer (or not) a particular bus. [1] After the course, this part of our conversation got me thinking about the relationship between the data collected and the user experience in the smart city concept.

Thus for my degree project, I consider questions of how we can focus on the user in the context of the smart city and interpret this data to develop their experience. Finally, I was interested in the smart city concept (hereafter: SC), user experience, and data collection.

Figure 1: My photo with my teammate from a surveillance camera in Hobujaama

1.2 Industry Partner Collaboration

Since the concept of the smart city is a very broad topic that involves many issues, the opportunity to work with a visionary and relevant industry partner would help me work on a specific topic related to SC.

I knew Ülemiste City (hereafter: ÜC) because 2 years ago I participated in Future City Hackathon, organised in cooperation with Tallinn University of Technology and ÜC. My team designed a future bus stop for ÜC and we received Ülo Parnits Special Prize.

Figure 2: My team photo at Future City Hackathon

During this hackathon, they mentioned that they support collaboration with students who want to work on their master thesis related to ÜC. Therefore, I turned to Mainor Ülemiste (hereafter MÜ), which has a futuristic vision that aims to be a smart and green city by developing solutions in the areas of environment and mobility.[2]

Today, more than 500 companies operate in ÜC, providing services to 70 countries around the world. Ülemiste developers consider ÜC city in the city. According to the website for this business campus, "Based on the labor tax coming in from business ventures, the contribution of Ülemiste City to the Estonian economy is on the third place after Tallinn and Tartu."[3].

ÜC assesses the current situation and develops a vision for the future by collecting data on the economy, knowledge, services, environment and community.

During our meeting, they mentioned that they are working on several themes in their 2025 service strategy. There are several topics, from green office interiors to how to attract tourists to the ÜC or to mobility. For me, the most interesting topic was the green dashboard that will help companies in ÜC in their green change by showing the data about their consumption in the offices.

1.3 Goals and objectives

The main goal of my thesis is to interpret and use collected data (regarding energy consumption, waste separation and commuting) in ÜC a from a user-centred perspective.

Regarding the Green Dashboard topic, I did not want to limit myself to just the dashboard and decided to approach it from the perspective of companies, sustainability experts, and employees for their sustainability on the ÜC campus to understand why it is needed, who the user will be, and what the user interaction will be.

Before beginning the research I defined my project goals :
- To go far and be open to possibilities,
- Discover opportunities in SC concept,
- Demonstrate ability to deal with uncertainty, [4]
- Demonstrate willingness to experiment, [4]
- Understand the users,
- Involve users in the ideation and design process,
- Analyse and identify potential areas of intervention,
- Prototype and iterate my design solution,

1.4 Background

Currently, there aren't any products or services in ÜC which is used for helping companies for their green change. There are over 500 businesses in ÜC, only a few of them have clear sustainability goals and are aware of their impact on the climate and take action. But many of them want to go green or be more environmentally friendly, but they do not know how and where to start this change.

In my research, I found several products on the market for monitoring corporate resource consumption. Some of them monitor and measure consumption of electricity, water, heating, cooling, or waste, while other systems were specialised only for specific measures such as waste, supply chain management, and so on. The usage of this products are limited only with the responsible person In addition, there was no product developed only for a corporate campus. These products are used only by a limited number of people, limited to monitoring and measurement, and do not help a large number of people in decision making and selection.

1.5 Problems, challenges and opportunities

MÜ has feedback from the compaines in ÜC, but they do not have feed-back from their employees on what they think and how they feel about the developments or if they want to contribute at ÜC. I think that looking at it from different perspectives, that is, not only from the company's side, but also from the employees' side, provides opportunities to discover ÜC.

Sustainability is also a very broad topic and in addition to the companies that have offices in ÜC, they operate in different sectors and have differ-ent needs and approaches to sustainability. I need to talk to various corpo-rate sustainability experts and officers to understand the current situation and gain insight.

1.6 Design Approach

I decided to apply the Human Centred Design Thinking [5] method from IDEO to my final project and broaden my perspective to be open to meaningful and impactful directions.

Inspiration phase, I conducted desk research, field observations, employee and expert interviews and in to better understand my objectives.

Ideation phase, I conducted a co-design workshop to understand the meaning of the commute for the employees and get inspiration and validation on my ideas.

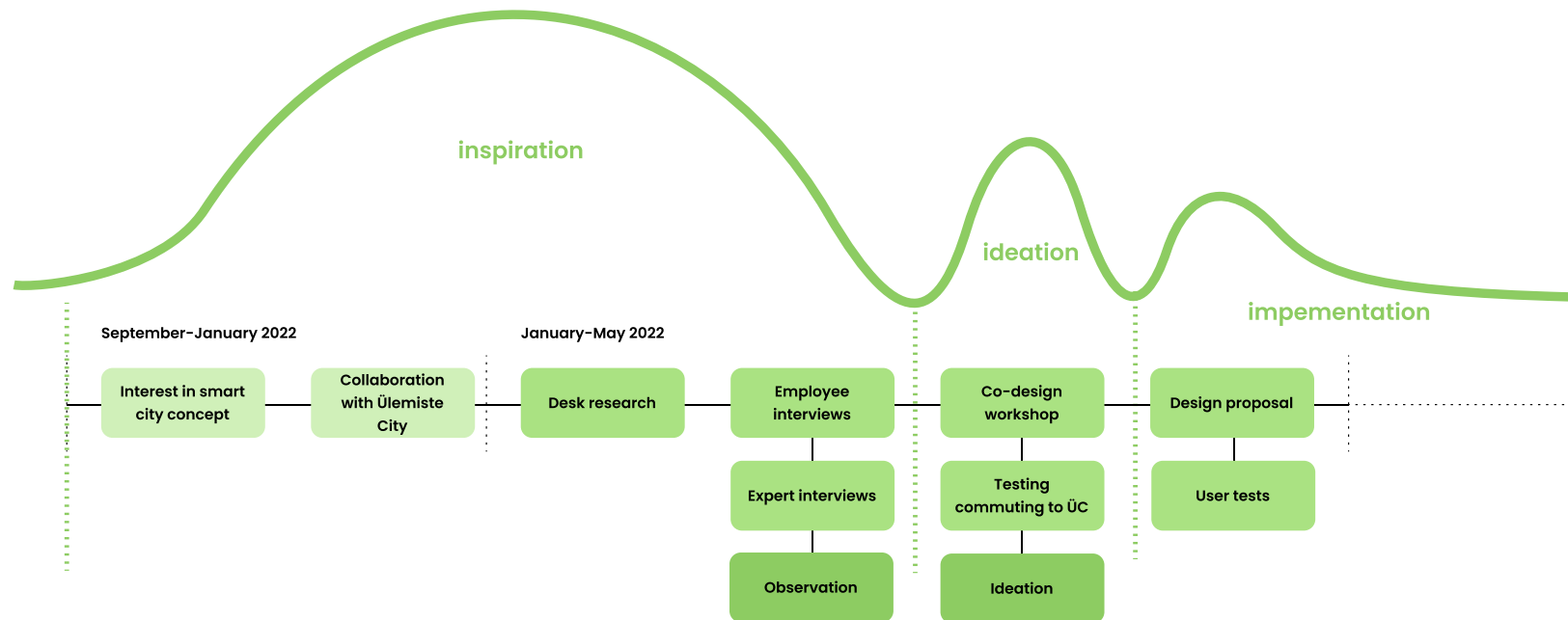**Implementation phase**, I crafted my ideas, conducted user test and delivered my design proposal.

Figure 3: IDEO Design Thinking Process[5]

1.7 Sampling

In Ülemiste city, there are more than 500 companies with 13,000 employees. Firstly I needed to understand the needs of businesses for today and the future regarding their sustainability actions and impacts in ÜC.

My target groups are employees and sustainability officers of the companies. Why did I choose these target groups? First, Ülemiste City employees play the biggest role for the companies in terms of green change. Their actions inside or outside the company influence the companies' green reports. Therefore, it is important to understand the employees' attitude and their current relationship with the companies in terms of reducing CO_2 emissions. I want to find out how they are currently acting, what they are missing, and if they are willing to change their current behaviour so that companies can act in the future.

Secondly, my other target audience is the sustainability officers of the companies of the companies in ÜC. Because they have the power to change things in the organisation. I want to find out how they think about green change or reporting. What have they done so far? Are they aware of the current situation of the company and the view and actions of the employees? Do they have sustainability goals or a green team in their company? What do they need to achieve their goal?

1.8 Research Methods

Desk Research: I began working on my project by researching terms and literature. I used relavant research papers in Google Scholar, Meduim articles and related websites during my research.

Ethnographic Research: I chosed Enthnographic Research, a research method that helps researchers collect qualitative data for my degree project. It consists of some other research methods such as observations, contextual interviews, and photography, etc., which help me understand the research objectives in their natural context.[6] [7] I planned to spend time there to make observations and talk to employees, sustainability officers and developers to understand the interactions between people and ÜC How the environment influences their sustainability and decisions.

1.9 Data Collection Methods

Field Observation: Since it is not possible to observe the inside of the offices. I plan to observe social areas where people spend their work breaks, such as cafeterias and lobbies of large office buildings. I will also observe and analyse how these areas affect the sustainable actions of employees and companies in ÜC. What is the interaction between the environment of ÜC and employees? I took photos and talked people.

Semi-structured interviews: I planned to conduct semi-structured interviews. These interviews provided me contextual information and qualitative data. This helped me to find out commonalities and differences among the participants. Semi-structured interviews gave me the flexibility to ask more questions and have fruitful conversations. [8]

Co-design workshop: Since there are different stakeholders after the surveys and interviews, it would be beneficial to have a co-design session. This would be helpful between the ideation and prototyping phases. To validate identified problems and develop ideas together. Also understand their perspective on some specific topics.

1.10 Data interpretation Method

Thematic analysis: To analyze the data obtained from the interviews, I used the method of thematic analysis. I sorted the data I had according to the themes, codes and the patterns. This helped me to uncover the hidden problems and needs. [9]

2. Desk Research

I began working on my project by researching terms and literature. How should I interpret sustainability in ÜC context? What agreements, protocols, and sanctions are in place regarding sustainability and CO2 emissions? And what can the ÜC do in this regard?

Smart City

In recent years, the number of people living in cities has increased rapidly and is expected to increase by 60% by 2030. Moreover, 70% of greenhouse gas emissions are generated in cities. Considering the massive development of information and communication technologies (ICT), Big Data, and machine learning, the concept of smart city seems to be the answer to the challenges and environmental problems we face. The smart city concept aims to improve operational efficiency in the city in areas such as energy, transportation, sustainability, and reduction of waste and resource consumption by incorporating information and communication technologies. The smart city concept promises many opportunities and benefits for citizens, such as better traffic flow, transportation services, urban safety, digital equity, non-graded infrastructure, energy efficiency, and a healthy environment. [10]

The concept of smart city looks promising, but at the same time there are debates about the implementation of this concept and its consequences.

I found that the biggest difference between failed and successful SC examples is citizen empowerement and involvement. Only implementing high technology without thinking citizen relation and interaction creates failure. I considered this factor during my design process. [11]

Paris Agreement and Businesses

The global climate crisis affects all nations and our future. To guide all nations and provide a framework for climate change, the Paris Climate Agreement was negotiated by 196 parties at the 2015 climate conference UN (COP21). The main goal of the Paris Agreement is to limit global warming to below 2°C, or preferably 1.5°C, by reducing greenhouse gases.

It provides financial support for developing countries to mitigate climate change and adapt to build resilience and develop capacity to cope with climate impacts.

The agreement operates on a 5-year cycle and every 5 years countries are expected to submit an updated commitment plan. [12][13] While countries are doing their commitment and businesses are also responsible for adapting practices for reducing GHG and climate resilience. Many businesses are planning their climate action and 5-year cycle plans. End of the year they are publishing transparently what they achieved, where do they stand in terms of reducing footprints and how they are close to their green goals.

Green Transition and EU Taxonomy

It is also called green turn, green deal. The climate crisis and environmental degradation threaten us, the European Union and our world. To face these challenges, it is inevitable to develop a new action plan. In this way, Europe can transform itself more into a novel, resource-efficient and competitive economy. The Green Transition approach aims to turn Europe into carbon neutral by 2050, develop sustainable manufacturing, transport and economy by including everyone. [14] Industries and companies have bigger role in green transition. The number of the businesses which are willing to have green transition are increasing.

For EU countries, it is important in terms of the Green Deal whether their financial measures or investments are climate change oriented. The EU taxonomy provides this classification for sustainable economic activities. For companies in the ÜC, the implementation of the EU taxonomy is becoming more and more important, as they need to meet these environmental objectives in order to develop their projects and receive funds or loans for their businesses. Financial institutions in the ÜC are also carefully reviewing and tracking their clients' applications against the requirements of the EU taxonomy. "These environmental goals are:

- Climate change mitigation,
- Adaptation to climate change,
- The sustainable use and protection of water and marine resources,
- The transition to a circular economy,
- Pollution prevention and control,
- The protection and restoration of biodiversity and ecosystems,"[15]

High-Impactful Climate Actions

When calculating the climate impact of companies, it is important to also consider the work-related induvidual impact of employees.

A research conducted by Seth Wynes and Kimberly A Nicholas they reviewed on 148 scenarios from 39 sources in the developed countries and the finding about the impactful actions are having one fewer child (an average for developed countries of 58.6 tonnes CO2-equivalent (tCO2e) emission reductions per year), living car-free (2.4 tCO2e saved per year), avoiding airplane travel (1.6 tCO2e saved per roundtrip transatlantic flight) and eating a plant-based diet (0.8 tCO2e saved per year). [16]

In addition to individual measures, there is also the Greenhouse Gas (GHG) Protocol, which provides standards for companies to calculate greenhouse gas emissions to measure their footprint. These calculations are done for companies with three types of emissions, Scope 1, 2 and 3. Scope 1 includes direct emissions that are under the control of the company, such as company facilities or vehicles. Scope 2 are indirect emissions caused by the company's energy consumption for purchased electricity, steam, cooling and heating that it uses for its facilities. Scope 3 includes broader emissions related to the company's value chain and activities. It depends on the scope and activities of the company.

In ÜC, most of the companies' facilities are offices; there is no physical or machine manufacturing. There are many IT enterprises or headquarters of manufacturers. Therefore, companies calculate scopes 1, 2, or 3 differently depending on their business activities, or they combine them for their needs. They use these calculations for various reasons, such as understanding their impact, applying for green office certifications, or applying for loans or funds. [17]
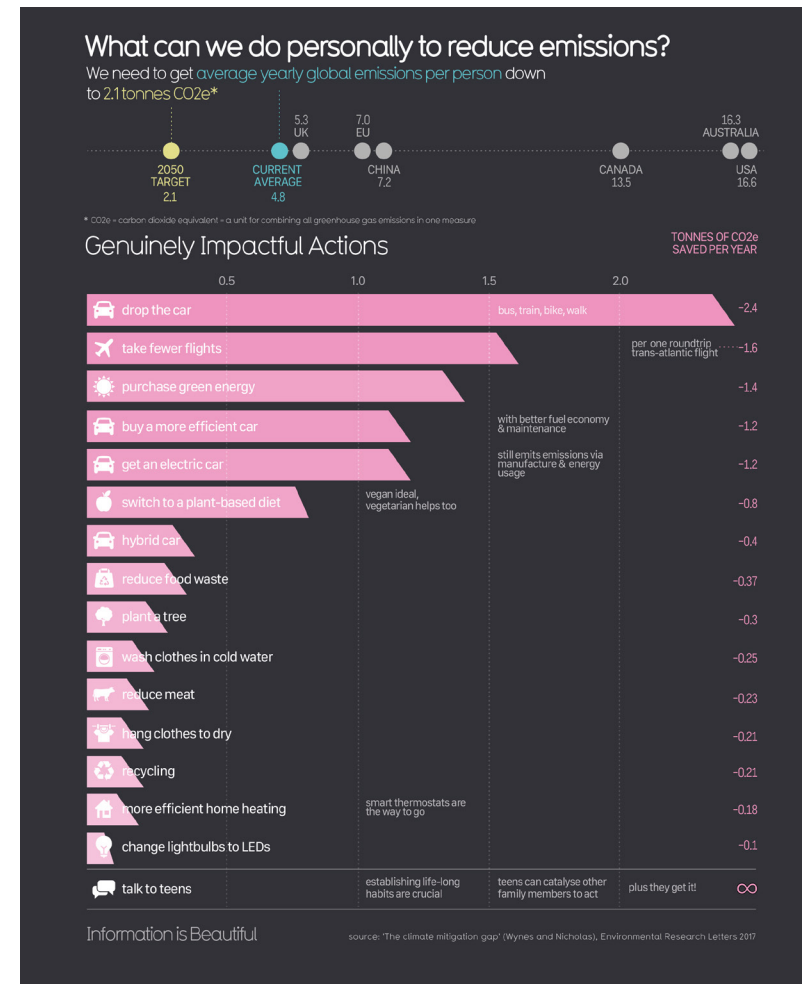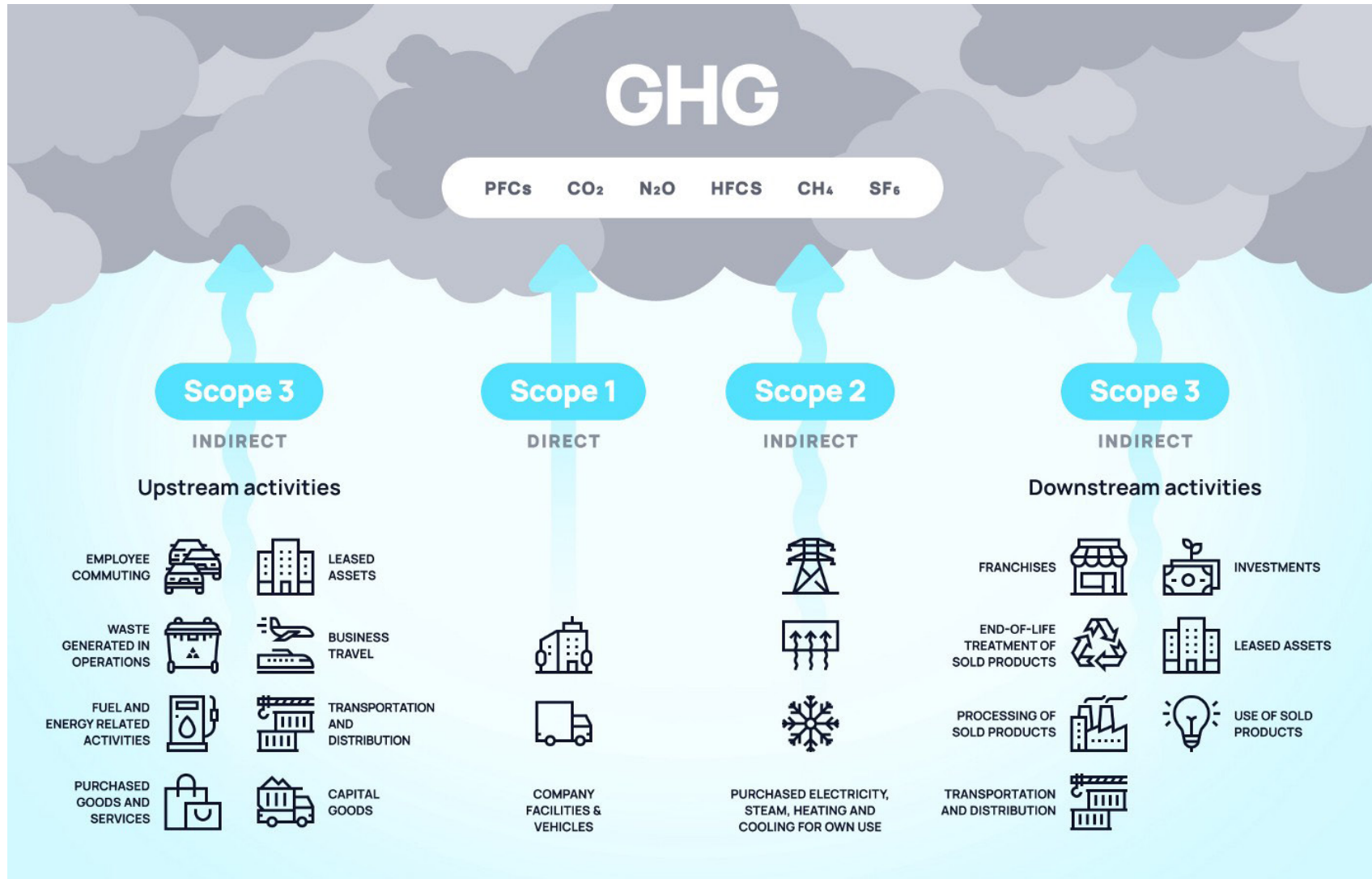

Figure 4: High Impactful Acts[14]

Figure 5: Scope 1, 2&3 emissions. Data source: GHG Protocol [16]

3. Field Observation

After getting an overview of related topics for my degree project, my initial task was developing a green dashboard to help companies green change. However, I decided to approach this topic from a broader perspective by understanding and analysing corporate and employee attitudes toward green transition and sustainability issues in ÜC. I spent some time on the ÜC campus observing and talking with ÜC employees and residents to understand the interactions between people and the ÜC. How the environment affects their sustainability and decisions. Since observation within offices is not so easy. I made observations in social areas where people spend their work breaks, such as cafeterias and lobbies of large office buildings. I also observed outdoor spaces to understand what things help employees and companies facilitate their green transition and act sustainably, and what barriers prevent employees and companies from acting sustainably and complicate the process.

Figure 6: Indoors and ourdoors in ÜC

For the first impression about the environment, everything is quiet during working hours and after 5 pm the ÜC turns into a ghost town. During the lunch breaks, the ÜC is more lively. In addition, the weather affects this situation because in the summer, the ÜC offers employees outdoor work areas, events and outdoor activities. There is a digital information board in the middle of the ÜC, but it has very little information such as the number of Technopolis, my location, and the company.

Also, the ÜC has recently worked with a design agency to design their signage system on campus. These signs are also very informative because the names and histories of the buildings are from ÜC. [18]

At first glance, these details about the environment in ÜC caught my attention. In my interviews with ÜC employees, I found out more details.
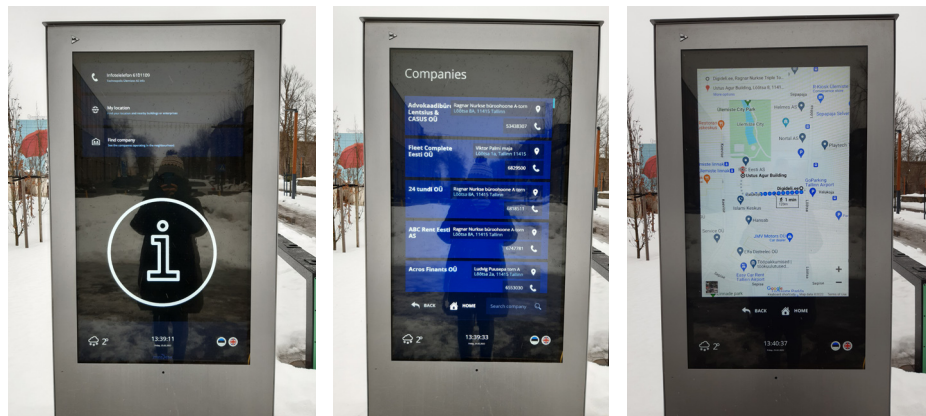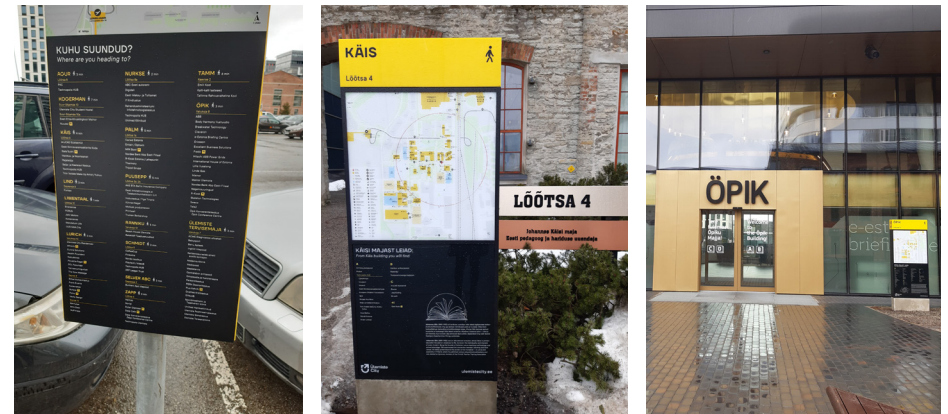

Figure 8: The signages in ÜC

Figure7: The digital board in the middle of ÜC

Figure 9: The signage and map of ÜC

4. Employee Interviews

I conducted 14 semi-structured interviews with employees in ÜC and MÜ. These interviews provided me with more contextual information and qualitative data. Depending on their answers I generated and asked different questions. Which gave me more deeper information and I observed them during our conversation.

I wanted to gather information about sustainability and green change in their organisation and their relationship and perspective on this issue.

During the interviews we talked about the topics below:
- Working in ÜC
- Commuting
- Working from home
- Company's sustainability goals & actions
- Trainings & Workshops related to sustainability
- Waste sorting
- Surprising Insights

Speculative Design Course for Inspiration

Beginning of the semester, I took Speculative Design course which is given by Nesli Hazal Oktay, Mert Oktay and Oliver Laas for the Digital Product Design major and was collaborating with MÜ on this project. I decided to take this course to gather information and gain inspiration for degree project. It was helpful my research process.

In this course with my teammates, we discovered lack of community feeling in ÜC. Even though ÜC puts effort on this, the employees doesn't have any bond for ÜC community. We developed speculative objects fot future ÜC. I considered community side for my design principles and ideation process.

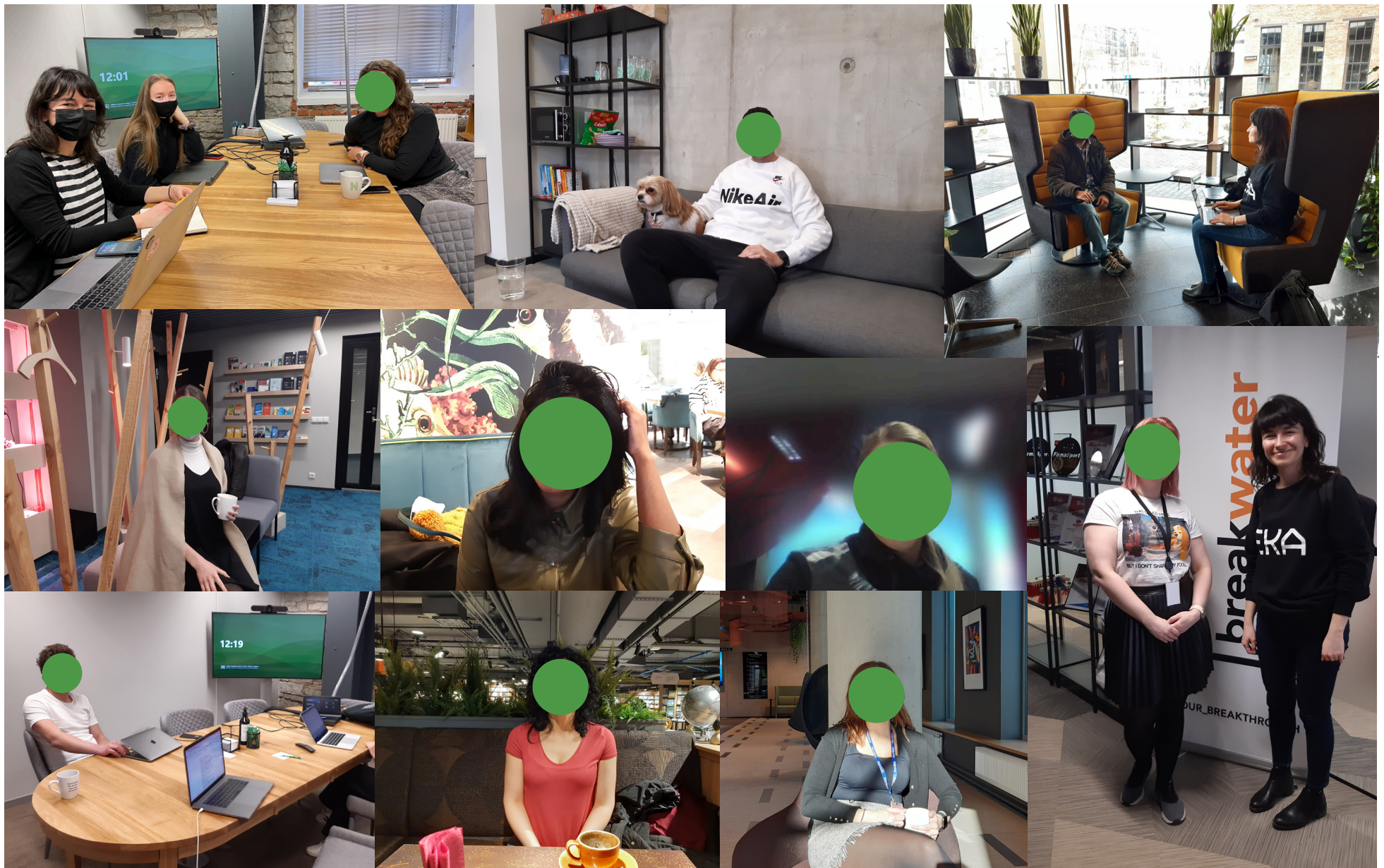Figure 10: Speculative Design Course

Figure 11: ÜC employees I interviewed

4.1 Insights from employees in ÜC

Working in ÜC

I asked them how they found working in ÜC. I asked them, "When do you compare your previous work experiences to how you feel about working in ÜC?" During our conversation, most of the employees mentioned their experience with the company where they work or the office environment. When I asked them, "How do they feel about the environment at ÜC?" They mentioned that, for the most part, they do not feel any difference. Some of them appreciated that there are some events or that they are around other businesses, but they also said that this is a business centre and nothing more and that the city is pretty dead after working hours. We also talked about whether they follow the events in ÜC. I found out that there is indirect communication between ÜC and the employees. I also observed the channels through which people in ÜC can get information or news about ÜC. I found that there are digital screens in the entrances, elevators, or outside the building, but the interviewees mentioned that they do not notice what is shown on these digital screens and many of them also do not check ÜC's social media channels.

Indirect Communication

"All our responsibility is to communicate it internally to make sure that our employees would be aware of what's happening and they would feel and be included. And at the same time, the external communication as well that we we would receive as much information from our landlords as possible."

"Our HR is informing us in the slack channel. Besides this I don't follow any social media accounts of Ülemiste City. Sometimes I check daily offer page but not any other social media channels."
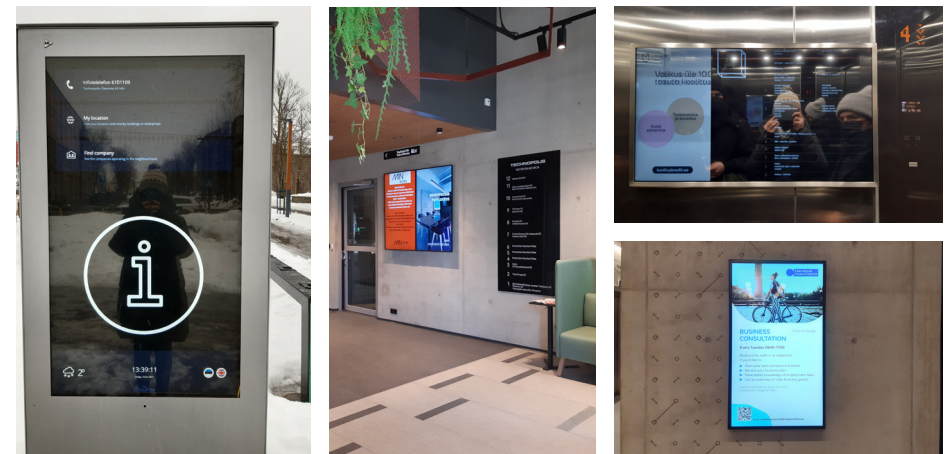

Figure 12: Indoor and outdoor digital boards

Community

One of the things ÜC wants to achieve and provide is the creation of a community in ÜC. If we consider that there are over 500 companies and 13000 employees, this is a promising and valuable idea that will bring more collaboration and growth opportunities to the ÜC ecosystem. When I asked people what they thought about the ÜC community? At the beginning, they even thought that there is a great community here, but they are not part of a community outside of their companies.

No sense of community

"No community. Every company just rents spaces. They want to create a community vibe. When you kind of tell a person that you work at Ülemiste City they would think that ok this Ülemiste City kind of guy who creates the illusion of "Ülemiste community". But in reality it's different if you work here. No collaboration with other companies, only work related."

"I know these people who work in these companies but actually I have never spoken to them."

"I haven't met anybody new since starting work at Ülemiste City, I only know friends who work in Ülemiste and I already knew them before."

While we were talking about ÜC and the community, I asked them what could be better in ÜC in terms of the community. Some of them mentioned that they would like to share their knowledge or exchange knowledge, but there is no place for that in ÜC. A creative centre would be a nice place to meet with like-minded people and develop professionally.

Creative Hub

"Creative hub, workshops - would be beneficial. Other than that there's no benefits of working at Ülemiste city."

"There should be a coworking space like Spring Hub. Lurich community doesn't exist."

"I don't know if we have a place for gathering. Let's meet there and share ideas. Let's share our projects. I don't really feel that I'm living in a community."

Working in ÜC Takeaways

- Employees value growing, meeting like-minded people, and contributing to the community.
- They believe that working in the ÜC is different from working elsewhere because they know there are great and successful companies here.
- They believe that the ÜC offers good potential for networking, sharing ideas, and collaboration, but at the moment they are not taking full advantage of this potential, but they expect to.

Commute

Since there are over 13000 employees in ÜC, these people come from different parts of Harju County, some of them even from the suburbs. On the map (Figure 13) we can see where the respondents come to work. The interviewees also mentioned that the Jaerve Vana road, which is marked by a red line, has already reached an intensity that is twice its own capacity. The detailed research of my mentor Damiano Cerrone and his team also supports this and shows future forecasts for the ÜC and the airport area. It shows that this [19] Also during my interviews, I tried to understand ÜC's vision and actions regarding commuting. I found that ÜC has a car-free vision and also supports commuting to work by bicycle. There are bike racks around the buildings and there are showers for employees in the office buildings. ÜC also organises events to promote commuting by bicycle. But despite these efforts and intentions, there are still parking problems and there is no visible decrease in commuting by car. During my interviews, I tried to understand why people commute by car or whether they consider leaving their cars behind. I found out that there are several reasons why people come to work by car, such as convenience, weather conditions, plans after work, there is no direct connection from some places, and it is time consuming for some of the employees. In addition, some employees have children and need to drop them off before work. These circumstances affect many employees, so they come to work by car.

Figure 13: The interviewees come to ÜC from different areas

Car Free ÜC

Ülemiste City developers: "Our goal is to change that by developing an environment that supports alternative transportation, and by 2030, we plan to have a car-free campus centre."

"Underground parking space would be the solution."

"What got worse is the parking situation - there are not enough parking spots since we lost the access to parking houses."

Figure 14: Parking lots in ÜC

Choosing Car for Comfort and Mobility

"Going by car and by bus it takes same time. But there is added value more comfort more freedom in winter. Depending on my time table I can go forward."

"Tram takes 40mins and car just 10. However I would prefer more sustainable solutions if these would not mean spending too much time on travelling.
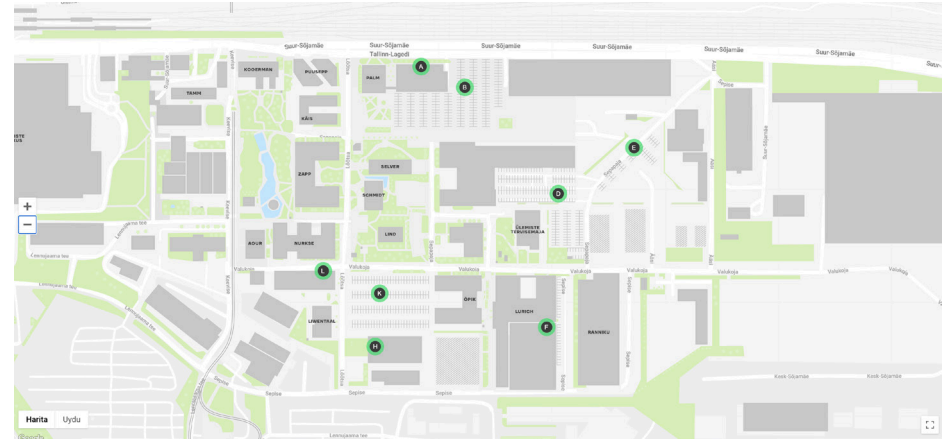*I have gone to work with a bike as well but since with 6km you get already a bit sweaty then I do not like it that much."*

Figure 15: Parking lots in ÜC [20]

Employees also mentioned that although they would like to bike to work, there are no bike lanes up to and in ÜC They do not feel safe riding their bikes to ÜC.

Figure 16: Biking event in ÜC [21]

Figure 17: Bike racks

Lack of safety and bike lanes

"I think Ülemiste could put more effort in pedestrian road or the places that cyclists could ride. Actually city is build for cars and even in during the winter when there are lots of snow basically you have to walk on the car road. Roads are so narrow for the pedestrians. If you have a car life is more convenient."

"Ülemiste City supports health of employees we have public bathrooms that we can take shower. I would love to come to work by bike in summer but I don't feel safe riding to here."

Commute Takeaways

- Commute time is valuable to workers and they don't want to spend so much time on it.
- They want to use commuting time effectively and efficiently.
- Some of them need to drop off their children or family members before work, which affects their commute decisions.
- Even though commute time is the same by public transportation and by car, convenience and flexibility play a critical role in transportation choices.
- After-work activities also affect the choice of transportation.

Figure 18: Showers in the buildings

Working from Home

After the outbreak of the Covid 19 pandemic, many companies started working from home. During my interviews, I found that almost all employees in ÜC have hybrid work options. Even though some of them prefer to go to work often, they are happy to have this flexibility. The average number of days employees work from home is 2. It is also clear from the findings that employees' productivity depends on their moods and tasks. Also from sustainability expert perspective working from is considered for the carbon footprint of the company and not many companies are aware of that.

Freedom to Choose

"I am coming five days a week to the office and I'm I'm really enjoying it because in my previous job, I worked from home over like it was one and a half years. I would say yes, and it was really tiring. I like I'm extremely happy that I have the possibility to come here because it's then it separates the home from the from the work."

"I rarely work from home, because I like working at the office. That's why I go to the office almost every day."

"I prefer coming to the office as it is easier to concentrate although they like the freedom to choose."

"I work in office four times a week . Few colleagues still prefer working from home as they live further away (Kopli) so they might come to the office couple times a week or when there are workshops etc. "

"Time to time I work from home, it depends on my mood, for example at last week I went to office everyday. Sometimes If I feel super lazy wake up in the morning I just don't go to the office and just work from home. If there are lot of meeting and if I need to focus myself I just work from home. But generally I work from home once a week."

Working from Home Takeaways

- Even though some employees prefer to work mainly in the office, they are happy to be able to choose how they work.
- Employee productivity depends on their mood, they do not just have a preference.
- Working from home affects the company's carbon footprint and is taken into account when calculating the carbon footprint.

Companies' sustainability goals & actions

From the findings of my interviews, I can say that the large companies have clear goals regarding sustainability. They take action and share their knowledge or progress with their employees. However, there are also some companies that have goals and intentions for green change, but the process is slower. Employees are aware of the companies' goals, but they are not as active in the process.

Awareness of company's sustainability goals

"All company cars should have minimal CO2 emissions, we do waste separation, totally paper free, we only use renewable energy when we purchase the electricity."

"We have like a huge goal this year to be more sustainable, to be greener and to do like to improve our our offices and our wellbeing of the employees to and guide them also to be more greener."

"I know that our management is trying to make business with the companies that are putting sustainability like they are holding them as a priority. Like, for example, if a customer is getting a loan about a project, we try to see if it's sustainable or not. Helping the customers to to invest in invest in sustainable or environmentally friendly projects."

Willingness to green change

"This is a topic that we are pushing at the moment because actually trying to come up with our own digital sustainability products it is how we can help clients to make more sustainable decisions and also services and vice so how we can create those services what clients are sustainably thinking about the planet."

Companies' sustainability goals and actions takeaways

- Large companies are aware of sustainability issues. These companies have environmental specialists and green teams.
- Some employees have no idea of their company's sustainability goals and measures, and some have only a very brief idea of them.
- Some employees have great interest in sustainability issues, but they don't have a medium to share their knowledge and contribute.

Trainings and Workshops Related to Sustainability

My interviews show that very few companies offer training on sustainability. Other companies organise events or send reminders to their employees. The ÜC has also started to organise sustainability events, such as the Digital Cleaning Day, and it also supports and promotes other companies' events on campus.

Big corporate companies provides various trainings

"I will have sustainable development training next month. I had some environmental based training like garbage management, how we manage our technological garbage. We had visual pollution training, like big billboards may affect animals who do moon based tracking or something like different insects and regular environmental issues like carbon pollution, carbon less pollution. What company does about these and what we should maintain as employees these kind of things."

Reminders

"We haven't done anything internally in our day so far. It's rather than a daily or weekly or monthly communication or some some quick email to the distribution list saying that, Hey, please do not forget the recycle or sending reminders how to do it. And we also have this Yammer community where we are also like promoting different stuff, things and also the events. And we are just mainly relying on general communication."

Figure 19: Company event [24]

Events

"We have sustainability week every year in the fall and we have the health month."

"There are two physical events organized as well (of course in accordance with government Covid-19 regulations). One group of people will go to clean up our beautiful Kadriorg park, and the other will be helping the Reuse Centre with their campaign to promote second-hand wedding dresses (the second one is definitely something unique and different, and I am most excited about it)."
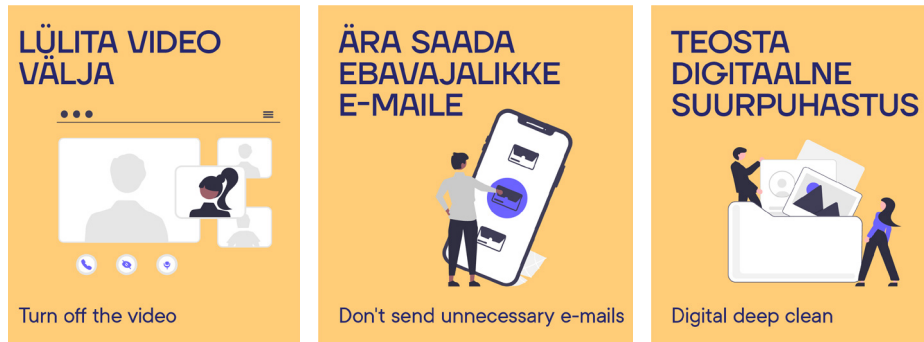
Figure 20: Company event [25]

Trainings and Workshops Related to Sustainability Takeaways

- Large companies hold training and workshops for their employees on topics such as sustainable development, reducing digital waste, e-waste, light pollution, etc.
- Very few companies have green teams/clubs that do activities with their employees.
- Employees are willing to contribute and are proud to participate in such events
- Some of them indicated that they were interested in serious incentives to act more sustainably.
- ÜC has recently started organizing events on sustainability.

Waste sorting

Most companies have separate garbage bins. Also outside and inside of main buildings have separate garbage bins. Still feedback from the ÜC side and some interviewees also mention the waste does not separate properly.

Figure 21: Outdoor waste bins

Doubts about Waste Sorting

"We are one of the few companies who recycles, which I also heard from Ülemiste City and which which was like a huge surprise for me because I was thinking that, like most of us are doing it."

"I see that people do not know how to sort the waste properly. What we throw in the in the paper trash bin is like contains like non paper stuff or we are not really sorting our waste properly. So we definitely need to either training or maybe some instructions because I observe people are not sorting it properly. At the end, we are not really caring for the environment."

ÜC has started a collaboration with bringpack to reduce the consumption of disposable packaging. But my interviews revealed that restaurants do not promote the use of bringpack packaging, even though one of the containers is located right next to one of the main restaurants in ÜC.

Waste Sorting takeaways

- Most employees believe they sort waste, but according to ÜC data, very few companies actually sort.
- There are package collection machines in some buildings and outside, but restaurants don't make people aware of them.
- Some employees are skeptical about waste sorting and package collection machines in ÜC, but they're willing to provide feedback and contribute.

- Individual businesses' waste isn't currently calculated, so businesse cannot measure it.
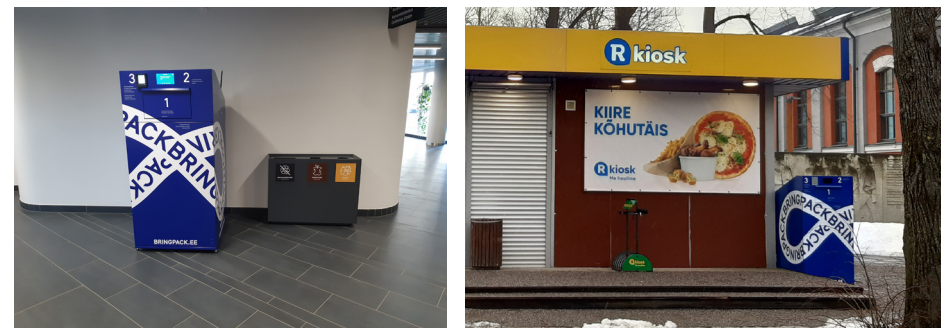

Figure 22: Office waste bin

Figure 23: The automat on the left is very close to a restaurant and the automat on the right doesn't work

Surprising Insight "Competition Motivates"

During the interviews, I found that employees participate in some challenges within their companies and in competitions organised by the ÜC. Some employees have strong competition or sports teams in their companies. This makes them feel responsible for their team and motivates them to keep trying. In addition, these activities strengthen cohesion within the company.

"Competition motivates me. There is also like teams competitions and you have to see that I don't want to fall back on my teams my steps as well."

"Last summer, we had this competition we formed some teams and like we were walking everyday all team members. Champion of the team got some discounts or gift cards. I think it was good."

"We have Ülemiste City competition(table tennis, bowling, and different sports) and every company which works in Ülemiste city be a part of it. In these competitions employees represent the company and play for these different competitions. I joined paintball and we won first place."
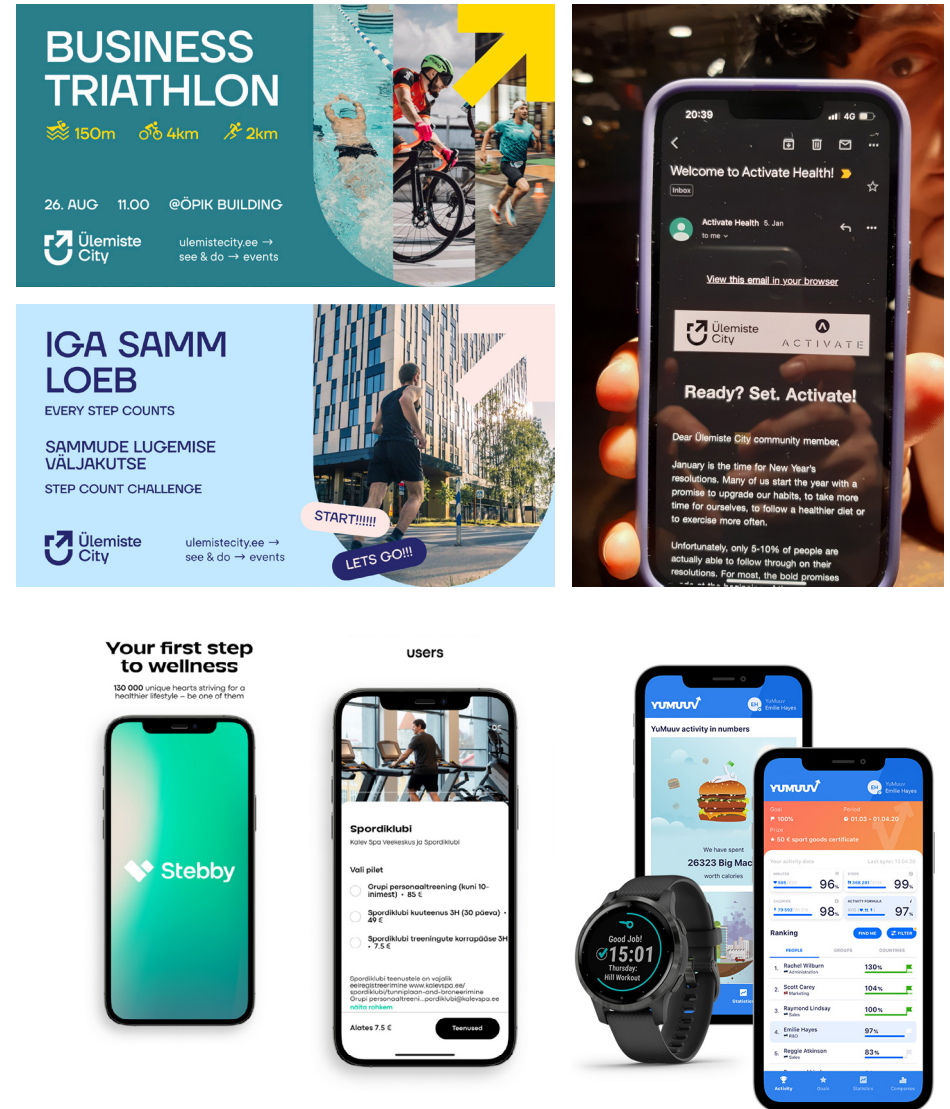
Figure 24: Health activities and apps that ÜC employees attend and use [22][23][24][25]

Conclusions from the employee interviews

Employees value work-life balance, and companies and ÜC also support healthy activities, not only physical but also mental. Other values are comfort, flexibility, freedom of choice, even if they do not prefer to work from home, but they are still satisfied that they have these options. They form teams within the company to compete with employees from other companies, or they challenge within the company to move more and be active. They also believe that working on the ÜC campus gives them a great opportunity to network with their peers and learn from each other. Most of them are aware of sustainability and are already applying it to their lives or habits. They also follow the changes at ÜC regarding sustainability and are willing to give feedback on what could be better at ÜC.

Figure 25: Values of employees

5. Expert Interviews

After interviewing employees, I interviewed environmental experts or employees who are responsible for sustainability issues in ÜC companies to understand what is working well in their ÜC company and what needs to be improved. How can ÜC help them with their green transformation? What kind of data or services do they need? The topics we talked about:

- What are the company's sustainability goals?
- Is there training or workshops for employees?
- What are steps for the green change?

I conducted four semi-structured interviews with three experts from companies in the ÜC, including an expert from a sustainability consulting firm. After my initial conversation, I realised that employee commuting was an important factor in the sustainability of the company. I asked other experts about the impact of employee commuting on the company.

Figure 26: Expert interviews

5.1 Insights from expert interviews

All experts have no professional environmental background, but they have a personal interest in sustainability
The experts I interviewed, only one has a professional background in the environmental field, while the people who are responsible for sustainability in companies generally have a strong interest in sustainability.

"Sustainability and developing our green strategy is one of the areas I'm connected to we don't have a separate position for that it's just something that I have been passionate as a person now we have a small group of leaders who are more into ESG topics and sustainability overall."

"A group workplace management team in that sense, so on a daily basis, I am maintaining the well-being of the employees in the offices and also making sure that everything works as it should work."

| accessing a system where everybody enter their data and they would gather this | internal software, track your data, shows what kind of energy we consume, information system gathers data | if Ülemiste City provides a frame work internally other companies can apply | calculation of water, waste, energy, employee commute |

Figure 27: Some tools could be provided by ÜC

Lack of knowledge about the role of companies in sustainability on ÜC

Last year, the ÜC organised a City Future Forum [26], which included several conferences on the future of innovative businesses, the future of the environment, and the future of talent and health. One of these seminars also addressed the vision of ÜC in terms of sustainability and the role of business in sustainability in ÜC. After this conference, one of the experts said that she already wanted to do something about sustainability in her company. As a result, they talked to ÜC to share their ideas. This year they started to do their first audit in their office. I think it's important to share ÜC's vision to create awareness in companies.

"We have a sustainability role in Ülemiste City I didn't know I have been working there over 3 years."

Similar Mindset

Since over 500 companies are operating in ÜC, to know these companies' sustainability actions or goals are inspiring and motivating for other companies. Interviews show that employees and experts feel that being in the same environment with various companies has a positive impact on them.

"The offices and the companies in Ülemiste City are working towards the same direction."

Barriers for green change

One of the most salient findings of the specialists was the scepticism of colleagues and managers. This creates barriers to implementing change within the company and making progress on the company's sustainability goals. It also decreases the motivation of environmental specialists.

"We often see the among our customers somebody wants to do some analysis but the colleagues are sceptical about it, they aren't sure why their company is doing that. They are sceptical that they would be do any changes."

"The most important thing is to support from management not only support also providing not only just moral support but also providing the the most important thing is the budget so you can actually get things done and also support from the management itself."

Engagement is the key

One of the most important findings of the experts was that it is very important for change that all members of the company are engaged. Starting with the employees and ending with the middle and senior managers, in order to get moral and financial support for the implementation of actions.

"In order to overcome scepticism I think gonna different layers aligning the joint understanding why we do this if we do this then what are the benefits for

us as a business where are our impacts? what exactly we can do? how can we engage our own people? how can we engage our own suppliers? because i think this is relevant part so that like the company would think out of its own four walls it's about our supply chain, it's about our value chain, in the end of day how we engage our customers how we educate our customers use our products differently. So it's like a big system. Of course it starts from joint understanding."

"Working in environmental field I would say that the most important thing is to support from management not only support also providing not only just moral support but also providing the the most important thing is the budget so you can actually get things done and also support from the management itself. Pretty much the engagement from top management to middle management and all the employees as well."

Employees are passionate about contribution for the sustainability Another finding and observation is that some employees are interested in sustainability and, although they do not have an environmental background, are willing to share their knowledge and feedback to improve things.

"It is really fun to engage people because people actually have lot of knowledge people are really passionate about this environmental field if they haven't study it isn't their profession but they are just really so passionate personally that is really cool. Because I have a lot valuable input then feedback. That is really important."

Figure 28: First steps of green change

First Step: It's important to companies to understand where do they stand in terms of climate impact

The first step for green change is to understand where companies stand in terms of their impact on climate, and then have a roadmap for change. The transition starts at the personal level, then at the corporate level, and finally at the client level. They need to be aware of the impact of the services and products that are provided to customers.

"We are in the beginning to understand where do we stand in terms of climate impact just this month we are doing very first sustainability audit or climate impact measuring.

It's the full GHG protocol Scope 1 measuring. We are assessing the entire CO2 footprint of our last years activities in our office in our purchase services and products. Also our people commuting and home office."

"We have measured air quality in our office due to the trucks that bring food and stuff to the city and to the cafes they stopping in front of our building and we get this through our ventilation so air quality is not that good."

Monthly calculation and sharing with all company

For being on the track it's important to set the goals, measure them and track with all company levels.

"We collect data on monthly basis regarding CO2 emissions that come from transportation, heating the buildings we use 100% clean electricity. We have green electricity certificate we don't calculate electricity our CO2 emission our electricity comes from renewable sources but we do calculate all CO2 emission in buildings on monthly, basis we also every month have all employees meeting and in that meaning we give an overview what was the consumption last month. So that people actually have an overview how we track this and can see where we are regarding our goal."

Who should see the climate impact reports?

The other issue is that sustainability reports are seen by only people who are responsible for sustainability but not by all employees or people who creates the biggest impact by designing or manufacturing. So these reports should have seen by people who take the decisions for creating impact. All people can effect for the decision, it is important to share with all employees.

"The correct answer would be that the ones who can make happen any changes would cause like positive impacts. End of the day this very much depends

in nature of the business if this is like manufacturing company of course like product designers procurement department, supply chain, head of operations so the ones most closely relating to the use of resources of course if it's more like service companies most office based businesses then true like very much depends on the knowledge, attitude or behaviour of the whole team of people is about like knowledge, attitude or culture."

Requirements for the Green Change

The change for companies starts at the personal level (employees), followed by the societal level (within the company) and the customer level (impact of products and services). To make the green change, all employees must develop a common understanding. This helps with the transition and reduces resistance in decision-making processes. Moral and financial support from all levels of management also plays an important role. Clear goals and tracking of the process are also critical to green change.

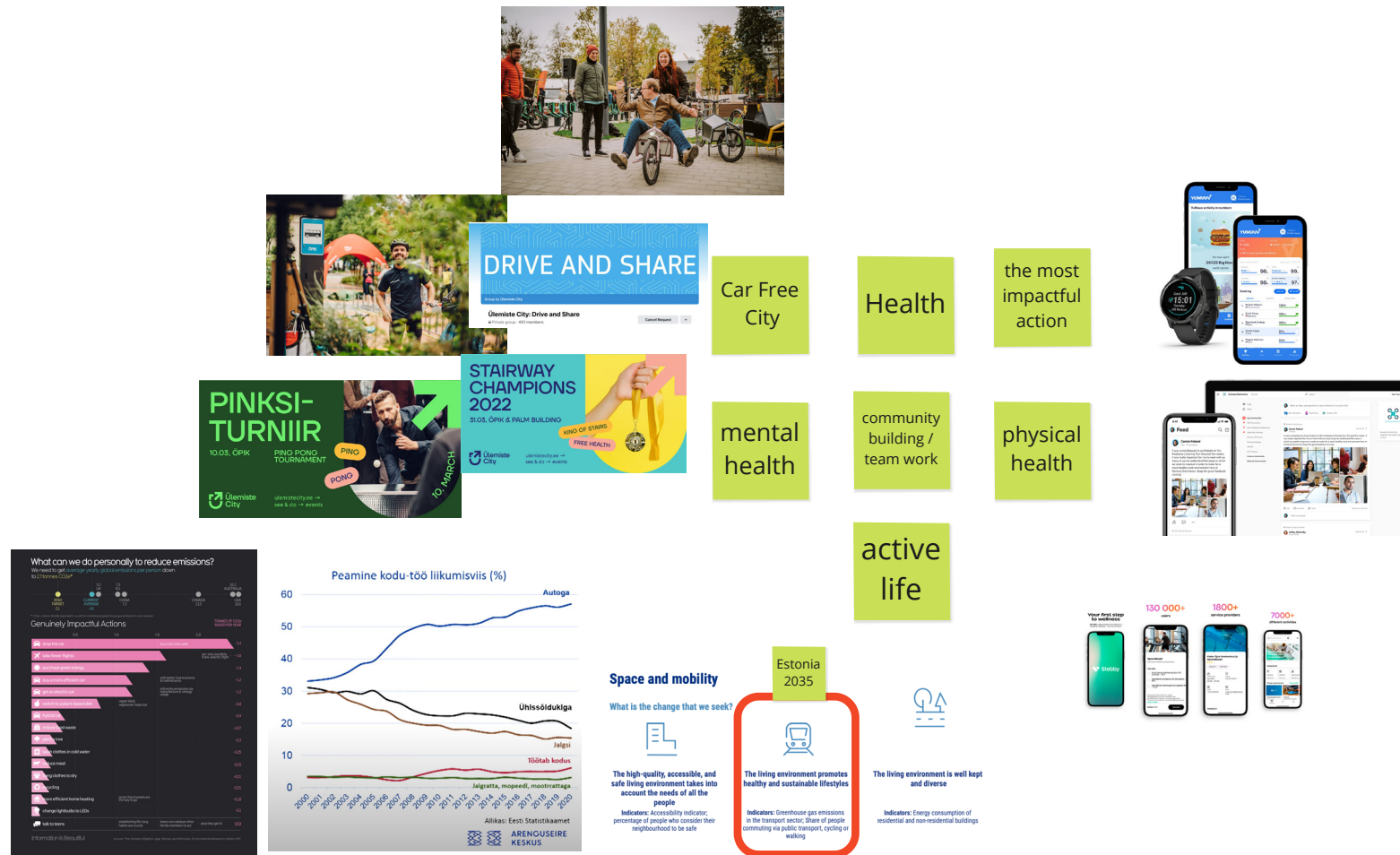| Personal Level	Company Level	Client Level

Figure 29: First steps of green transition

Figure 30: Relation of commute and health, vision on Estonia and ÜC

6. Focus Area

After my interviews with experts and desk research, I found that employee commuting had a large impact on green change of the companies. I started thinking about how to motivate employees for sustainable commute choices and let them contribute to their company and ÜC.

I also realised that companies and ÜC care about the physical and mental health of their employees. They support activities, events, or give incentives or prizes to encourage employees' health behaviours. ÜC also has a car-free vision for the future. [27] Furthermore, if we look at the big picture of Estonia's carbon neutrality vision for 2035, we see that Estonia intends to make the flow between living, studying, working, and leisure active, user-centred, environmentally friendly, and accessible to citizens. [28] I have found that there is a direct correlation between not using cars and the problems I mentioned. Since there are more than 13,000 employees on campus, even a small change in employee behaviour would go a long way toward reducing the environmental footprint of the campus and its businesses. In addition, I reasoned that commuting can use the green dashboard to get employees to track and contribute to the climate impact on campus. Also recent surveys conducted by ÜC showed that 50% of the employees commute by car.[29]
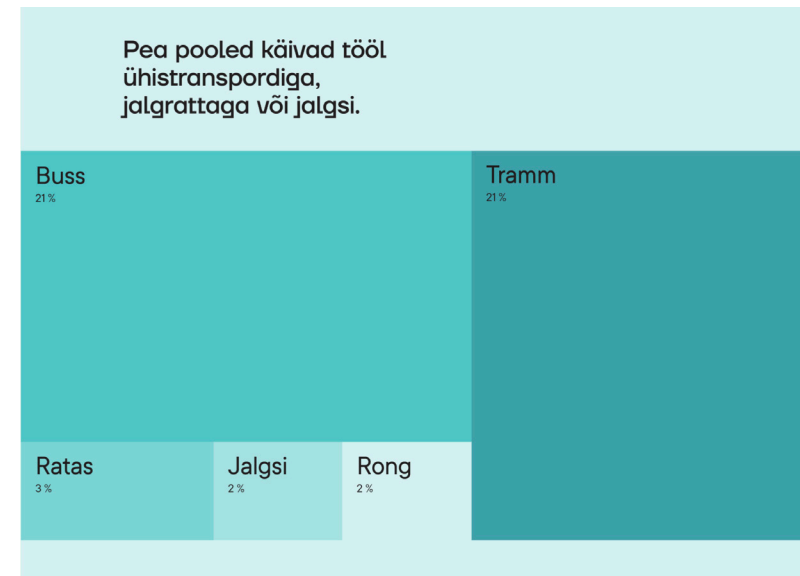
Figure 31: Recent survey in ÜC shows that 50% of the employees commute by car [29]

6.1 Why employee commute is important for the employee engagement?

Commute and Health

"On time and ready to go: an analysis of commuters' punctuality and energy levels at work or school," a study conducted in McGill, Canada, shows that employees or students who bike to work are more efficient than others who walk, drive, or take public transportation. [30] Another study from the UK also shows that active commuting (by bike or on foot) reduces stress. [31] If we consider that companies and ÜC value the health and well-being of their employees, we can say that there is a connetion between health and commuting.
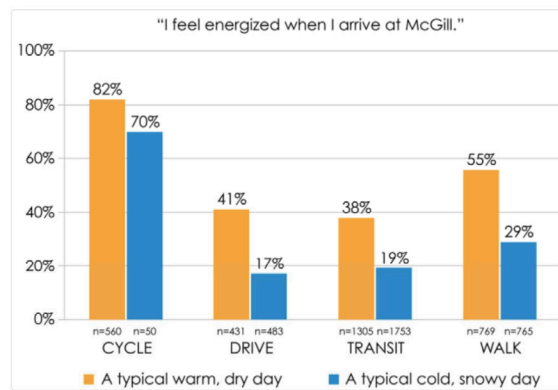
Loong, C., van Lierop, D., & El-Geneidy A. (2017). On time and ready to go: An analysis of commuters

Figure 32: Commute's impact on the employees [30]

In Denmark, research shows that Copenhageners who bike claim 1.1 million fewer sick days. Another study shows that all Danes who cycle more than 10% per year have 267000 fewer sick days. [32]

Barriers for sustainable commute

Looking at countries like Denmark, the Netherlands, and Finland, people are tempted to use bicycles or public transportation more for several reasons. First, taxes on motor vehicles and gasoline are high. [32] In the list, we find that Estonia is at the bottom of the list and "Estonia is the only EU country without car tax." [33] The other reason is the gasoline crisis in the Middle East and the movement for car-free Sundays, which has helped to develop a bicycle culture in Denmark and the Netherlands.
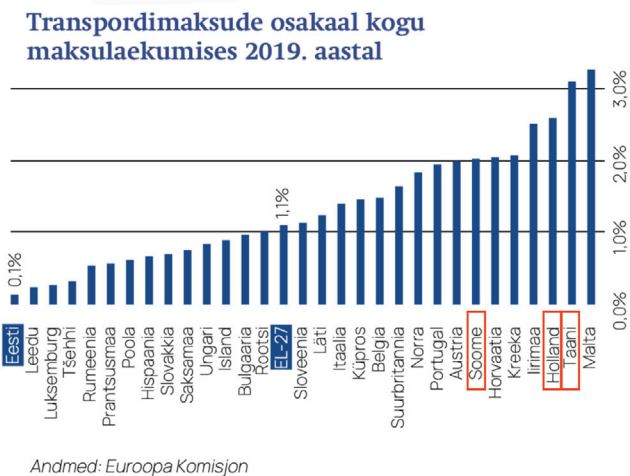
Figure 33: Motor vehicle taxes in EU[33]

Also, bike lanes are not well connected to the ÜC and there are no bike lanes within the ÜC. Some employees are concerned about safety when riding through major streets such as Tartu Street. Also, in winter, the sidewalks are not so comfortable because of the piles of snow.

Figure 34: Job advertisement in one of the company in ÜC

Free car parking is in the benefit package of several companies in ÜC. That also attracts employees to come to work by car.

The mobility report shows that the number of people who own a car is increasing year by year. [34] Even though public transport in Tallinn has been free since 2013. This has not had much impact on car owners. [35]

I was wondering why it is so easy to ride a bicycle in the Netherlands, Denmark or Germany. Middle East oil crisis led to greater promotion of cycling and the proclamation of 'car-free Sundays'. [36] Not only the crisis, but also the policies of governments in terms of urban planning, limiting car traffic and promoting cycling play a major role in the emergence of the cycling tradition. [37]

Opportunity areas for sustainable commute

The results of my interviews show that the increasing number of cars in companies leads to parking problems and companies have to buy additional parking spaces even though they have free parking. In addition, some companies want their employees to return to the offices as we slowly return to normal life. This leads to an increase in traffic congestion around the ÜC during peak hours, and the amount of time spent in traffic in one's own car also increases. Employees also complain about the increase in gas prices, the cost of owning a car, parking fees, etc.

Additionally, Rail Baltica project provides strengethen transportation alternatives around Ülemiste area. It aims to create a connection between the Baltic regions and Europe. [38]In addition, the Tallinn city government is developing new transport projects with the support of Rail Baltica. For example, a new streetcar line from the Old Port to the airport and Ülemiste Terminal. Thanks to these projects, Ülemiste is developing into a transportation hub day by day.[39]

Besides those developments ÜC developers have power to collaborate with Tallinn City to add new bus routes depending on the need of the area.

Figure 35: Co-design workshop with employees and MÜ chief green manager

7. Co-design Workshop

Since there are different stakeholders, I thought it would be useful to have a co-design session after the interviews. This would be helpful between the ideation and prototyping phases. To validate identified problems and develop ideas together. After focusing on the commuting problem, I planned a workshop with four employees from ÜC and the MÜ Green Chief Officer.

What I would like to accomplish in this workshop is:

- I would like to know their how they perceive commute.
- I had some ideas about this and I wanted to check them out.
- I would like them to look at the dashboard from a physical point of view to discover more possibilities.

Preparations:

- I added notes about commuting and its effects, its relationship to mental and physical health, its relationship to ÜC, and the attitude of companies toward their employees.
- Based on the results of my interviews, I created the values of the employees and the key words that the experts pointed out.
- Based on the interviews, I created two personas.
- Based on the employees' values and the experts' findings, I developed design principles.

Figure 36: The workshop kit

Henri, 40,
Project Manager works at Ülemiste City

- Introvert
- Caring
- Self motivated

Father of two (6 years old, 8 years old)
Lives in Laagri
Before coming to work he drops his kids to school.
He often comes to work by car.
In his free time he takes his kids to nature or park greenery areas.
He enjoys going to hiking.
He sometimes plays table tennis with his colleagues.

His Frustrations
- Rarely he comes to work by public transport he needs to go to Baltijaam first then change the train and come to Ülemiste City. He also has to check the train hours for the connection.

His Goals
- He is willing to change to be more sustainable, but doesn't know where to begin.
- Since he likes spending free time mostly in nature, he wants to preserve nature and environment.

Julia, 32,
Marketing Expert works at Ülemiste City

- Extrovert
- Friendly
- Active

Lives in Põhja-Tallinn,
Lives in a studio apartment that's why she prefers most of the time working at the office.
She goes to work by car.
She goes to badminton class after work.
She enjoys joining running and sport competitions in Ülemiste City and Tallinn.

Her Frustrations
- Before she tried coming to work by tram but it takes around 50 minutes and also she has to change the tram. There isn't a direct public transport to Ülemiste City from where she lives.
- She doesn't like taking busses because not feel hygienic. For her trams and trains are cleaner and safer than busses.

Her Goals
- She contributes to sustainability topics in her company. She wants to help her company to be more sustainable and mindful.
- She is planning to drop her car and change her travel mode when it's more convenient to her.

Figure 37: Personas in co-design workshop

7.1 Design Principles for the Personas

Before the ideation phase I reminded them design principles which I created based on employee values and insights from the experts.
Those principles are:

Engaging
It engages everyone in the organisation (employees, managers, experts, etc.).

Community Building
It supports teamwork, builds teams, and gives all members a voice.

Freedom to choose
It is not demanding gives people freedom to choose.

Work-life balance
It supports healthy behaviours and mindfulness.

Making collected data visible
It supports healthy behaviours and mindfulness.

7.2 Insights from Co-design Workshop:

Experience of the Participants about their last commute

Some participants who came by car were on autopilot mode, not thinking about or noticing what was going on around them or in the traffic.

From my interviews I knew that people find busses uncomfortable and unhygienic one participant shared her unpleasant last commute experience the bus. Unplesant experiences lead people to drive car.

Other participants talked about the impact of the weather on campus from ÜC. They also mentioned weather conditions are effective on their commute mode choice. While they are commuting in spring and summer bike, motorbike or escooter, they prefer cars cold and dark weather conditions.

What works well (on their journey to) the ÜC :

Although the Facebook group for carpooling is not active (which was also due to Covid-19), participants surprisingly mentioned that carpooling works well for those who want to leave their cars.

What could be better (on their journey to) the ÜC:

Participants mentioned that cycling groups would be useful and moti-

vating. On the one hand, you can learn from each other what new routes or easiest ways there are, and on the other hand, you are responsible for each other, because you do not want to keep your colleague waiting. This suggests that there is a lack of social interaction in the ASC that they are willing to engage in. Commuting time could be a time for socialising.

Ideas to motivate/support these personas to drop the car and switch modes of transportation

This session was very fruitful. I realised that I had thought about some of the same ideas before, and this session helped me confirm some of my ideas. They also gave me inspiring and different perspectives to think about further. The ideas they came up with are better childcare, a special bus for ÜC, more lockers for employees, and setting up bike groups. In addition, rewards and social groups are key motivators underlying our conversations.

Designing a tool for these personas

The participants created tangible things that the participants suggested to represent visually and not just numerically, let the personas. This workshop reminded me of the importance of being playful and supporting numerical calculations with simple visual representations that help people interpret them. Also competition, rewards and badges were used as motivators.

Conclusions

Environmental factors and company support are very important to the changes that occur in commuting. In addition to company support, employees can motivate each other and form a team. Or they can share their knowledge with others. Looking at the impact they are causing and considering the consequences are also effective. A reward system is also a motivating factor for employees to choose sustainability.

One of the most valuable parts of this workshop for me was that we continued our discussion after the workshop. With MÜ green chief officer and an employee, who is interested in and highly motivated to contribution and giving feedback about the existing and future developments.

My observations and research have shown that the ÜC is making efforts to make the campus and employees healthier and greener. But I have seen that they sometimes take a top-down approach, resulting in lower participation in events and activities. I believe that the citizen participation approach will help ÜC achieve its goals. During my ideation and design process, I will it in mind.
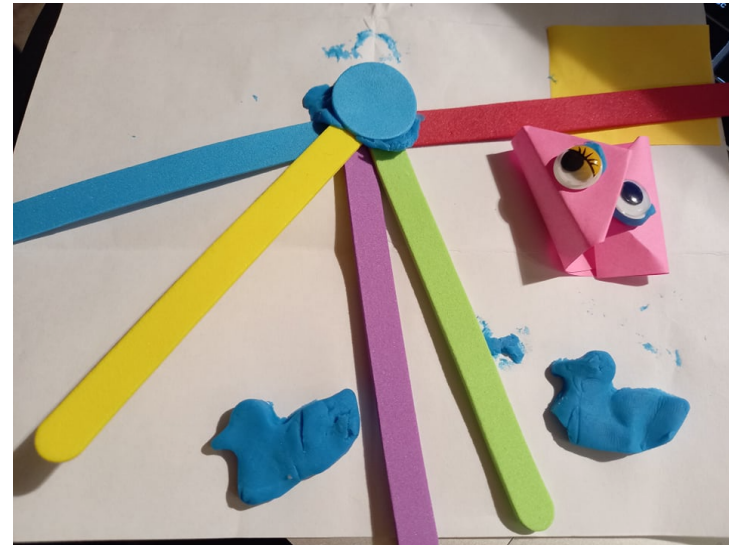
Figure 38: Participants designed tools for the personas

8. Try It Yourself Method

After the workshop, I decided to use the research method "Try it yourself" [40] to empathise with and experience the problems of the ÜC employees. I chose this method because it was practical and quick. I could confirm or be inspired by my first-hand assumptions. I travelled to the ÜC by car, tram (from Pelguranna), and bicycle (from the EKA dormitory).

Conclusions

Commuting by car is convenient and faster (depending on traffic jams and time of day), but waiting in traffic jams or sometimes other drivers cause stress. Moreover, the number of car owners in Tallinn is increasing, which leads to more traffic jams day by day. As a driver, it's easy to be in an auto-pilot mood.

Taking the tram to work is fine, it's only when coming from Pelguranna or Põhja Tallinn that you need time. The survey conducted in ÜC shows that most people don't want take more than 45 minutes to get to work, most spend 15-29 minutes. (Figure 29) [41]

I've found that bicycling offers more freedom and flexibility to get around the city. But we've to consider the weather and conditions. Also, I like riding with someone or in a group, I feel safer. Before going to ÜC, I looked but I couldn't find a handy map like Google Maps for bike routes in Tallinn

to help cyclists navigate. But I share the routes I found with my friends, and they also share their findings with me. I also found that there are some Facebook groups where people share bike routes.

85% kulutab tööle jõudmiseks vähem kui 45 minutit

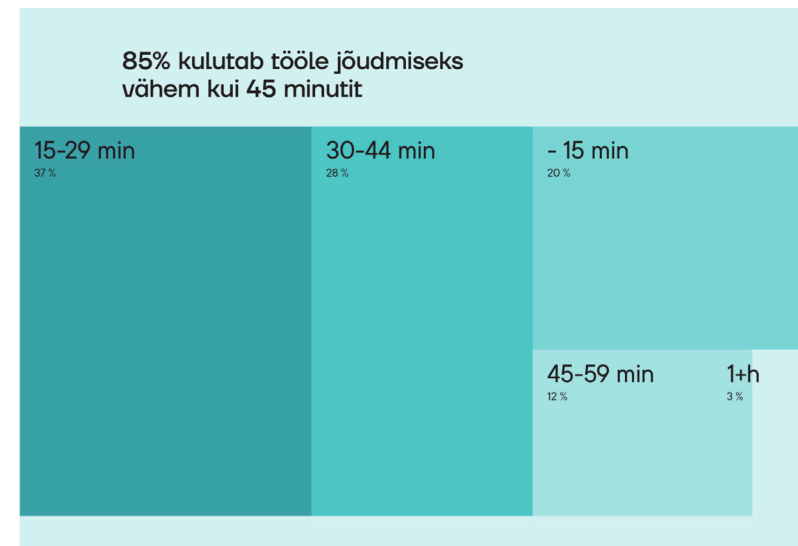| 15-29 min | 30-44 min | - 15 min |
| 37 % | 28 % | 20 % |

| 45-59 min | 1+h |
| 12 % | 3 % |

Figure 39: The commute time of ÜC employees [41]
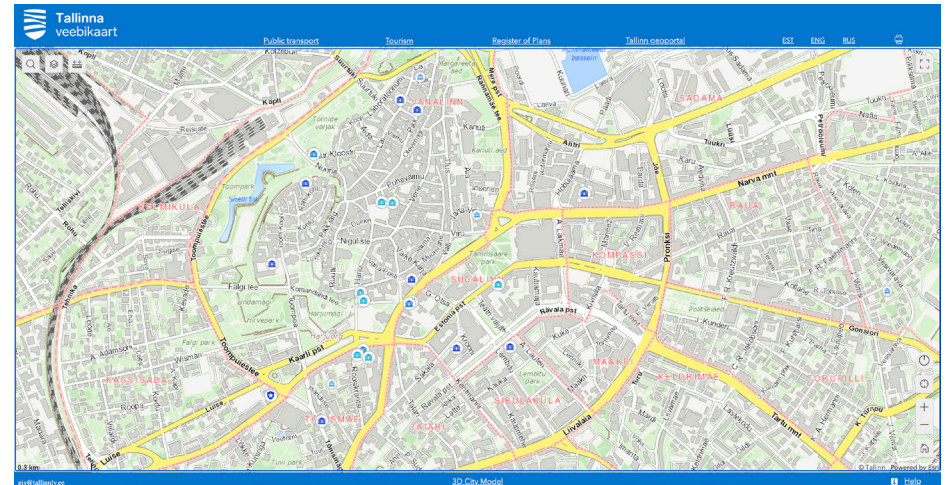
Figure 40: Driving to ÜC from Pelguranna

Figure 41: Only map shows bike lanes in Tallinn [42]

Figure 42: We used a new bike lane with my boyfriend while going to ÜC

9. Concept Development

9.1 Exploring themes

For a green change, it is important to see where the company stands. To do this, companies need to track their consumption and footprint. ÜC is aware of this need. During my research, I explored whether this is really necessary or who should see this tool. I found that the first step to green change is to include all parts of the company. Commuting is closely related to health, employee well-being, and the future carbon neutrality vision of ÜC and Estonia. Companies in ÜC are investing and working on these issues. By engaging employees in the green chnage through commuting, we are able to demonstrate their impact and contribution to their companies and the ÜC campus.

Corporate energy, water use, and waste management data will be collected. Since there is no tool to view the overall data, it is very difficult for the companies to track their overall impact and see where they stand. In our meeting with Mati (Chief Green Officer at ÜC), I learned that ÜC has an AI system that records in real time how many cars, buses or trains stop in ÜC. This data is collected somewhere. I thought that with this data, we can show the average CO_2 emissions of commuters in ÜC in real time.

The dashboard shows the climate impact on the ÜC campus and provides guidance to employees, businesses and ÜC to take effective action. I think it's important to show impact, but that alone is not enough. Employee engagement, interaction and creating a sense of community are also worth considering. Ultimately, I decided to develop a tangible tool that invites employees to enter their data together in the office buildings, through a direct connection to an application that displays a real-time dashboard in ÜC. This application helps employees track the impact of their trips and their contribution to the company's green goals.

9.2 Design Principles

Engaging

It engages everyone in the organisation (employees, managers, experts, etc.). Engament is the core value of my design. This engagement is achieved by using the data collected.

Community Building

It supports teamwork, builds teams, and gives all members a voice. Community motivates people to stick with what they are doing. Sometimes friends can also be a motivation for others to take action. Users who are willing to give feedback or contribute new ideas should find a place in my design.

Freedom to choose

It is not demanding to give people the freedom to choose. It is important that it is not mandatory to have an account. The users who do not have an account can see the general part of the ÜC dashboard. The users who want to see their impact and are willing to contribute to the sustainability of their company and the ÜC, they can create an account with their company's mail address.

Work-life balance

Work-life balance is a core value of ÜC's employees that's why my design proposal should support healthy behaviours and mindfulness.

9.3 How might we question

Before the ideation session, I formulated HMW questions to specify what I wanted to accomplish and how I wanted to design it.

HMW
help ÜC employees
to contribute in green change
in their companies and ÜC?
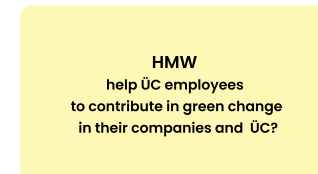
Figure 43: HMW question

Fogg Behaviour Model

After deciding on my HMW question, I decided to use the Fogg behavioural model to decide what behaviour I wanted to change and what the motivation of the users might be and how I could get them to achieve the targeted behaviour. [43]
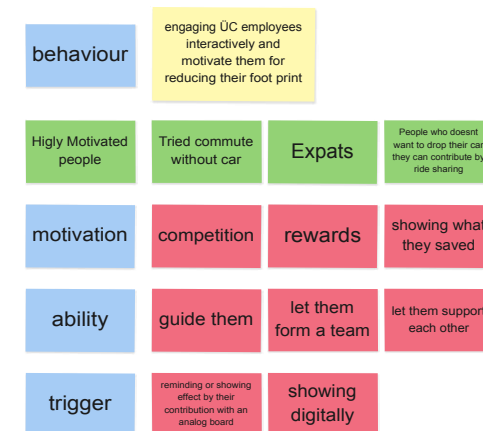

Figure 44: Adapting the target behaviour in Fogg model

Motivation

While thinking about motivating employees to reduce their footprint I considered with two main types of motivation, extrinsic and intrinsic.

Extrinsic motivation is triggered by external factors to perform a certain action and receive a reward for it such as money, badges, stars, points, etc. I noticed that the companies in ÜC use extrinsic motivation a lot to motivate their employees.

Intrinsic motivation is internally triggered by personal beliefs and values to perform a certain action, to learn or to fulfil autonomy, competence or connectedness.[44]

It is important to consider motivation for continuity of sustainable employee behaviours. External rewards alone are not sufficient. In addition, colleagues can influence each other by sharing the same values and seeing each other's actions. Since most employees are willing to act sustainably, I need to think about motivators that trigger this. But one of the strongest triggers could be showing their influence (all employees in the building) and contribution to their company in ÜC.

Decisions for the design elements

I found a card game about behaviour modification called Sparks [45] and decided to use it. I asked myself what I wanted to accomplish with what I was designing.

• I want to show people their impact.
• The consequences of their impact.
• To guide and motivate them to be better.

I decided to use the Goal Gradient Effect in my design proposal to show what is left. This study shows that when we show people what is left to complete a task, they are more tempted to finish it. In my design, I plan to show the progress of employees, companies or ÜC towards sustainability. [46]

I thought applying the framing effect in to my design proposal would be useful in articulating the goal and targets to be achieved for reducing climate impacts at the personal, company, and ÜC campus levels. I plan to have the sustainability officers and ÜC define the sustainability goals for the employees, companies, and campus. [47]
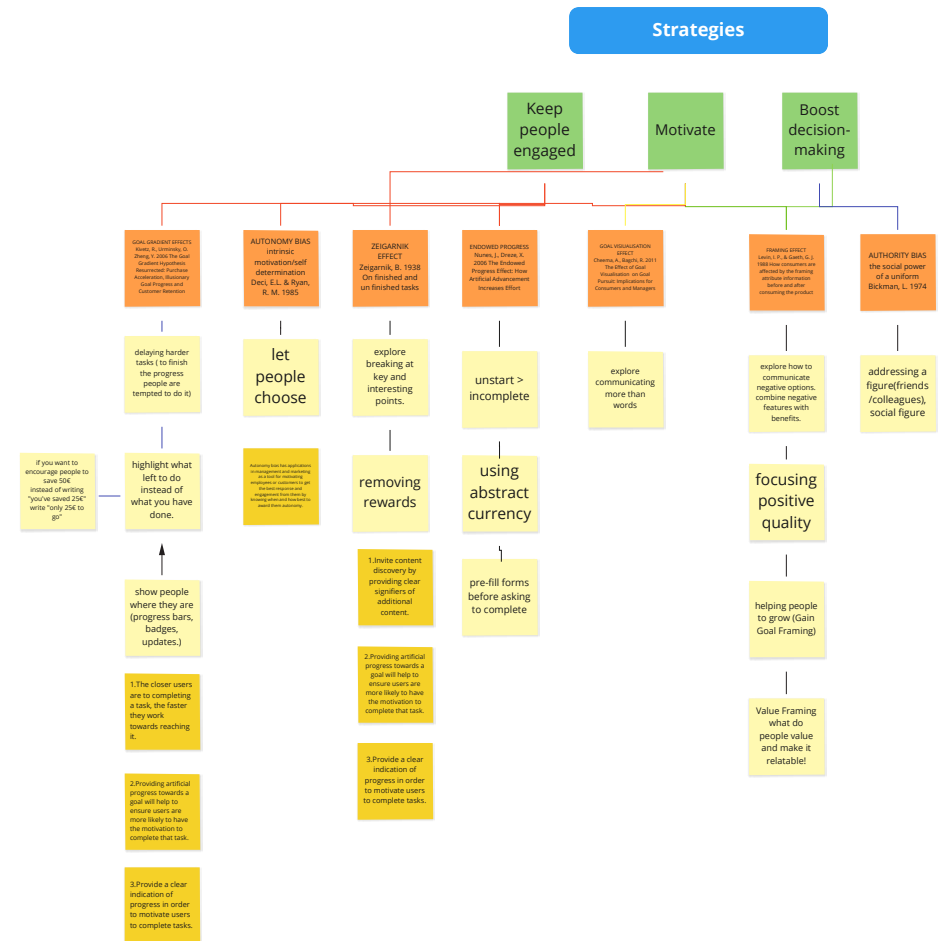
Figure 45: Chosen strategies from Sparks card deck[45]
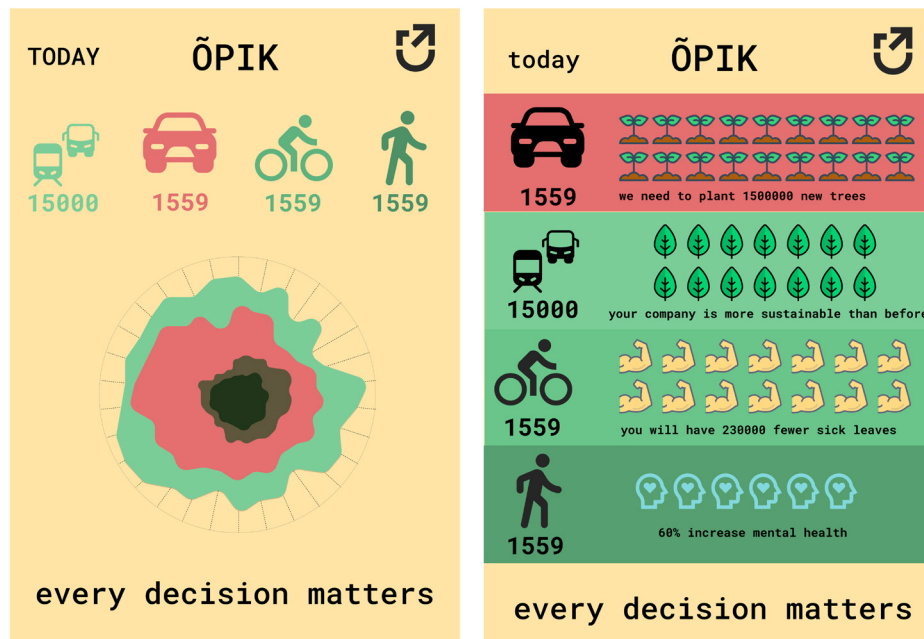
Figure 46: First ideas on the left design-a on the right design-b

9.5 Low-Fidelity Prototyping

First Idea

There are signs in the parking lots and in front of the buildings that give information about the buildings. I thought, how about turning them into digital boards that constantly change and provide information about the buildings. I conducted user tests and found that with these interfaces, users found the design-b to be clearer.
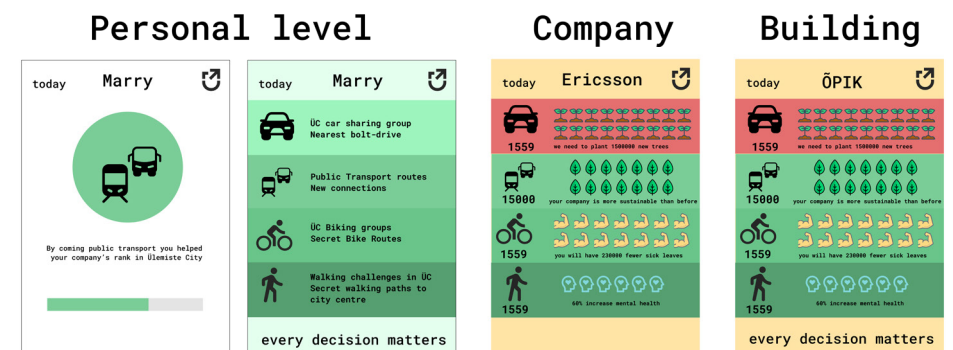
Later, I realised that it's not efficient to show employees only the impact on the entrance of the building and the parking spaces. After a while, employees will start to ignore these boards. To prevent this, I should suggest an interactive design.

Figure 47: First ideas

Figure 48: First ideas

Second Idea

I thought of an object in each building that represents the companies and physically shows their influence, and one of the feedbacks I received was "public shaming," which does not sound so good. Then I thought about the buildings on the ÜC site, there are 15 buildings in total. Then it is not so attractive for people to see only the information and it was a one-way interaction. Besides, I already know from my previous observations and findings that people do not notice the digital board because they are busy with their phones.

I thought, what if they had to do something that was simple, fun, and interactive. I decided to design a tool that would encourage people to participate.
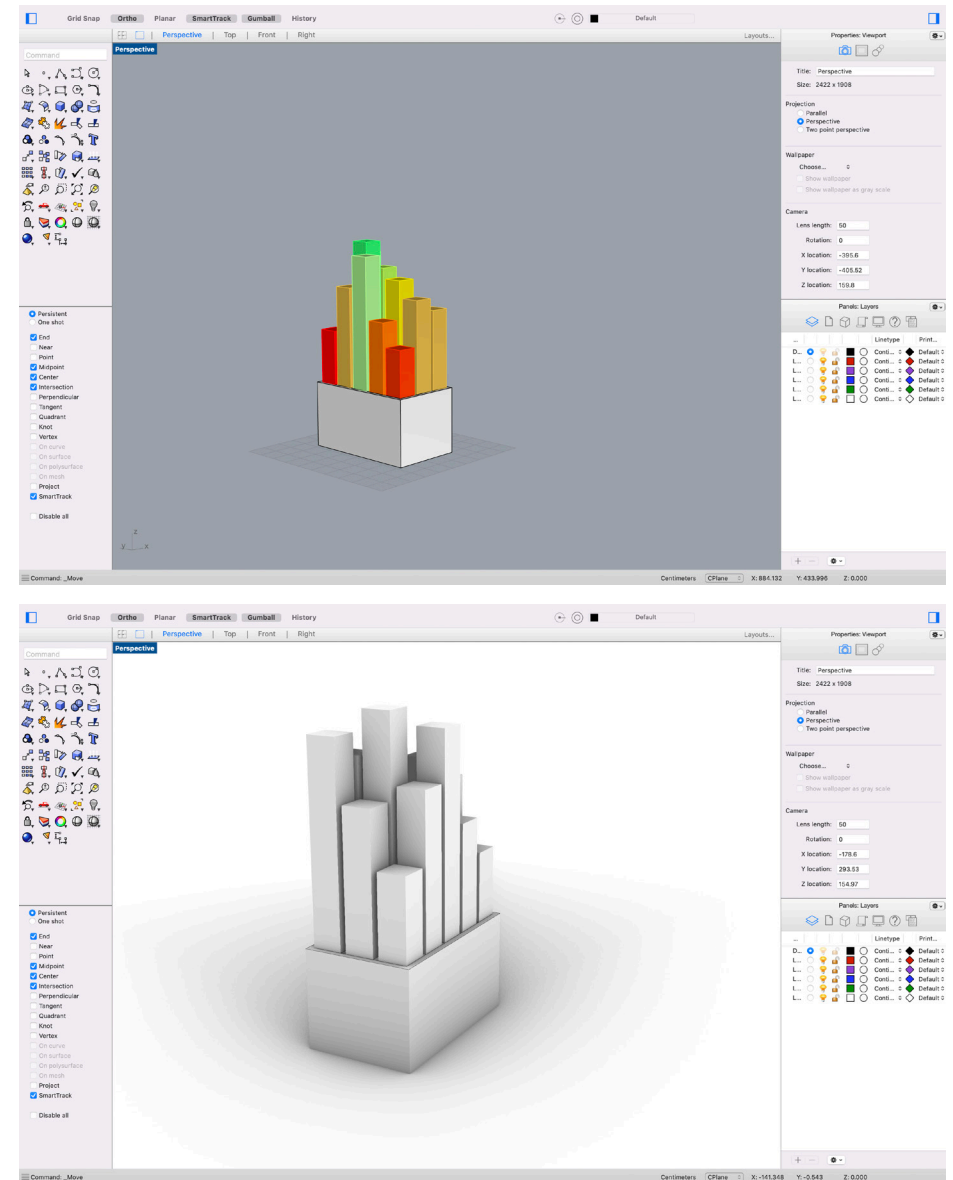
Figure 49: Second Idea

Figure 50: Crazy 8 ideation method

Crazy 8

I decided to use the crazy 8 method to come up with playful ideas. This is a quick brainstorming session that involves folding a paper four times and dividing it into eight parts so that I can draw an idea in each part in one minute. I decided to go with the idea of asking people, "How did you commute today?" and putting a dot on the board depending on their answer. These dots have different sizes that represent their impact on the climate. I chose wood as the material for the board because it contrasts well with the smart and digital environment of the ÜC.

The world picture represents our world and environment, and the dots represent the impact we cause by our choices in commuting.

First, I coloured the dots on the earth dark to show the footprint we leave behind.

Then I got feedback from my friends and supervisors that showing negativity would not motivate people. As a result, I thought, why not show the positive impact they are causing. Then I changed the colour of the dots and the way we commute. (Figure 60)
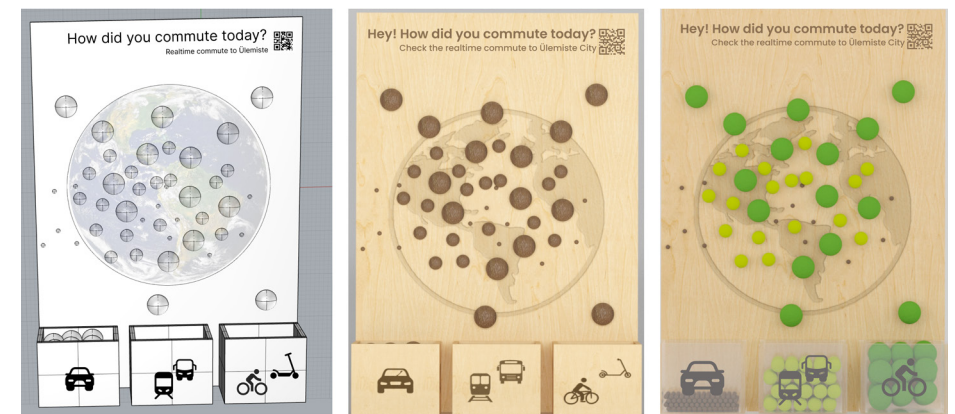
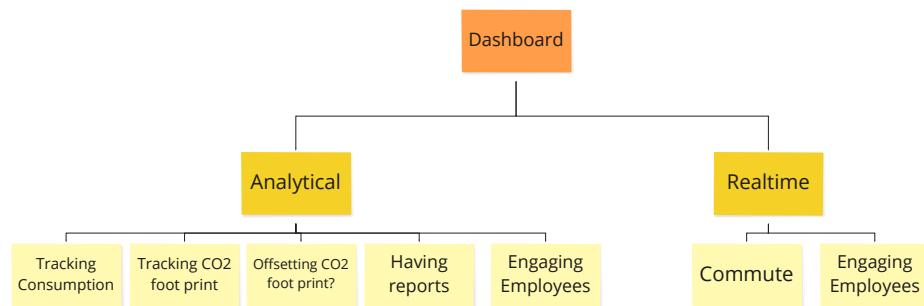Figure 51: Refining the design of the tangible board

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Figure 52: Dashboard basic functions

Dashboard Design

The physical interaction withthe tangible tool would lead the employees to the dashboard. I divided the dashboard into two parts.

Analytical dashboard

It helps employees track their overall carbon footprint and see their contribution to their company and the ÜC.

It also helps corporate sustainability professionals track their company's resource use and carbon footprint and get automated reports.

Real-time dashboard

This allows everyone in the ÜC to see and track how many people came to the ÜC by car, bike or public transportation and the immediate impact they made.
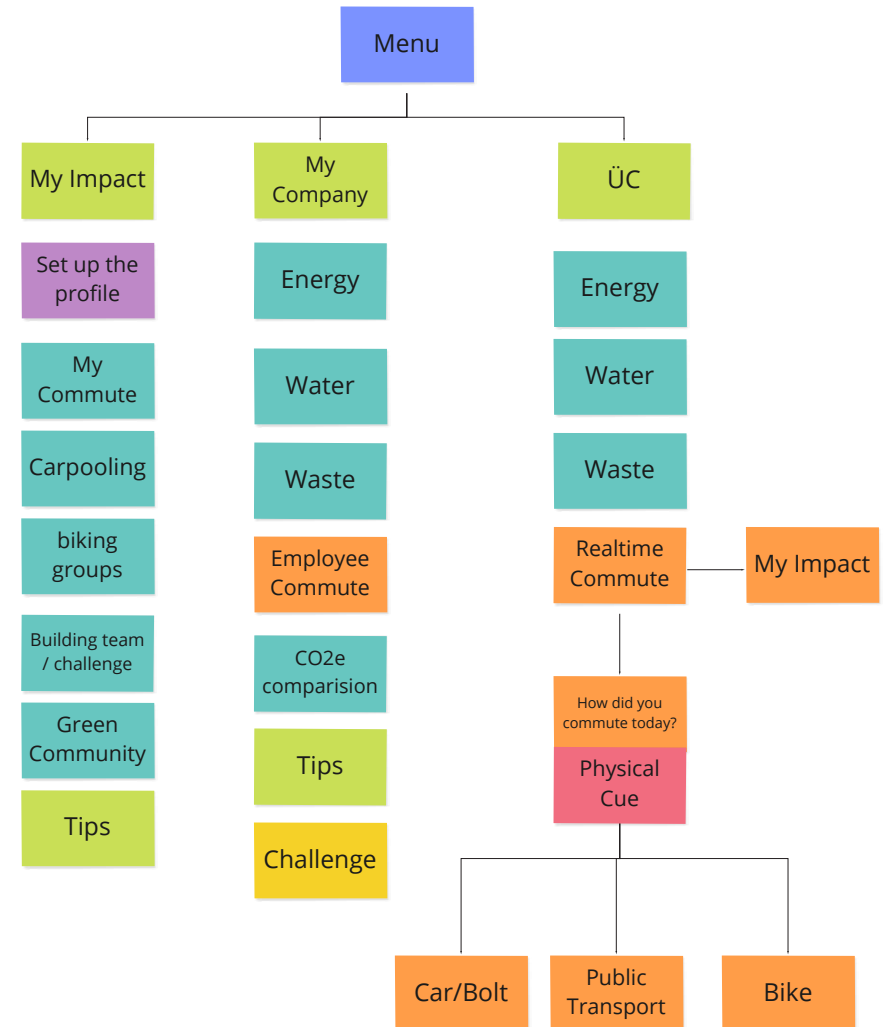
Figure 53: Dashboard information architecture
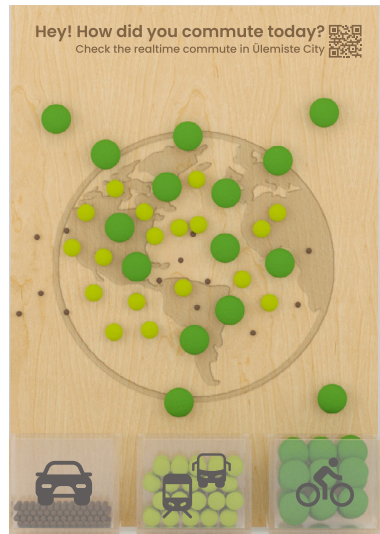
1. **Users scan the QR Code on the commute board**
2. **QR code directs users to real time commute dashboard**
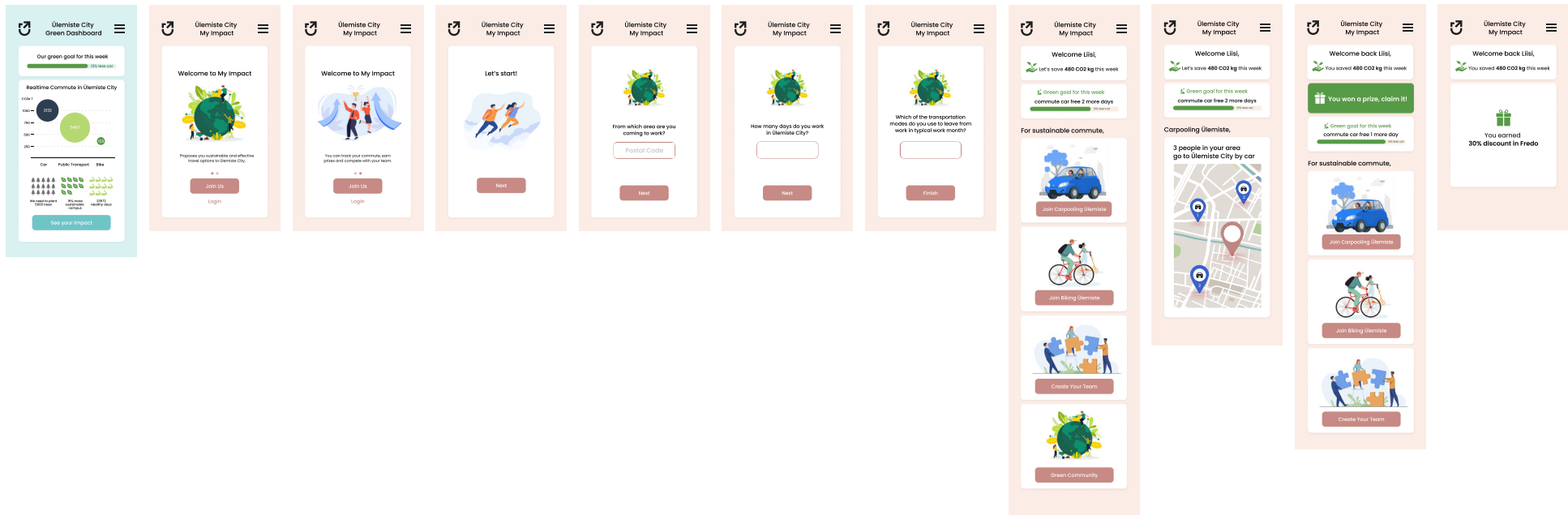3. **From real time commute dashboard users can continue with My Impact app**

Figure 54: Commute board, ÜC real-time commute dashboard and My Impact app

Figure 55: Desktop version of the dashboard

First, I decided to divide the dashboard into 3 sections:

My Impact

This part aims to engage employees, guide them and encourage them to commute sustainably.

My Company

This part aims to show resource consumption and carbon footprint. Sustainability experts can produce reports on resource use and carbon footprint.

Ülemiste City

This section publicly displays both analytical and real-time data.

I was thinking that I should separate the part about My Impact from the parts about My Company and ÜC. I thought it was like a separate mobile app. After getting feedback from my supervisors, I decided to combine these parts. The main idea is that employees can sign up through their company email and ÜC will approve the sustainability experts or one of the managers from each company. People who have signed up will see different features depending on their authorization. Also, employees without an account can only see the ÜC area.

I designed a mobile application version of the dashboard because I was directing people through the QR code on the physical object.
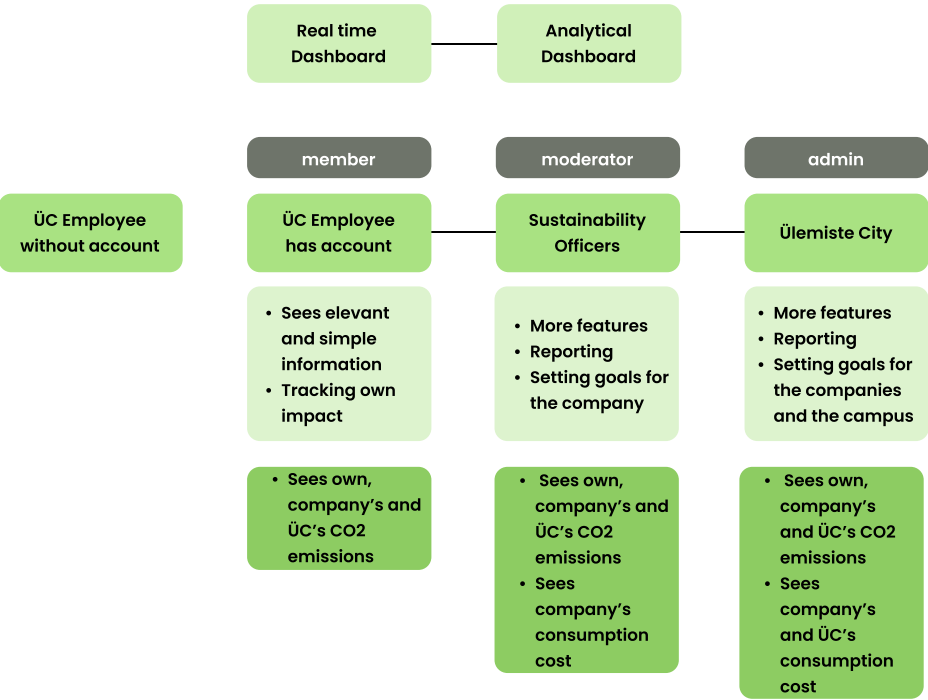
Figure 56: New functions and authorization of users

Figure 57: User test of physical object

9.6 Validating

I performed user tests with three employees in the ÜC.
During the test I aimed to understand:

- How do they interact and interpret the physical object and app?
- Could they navigate through the sections?
- Could they use some specific functions?

First, I tested the physical object. Most of them understood the purpose of the object. But I found that the representation of the globe is a bit confusing because the participants were tempted to put the dots on their countries.
I also tested to see if they understood the dashboard app. They easily found the parts I wanted them to navigate through. They found the "My Impact" part to be good and useful. They also gave positive feedback in other dashboards when they saw their contribution and the performance of their company.

Regarding the real-time dashboard, it was mentioned that it is more efficient to see numbers. One participant even mentioned that it is effective to see the percentage of people and that it would be informative to see a weekly commute graph.

"Nowadays we spend so much time in the office that we do not have time for sports. If I ride my bike to work, it's good for my health and I use the commut- *ing time efficiently."* - Commute is a valuble time it could be a time for exercising. In "My Impact" part "Join Biking Ülemiste" is important. I should consider further development.

"I like one thing you see your impact you see your company's impact. Because you can take initiative from there and you can come up with the some projects to improve." - Seeing own impact is effective and motivates people to act.

"If you want to bike to Ülemiste I'm not sure if there is something to show the route this might be included in here." - "Join Biking Ülemiste" section should include biking routes.

"What is the purpose of the map? It's a bit confusing for me."
"If you have a map you want to pin in where do you come from or where would you like to go." - The world map on the tangible board is confusing.

"When you see more people doing something it motivates you to do so as well." - The tangible board can motivate other employee to participate.

"Oh our company is in the first place. Actually what they are saying and doing is right!" - The employees cares about the acts of the company, transparency is important.

"When I login, I would like to see my impact first. If there are too much other information I can loose my interest." - I was unsure about in the application directing leading users to the my impact part, in the test participant

mentioned that she wanted to see overall information lastly. At first she tempted to see her impact.

"Employees need to see simple, clear and relevant information." - I need to consider simple and clean graphics for employee view, in sustainability officers' and ÜC part there could be professional and complex graphs.

"It's very good to see and measure our position in the campus for moving forward." - In the dashboard company rankings need to be considered. Companies wants to see the comparison and progress.

9.7 Refining

After user tests firstly I did several changes:

1. I changed the globe image on the tangible board instead of a proper world map I drawed more abstract world image. Because I found out that the real world image is misleading.
2. I united the dashboards in the mobile version with my impact. In this way the employees could see their contribution to their companies and ÜC.
3. For the desktop version I designed one login page and users could see the parts of the dashboard where they have autorisation.
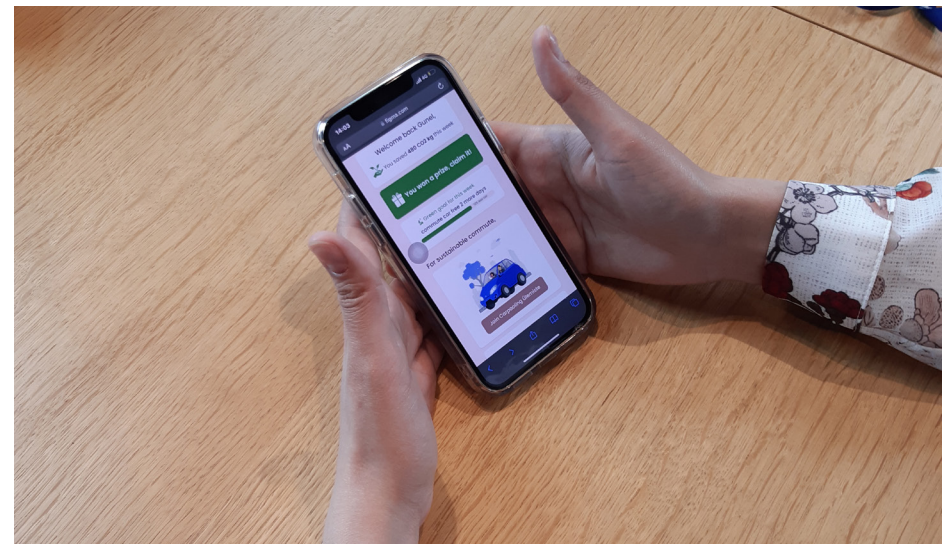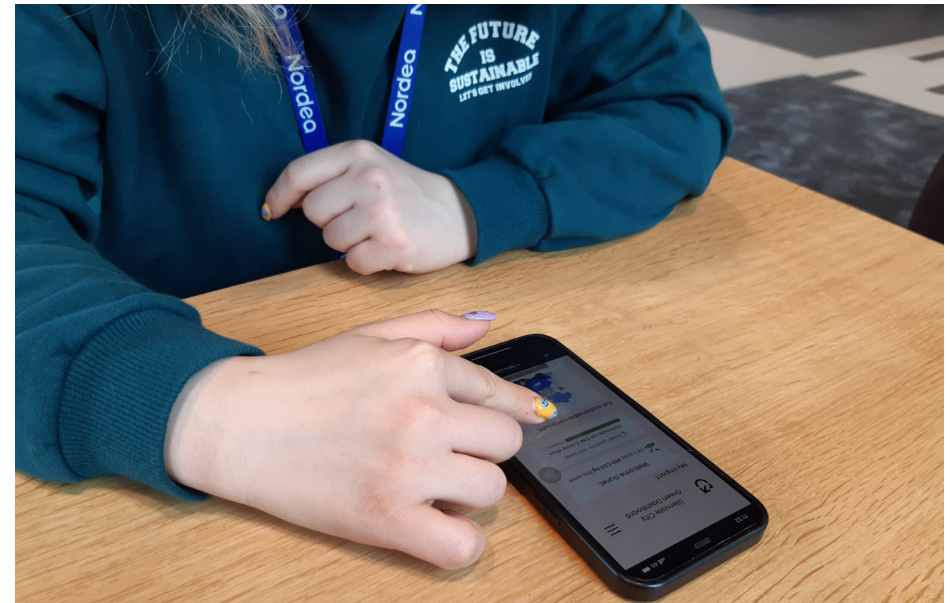

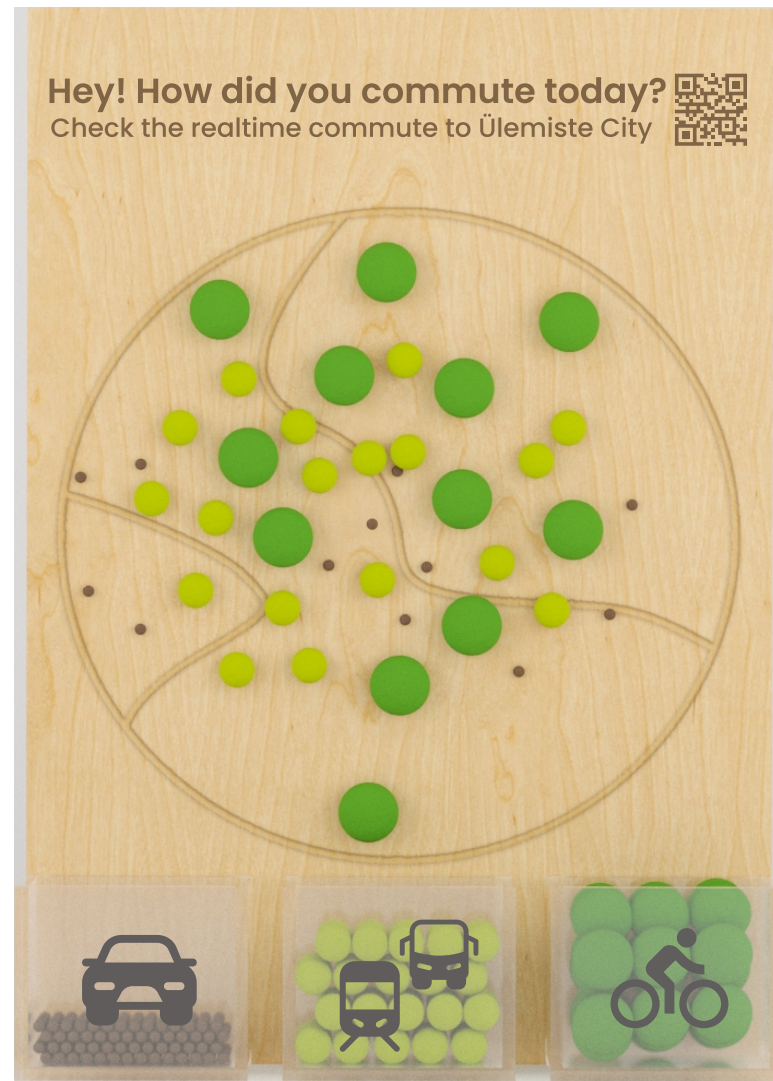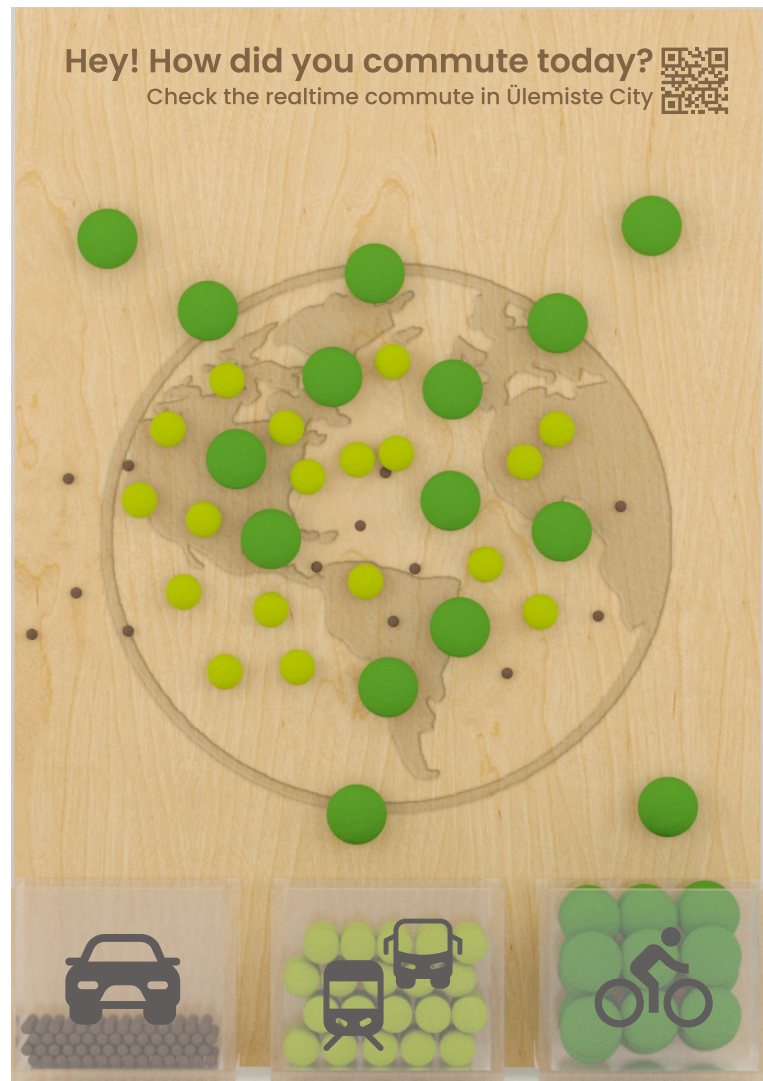Figure 58: User test of mobile version of the dashboard

Figure 59: Refining the design of the tangible board
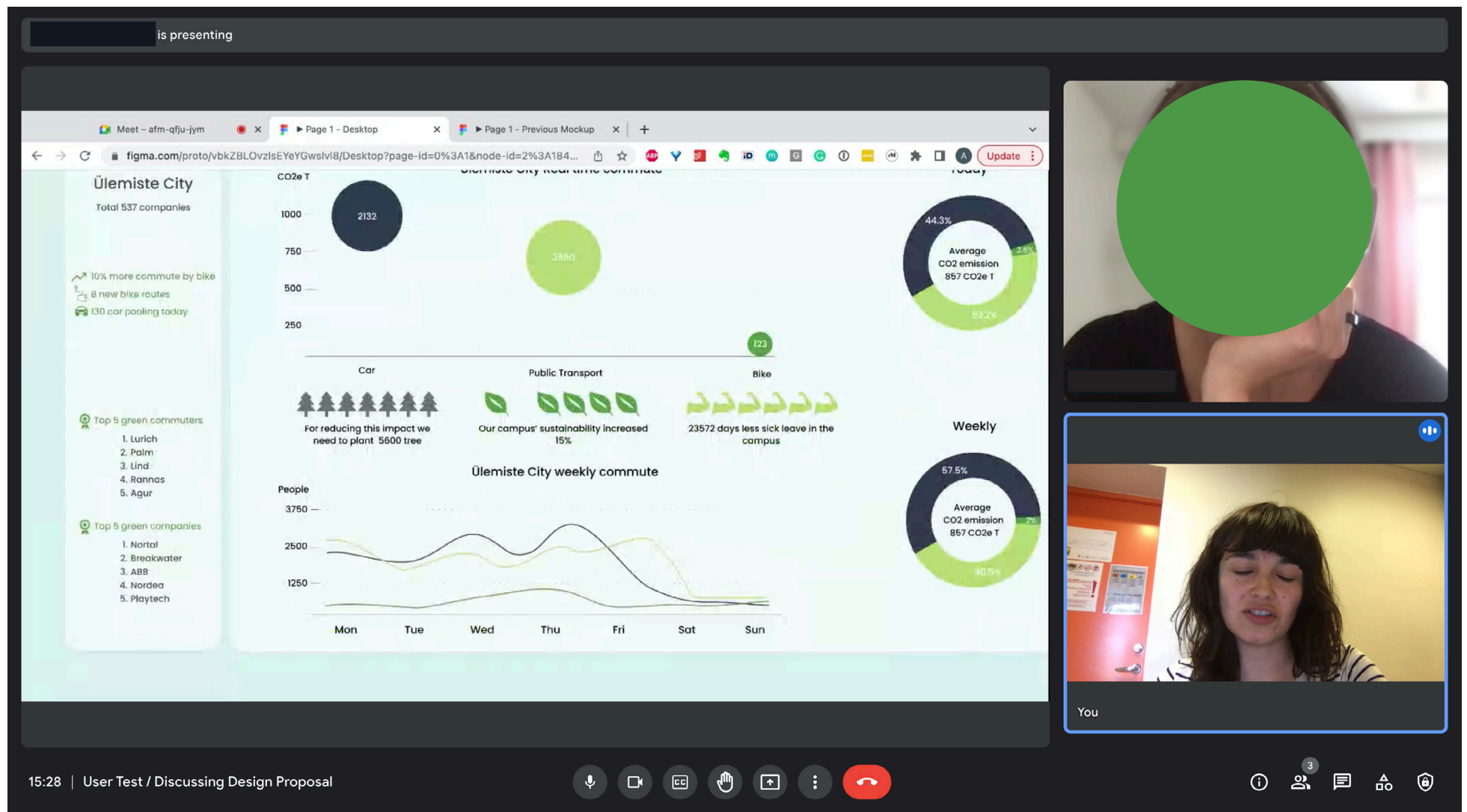Previous board on the left new board on the right

Figure 60: User test of desktop version of the dashboard

10. Result

10.1 Description of the final design

My final design consists of two parts, one tangible and one digital.

Tangible Board

- The tangible board is placed next to the elevators where all employees spend some time to get to their offices. The tangible board is a reference point for employees to show their influence together and in a fun way.

ÜC Green Dashboard Application

- The code QR on the tangible object directs employees to the ÜC real-time commute dashboard where they can track how many cars, busses or bikes have arrived on campus and the impact of using these modes of transportation.
- There are two calls to action, if employees want to see their impact they can click on the onboarding my impact and go.
- After they complete onboarding, they can see their impact.
- The "My Impact" portion shows the weekly goals to be achieved. These goals are set by corporate sustainability officers. As employees reach their goals, they receive prizes, such as discounts at ÜC restaurants or on sports or bike accessories or equipment.
- The app will help employees make more sustainable choices. For example, if some of them cannot park their car, they can contribute by picking up their colleagues. In this way, cohesion in the ÜC will be From the results, employees like challenges or team competitions, so the environmental officers could organize some challenges or compete with their colleagues.
- There is also a green community section where they can follow events and discussions about sustainability at ÜC.
- Through the app itself, they can view their company's and ÜC's green report and see their contribution.

ÜC Green Dashboard Desktop Version

- The desktop version of the dashboard is most useful for sustainability officers to receive green reports and reports on monthly and annual activities.
- My company's dashboard provides feedback on what is working well and what could be improved. For further action, they can contact ÜC. They will provide guidance and framework.
- They can also see comparisons between other companies in ÜC to understand where they are and what more they can do.

Design Concept Video

- https://vimeo.com/nursultanbarun

Figure 61: The tangible object will be places next to the elevators like Õpik building in ÜC

9.8 Design Concept

Tangible Board

Application

Website

Figure 62: Design proposal: a tangible board, an application and a website

In this design proposal, the icons and illustrations from online resources are used. [48][49][50]
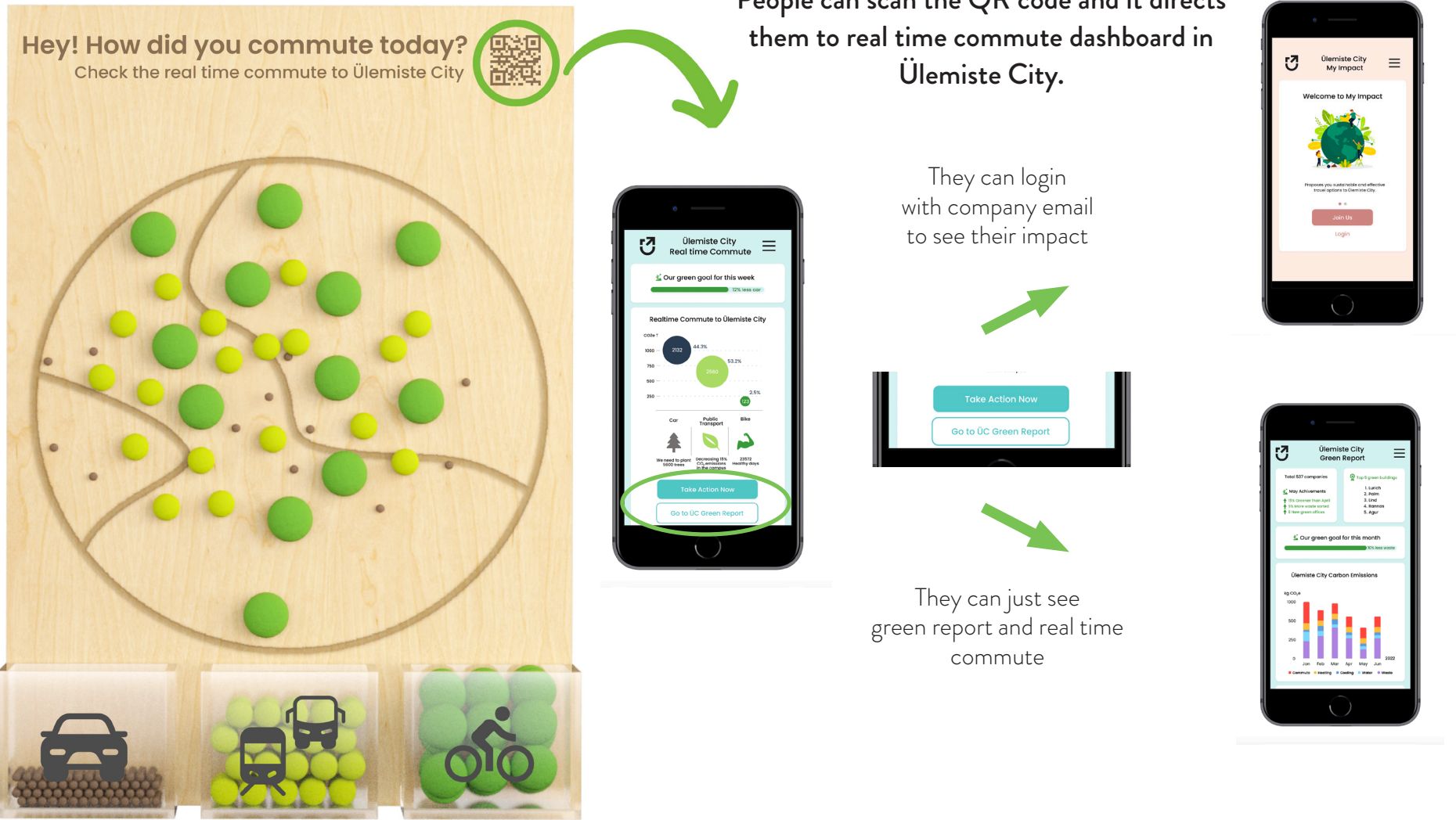
How Does It Work?

Hey! How did you commute today?
Check the real time commute to Ülemiste City

People can scan the QR code and it directs them to real time commute dashboard in Ülemiste City.

They can login with company email to see their impact
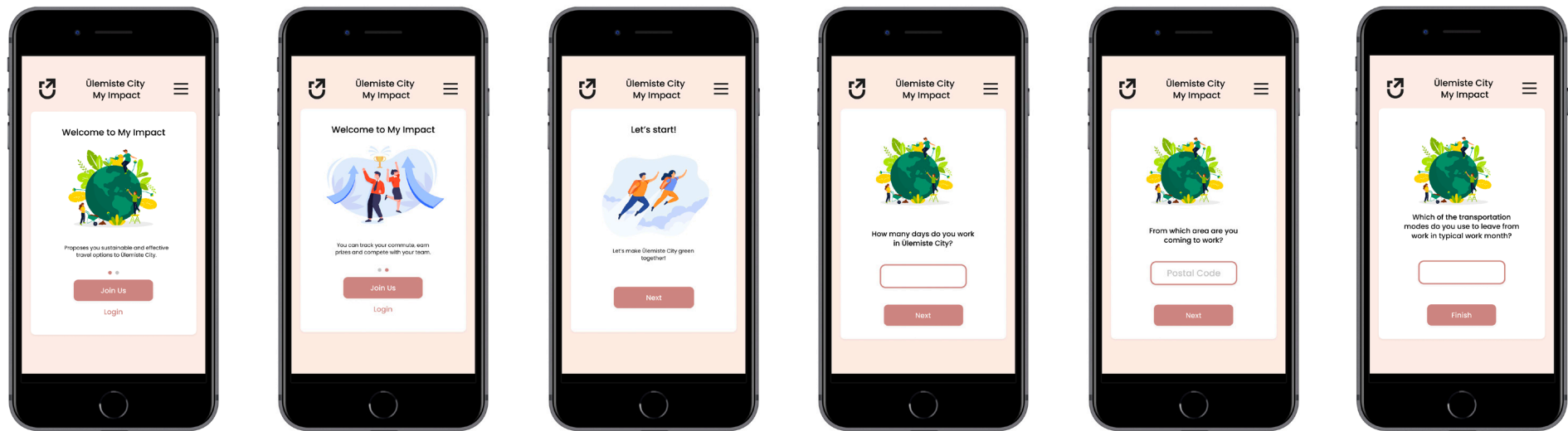
They can just see green report and real time commute

Figure 63: How does my design proposal work?

Onboarding

Users are onboarding and sharing their information.
Based on their information and actions, their carbon footprint is automatically calculated.
The application guides the user through personalised suggestions.

Figure 63: Onboarding in My Impact

Sustainable Acts
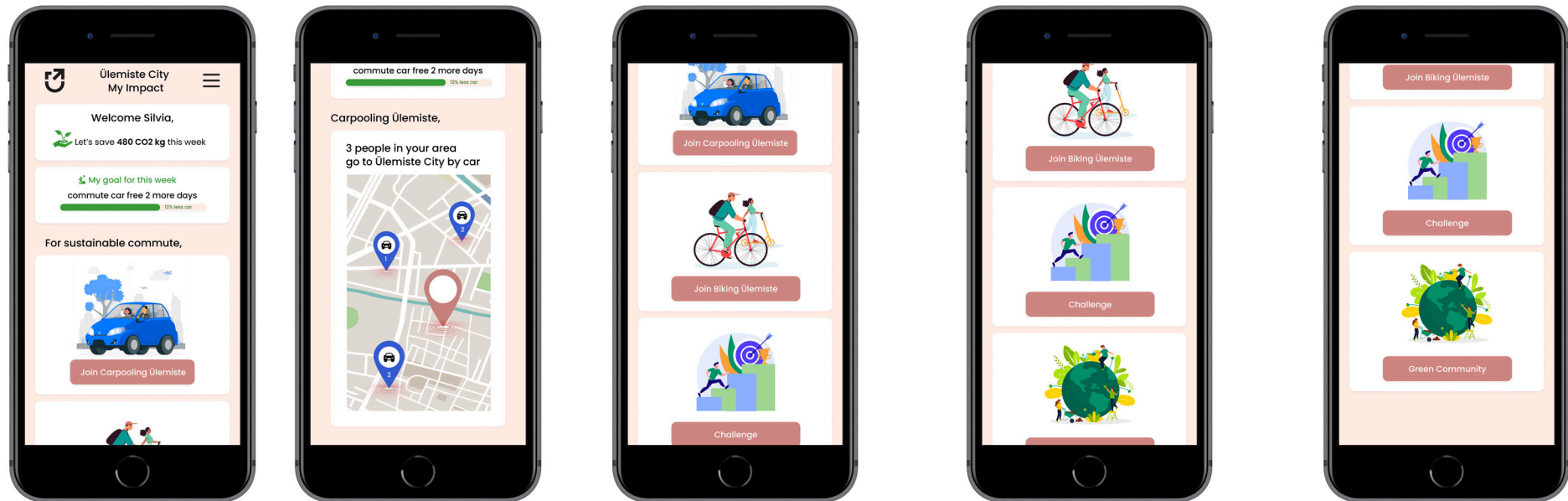
Users can participate in carpools.
In this way, users who cannot drop off their cars can still contribute to sustainability by giving rides or dropping off their colleagues or other employees in the ÜC.

Users can join cycling groups. They can cycle together or share alternative routes.

Users can compete with their colleagues or other employees in the ÜC.
If they win the challenge, they receive badges and discounts at restaurants in the ÜC or at sports activities.

Users can participate in the green community in the ÜC. They can follow green events, conferences, and activities in the ÜC.
They can provide feedback or suggest developments related to the sustainability of their company and the ÜC.

Figure 64: Features of My Impact

Personal Impact, Contribution and Prizes
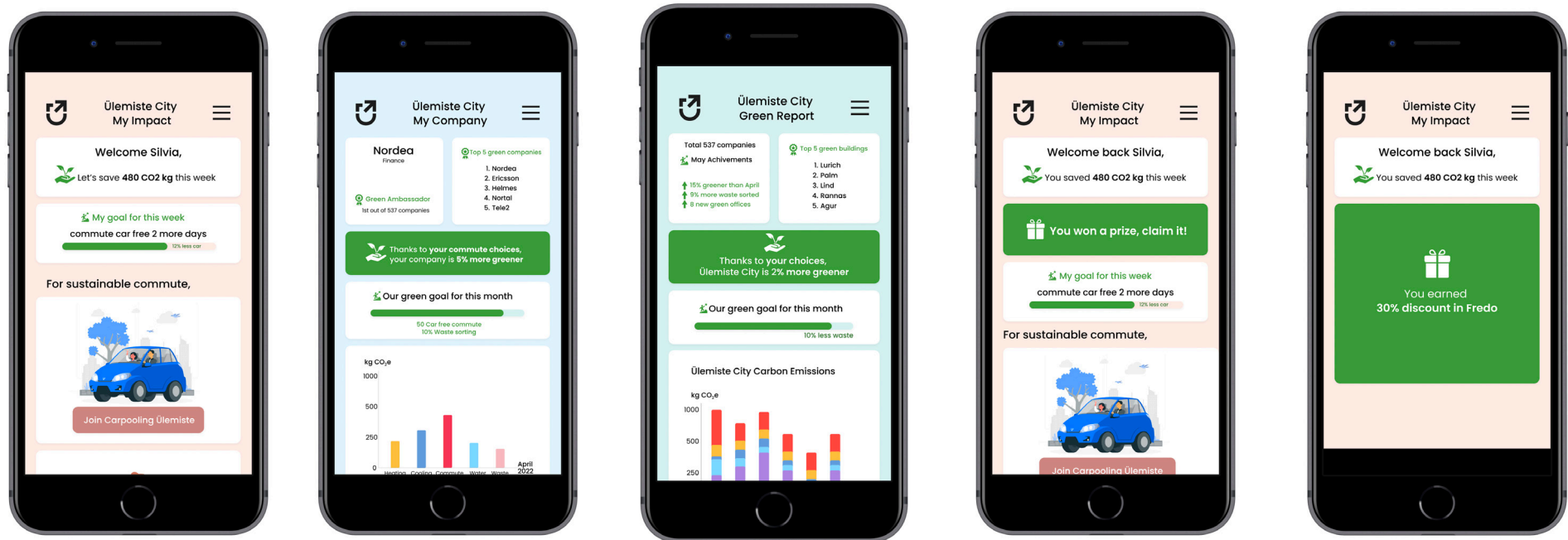
Users can track their impact.

Users can track and see their contribution to their company

Users can track and see their contribution to the ÜC.

By achieving personal goals set by company sustainability officers. Users earn prizes.

Figure 65: My Impact, My Company, Ülemiste City Green Report
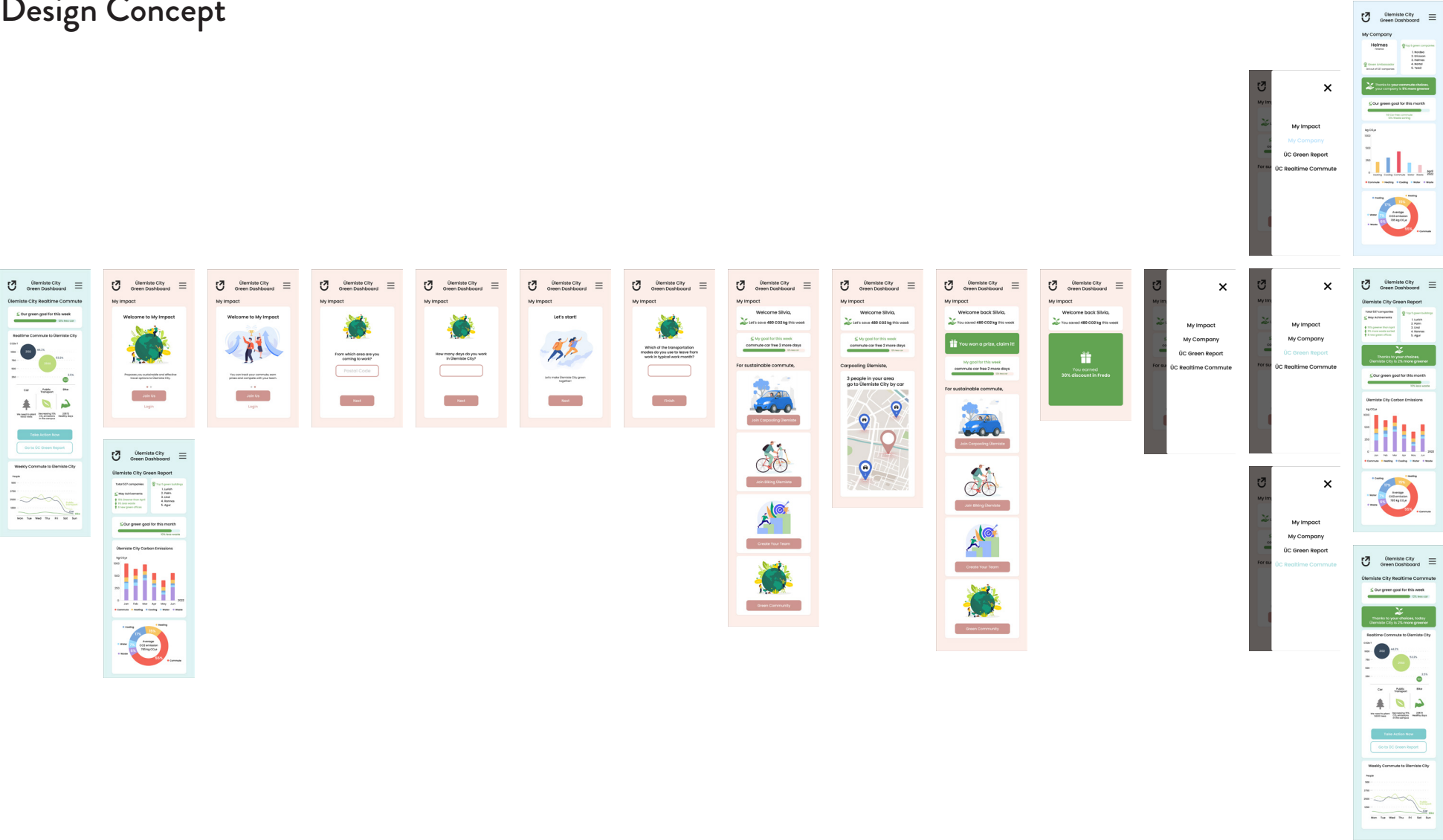
Design Concept

Figure 66: Application Features
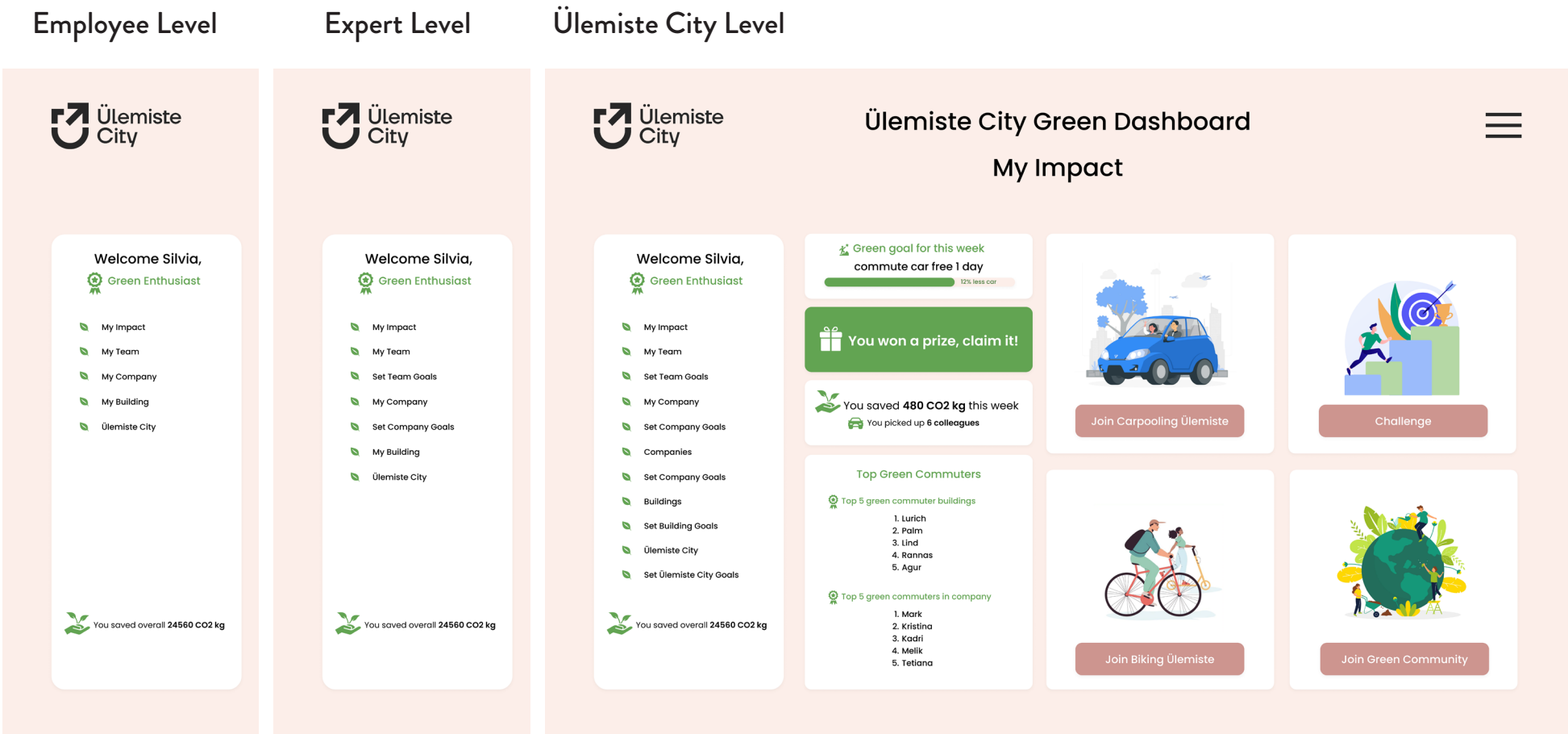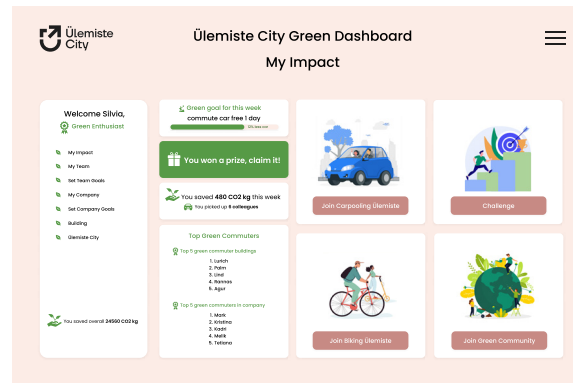
73

Design Concept

Employee Level

Expert Level

Ülemiste City Level

Figure 67: Different stakeholders see different features in the dashboard

Design Concept
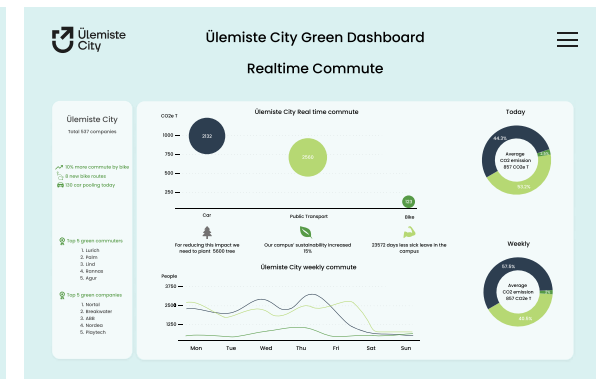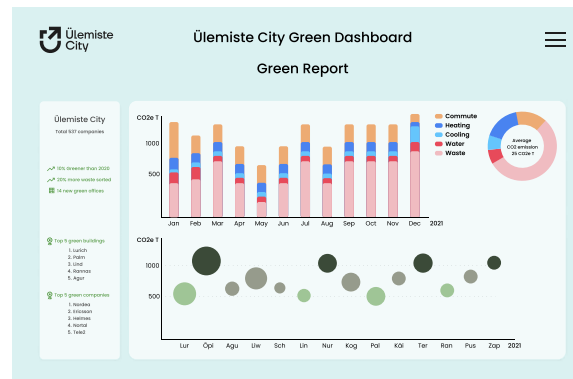
Figure 68: Desktop version of the dashboard

Figure 69: Desktop version of the dashboard from sustainability officer account

11. Reflection

11.1 Evaluation of the Process

It was a valuable learning process for me. Working with an industry partner gave me more responsibility and allowed me to consider different aspects of my final project. In addition, I was able to gain new experience through research in ÜC. I'm glad that I was able to apply my knowledge from IxD. MA at a professional level to engage stakeholders. I also met many professionals from different backgrounds, all of whom were very supportive and gave me many valuable insights to move forward in my final project.

During the process, I often got lost because of the depth of the topics, but thanks to the support of my supervisors and mentor, I found my way.

In this process, I understood that in the concept of SC, intelligence doesn't come from technology, but from approaching the right problem and solving it together with users. In this regard, ÜC was a great place for my studies to learn this. During the research process, I discovered that there's an AI system that recognises vehicles, which surprised me and was valuable for my design proposal. By making this data accessible and user-oriented, I'm fulfilling my personal goal in my thesis. I think it's important to use and humanise the data for meaningful products and services.

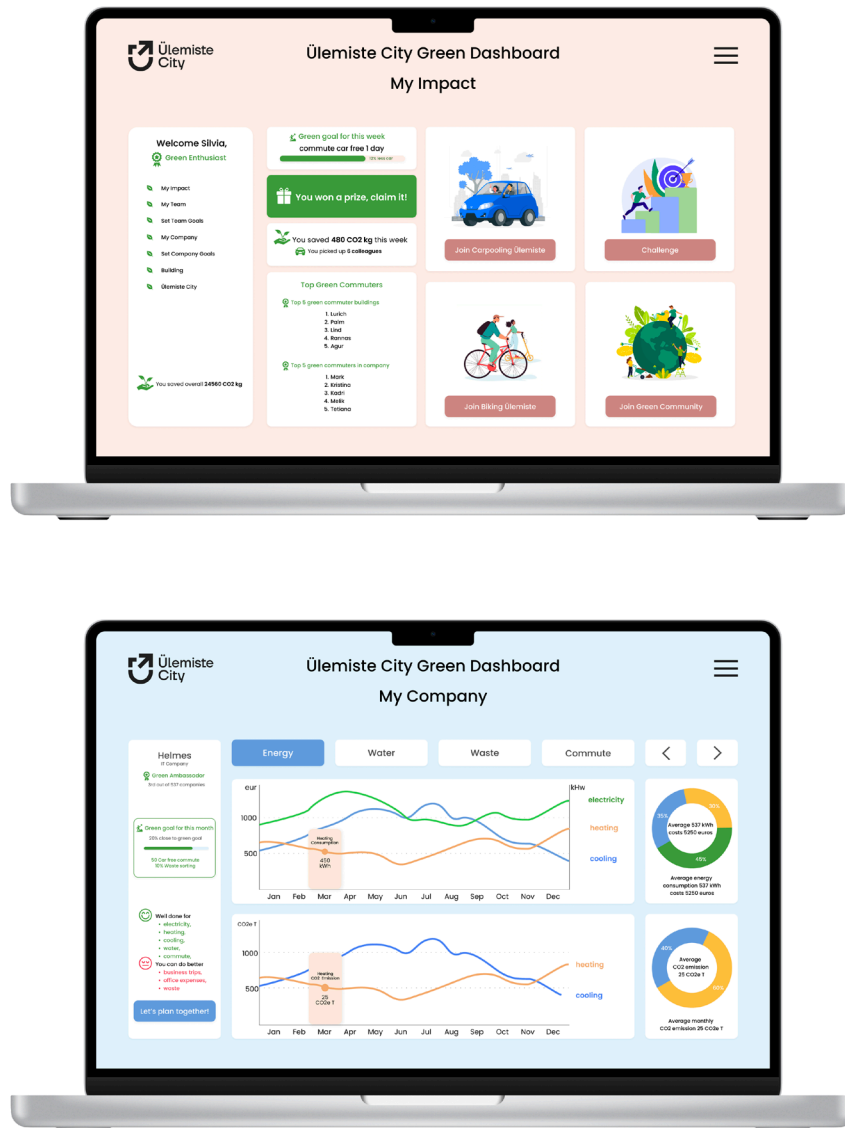I put a lot of thought into who the user of the dashboard will be, and I'm

glad I came up with a meaningful answer with additional features at the end of my process.

Dealing with uncertainties isn't easy, but always surprising. Keeping an open mind and looking at the issue from a larger perspective has helped me understand what companies want to achieve in terms of their green change and how I can make that happen as a designer.

I know there are many details to improve and consider, but I've received positive feedback from the staff and sustainability experts I've done user testing with. Some reactions were really hard to describe, for example, one employee saw on the prototype that her company came first and she said, "Wow, my company really does what they say. I'm really proud of it." This reaction shows me that transparency is becoming more and more important, and that change isn't just coming from the decision makers, but is being embraced by everyone.

In addition, commuting has different meanings for employees. Commuting is a time for networking, exercise or community building. I think there are many opportunities to explore here.

At the end of my process, I understood that I was at the bottom of the ladder when it came to sustainability, mobility and SC. But the part that I wanted to define and address in these topics, I think I fulfilled.

11.2 Future Developments & Considerations

I think my degree project is a good foundation and it would be a long term project for development and provides value to employees, companies and ÜC. My design proposal also includes the collection of personal data, which provides the opportunity to identify needs and develop different services. The ÜC has the possibility to initiate changes, e.g. in cooperation with the City of Tallinn to introduce a new line towards ÜC, or one of the visions meets all the needs of the ÜC, this would be done during the data collection.

I would also like to continue working on the dashboard part to build out the systems and features. I would also like to continue working on the sustainability and mobility topics. These topics are complex and involve different stakeholders, so it's easy to get lost. At the same time, I find it exciting because there is still a lot to do and it requires commitment and collaboration on a larger scale.

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I hereby declare that:

1. The present Master's thesis is the result of my personal contribution and it has not been submitted (for defence) earlier by anyone else;
2. All works and important viewpoints by other authors as well as any other data from other sources used in the compilation of the Master's thesis are duly acknowledged in the references;
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14 May 2022

Nursultan Barun

(The name and the signature of the author of the Master's thesis)

The thesis complies with the Master's thesis requirements:

_____

(date)

_____

(the signature of the Master's thesis supervisor, academic or research degree)

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