UI & UX DESIGN of a Virtual Reality Application for Participatory Urban Planning Processes

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The thesis studies and follows the design process of a user interface concept that can be adapted into virtual reality. The thesis is part of the collaborative Augmented Urbans project, which aims to create solutions to urban planning processes and scenarios that are easier to understand by using evolving XR technologies.

The thesis aims to create a user interface concept, the focus of which is to improve the understanding and involvement of different stakeholders in the development of the cities.

The design process of the thesis begins with the definition and presentation of the design principles of virtual reality, based on which the accessibility and usability of the user interface are taken into account.

Different versions of the user interface are evolved in the thesis by the framework of iterative design using user-centered design methods, such as studying user needs and challenges utilising user personas and user stories.

As the design process progresses, how the different versions of the application evolve from the ideation phase to the finished user interface concept is followed and explained in detail. At the end of the design process, the results of the heuristic evaluation and the finished user interface concept are presented. At the end of the work, a comparison of the user needs against the interface concept is presented.

Keywords
virtual reality vr ui ux user experience interface participatory urban planning

Tiivistelmä
Opinnäytetyössä tutkitaan ja käsitellään virtuaalitodellisuuteen sovitettavan käyttöliittymäkonseptin suunnitteluprosessia. Opinnäytetyö on osana Augmented Urbans yhteistyöhanketta, minkä tarkoituksena on luoda ratkaisuja kaupunkisuunnittelun prosesseista ja skenaarioista helpommin ymmärrettäviä kehittyvien XR-teknologioiden avulla.

Opinnäytetyön tavoitteena on luoda käyttöliittymäkonsepti, minkä keskiössä on parantaa eri sidosryhmien ymmärrystä ja osallisuutta kaupunkien kehittämiseen.

Työn suunnitteluprosessi alkaa virtuaalitodellisuuden suunnitteluperiaatteellisten tekijöiden määrittelyllä ja esittelyllä, joiden perusteella huomioidaan käyttöliittymän saavutettavuus ja käytettävyys.

Käyttöliittymän eri versioita kehitetään opinnäytetyössä iteratiivisen suunnittelun viitekehyksessä käyttäjälähtöisen suunnittelun menetelmillä, kuten tutkimalla käyttäjien tarpeita ja haasteita hyödyntäen käyttäjäpersoonia ja käyttäjätarinoita.

Suunnitteluprosessin edetessä seurataan ja selitetään yksityiskohtaisesti kuinka sovelluksen eri versiot kehittyvät ideointivaiheesta valmiiksi käyttöliittymäkonseptiksi. Suunnitteluprosessin lopussa käsitellään heuristisen arvioinnin tuloksia ja valmiin käyttöliittymäkonseptin esittely. Työn lopussa tuodaan esille työn alkuvaiheessa määriteltyjen käyttäjätarpeiden vertaus käyttöliittymäkonseptiin.

Otsikko
VR sovelluksen käyttöliittymäsuunnittelu osallistavaan kaupunkisuunnitteluun

Table of Contents

Chapter

1 INTRODUCTION

In this thesis, I am going to explore and iterate the use of virtual reality in early stages of participatory urban planning, by designing a concept of VR application. This VR application would be mainly targeted for residents in the City of Helsinki and anyone who is interested in the urban planning processes.

From a design point of view, the focus is to provide a user interface for the application with a user centered approach. The design process follows and explains accessibility, usability and ergonomic factors of the application and how these factors exist in VR environments.

1.1 Terminology

Along this thesis a variety of terms and abbreviations are used so this list is to guide on what I am referring to during the design process.

Urban Planning Technical and political process concerned with the control of the use of land and design of the urban environment (Wikipedia 2020).

XR – Extended Reality Extended reality, a term referring to all virtual and real life combined environments (Wikipedia 2020).

VR – Virtual Reality Virtual reality is a simulated experience which is similar or completely different from the real world (Wikipedia 2020).

UI – User Interface User interface is the space where humans and machines interactions occur (Wikipedia 2020).

UX – User Experience User experience is a person's emotions and attitudes about using a particular product, system or service (Wikipedia 2020).

FOV – Field of View Field of view is the extent of the observable world at any given time (Jay 2016).

UCD – User-Centered Design User-Centered Design is an iterative process that takes an understanding of the users (Interaction Design Foundation 2020).

Low and High Fidelity Fidelity refers to the level of detail and functionality included in designs (Esposito 2020).

1.2 Client and My Role

Augmented Urbans

(Image 1., Augmented Urbans)

Augmented Urbans is a project which aims to develop and test the use of XR technologies in inclusive and sustainable urban planning. The Augmented Urbans is a project coordinated by Metropolia University of Applied Sciences with partners from five different cities and municipalities around the Baltic Sea region. (Augmented Urbans 2019.)

My role in the project is to design user experience and interface for a VR application that would be used by the residents of Helsinki in the early stages of urban planning processes. In the design process I will utilize various design thinking methods and focuses, explain the user-centred approach as well as and provide a user journey map and visual designs of the application.

(Image 2., Augmented Urbans)

1.3 Objectives for the Project, Augmented Urbans and Users

My goals are to utilize well researched and tested information on what to consider when designing a VR experience, with the target group being as wide as residents of Helsinki. In addition, my aim is to consider the possible features and usability patterns, which would be suitable for participatory urban planning while having the experience highly accessible.

By examining a bit more in depth what the future for participatory urban planning could look like, I have collected some high level questions to answer and design drivers to follow along the process. Questions and some of the drivers for the project are inspired by publications that research the participatory urban planning through qualitative interviews.

Alongside the research publications I have chosen various articles to provide guidelines, know-how, notes about the limitations and what to keep in mind when designing VR experiences.

1.4 Virtual Reality

Virtual reality (VR) is a simulated experience that can be similar to or completely different from the real world. Applications of virtual reality can include entertainment (e.g. video games) and educational purposes (e.g. medical or military training).

(Wikipedia, 2020)

By the year 2020, VR technology has improved and its potential has become more clear by being adopted across companies, organisations and even governments worldwide. VR headset equipment has also improved and become more accessible from a gaze-based Google Cardboard setups to a dynamic and immersive gaming experience with Facebook Technologies Oculus lineup of headset and controllers.

Input Mechanism

For the user inputs, I have decided to use a controller-based approach for allowing more variety in interactions and control across the UI.

1.5 Research Questions

In the research phase I kept few questions in mind, that would also work as design drivers for the application.

1. *How to implement a virtual reality experience, with a low-threshold and short learning curve?*

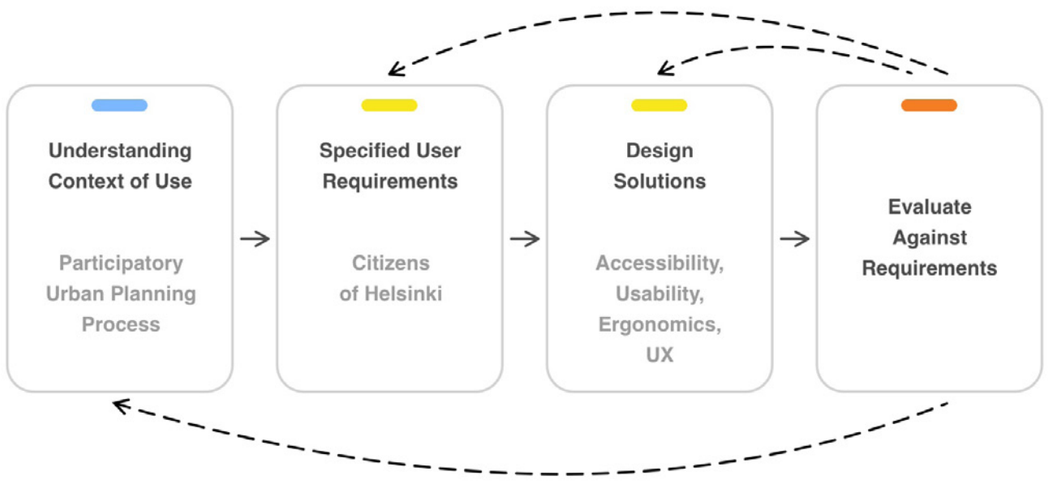
2. *How could future urban planning benefit from this method?*

3. *Can the urban planning process be made into a more simple and easy to understand format?*

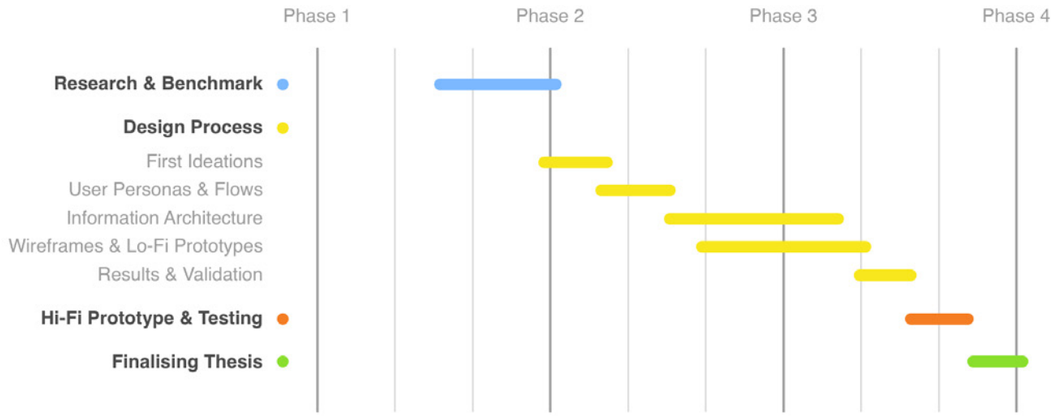
4. *What residents think about urban planning processes and what might be challenging to understand in the planning?*

1.6 Theoretical Framework

User-Centered Design is an iterative process that takes an understanding of the users and their context as a starting point for all design and development (Interaction Design Foundation, 2019), which includes research around the use case and users needs, creating user personas, designing wireframes and interactive prototypes as well as testing designs.



(Diagram 1. Theoretical framework for user-centered design process.)



(Diagram 2. Project timeline.)

1.7 Rough Timeline

I have kept my timeline rough from early on, since the designs are going to have various iterations through the work process. So jumping back and forth in different steps of the design phases is expectable in some cases.

1.8 Research Material

For different phases of the design process I will be using selected articles and publications to support various design choices regarding the application concept. These materials are focusing on factors that are both present in urban planning processes and in virtual reality environments.

Tackling UX challenges in VR – Samadrita Das

An article about understanding the human factors how people interact in VR, by Samadrita Das and as the name suggests, this article is focusing on how critical human factors are affecting virtual reality environments.

Fitts's Law: The Importance of Size and Distance in UI Design – Interaction Design Foundation

An article about the law of model of movement, for accurate predictions on the amount of time taken to move and select a target. Fitts's law was originally established in 1954 by Paul Fitts. Article is used to support visual design choices for objects placements and distance relations in the UI.

Field of View for Virtual Reality Headsets Explained – VR Lens Lab

Know-how and explanations behind field of view in terms of virtual reality. These know-hows and explanations are used when considering depth perception of human vision in relation to the UI.

Future Illustrative and Participatory Community Planning – VTT Technology

VTT's research publication on where political decision makers, municipal officials and companies perceive new, participative urban planning service concepts through qualitative interviews. Research publication is used as a background material to demonstrate the challenges in urban planning processes from the city residents point of view. These challenges are then turned into design objectives.

UX 101 for Virtual and Mixed Reality – Jacob Payne

Introduction to various forms of input, physicality, different senses and UI works in three dimensional environments. Payne explains how the whole three dimensional environment works as an interface by taking into account distance, eye and neck movement, natural gaze and field of view.

Display technologies for Augmented and Virtual Reality – Inborn Experience

An article about human factors, where Jay from Inborn Experience explains basic properties of the human eye in relation to virtual reality. These properties are taken into account on UI object placement.

Designing for Virtual Reality – Google

Google Cardboard teams design principles to guide and help when creating virtual reality experiences that do not frustrate or make users nauseous.

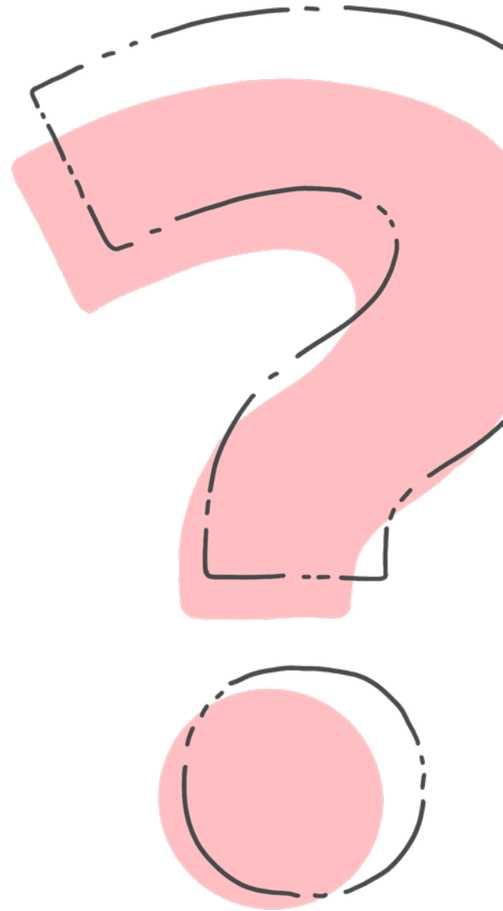
Chapter

2. UNDERSTANDING CONTEXT AND USERS

2.1 About Urban Planning Processes

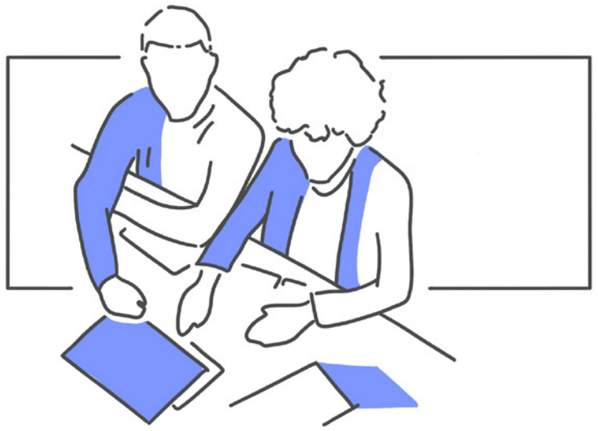
While deep-diving into the territory of urban planning, I noted that information is published but problems occur when most of the people just do not care to find and read it. In addition usually the information is seen too late to have any possibility and way to affect the process and this can cause frustration or confusion from residents' point of view.

Information and documents have also been seen as hard to understand and while there is a need for more collaborative urban planning, most of the people are usually only interested in projects that are affecting their local areas. There are also risks when locals are missing information, this can then create confusion, doubtfulness and in the worst case scenario; spread rumors and threats that can lead to resistance against the projects. Residents are not aware, when they have the possibility to influence the process. (VTT Technology 2014, 26-27)



2.2 Specified User Requirements

For user requirements and user stories I have referenced and gathered inspiration from VTT Technology's research study; Future Illustrative and Participatory Community Planning, where VTT interviewed handful of political decision makers and city officials from Tampere and Pirkkala, with additional of five company representatives from architect, construction and visualization software companies (VTT technology 2014, 5).



User story 1

"As a young adult, who just moved here, I want to take part in the process so that I get to live in an area that builds residents' needs in mind."

User story 2

"As an older citizen, I want to understand complex material so that I know when this is happening and how it's affecting me and my surroundings."

User story 3

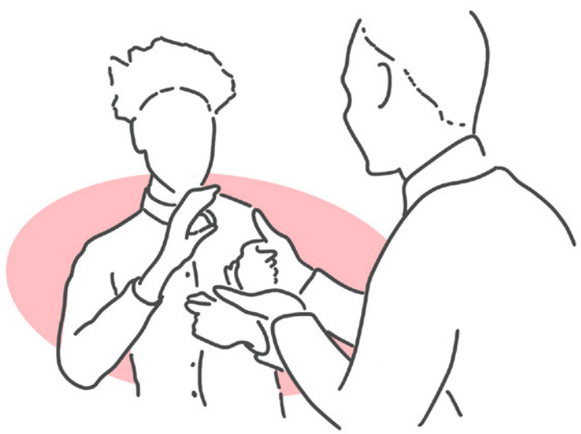
"As an avid residential, I want to see realistic and real material so that the end results are what to be expected and decided previously."

(Illustrations 1–4, Lasse Ahlberg)

2.3 User Personas for Accessibility and Usability

Since my main drivers in this project are focused around providing an application for users from various backgrounds, I have defined user personas that will aid in making design decisions, understand their possible struggles and to have empathy for the users. I also use these user personas later in the process to evaluate various design choices.

These user personas are used as guidelines and reference points for important priorities to provide an accessible virtual reality experience.



Vilma, 24 years old

About
Studying design at the university and wants to take part in planning her neighbourhood's future.

Challenges
Uses video chat and texting to connect with anyone else who is deaf or hard of hearing. Deaf; uses ASL along with interpreters

(Illustrations 5–8, Lasse Ahlberg)

Mihail, 32 years old

About
Has been living in Finland for a few years with his wife and kids, does not speak Finnish fluently.

Challenges
Uses computer translations, requires clearly written information.

Cecilia, 15 years old

About
Likes playing games with her friends and is native in digital environments.

Challenges
Poor reading skills; difficulty with visual comprehension and gets easily distracted if a lot is happening at once.

Matti, 44 years old

About
Does not live in Helsinki anymore but visits there occasionally, he is curious to know about what is happening, where and why.

Challenges
Low vision due to glaucoma. Prefers to use screen magnifiers and contrast adjustment in digital environments.

Chapter

3. ACCESSIBILITY AND DESIGN PRINCIPLES

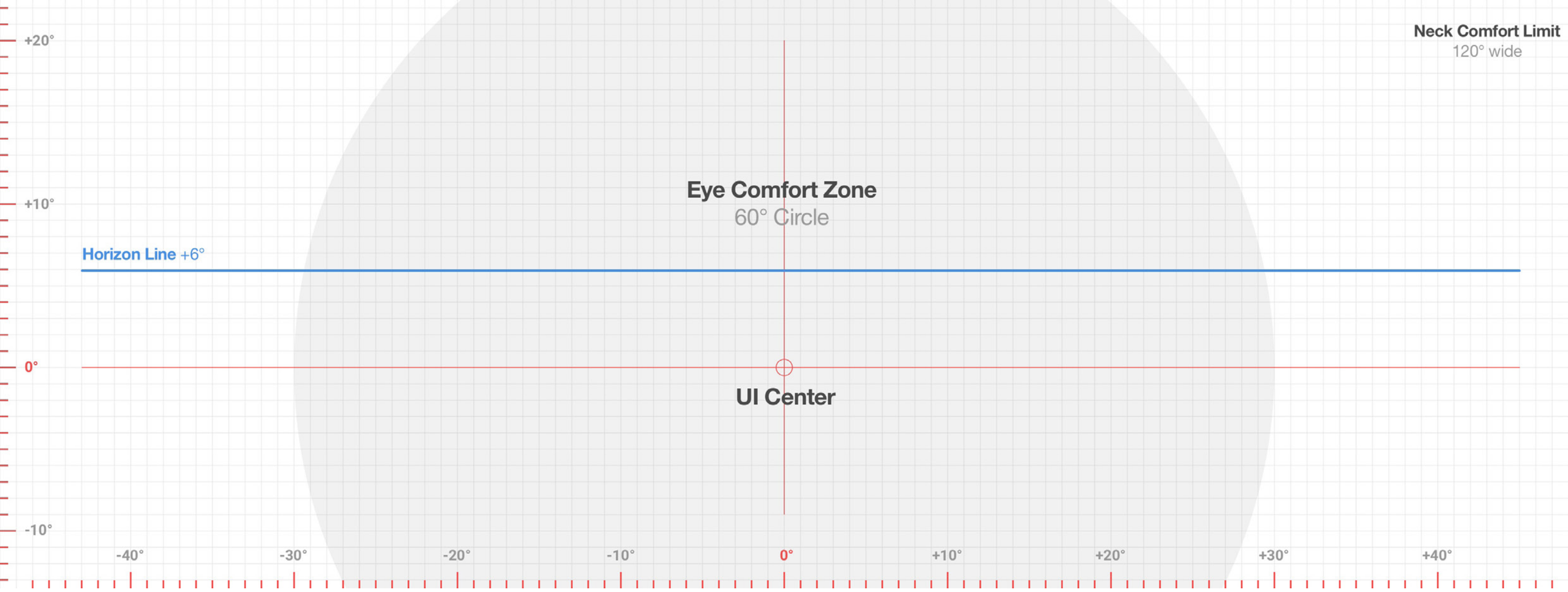
3.1 Avoiding Bad Design

When designing for virtual reality, ergonomics are in an important role while creating and crafting the overall user-experience. Poorly produced and executed design choices can lead users to feel motion sickness, since your brains can start to think that you are moving, even though you are not (Samadrita Das 2018.).

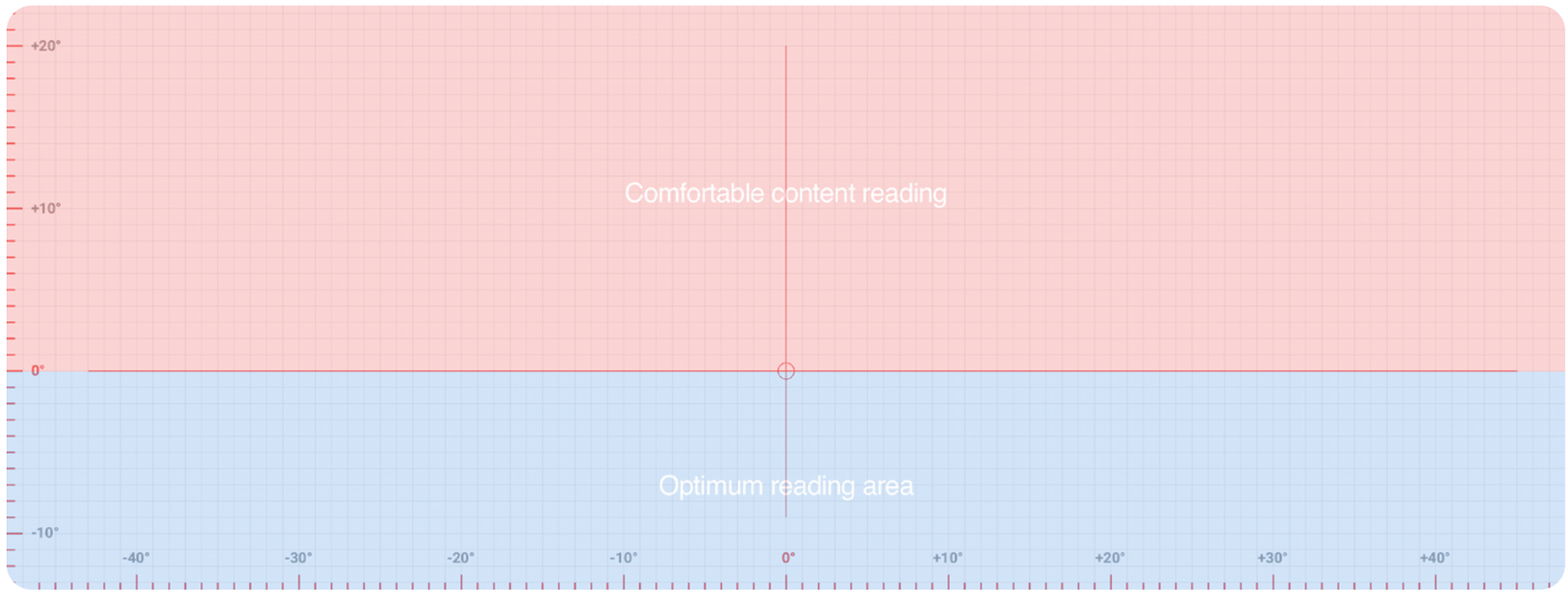
3.2 Field of View

Field of view is defined as the total angular size of the image visible to both the eyes. On an average, the horizontal binocular FOV is 200 degrees out of which 120 degrees is a binocular overlap. The binocular overlap is especially important for stereopsis and other depth cues discussed further. The vertical FOV is approximately 130 degrees. (Kore 2018.)

It is also good to notice that our heads naturally tilt down about 10 to 15 degrees with our eyes looking up, resulting in our average gaze being about 6 degrees below where you would assume it to be (Payne 2019.).



(Diagram 3. Tilted gaze.)

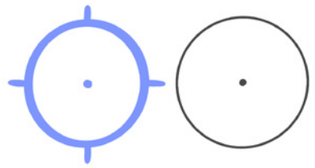


(Diagram 4. Reading area)

3.3 Design Principles

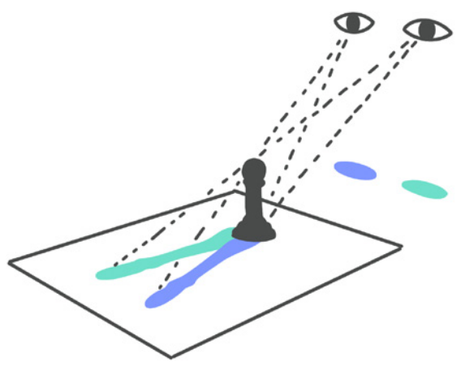
Using a Reticle

Without a visual aid it is hard to tell when objects are actually in the center of our field of view. Overlaying a visual aid or in this case, a reticle, makes targeting objects a lot easier. The best reticles are unobtrusive and react to interactive elements in the environment.



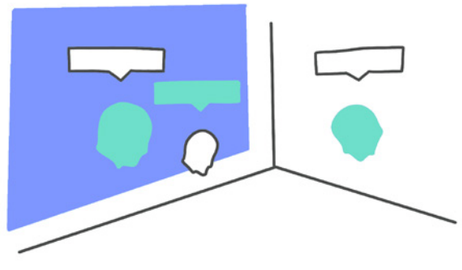
UI Depth & Eye Strain

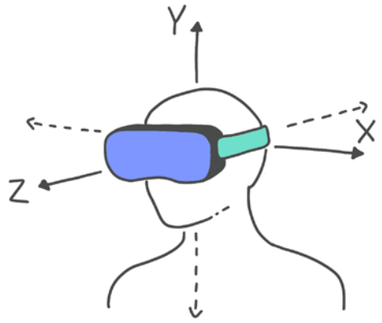
Many things affect text legibility. Font sizes, contrast ratios, spacings of the letters and objects play an important role. Virtual reality adds another factor: depth. About 3 meters from the viewer is seen as a good distance for a comfortable UI. It's far enough away to be comfortably legible, but close enough to not interfere with most scenes.



Keeping the User Grounded

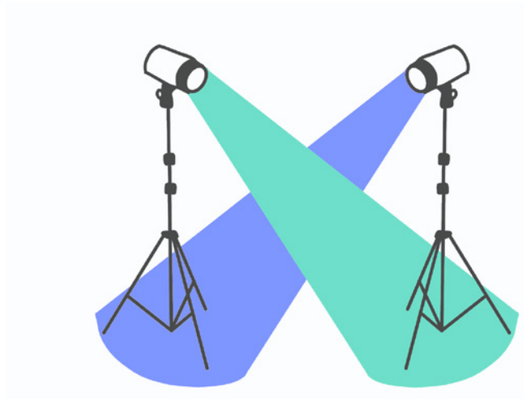
It is easy to become disoriented in virtual environments. You should always include plenty of reference points so that the user can understand their surroundings.





Maintaining Head Tracking

The key to virtual reality is smooth, low-latency head tracking. No matter what, make sure at least one element in the scene always maintains head tracking.



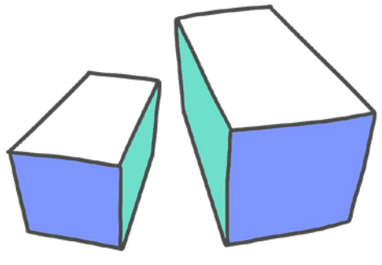
Guiding with Light

Designing for VR means designing for 3D spaces. This creates a challenge of drawing the user's attention. A common technique for example in video game design is to leverage lighting cues. While subtle, users will be drawn to the brightest part of a scene..

Leveraging Scale

Large differences in scale between user and environment are very effective in virtual reality. By using scaling as a feature, it is effective on how the user perceives their environment and their physical size in the world.

(Google 2016.)



(Illustrations 9–14, Lasse Ahlberg)

Chapter

4. DESIGN PROCESS

4.1 Design Tools Overview

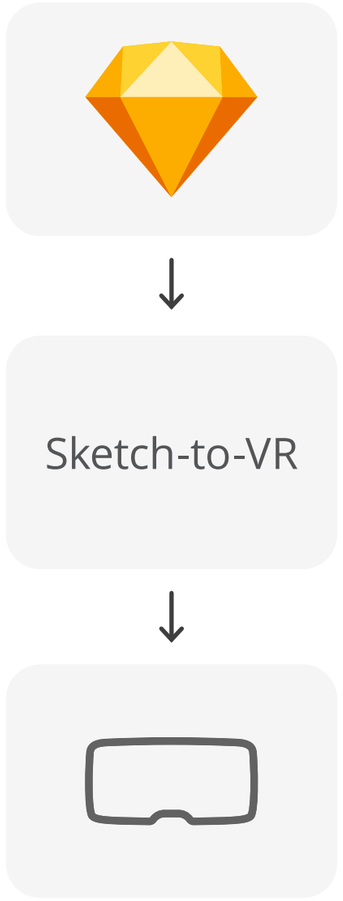
Sketch App

Sketch is a vector graphics editor for macOS developed by the Dutch company Bohemian Coding and it is primarily used for user interface and user experience designs (Wikipedia 2019).

Sketch-to-VR Plugin

To preview individual scenes of wireframes, mockups and final designs in a virtual reality, I used a free plugin; Sketch to VR. With the help of the plugin, all of the individual design scenes can be exported from Sketch to a VR headset.

The plugin works in a way that the exported folder from Sketch will be used to run A-Frame, an open-source Web VR library developed by MozVR. It requires a local server to work (simply opening the HTML page in a browser will not work), in which the plugin developer suggests to use SimpleHTTPServer by Scott Garner as an addition. (auxdesigner 2019.)



(Image 3. Sketch App logo.)

4.2 Phase 1 - Brainstorming and First Ideas

Now that there are some guidelines laid out around the application, the first round of brainstorm and ideation phase was started.

Outcomes of the first session were a group of questions that had a driving impact in the terms of the users needs and overall experience.

Q1 – What the application could include and offer?

- *Competition or review between different concepts if there are more than one iteration of the area – possibility to vote*
- *Collection of data and 360 images of the current state of the planning*
- *In-person viewing inside the construction or planning area, current state and what is coming*
- *"Introductory game" of the plans on the site or what is to be done*
- *Complex, informational jargon and documentation made into more simple, easy to understand format*

Q2 – What drives users to try this out, what are they seeking?

- *Excitement*
- *Interest*
- *To know more about the future near them*
- *Participate and being part of the process*
- *Clear understanding of the process, what is coming and how this affect their personal lives*

Q3 – What type of scenarios or steps could be in the VR environment?

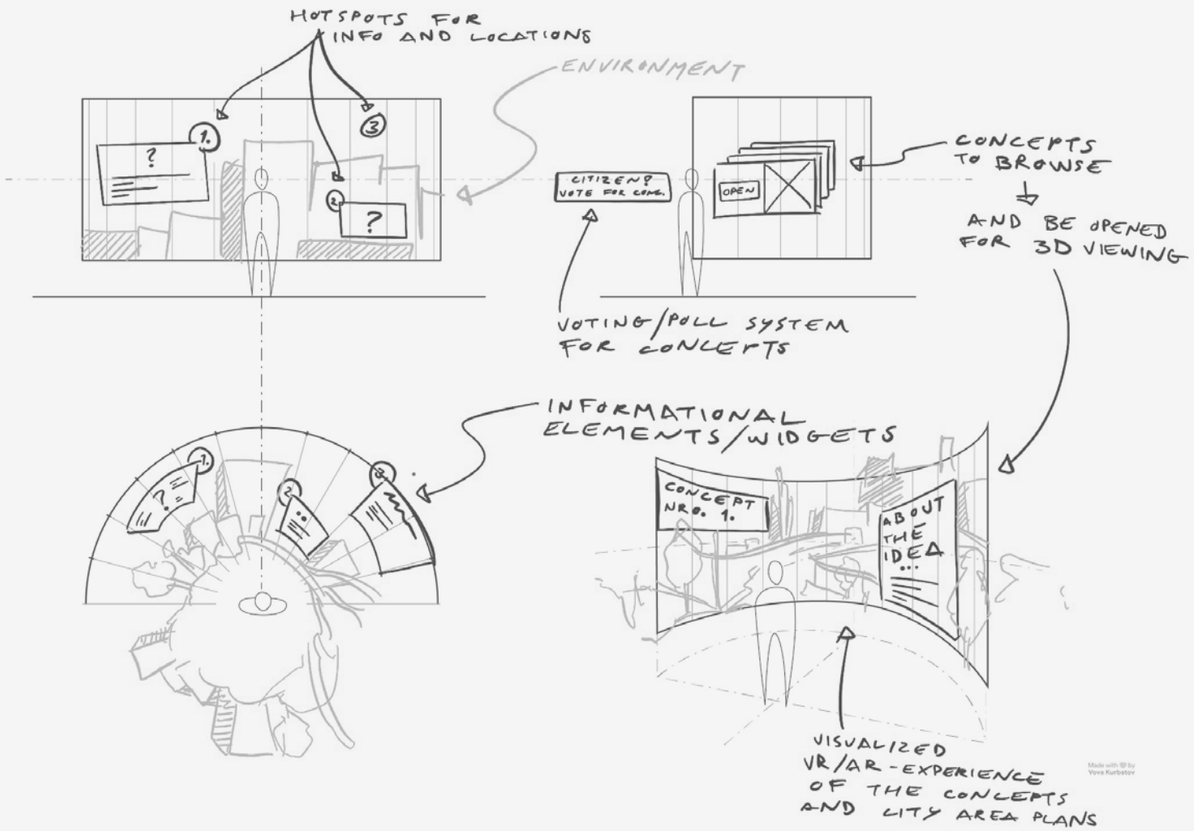
- *Introduction to the experience and guidance when needed*
- *Main menu with navigational elements*
- *Map exploring with different touch points and access points to continue in other environments*

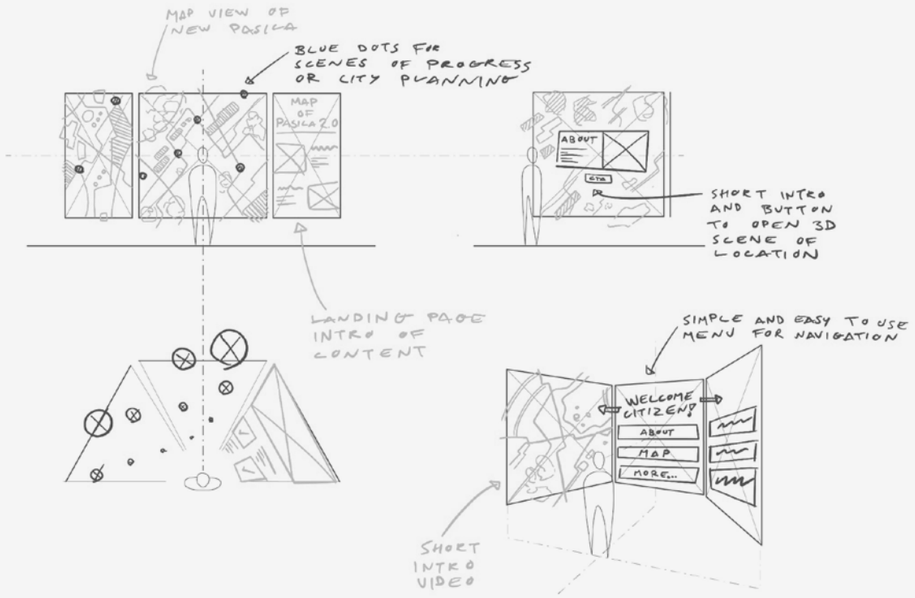
Q4 – What type of information could be useful?

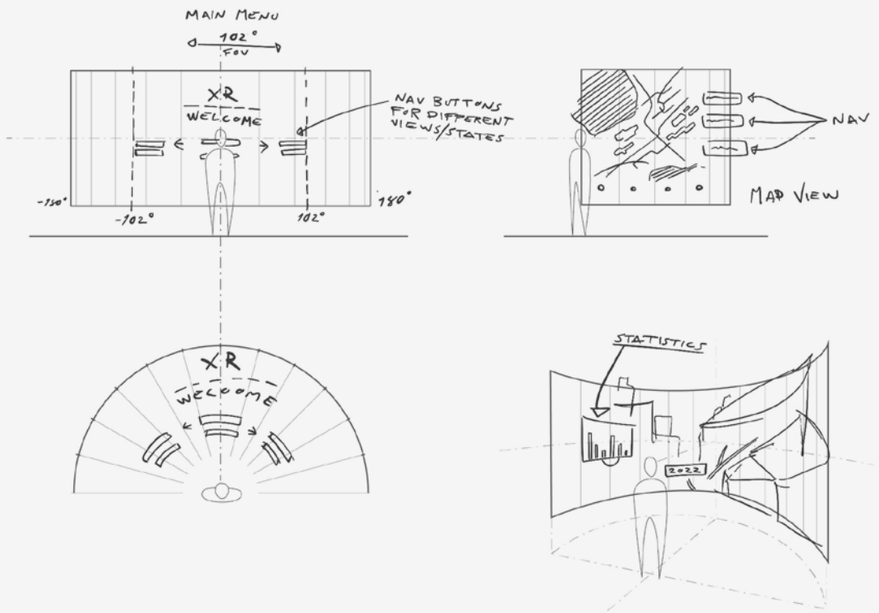
- *Statistics or trivial information of the upcoming buildings and areas, for example what are the surface materials, how many people can be there at once and so on*
- *What is the state of the process at the given moment*
- *Who is in charge and who are the people behind the planning*

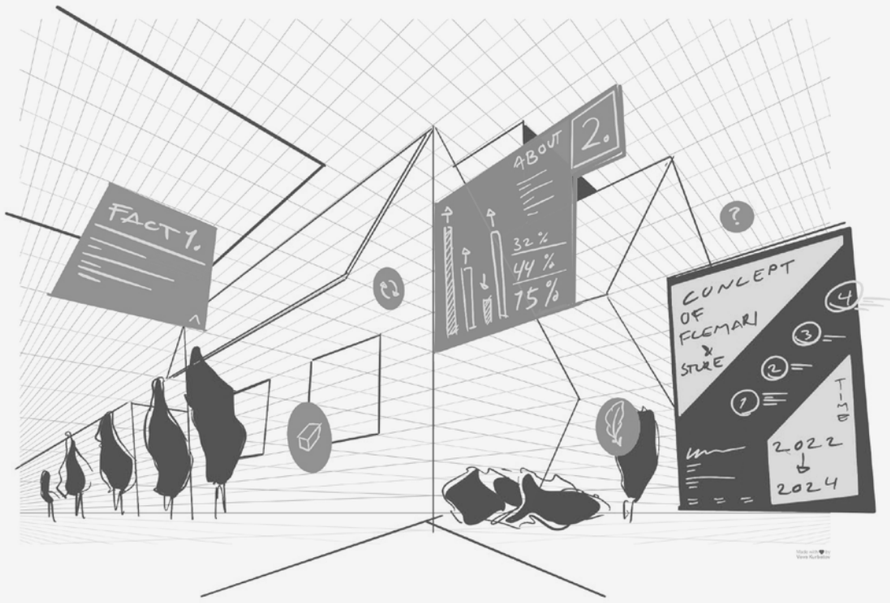
Q5 – What should be the outcome of approx 15 minute long session in VR?

- *Users would feel more trust about planning around their area*
- *Understanding of the current state of the urban planning process in their area*
- *If there is a possibility to vote, what is the valuable data for the planning officers*









Continuation from the brainstorm session, the plan was to loosely sketch out ideas based on the group of questions. To ease out the process a little bit, I used VR sketching templates, done by Volodymyr Kurbatov.

Prior to this thesis project, I did not have any experience in terms of designing for virtual reality or any other mixed realities, so these types of templates did help a lot to understand various factors including object placements, viewing angles and field of view.

4.3 Phase 2 - Journey Map and Wireframes

Journey Map

From the group questions, I wanted to define the user's journey more in depth inside the VR application. Since this was the beginning of the first iteration round, I thought that it would be good to keep the content and navigation structure as straightforward as possible.

Later in the design process, I use this journey map as a guidance and reference to create the first 2D, low fidelity designs of the application.

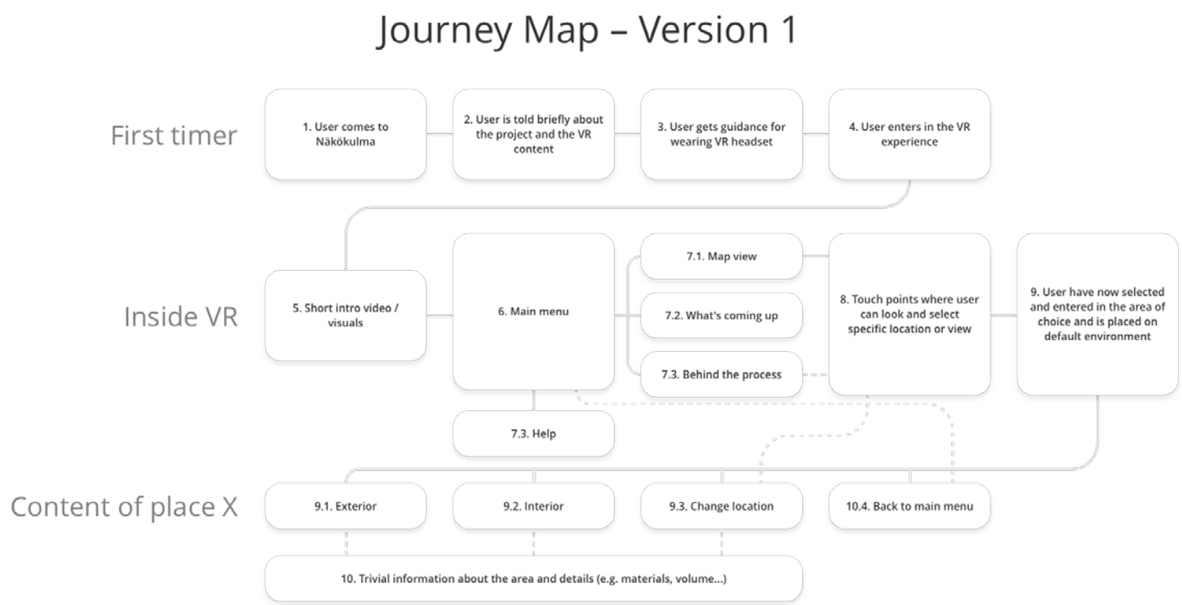
Great way to think

The making of a journey map was one of the most helpful parts in the process when thinking about the features and user experience. This way the focus can be thoroughly on the users and the map combines two powerful instruments – storytelling and visualization.

The journey map is roughly defined from a first timers point of view, who would have no prior knowledge about the use of the application. The importance of the journey map comes when taking into account how users would navigate and interact within the application, from action point to another. Journey map will also give reference on where to place a variety of features.

The journey map starts from the first timer aspect with a basic customer experience situation, where the user is informed about the application and its features.

(Diagram 4. Journey map.)



1. Second step starts with a short, animated intro video into the main menu, where users can begin to interact with the environment.

- Menu consists of buttons for Map view, *What's coming up* -section and *Behind the process* -journal.
- The users can then continue to Map view and start to glance through on-going projects and select one of them.

2. After selecting one of the on-going projects from the map, users can then start to explore the environment. Users can interact with point of interests and UI objects, for example action buttons, that allow users to navigate through different environments.

- Virtual environments are 3D modeled spaces or 360-images. Images can vary from interior to exterior views.
- *Point of interest* is information that can provide material or dimensional information about the project.

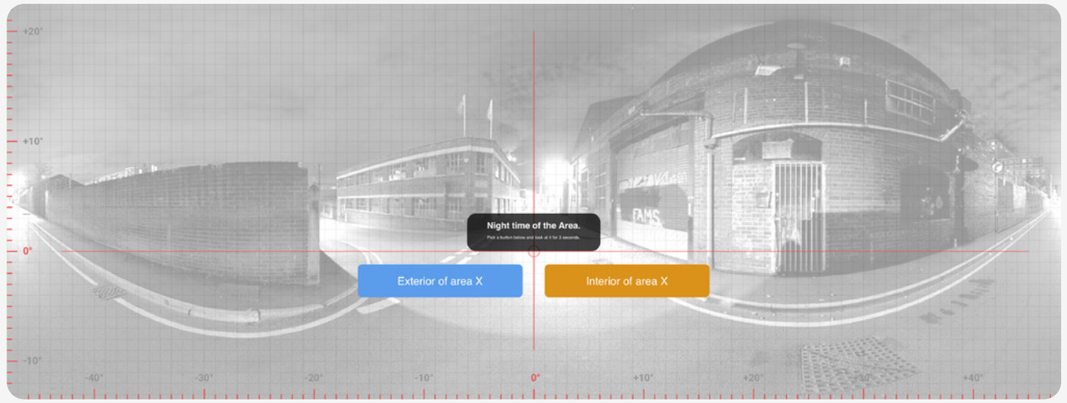
Wireframes

With the help of the user journey map, the design process continued in the making of wireframe designs. Wireframes works as foundational building blocks and guidelines behind the user experience and user interface. Grey background circles along with the red indication lines serve as visual guidelines for the eye comfort zones and field of view as mentioned in the *Chapter 3 - Accessibility and Design Principles*.

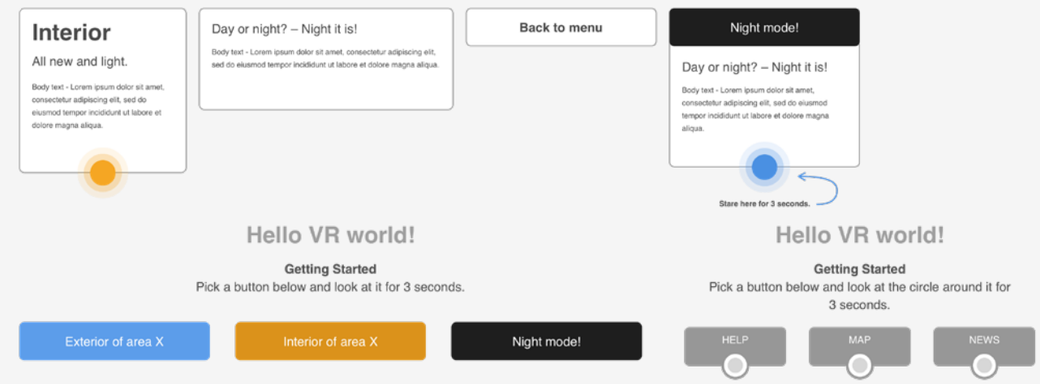
During the drawing of the wireframes, I mostly focused to explore the most optimal placements and sizes for the type and UI objects. After multiple iterations on switching between VR headset and Sketch, I got a general idea about the type sizes and UI object placements.

(Wireframe 1. Main menu view with generic buttons.)

(Wireframe 2. Main menu view with Help-indication modal.)



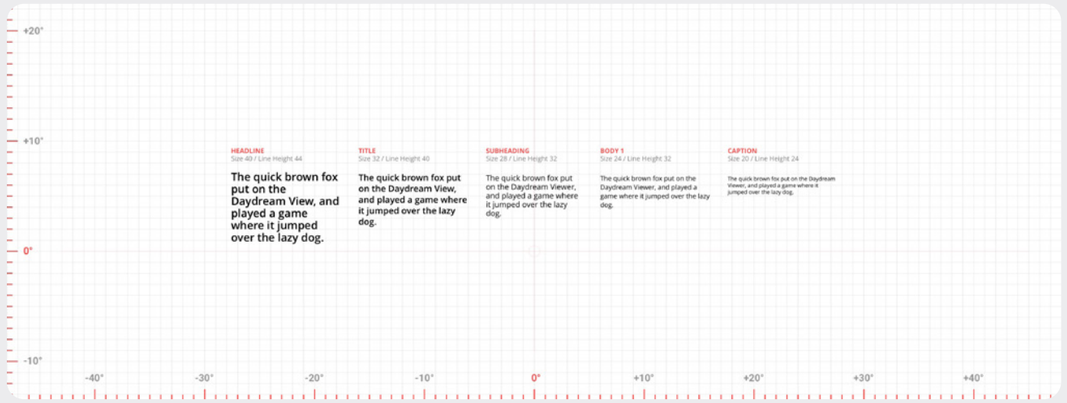
(Wireframe 3. Environment testing with 360-image, buttons and description card.)



(Wireframe 4. Various wireframe UI objects and symbols.)

Good to keep in mind

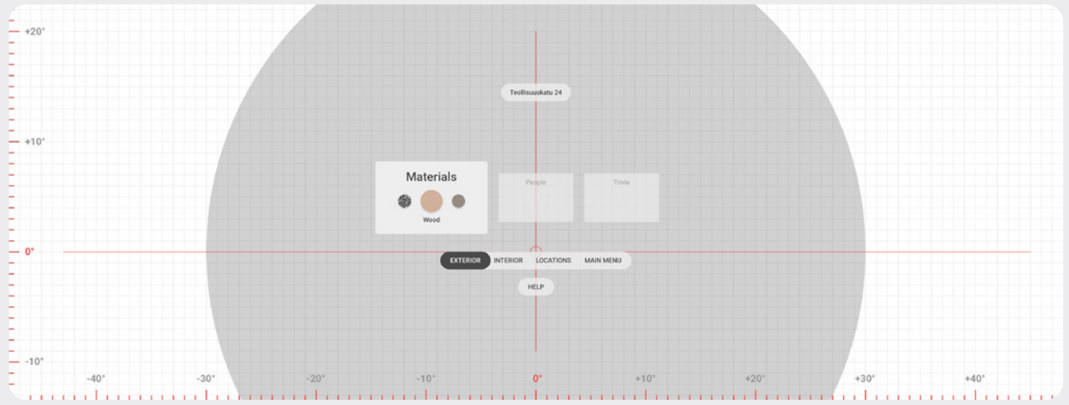
Even though the design resources for VR experiences have increased over time, that does not remove the fact of checking VR designs every now and then with your own eyes – in this case I used a relatively cheap headset with a 102 degree field of view and a VR supported smartphone.



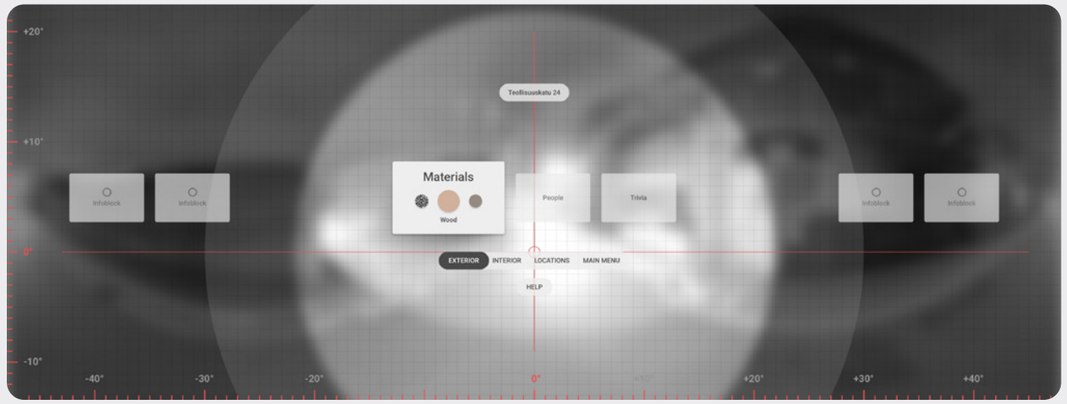
(Wireframe 5. Type scale system.)

(Wireframe 6. Main menu, version 2 with colour coded action buttons.)

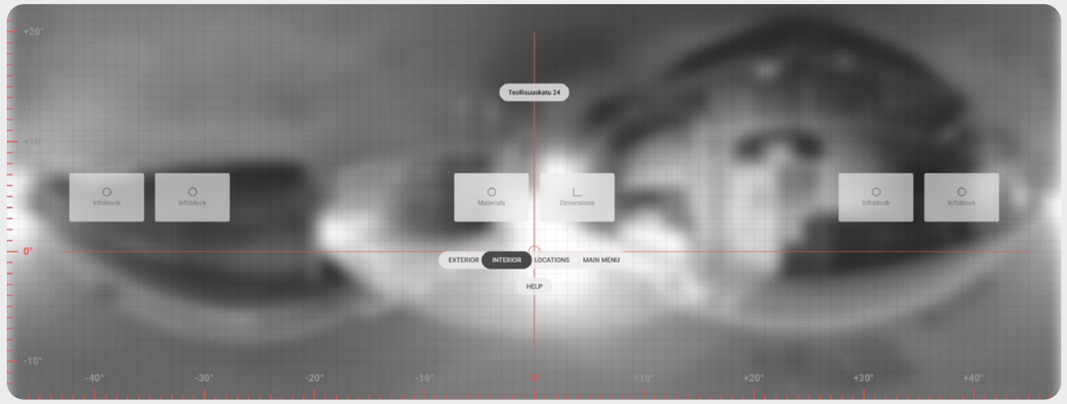
(Wireframe 7. Main menu, version 1 with simple action buttons.)



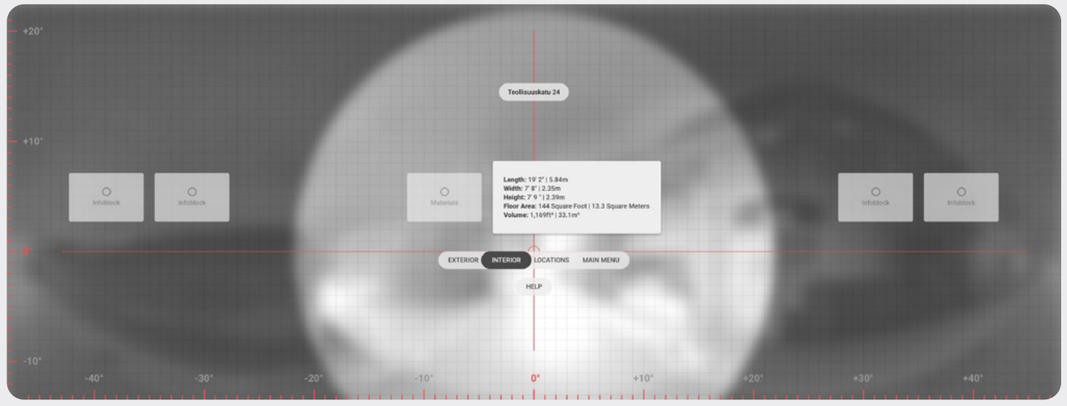
(Wireframe 8. Informational UI objects in an open/focused state.)



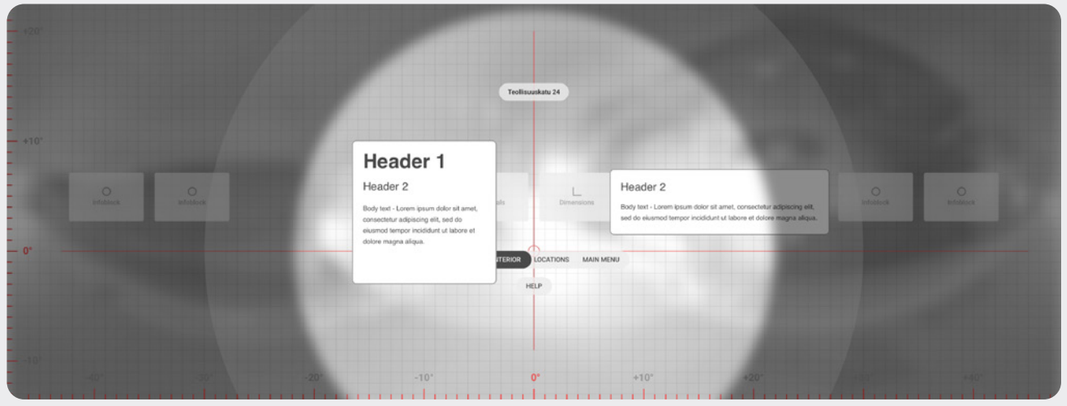
(Wireframe 9. Informational UI objects in a 360-image environment.)



(Wireframe 10. Generic 360-image environment with interactive UI objects.)



(Wireframe 11. Information card in 360-image environment.)



(Wireframe 12. Differently sized information cards in 360-image environment.)

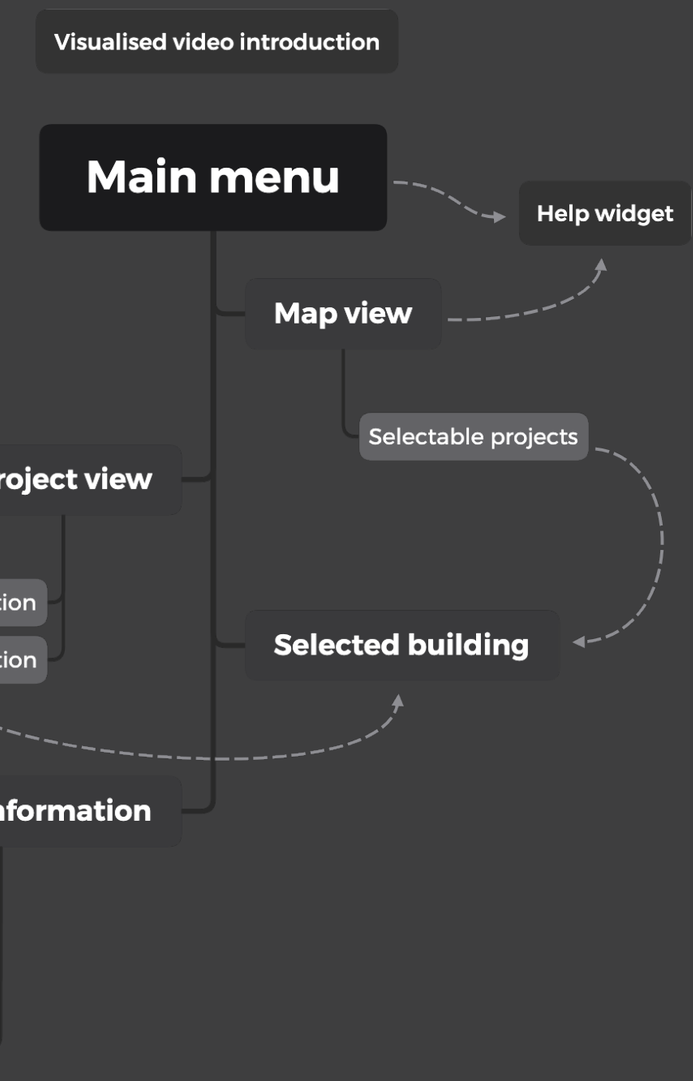
4.4 Phase 3 - Low Fidelity Visuals

After wireframes it was time to take a closer look and iterate more refined (but still low fidelity) versions of the designs. For the features in the designs, I compiled a feature list from various documents, maps and materials that the City of Helsinki provides on their site. I also kept in mind the group of questions from the brainstorm session.

Future-proofing

To ease out the design workflow, I already started at this point to build a simple symbol library in Sketch. This helped a lot whenever there came a need to recycle or make updates on existing UI objects. With a symbol library, it is easier to have all of the objects being in sync and consistent.

Visual Design Structure



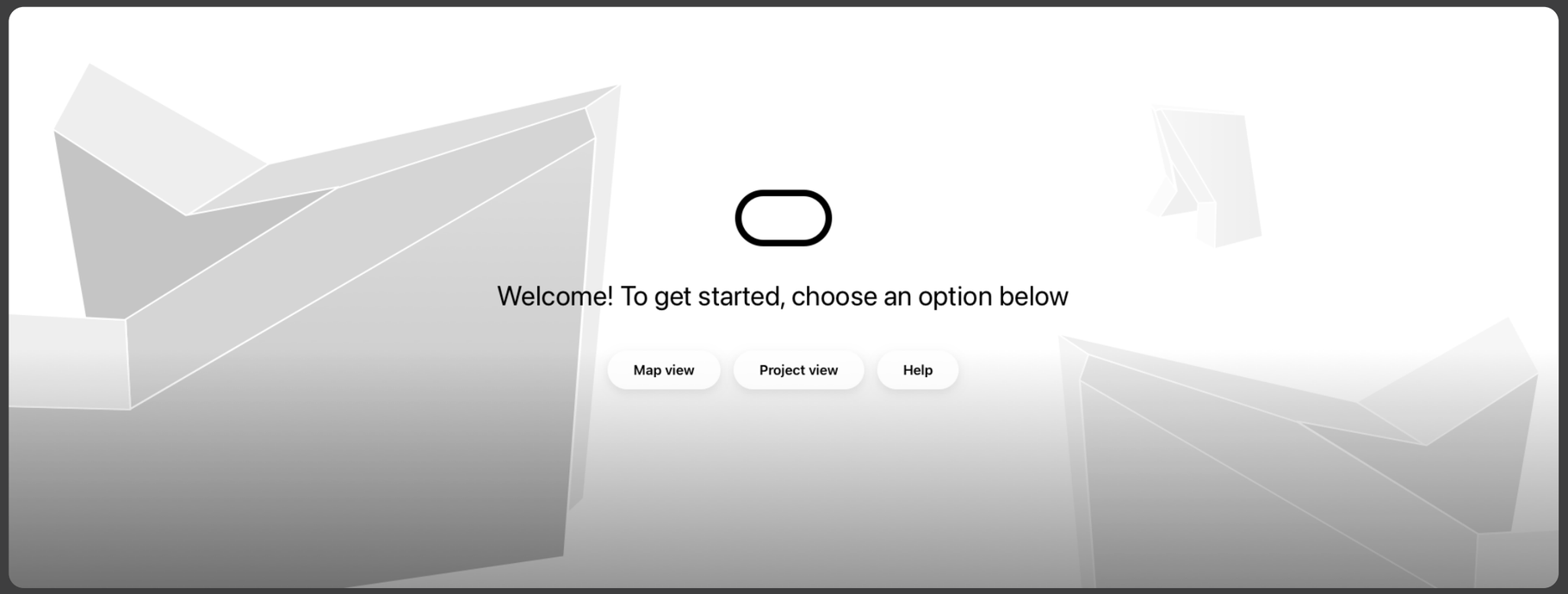
(Diagram 5. Low fidelity design structure.)

Video Introduction

(Low fidelity visual 1. Visualised video introduction to the main menu)

Main Menu

(Low fidelity visual 2. Main menu)

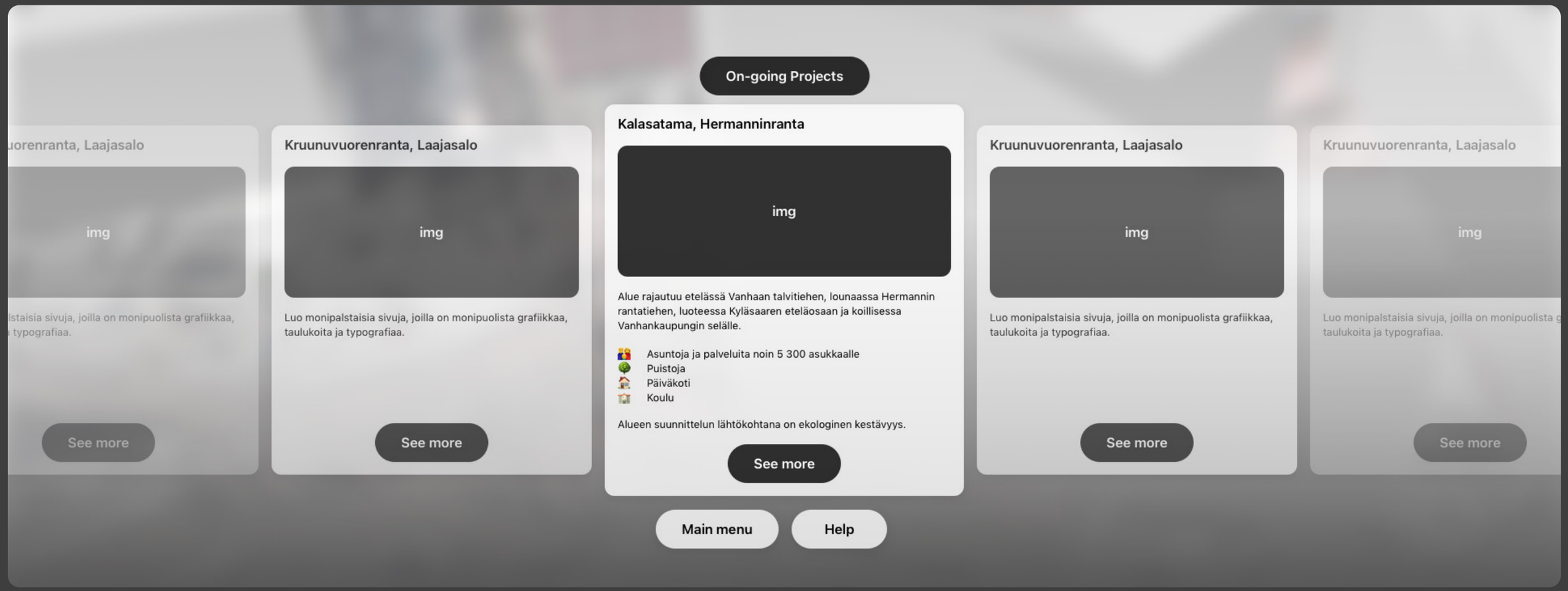


The Main menu has access to a variety of touch points in the application. Scene and UI objects are kept simple and unobtrusive to minimise visual distractions. Background is stylised with simplified and low poly stylised things from urban environments, for example buildings, trees and benches.

Menu navigation contains three buttons

- Map View
- Project view
- Help

Project Selection

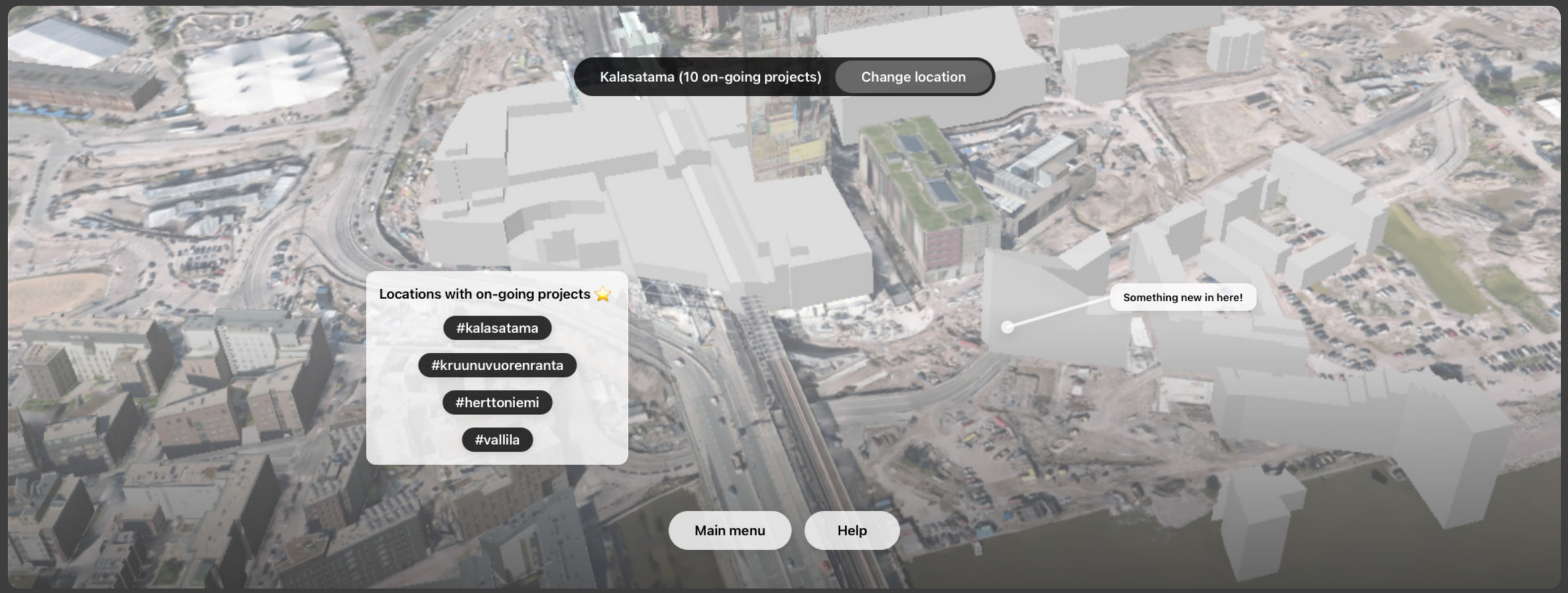


(Low fidelity visual 2. Project selection view)

In the project selection view, users are able to glance through information cards that display information about on-going planning and construction projects.

Card contains an image, brief information about the project and some of the highlighted points of interests. In this example the amount of apartments and near services.

Map View



(Lo-fi visual 3. Map view)

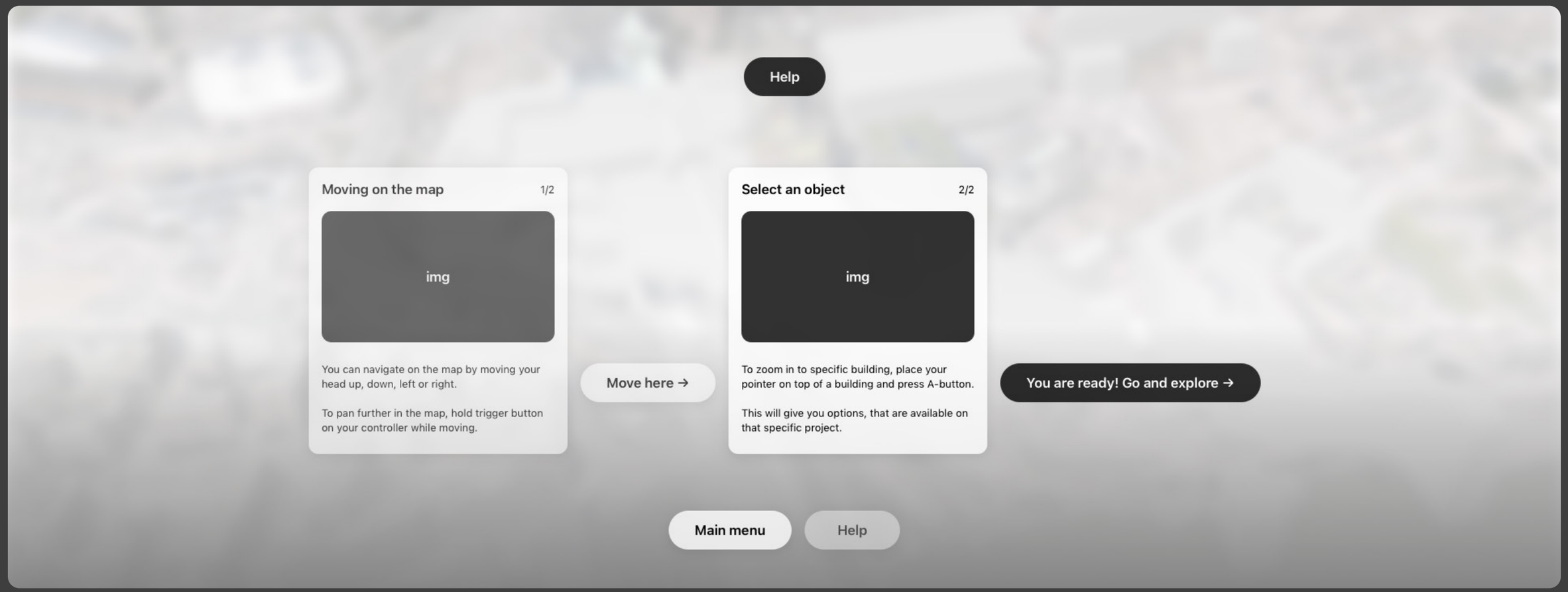
Map view is one of the most essential parts of the service. Map includes multiple UI objects for users to interact with. Map itself is a 3D modeled version of
Helsinki.

Users are able to navigate to a predefined location on the map with an information widget. Information widget shows locations from the map and it allows users to change locations with on-going urban planning projects.

Users current location is shown on top of the UI as a header object. Header objects main function is to keep users on track where they currently are. Users are able to change location from the header by pressing the Change location -button.

Main Menu and Help buttons are provided and accessible on the lower area of the UI, under the UI center.

Help Widget

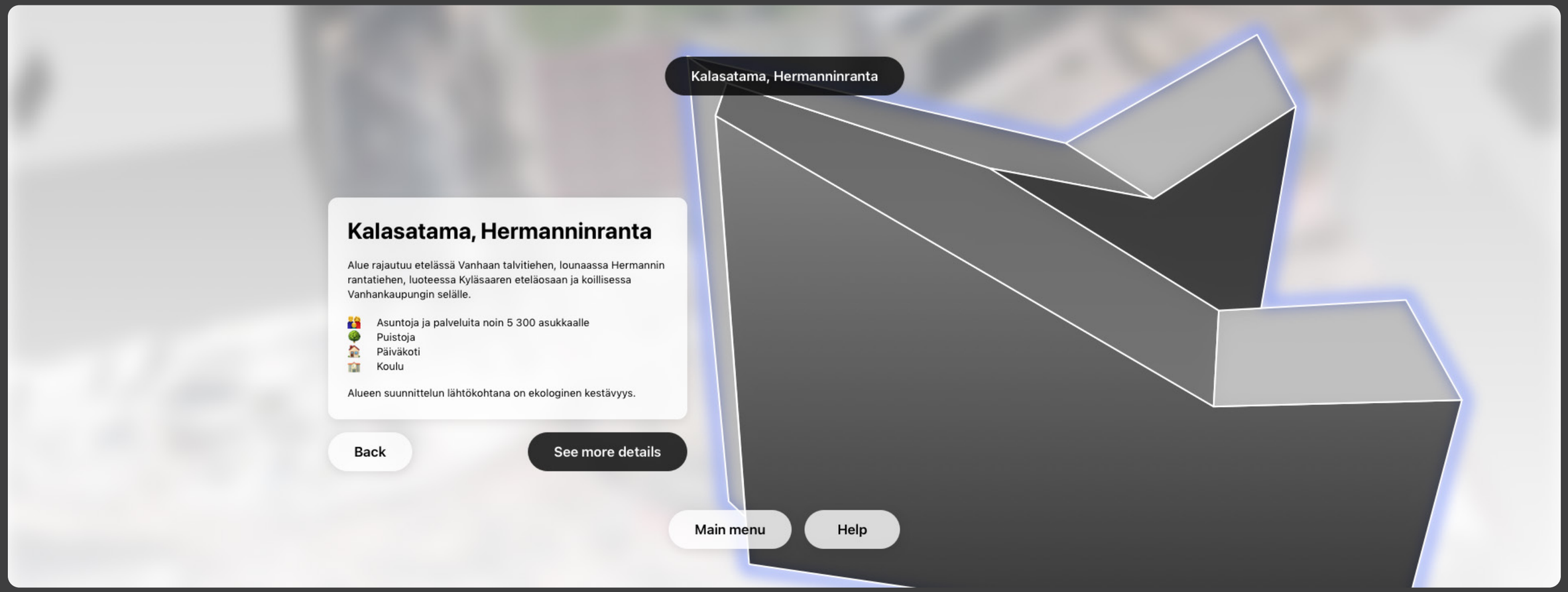


(Low fidelity visual 4. Help widget and instructions)

The help widget is a way to introduce and get users familiar with the application without prior knowledge. Widget includes How to... -sections with instructions.

First thing for users to learn is how to move on the map and second comes object selection. Help widget can vary within environments. Help widget can be used throughout the application whenever a new way to interact with an environment or UI object is present.

Selected Building



(Low fidelity visual 5. Selected building)

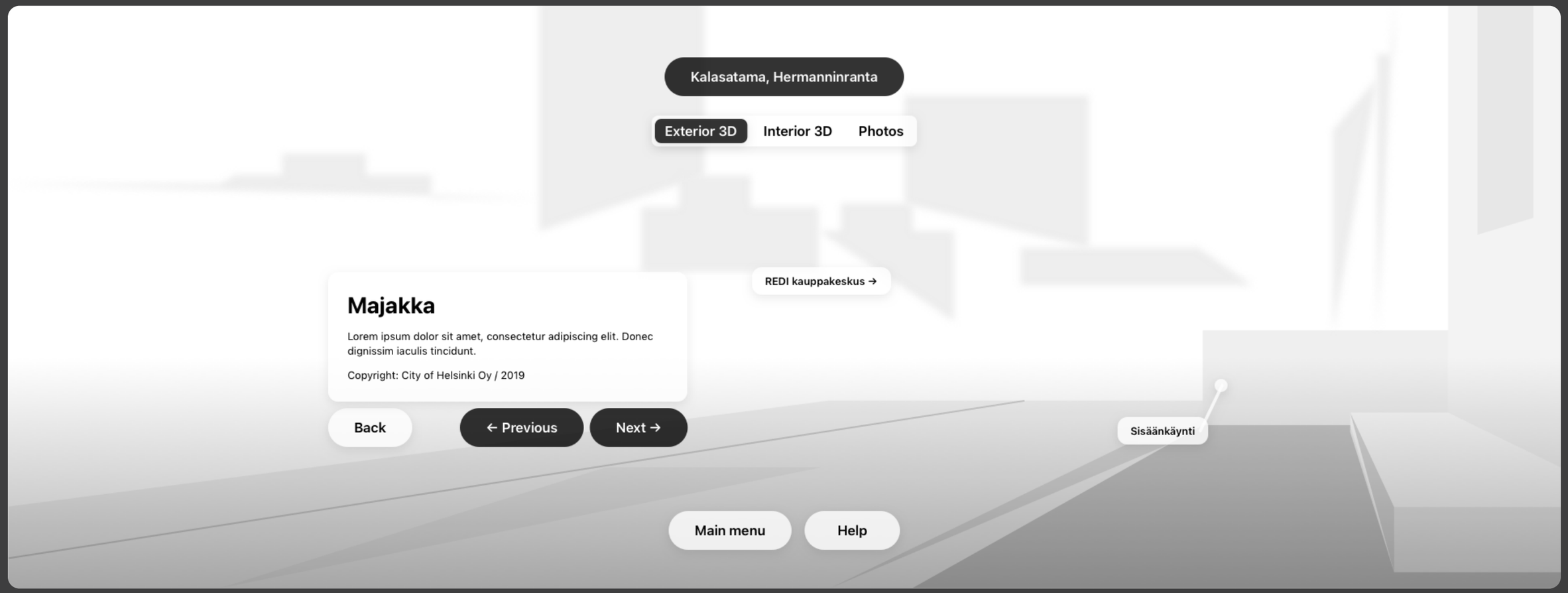
When users select a building or any on-going project from the map, 3D objects from that project are highlighted and the camera is zoomed closer to the selected object.

Selected view items:

- Header element
- Information card with a project information
- *Call to action* -buttons for returning to map or to see more details.

In the selected view users are able to pan and zoom around the building and have a brief introduction to the plannings, goals and documentation.

Exterior Scene



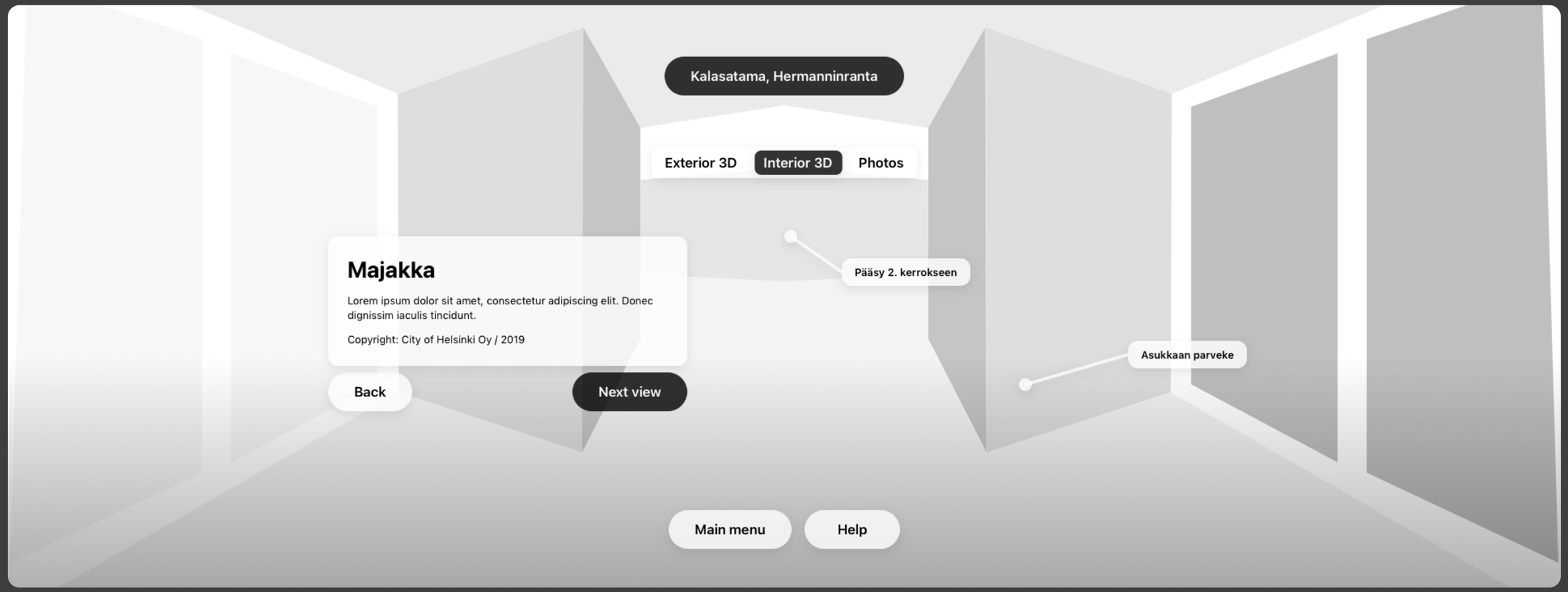
(Low fidelity visual 6. Exterior scene)

When See more details -button has pressed in Selected building -view, detailed view and planning details are shown. In this view the users are able to have a look around 3D modeled and 360-image material from the construction area. From the top users can change between Exterior, Interior and Photos view with the tab object.

Details from the 3D modeled space are highlighted for example pointing out where there would be emergency exits, shared community spaces and bicycle storage.

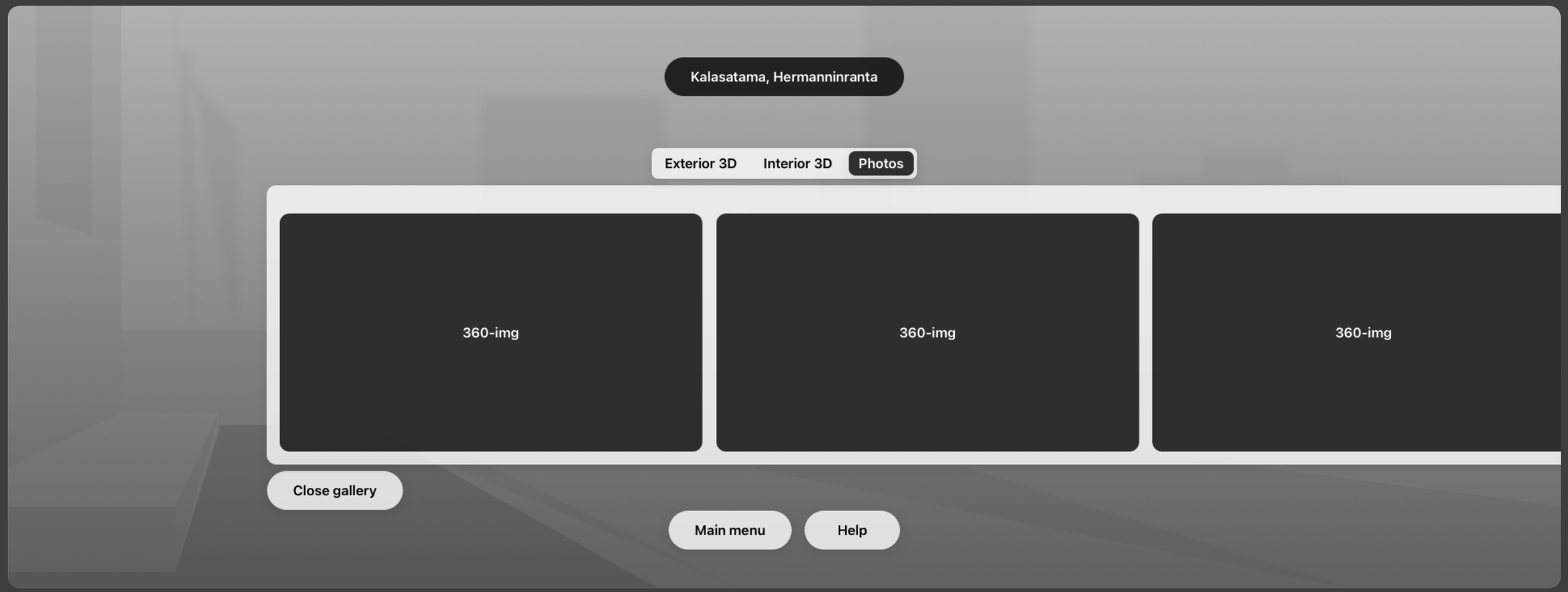
Main idea behind these environments was that users would have a real life resembling experience on the scale and design choices.

Interior Scene



(Low fidelity visual 7. Interior scene)

Photo and Video Gallery



(Low fidelity visual 8. Photo and video gallery)

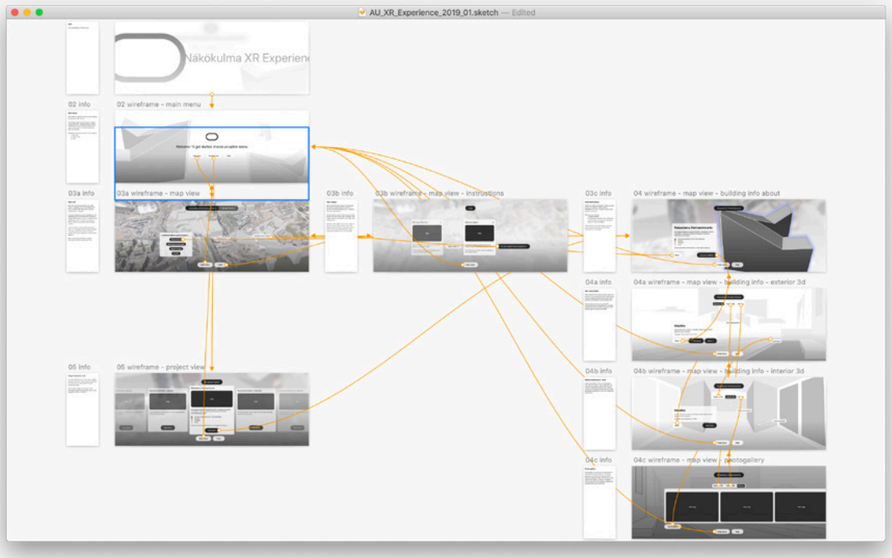
Photo gallery serves as a visual journal of the planning site, where on-going construction processes can be followed. People involved in the process could upload 360-images and -videos in the gallery and have more engaging visibility.

4.5 Phase 4 - Design Evaluation

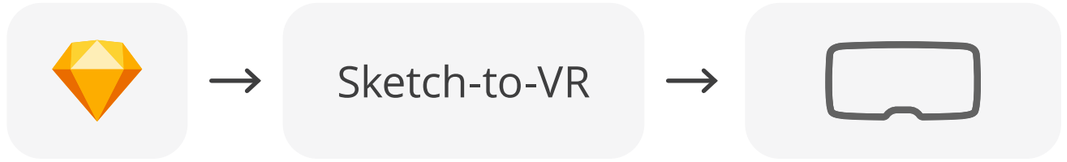
Heuristic evaluation involves having a small set of evaluators to examine the interface and judge its compliance with recognized usability principles – the “heuristics”.

To be noted at this point, heuristic evaluation for one person to do is usually difficult due to that one person will not be able to find all usability related problems in an interface. But that is no reason to dismiss use of the method, the method can be significantly improved by involving multiple evaluators (Nielsen 1994).

While deciding evaluators I kept in mind restrictions that are present in low fidelity designs, that are not fully translating the simulated experience. In this case I was not able to review microinteractions, animated effects or complex depth.



(Image 4. Prototype structure inside Sketch)

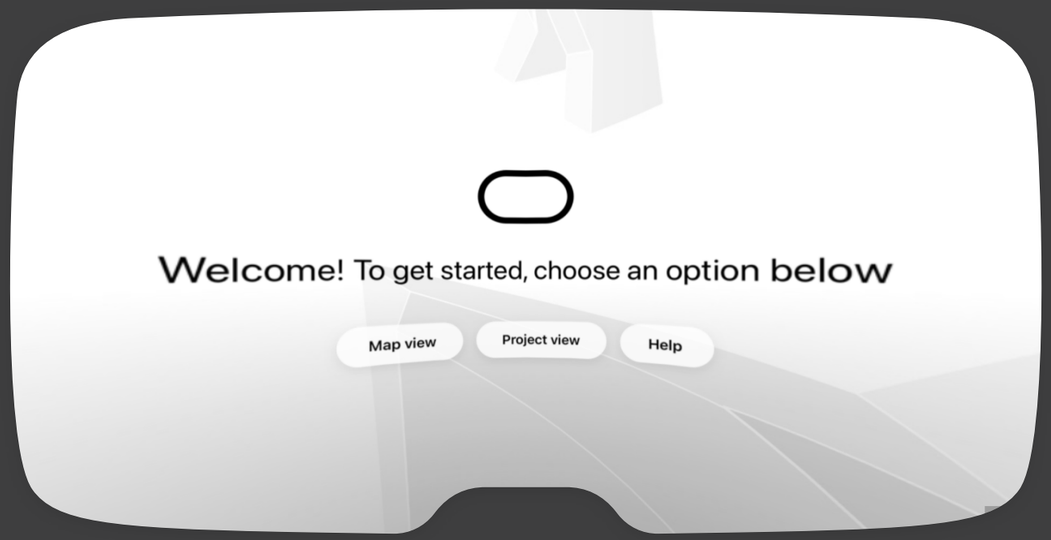


For testing purposes, I made a clickthrough prototype in Sketch from the previous low fidelity designs and alongside the prototype I used Sketch to VR plugin so all of the scenes could be viewed through browser and a VR headset. I thoroughly reviewed every scene and UI object with the following evaluators from the users point of view.

Evaluators

1. *Consistency and standards in the UI*
2. *Provide clear exit*
3. *Familiar language (avoid technical jargon) and logic*
4. *Display information until it is not needed*
5. *Irrelevant or rarely used information should not be displayed*
6. *Aesthetics and minimalist design*
7. *Accounting both experienced and inexperienced users*
8. *Availability of help and documentation*

Main Menu



(Evaluation screenshot 1. Main Menu)

1. Button styles have logical placement and shape. Adding icons inside buttons could give additional visual interest.

2. Word *View* is repeated twice, which seems a bit unnecessary due to the minimal amount of text in this scene. Also the welcoming text could be more descriptive about the application.

3.–6. Scene is kept minimal and unobtrusive from unnecessary things.

7.–8. Help button is clear and visible but the lack of information about the application could be improved.

Project Selection

(Evaluation screenshot 2. Project Selection Scene)

1. Project cards follow the same structure and information hierarchy. Header object might cause confusion due to being so similar with other buttons in the UI.

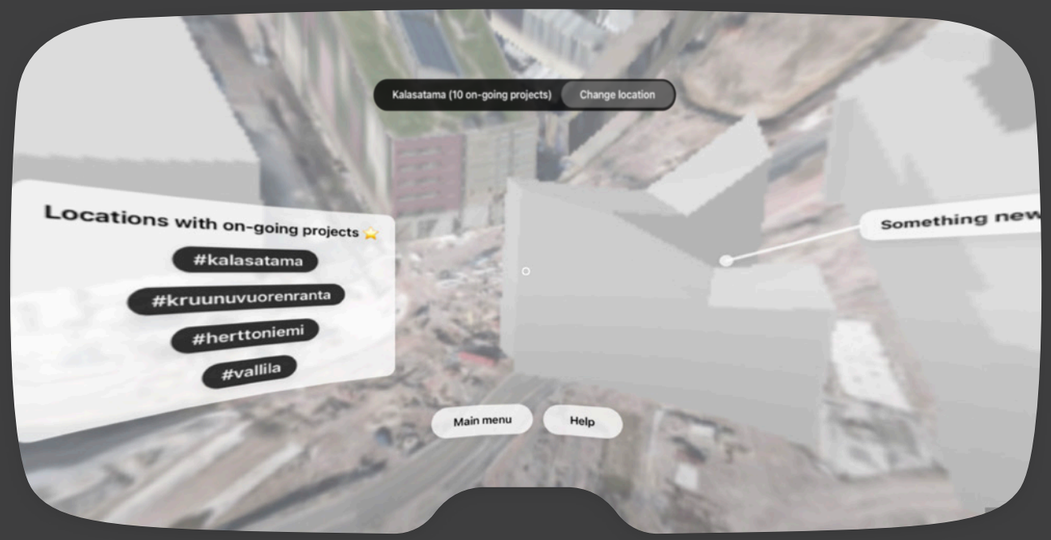
3.–2. Main menu -button can be found from the same place as previously. Wording “on-going” seems unnecessary in the header element.

4.–6. Project card in the center focus area is clear from useless information. Cards that are not in the center focus are slightly too close to focused cards – this might cause visual distraction.

7.–8. Scene could have more filtering options for example city districts and which projects are more timely relevant at the moment. This would allow users to search more in detail.

3/7

Map View



(Evaluation screenshot 3. Map View)

1.–2. UI objects are following the same style and informational hierarchy as previous scenes. Size of the location tag card could be more compact. Header element has a button inside which could have more contrast.

3.–5. Locations with on-going projects -card header could have better wording and functionality. Something new -notification seems irrelevant if the user is a first timer.

6.–8. Something new -notification could have more or other function than notifying on new projects. Map design could work better with less detailed style and have emphasis on visuality.

4/7

Help Cards and Instructions

(Evaluation screenshot 4. Help Cards and Instructions)

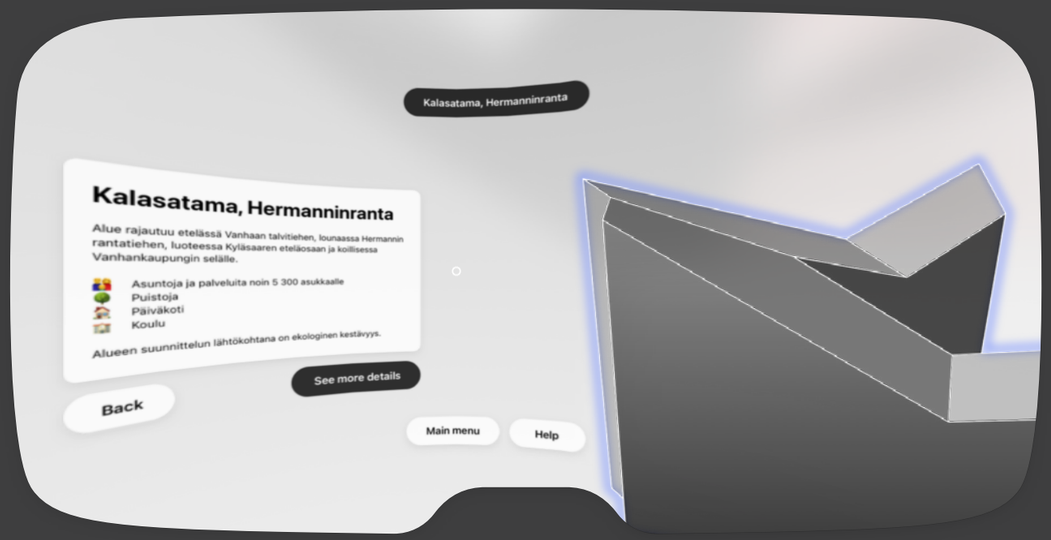
1.–2. Overall design and hierarchy of the cards follows the language as previous scenes. Header object is also in this scene too similar to buttons. Move here -indicator can be confused to be a button.

3.–5. Text reads well and is understandable but some of the words could be highlighted and correlated with the image inside the card. Text in the header object could be more descriptive about the context.

6.–8. Since cards have white background, darker main background images could highlight more the card inside the focus area. Go and explore -button could have better wording.

5/7

Selected Building



(Evaluation screenshot 5. Selected building scene)

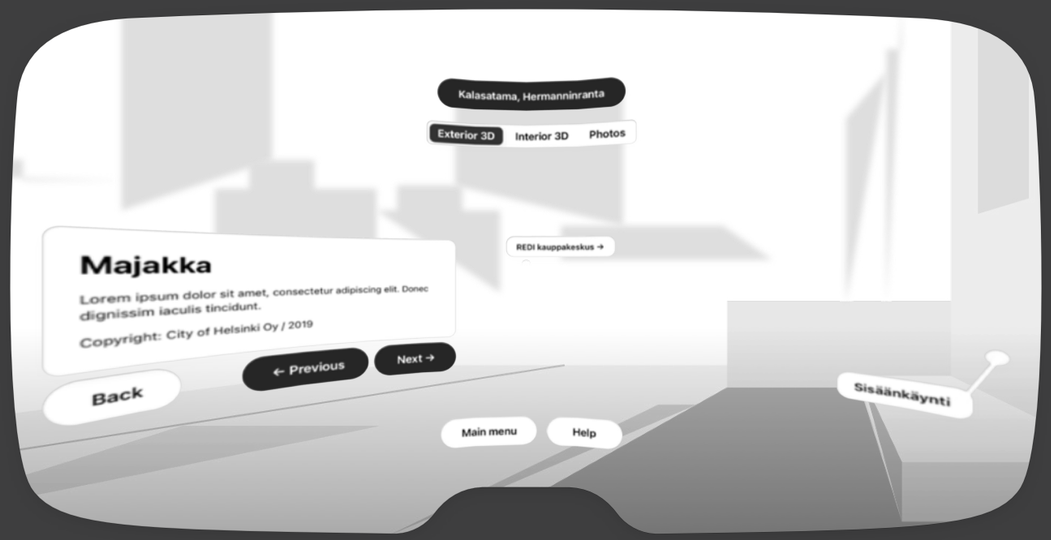
1.–2. Information and UI object hierarchy in the information card is consistent with previous card designs. Highlighted parts in the text could be more visually appealing.

3.–5. Only the necessary information visible for proceeding but button styles and colors need more variance. Information card could also include more details about the planning timeline.

6.–8. Visual style of the building could be more appealing and have more depth. Reference objects for the scale would be interesting to try out.

6/7

Exterior and Interior



(Evaluation screenshot 6. Exterior scene)

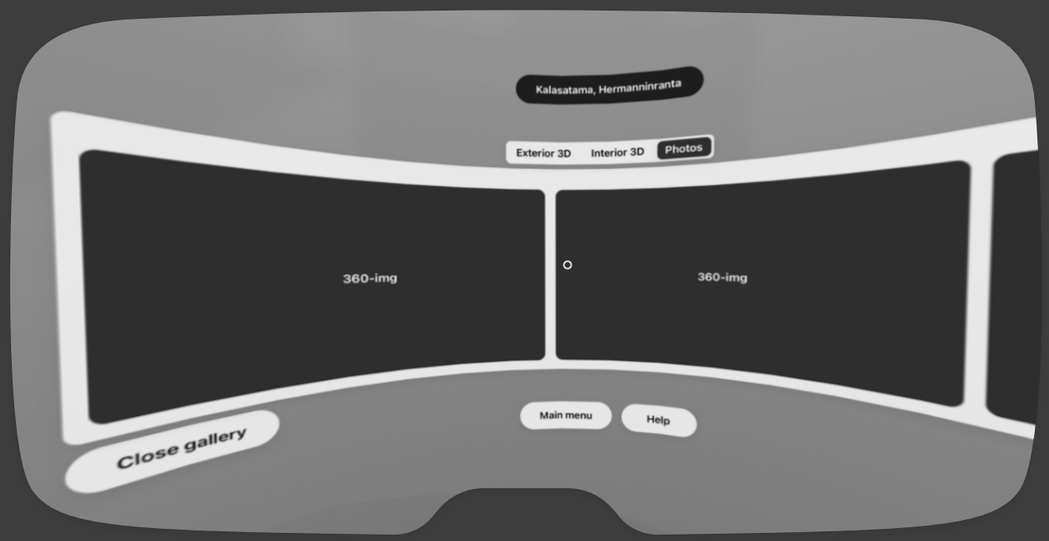
1.–2. Information hierarchy and interaction patterns are mostly identical when compared to previous scenes. New tab object is introduced and it is distinct from other UI objects.

3.–5. Buttons for Previous and Next under the information card could be more descriptive and clear on whether they change the whole scene or just one entity. Word 3D in the tab component seems unnecessary for the average user who might not be familiar with technical abbreviations.

6.–8. Notifications could be more understandable with added iconography and color coding.

Note: Exterior and interior scenes evaluations are combined because scenes being nearly identical with the UI objects and information hierarchy.

Photo Gallery



(Evaluation screenshot 7. Photo Gallery)

1. As in previous scenes, the header element lacks distinguishable style. Gallery card design could be improved by using the same card style as in Project Selection -scene.

2. Close gallery -button would work better next to lower navigation buttons or next to tab selection object.

2.–6. Instead of photographic content the scene could also have text documents and related infographics that are present in urban planning publications.

7.–8. Description of each document with an added button could add more clarity to proceed to explore content.

Chapter

5. FINAL DESIGNS AND END RESULTS

5.1 After Evaluation

After analysation of evaluation results, it was quite clear that most of the UI objects were in need of a redesign work by providing more variance in shapes, colors and functionality. The most confusing object was clearly the header object, by being too similar with generic buttons. Even though the visual style was kept minimalistic in a purpose, it was significantly affecting the evaluation results. For example distinguishing between interactionable objects or static objects, the color palette plays an important role when objects shapes are even somewhat similar to each other.

Changes In Designs

Video Introduction

Video introduction design was not evaluated due to not requiring any interactions from the user. Visual style was made to match overall design.

Main Menu

From the evaluation, wording in the Project view -button was changed to All projects to have better legibility. Welcoming text was also changed to be more descriptive about the application's purpose.

All Projects & Map View

For the project selection view and map view, header objects were updated to tab objects. For more specific search, Filters-button was added. Non-focused cards were changed to look less in focus by using a blur effect.

One of the largest changes was to redesign how the map is interacted by the users:

- In the previous version, users were able to select individual buildings and from there continue to the detailed views.
- In the redesigned version, users are now able to select larger planning areas instead of individual buildings and continue from detailed planning view to individual buildings.

Reason to do this was that the map can be kept more simple, user friendly and less cluttered from information flood. Each of the planning areas can now be provided with more information in separated views.

In Map View, the project tag card was removed due to filtering having too similar functionality. Something new -notifications were replaced with location based notifications, that are displaying the amount of on-going and upcoming planning projects. Visual style of the map was also updated into a more low poly look, so users could immediately detect which areas have on-going and upcoming planning projects.

Help Cards and Instructions

Mainly the visual style was changed in the card design. Some of the instruction texts were also changed to have improved legibility.

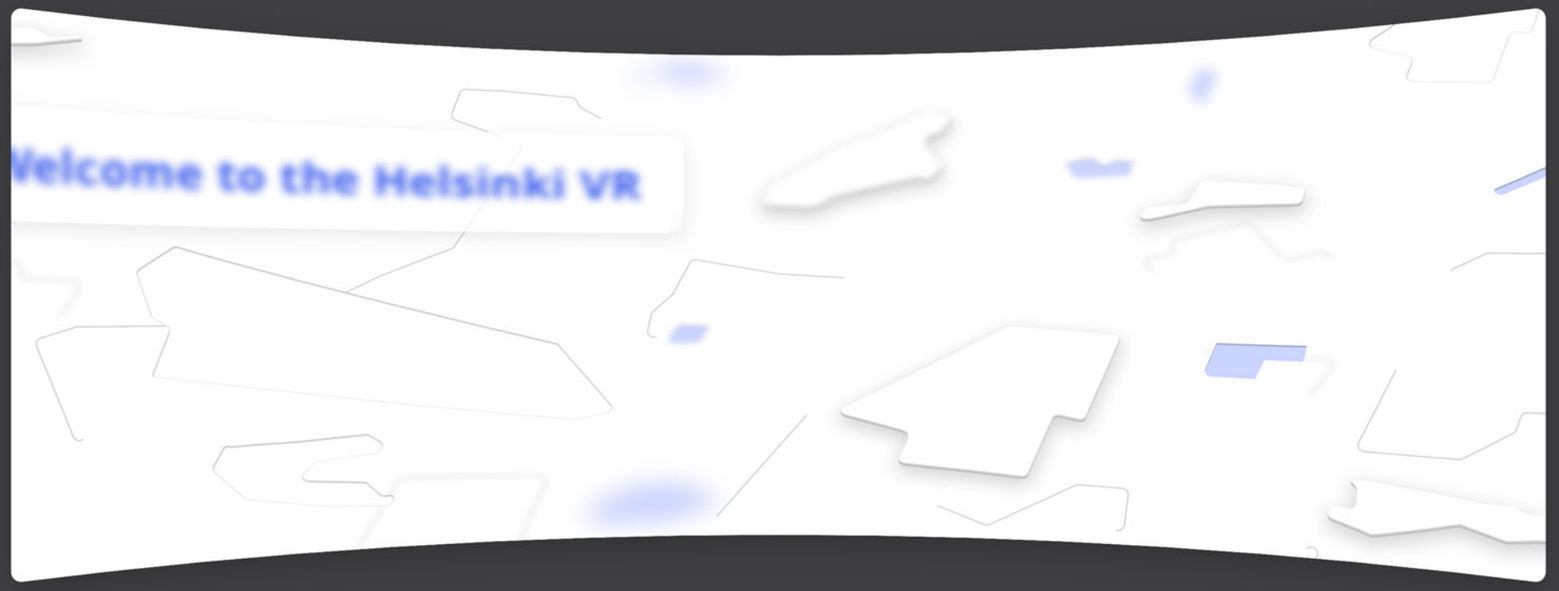
Selected Area & Selected Building

The way how information is displayed was changed in the Selected Building -view and some new information cards were added. For example information about how far the process has advanced so far and detailed specifications of the building.

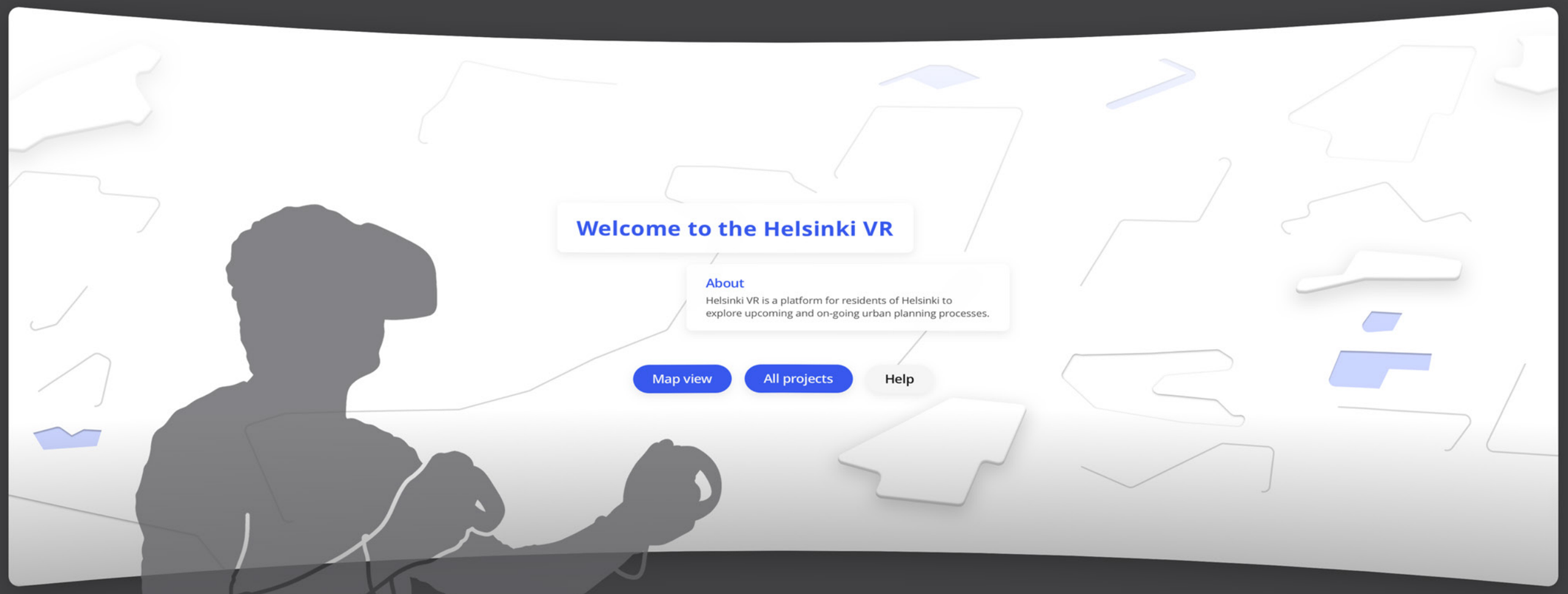
Interior, Exterior and Documents

Largest change was to redesign the Photo gallery's function and naming to Documents. By doing these changes, the new Documents-section is now reserved for planning blueprints, documents about decision making and other related information.

Both of the Interior and Exterior views are updated to have similar card designs as in previous scenes.

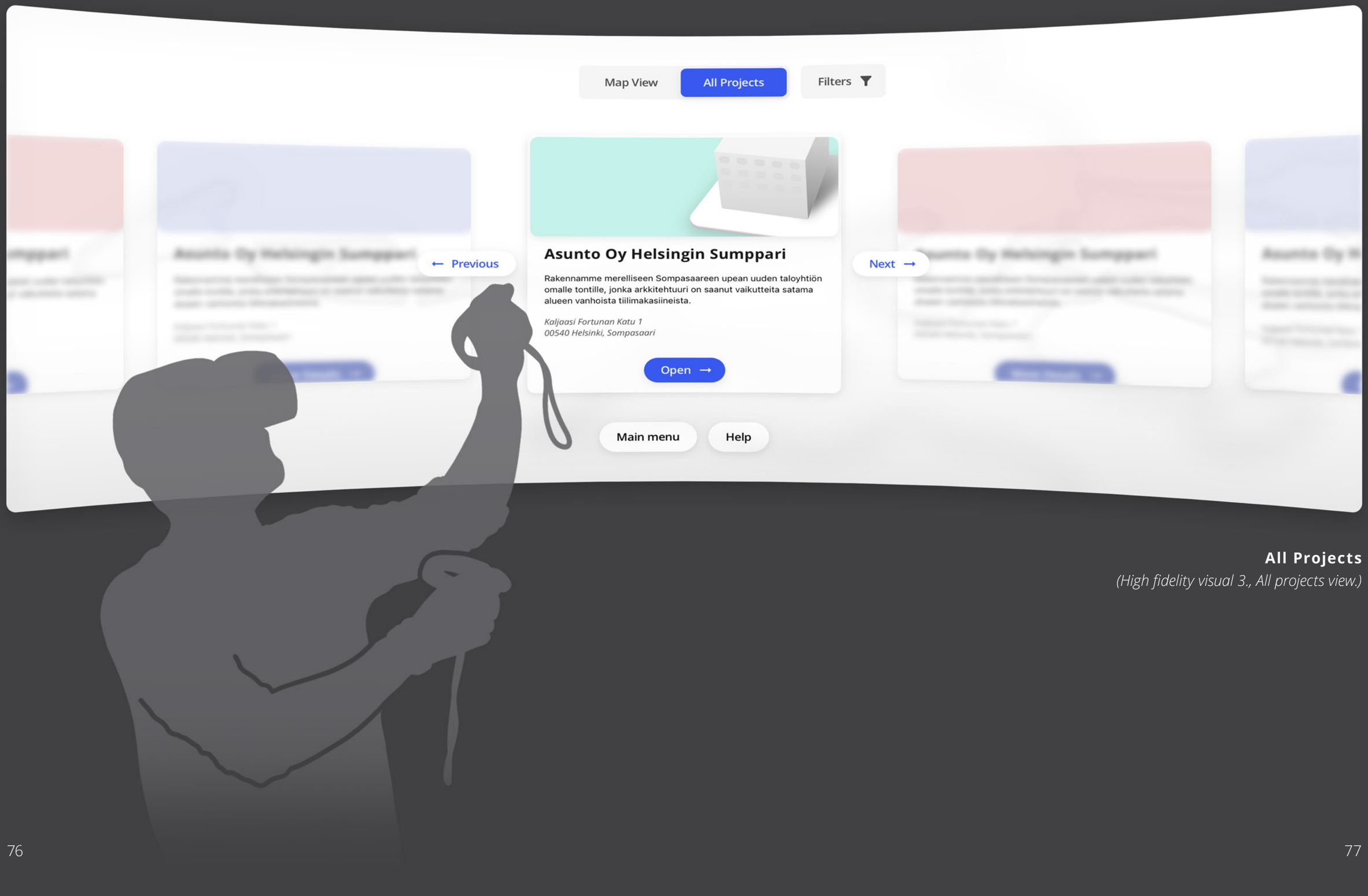


5.2 New Designs



Video Introduction & Main Menu

(High fidelity visuals 1.–2., Video introduction and Main menu.)

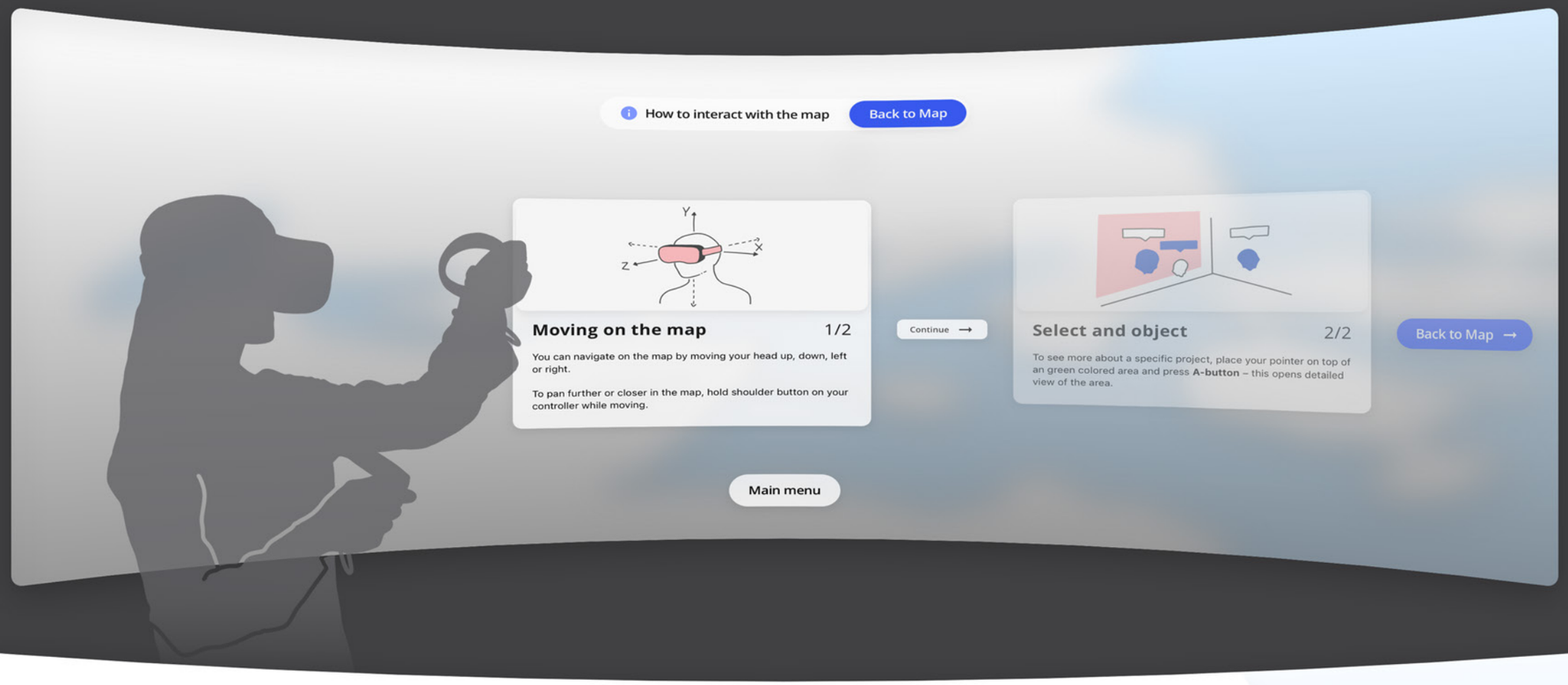


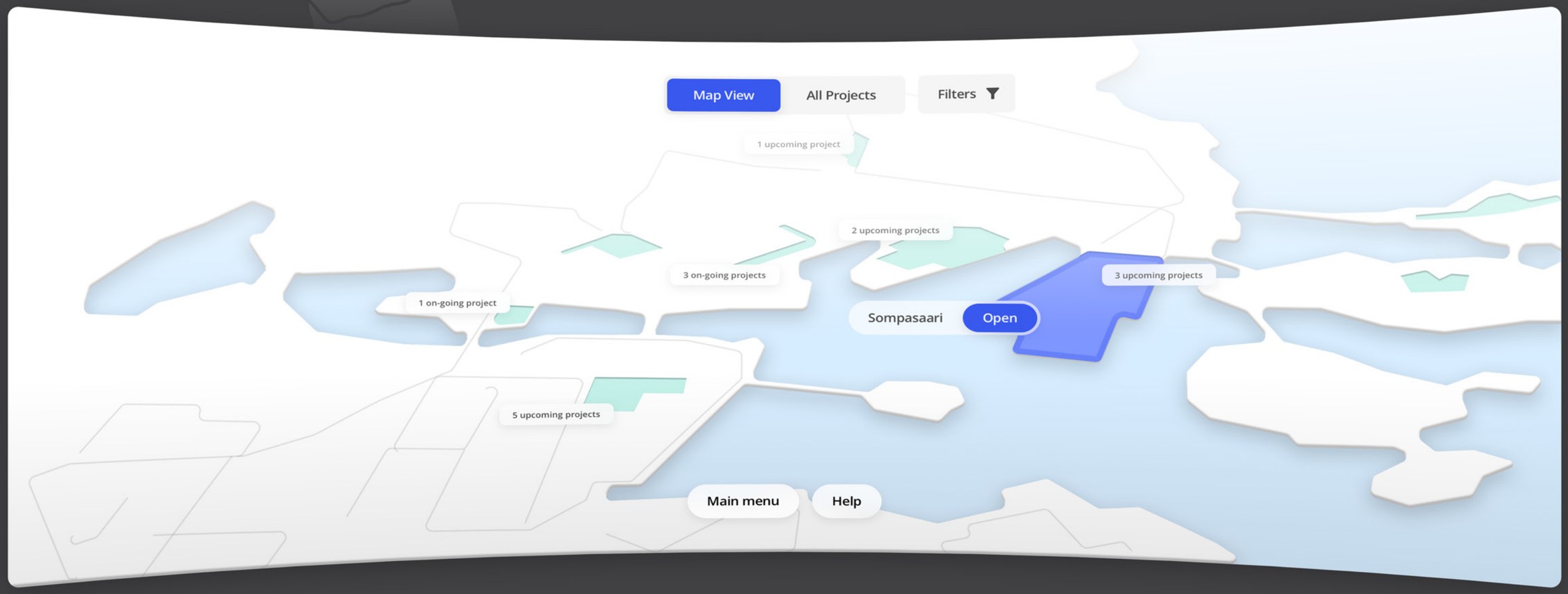
All Projects

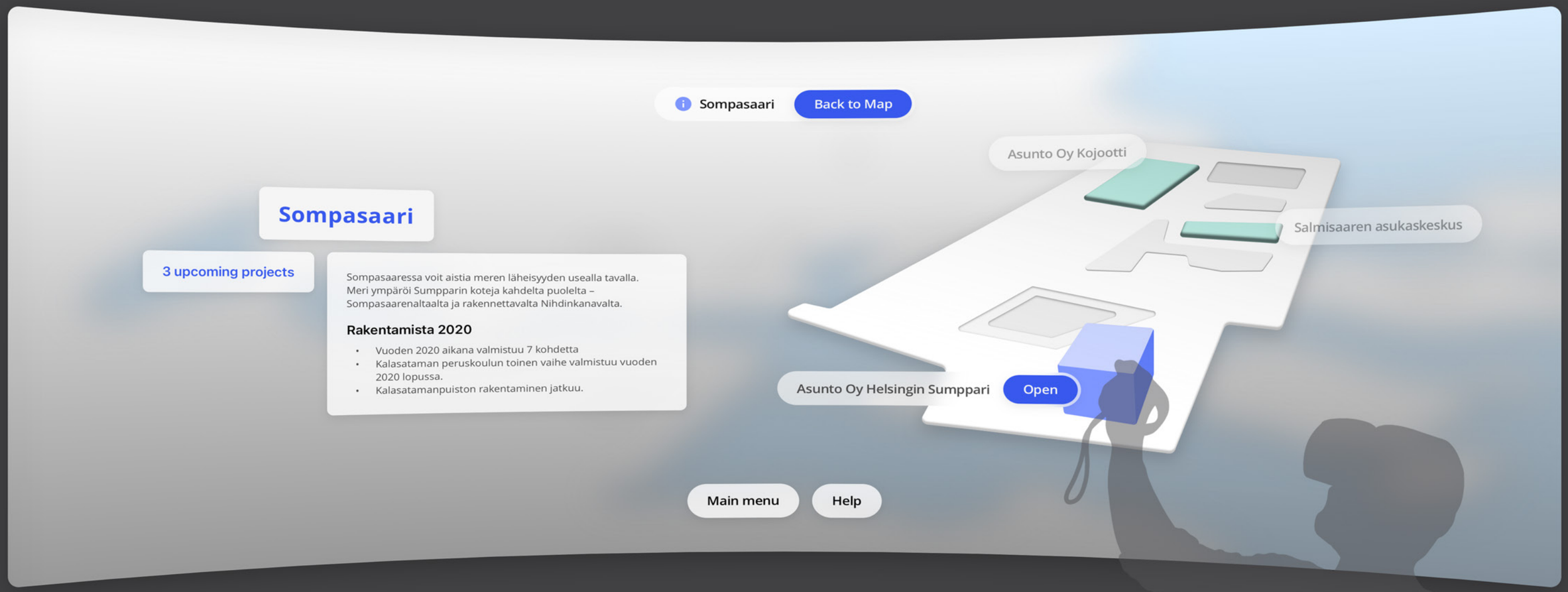
(High fidelity visual 3., All projects view.)

Help & Map View

(High fidelity visuals 4.–5., Help instructions and Map View.)





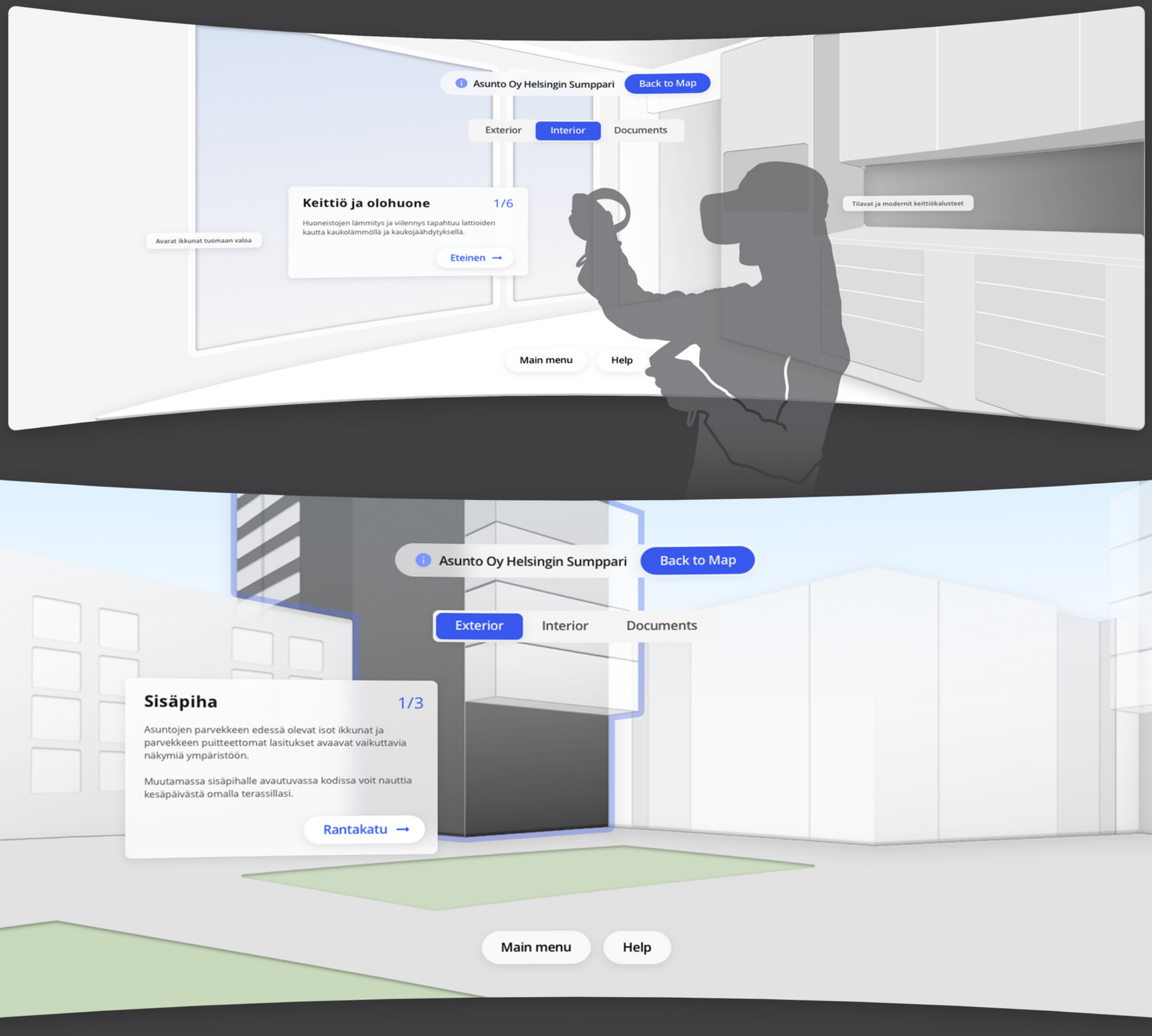


Selected Area

(High fidelity visual 6., Selected area view.)

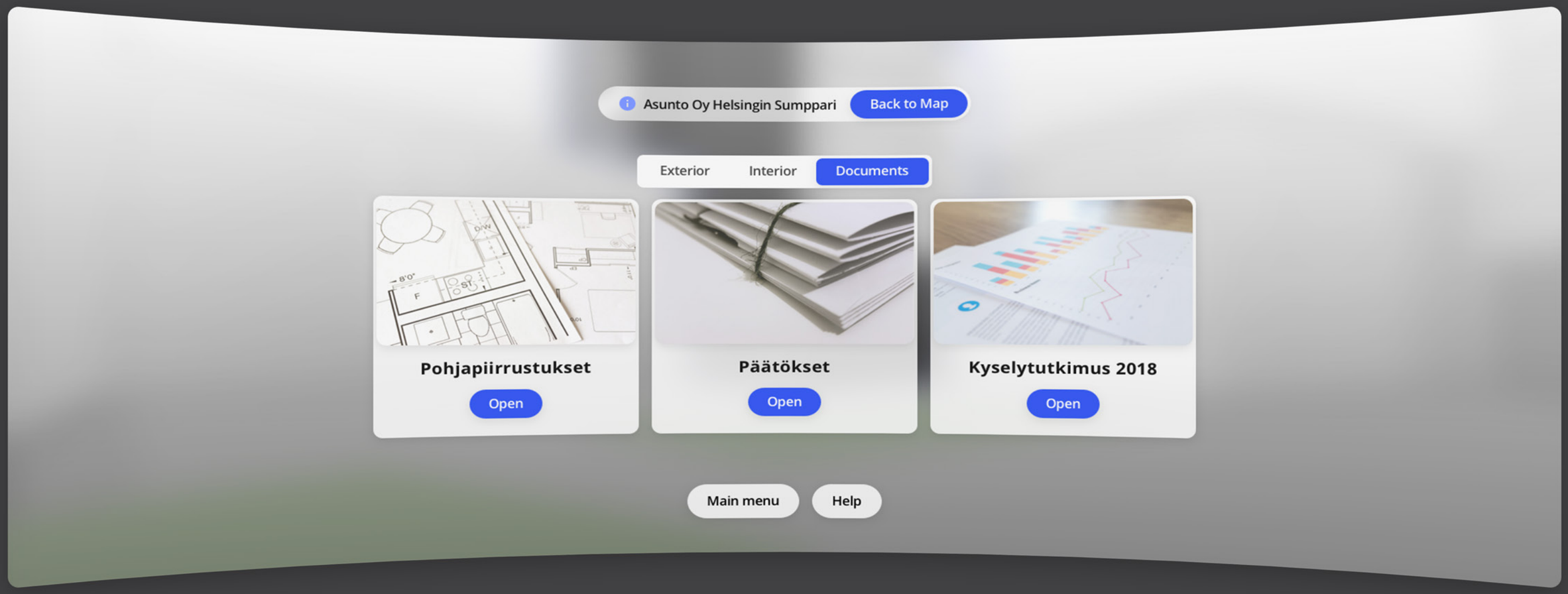
Selected Building

(High fidelity visual 7., Selected building view.)



Interior & Exterior Views

(High fidelity visuals 8.–9., Interior and exterior views.)



Documents View

(High fidelity visual 10., Documents view.)

5.3 Summary and Thoughts

Back to Beginning

By the end of this process, I revisited the original research questions that were guiding the design process and decision making.

Q. *How to implement a virtual reality experience, with a low-threshold and short learning curve?*

A. Short learning curves can and should be provided with designs, which have only the necessary information for the needed step or phase. Visual style was chosen for translating playfulness.

Q. *How could future urban planning benefit from this method?*

A. Previous research and design making made me think that just because there is information available, it is important to curate it in that way, it's easily accessible for those who are interested and would benefit from it.

Q. *Can the urban planning process be made into a more simple and easy to understand format?*

What residents think about urban planning processes and what might be challenging to understand in the planning?

A. In my opinion, the question of simple and easy comes to anyone who is curating and managing the information that is provided to be seen. As a combination with other workshop methods, virtual reality could give more sense of proportionality for details. If complex information can be translated into real life resembling experiences, people could provide more interesting and in-depth opinions for the planning processes.

What could have been improved?

Most of the original ideas for the application features were not implemented and I would have liked to test more on the ways of participating and see which type of features evokes users in this type of participation. For this survey-based research could have brought viability.

The process could have also brought more interesting and surprising results if real users would have been available during interactive prototype tests. Due to lack of skills in complex 3D game engines and C# coding, I would have benefitted at least one set of eyes, arms and brains more. This was also a learning experience and somewhat a personal challenge to see how far can skills and knowledge go on new areas of technology.

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