Supplementary materials

Supplementary Materials A: Generation of the landscape model

Three-dimensional model of the landscape for virtual interventions testing was based on real landscape around BlueHealth intervention site at Kopli in Tallinn, Estonia. Commercial software package LandSim3D (Bionatics s.a., Paris, France) was used to create the simulation. The software uses various GIS (geographic information system) layers to automatically generate parametric landscape model that can further be enhanced with specific 3-d models of components (specific 3-d models of the intervention designs in our case). Open data geographic information was acquired from Geoportal of the Estonian Land Board under Licence of open data by Estonian Land Board, 1.07.2018 (<https://geoportaal.maaamet.ee/opendata-licence>) and enhanced further for the purpose of the model.

Despite the fact that landscape model is generated automatically by the software there is actually a lot of work that goes into the preparation and specification of the input data, creation of the sub-components (ie 3-d vegetation, ground textures etc) and testing of the visualisation for realism. Following is a brief overview of the layers which were created for the landscape model.

Because of the large scale open-view dominated landscape that was used for visualisation, a quite large extent of 5km by 8km was selected to include both shores of the Kopli bay. Orthophoto (Figure A1) was used to verify other map layers' accuracy and for draping the modelled ground surface with geospecific texture.



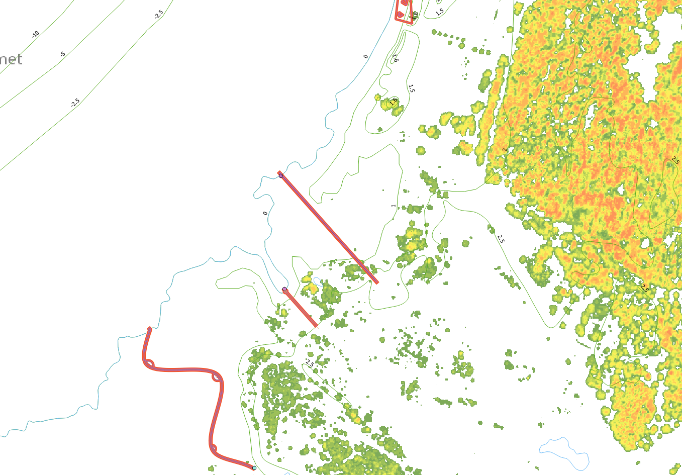
**Figure A1**. Extent of the landscape model showing locations of all interventions in red overlay on top of 2018 Summertime Orthophoto (Estonian Land Board. 2020. Summertime forestry flight 28.05.2018. Published under Licence of open data by Estonian Land Board, 1.07.2018.).

In order to represent landform of the model, a raster digital elevation model had to be generated from the topographic contour lines (Figure A2). The visualisation software would generate a wireframe surface model from this information and drape orthographic photo and ground textures onto this wireframe model.



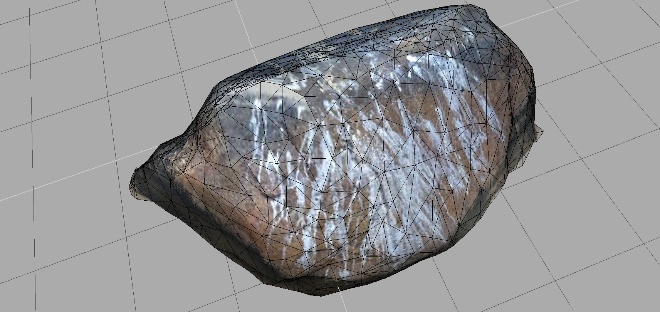
**Figure A2**. Sample of the greyshade digital elevation model (DEM) with overlay of coastline in blue and reed interventions shown in red (Topographic data: Estonian Land Board. 2018. Topographic data based on 27.01.2016 ETAK extract. Published under Licence of open data by Estonian Land Board, 1.07.2018.).

The ground surface needs to be populated with 3-d models of vegetation and other landscape elements. Placement of these elements is controlled by a parametric biotope definition (species composition, density and placement rules) and a land use map where different colours represent different biotopes. Information from Estonian basic map had to be combined with the digital land cover model to enrich the data and achieve more realistic landscape model (Figure A3).

**Figure A3**. Initial land use map generated from the Estonian Basic Map (Topographic data: Estonian Land Board. 2018. Topographic data based on 27.01.2016 ETAK extract. Published under Licence of open data by Estonian Land Board, 1.07.2018.) polygon data on the left had to be combined with digital land cover model (Topographic data: Estonian Land Board. 2018. Topographic data based on 27.01.2016 ETAK extract. Published under Licence of open data by Estonian Land Board, 1.07.2018.) on the right. Both show the same location with the reed interventions as overlays.

It is possible to reuse 3-d components from previous landscape models (Figure A5), but for the purpose of this model quite a lot of unique components, including rocks, herbal ground vegetation and bushes had to be created from scratch (Figure A4) because coastal landscape had not been visualised in such detail before.

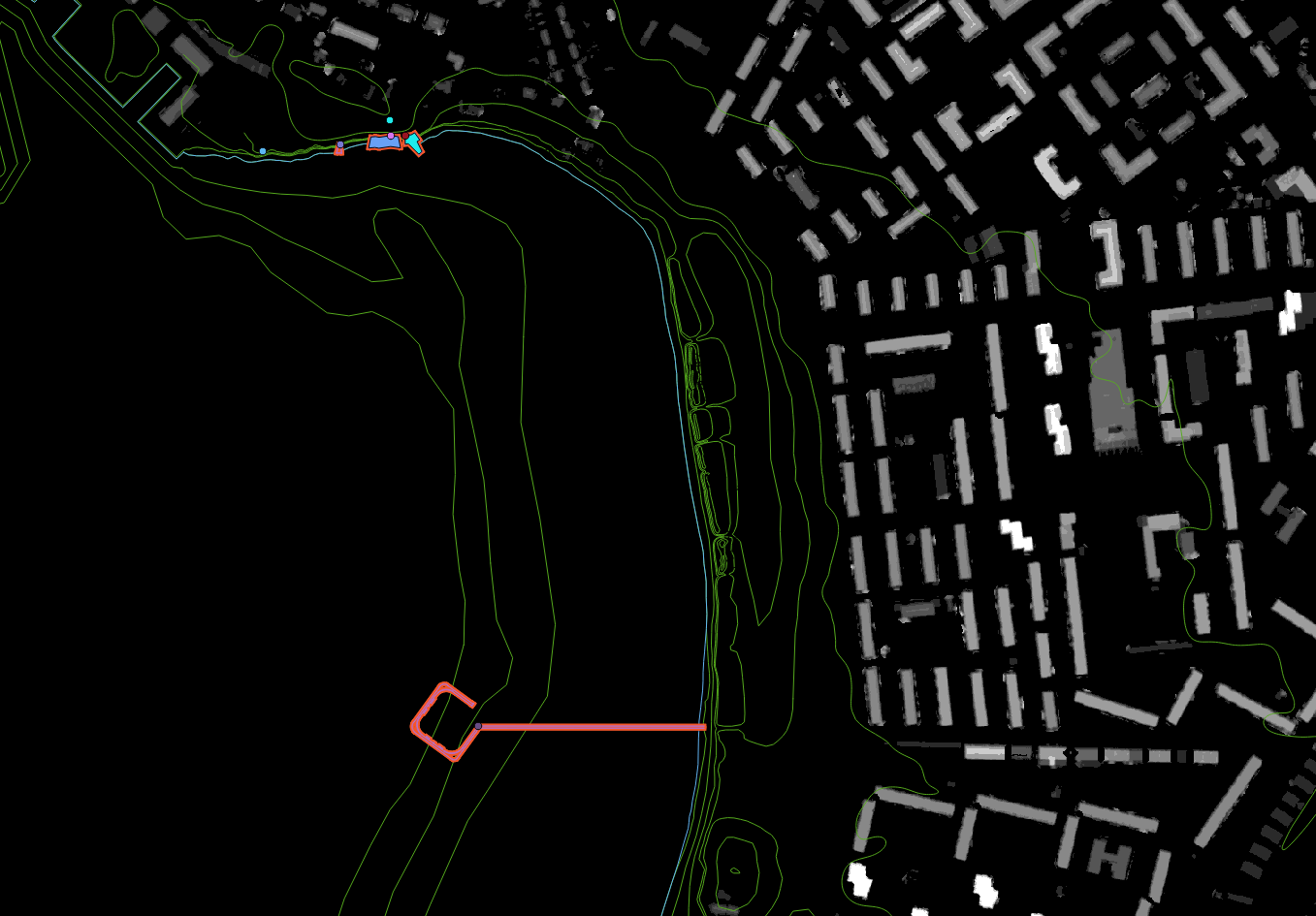
 

**Figure A4**. Sample of rocks that were created with the help of photogrammetric modelling (texturised polygon mesh generated from point-cloud that itself is generated from photogrammetric calculations based on multiple angle photos of the object).



**Figure A5**. Sample of pine forest biotope definition with vegetation models and ground textures that could be reused (with modifications) in the creation of this landscape model*.*

In addition to biotopes, several man-made structures had to be defined in the landscape model. A vector based road and path network and basic cubes of surrounding houses were generated from Estonian Basic Map data that was enhanced with the help of digital land cover model (Figure A6).



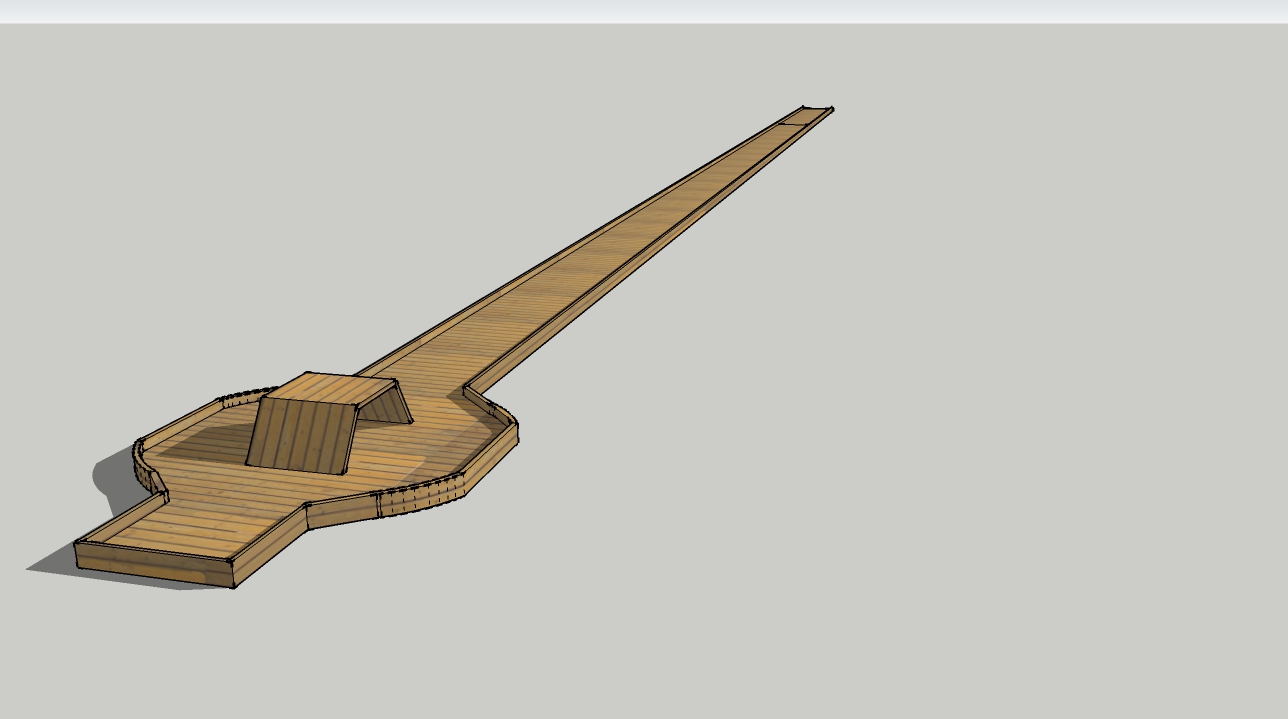
**Figure A6**. Heights of building volumes (shown with different shades of grey) for parametric auto-generation of the building models was obtained from digital land surface model (Topographic data: Estonian Land Board. 2018. Topographic data based on 27.01.2016 ETAK extract. Published under Licence of open data by Estonian Land Board, 1.07.2018.).

Finally the obtained virtual landscape model was complete (Figure A7) and individual models of interventions were placed in the landscape for video creation.

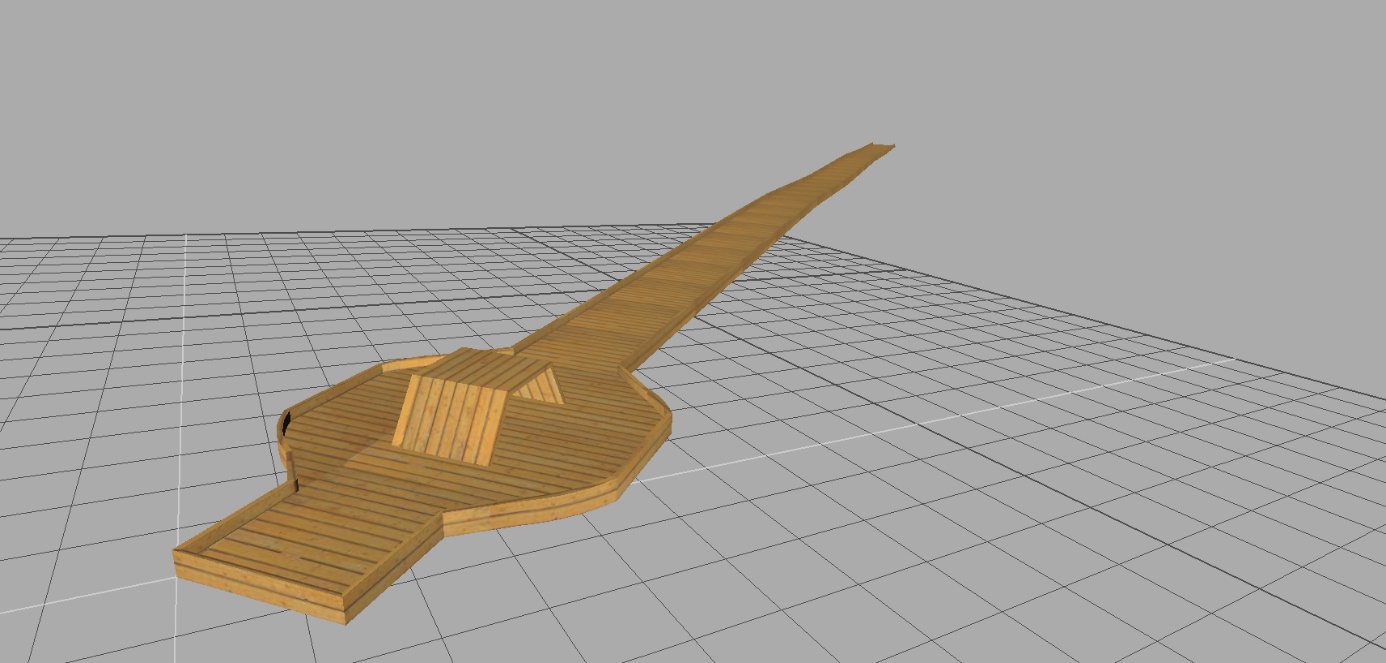


**Figure A7**. Sample scene of the completed virtual coastal landscape model on which 9 different virtual interventions were placed*.*

Nine virtual interventions were first created in Trimble SketchUp software package (Figure A8). These were test-fitted in the landscape and adjusted to fit the topography and various landscape elements in the vicinity (Figure A9).



**Figure A8**. Initial model of Reed 2 intervention modelled in Trimble SketchUp as the generalised concept model used in the design discussions.



**Figure A9**. Final model of Reed 2 intervention after fitting with local terrain (notice the curvature of the boardwalk on far end), ready to be inserted into the virtual landscape model.

Supplementary Materials B: Questionnaire

Here is the whole questionnaire that was served to the participants for the online survey along with the final visuals in an animated video clip form. Questions are presented in three languages, English, Estonian and Russian and answers by the participants were found in Estonian and Russian language.

VEEKOGUÄÄRSETE RAJATISTE DISAINIVALIKUTE EELISTUSTE UURING

ОПРОСНИК О ПРЕДПОЧТЕНИЯХ ВАРИАНТОВ ДИЗАЙНА ОКРЕСТНОСТЕЙ ВОДОЁМОВ

Screening for gender and age group

**<Q0> What language would you prefer for this survey?**

**Millises keeles eelistaksite sellele küsimustikule vastata?**

**На каком языке вы бы предпочли ответить на этот опрос?**

Eesti / На эстонском

Vene / На русском

**<Q16> Please indicate your age in full years**

**<K16> Palun märkige oma vanus täisaastates**

**Пожалуйста, укажите ваш возраст в полных годах**

Converted to age groups: 18-29 30—39 40-49 50-59 60-69 70+

**<Q15> Please indicate your sex**

**<K15> Palun märkige oma sugu**

**Пожалуйста, укажите ваш пол**

Male Female | Mees Naine | Мужчина Женщина

Introduction

We are carrying out research into the design of small elements that might be constructed in the landscape next to waterbodies in order to improve the possibilities for people to get closer to the water for a variety of purposes.

The survey is completely anonymous and apart from your age-group and gender we are not collecting personal information of any kind. Based on collected data we still have absolutely no possibility of identifying you personally. You are free to withdraw from the survey at any time. If you wish to get more information about the survey, please contact [simon.bell@emu.ee](file:///F:\Spring%202020\write%20up\simon.bell@emu.ee) or visit the web page for the consortium of the scientific institutions involved in this research project <https://bluehealth2020.eu/> . This survey was commissioned by the Chair of Landscape Architecture of Eesti Maaülikool.

Korraldame uuringut väikerajatiste kujunduse kohta, mida saaks ehitada veekogude lähedale, et lihtsustada inimeste ligipääsu veele ja võimaldada erinevaid veega seotud tegevusi.

Uuring on täielikult anonüümne ja me ei kogu isiklikku infot peale Teie soo ja vanusegrupi. Kogutud andmete põhjal puudub meil aga igasugune võimalus tuvastada konkreetselt Teie isikut. Te võite loobuda uuringus osalemisest ükskõik mis ajal. Kui Te soovite saada rohkem teavet uuringu kohta, võtke ühendust [simon.bell@emu.ee](mailto:simon.bell@emu.ee) või külastage uuringuprojektis osalevate teadusasutuste ühist kodulehte <https://bluehealth2020.eu/>. Antud uuringu on tellinud Eesti Maaülikooli maastikuarhitektuuri õppetool.

Мы проводим исследование с целью оценить эффект небольших архитектурных построек вблизи водоёмов, которые упрощают людям доступ к воде и предоставляют разные действия связанные с водой.

Этот опрос полностью анонимен, мы не собираем какую-либо личную информацию, кроме Вашей возрастной группы и пола. По собранным данным будет совершенно невозможно определить Вашу личность. Вы можете отказаться от участия в опросе в любое время. Если Вы желаете узнать больше информации об этом исследовании, то можете связаться по электронной почте [simon.bell@emu.ee](mailto:simon.bell@emu.ee) или посетить общий сайт научных учреждений участвующих в данном исследовании <https://bluehealth2020.eu/>. Данное исследование проводиться по заказу кафедры ландшафтной архитектуры Eesti Maaülikool.

First page

We would like you to imagine that you live in a residence close to a water body which you can visit for recreation or leisure at any time. You will first be shown a short video which will introduce the way you would go to reach this beach area.

<video Intro\_s.mp4 1:30>

On following pages you will be shown 9 short videos of different designs which might be constructed at this beach in order to improve access to the water. Each video will be followed by a series of standard questions with response options on a rating scale of 1-5. For each video we ask you to imagine that you are really in that landscape and answer the questions below the video.

Kujutlege, et elate suure veekogu lähedal ning Teil on võimalus selle äärde randa puhkama või vaba aega veetma minna ükskõik millal. Kõigepealt näidatakse Teile lühikest videot, mis tutvustab Teile teed mida pidi Te läheksite sinna randa.

<video Intro\_s.pm4 1:30>

Järgnevatel lehtedel näidatakse Teile videote vahendusel üheksat kujundusvarianti rannas olevatest rajatistest, mis võiksid olla ehitatud sinna piirkonda selleks, et parandada juurdepääsu veele. Igale videole järgnevad standardsed küsimused, mille vastused paigutuvad skaalale ühest viieni. Palun kujutage iga video puhul ette, et viibite reaalselt selles maastikus ning vastake video all olevatele küsimustele.

Пожалуйста представьте, что Вы живёте недалеко от большого водоёма, который Вы можете посещать для отдыха или досуга в любое время. Сначала Вам покажут короткое видео, которое представит Вам путь ведущий к пляжу.

<video Intro\_s.pm4 1:30>

На следующих страницах Вам будут показаны (с помощью видео) 9 различных вариантов архитектурных сооружений, которые могут быть построены в данный район, чтобы улучшить доступ к воде. После каждого видеоролика мы просим Вас ответить на ряд стандартных вопросов, используя шкалу оценок от 1 до 5. Пожалуйста представьте себе каждый раз, что Вы действительно находитесь в этом ландшафте и ответьте на вопросы находящиеся под видео.

QUESTIONS PER EACH DESIGN OPTION IGA DISAINIVALIKU KOHTA:

Random order of 9 videos; ability to replay the video; video stays on top of page for reviewing; possible to start answering without finishing the video first, but progression to next video blocked until current video has finished.

Questions 3.1, 4.1, 5.1, 6.1, 7.1, 8.1 and 9.1 about the importance of the factor shown only once with the first randomly ordered video.

**<Q1> How much free time would you spend here on a warm summer day if you are visiting the area couple of times a week?**

**<K1> Kui palju vaba aega veedaksite siin soojal suvepäeval juhul kui Te külastaksite randa paar korda nädalas?**

**Сколько свободного времени Вы бы провели здесь в теплый летний день, если бы посещали это место пару раз в неделю?**

Very little (a few minutes) 1 - 2 - 3 - 4 - 5 Quite a lot (more than 1 hour)

Väga vähe (mõned minutid) 1 - 2 - 3 - 4 - 5 Väga palju (rohkem kui üks tund)

Очень мало (несколько минут) 1 - 2 - 3 - 4 - 5 Очень много (больше часа)

**<Q2> How comfortable would you find the place to be for you?**

**<K2> Kui mugav see koht Teile oleks?**

**Насколько удобно Вам было бы в этом месте?**

Very uncomfortable 1 - 2 - 3 - 4 - 5 Very comfortable

Väga ebamugav 1 - 2 - 3 - 4 - 5 Väga mugav

Очень неудобно 1 - 2 - 3 - 4 - 5 Очень удобно

**Please assess how much you agree to the following statements.**

**Palun hinnake, kuivõrd Te järgnevate väidetega nõustute.**

**Пожалуйста оцените насколько Вы согласны со следующими утверждениями.**

**<Q3> "I could enjoy the view"**

**<K3> „Ma saaksin nautida vaadet.“**

**«Я мог(ла) бы наслаждаться видом.»**

Not at all 1 - 2 - 3 - 4 - 5 Yes, very much so

Üldse mitte 1 - 2 - 3 - 4 - 5 Jah, tõesti väga

Совсем нет 1 - 2 - 3 - 4 - 5 Да, определенно

**<Q3.1> "This aspect is very important for me"**

**<K3.1> „See aspekt on minu jaoks väga oluline.“**

**«Этот аспект для меня очень важен.»**

Not at all 1 - 2 - 3 - 4 - 5 Yes, very much so

Üldse mitte 1 - 2 - 3 - 4 - 5 Jah, tõesti väga

Совсем нет 1 - 2 - 3 - 4 - 5 Да, определенно

**<Q4> "I could feel closer to nature"**

**<K4> „Ma saaksin tunda ennast loodusele lähemal olevat.“**

**«Я мог(ла) бы почувствовать себя ближе к природе.»**

Not at all 1 - 2 - 3 - 4 - 5 Yes, very much so

Üldse mitte 1 - 2 - 3 - 4 - 5 Jah, tõesti väga

Совсем нет 1 - 2 - 3 - 4 - 5 Да, определенно

**<Q4.1> "This aspect is very important for me."**

**<K4.1> „See aspekt on minu jaoks väga oluline.“**

**«Этот аспект для меня очень важен.»**

Not at all 1 - 2 - 3 - 4 - 5 Yes, very much so

Üldse mitte 1 - 2 - 3 - 4 - 5 Jah, tõesti väga

Совсем нет 1 - 2 - 3 - 4 - 5 Да, определенно

**<Q5> "I could feel safe and protected from danger"**

**<K5> „Ma tunneksin end turvaliselt ja ohtude eest kaitstult.“**

**«Я чувствовал(a) бы себя безопасно и защищенным(-oй) от неприятностей.»**

Not at all 1 - 2 - 3 - 4 - 5 Yes, very much so

Üldse mitte 1 - 2 - 3 - 4 - 5 Jah, tõesti väga

Совсем нет 1 - 2 - 3 - 4 - 5 Да, определенно

**<Q5.1> "This aspect is very important for me."**

**<K5.1> „See aspekt on minu jaoks väga oluline.“**

**«Этот аспект для меня очень важен.»**

Not at all 1 - 2 - 3 - 4 - 5 Yes, very much so

Üldse mitte 1 - 2 - 3 - 4 - 5 Jah, tõesti väga

Совсем нет 1 - 2 - 3 - 4 - 5 Да, определенно

**<Q6> "I could feel relaxed and less stressful"**

**<K6> „Ma tunneksin end lõdvestunult ja pingevabalt.“**

**«Я мог(ла) бы почувствовать себя расслабленным(-ой) и менее напряженным(-ой).»**

Not at all 1 - 2 - 3 - 4 - 5 Yes, very much so

Üldse mitte 1 - 2 - 3 - 4 - 5 Jah, tõesti väga

Совсем нет 1 - 2 - 3 - 4 - 5 Да, определенно

**<Q6.1> "This aspect is very important for me."**

**<K6.1>“ See aspekt on minu jaoks väga oluline.“**

**«Этот аспект для меня очень важен.»**

Not at all 1 - 2 - 3 - 4 - 5 Yes, very much so

Üldse mitte 1 - 2 - 3 - 4 - 5 Jah, tõesti väga

Совсем нет 1 - 2 - 3 - 4 - 5 Да, определенно

**<Q7> "I would like to spend time with my family or/and friends at this place"**

**<K7> „Ma tahaksin veeta oma perega/sõpradega seal aega.“**

**«Я хотел(а) бы провести в этом месте время со своей семьёй или друзьями.»**

Not at all 1 - 2 - 3 - 4 - 5 Yes, very much so

Üldse mitte 1 - 2 - 3 - 4 - 5 Jah, tõesti väga

Совсем нет 1 - 2 - 3 - 4 - 5 Да, определенно

**<Q7.1> "This aspect is very important for me."**

**<K7.1> „See aspekt on minu jaoks väga oluline.“**

**«Этот аспект для меня очень важен.»**

Not at all 1 - 2 - 3 - 4 - 5 Yes, very much so

Üldse mitte 1 - 2 - 3 - 4 - 5 Jah, tõesti väga

Совсем нет 1 - 2 - 3 - 4 - 5 Да, определенно

**<Q8> "I could enjoy watching and/or interaction with wildlife (eg birds, fish, insects, flowers etc)"**

**<K8> „Ma naudiksin looduse (linnud, kalad, putukad, lilled jne) vaatlemist või sellega tegelemist.“**

**«Я мог(ла) бы наслаждаться наблюдением за прородой или занятиями с природой (например: птицами, рыбами, насекомыми, цветами и т.д.).»**

Not at all 1 - 2 - 3 - 4 - 5 Yes, very much so

Üldse mitte 1 - 2 - 3 - 4 - 5 Jah, tõesti väga

Совсем нет 1 - 2 - 3 - 4 - 5 Да, определенно

**<Q8.1> "This aspect is very important for me."**

**<K8.1> „See aspekt on minu jaoks väga oluline.“**

**«Этот аспект для меня очень важен.»**

Not at all 1 - 2 - 3 - 4 - 5 Yes, very much so

Üldse mitte 1 - 2 - 3 - 4 - 5 Jah, tõesti väga

Совсем нет 1 - 2 - 3 - 4 - 5 Да, определенно

**<Q9> "I could make direct contact with water (touch or enter the water eg. to paddle or swim)"**

**<K9> „Ma saaksin veega vahetus kontaktis olla (näiteks puudutada, kõndida vees, sulistada, ujuda).“**

**«Я мог(ла) бы находиться в прямом контакте с водой (например: прикоснуться, пройти, плескаться, плавать).»**

Not at all 1 - 2 - 3 - 4 - 5 Yes, very much so

Üldse mitte 1 - 2 - 3 - 4 - 5 Jah, tõesti väga

Совсем нет 1 - 2 - 3 - 4 - 5 Да, определенно

**<Q9.1> "This aspect is very important for me."**

**<K9.1> „See aspekt on minu jaoks väga oluline.“**

**«Этот аспект для меня очень важен.»**

Not at all 1 - 2 - 3 - 4 - 5 Yes, very much so

Üldse mitte 1 - 2 - 3 - 4 - 5 Jah, tõesti väga

Совсем нет 1 - 2 - 3 - 4 - 5 Да, определенно

**<Q10> How accessible do you think this design is?**

**<K10> Kui lihtsasti ligipääsetav on Teie arvates see kujundusvariant?**

**Как Вы оцениваете физическую доступность этого сооружения для Вас?**

Difficult for me to access 1 - 2 - 3 - 4 - 5 Easy for me to access

Minu jaoks halvasti ligipääsetav 1 - 2 - 3 - 4 - 5 Minu jaoks hästi ligipääsetav

Для меня плохо доступный 1 - 2 - 3 - 4 - 5 Для меня легко доступный

**<Q11> If this was a real place, would you come back for a return visit?**

**<K11> Kui see oleks päris koht, kas Te tuleksite tagasi, et seda veelkord külastada?**

**Если бы это было реальное место, Вы бы вернулись сюда ещё раз?**

Yes - No

Jah - Ei

Да - Нет

**<Q12> Please write some comments if you have any about what you think is particularly good or bad about this design.**

**<K12> Palun kommenteerige soovi korral, mis on Teie arvates selle kujundusvariandi puhul eriti hea või halb.**

**При желинии, пожалуйста прокомментируйте, что Вам в этом варианте особенно понравилось или не понравилось?**

Free text

After all 9 options have been scored

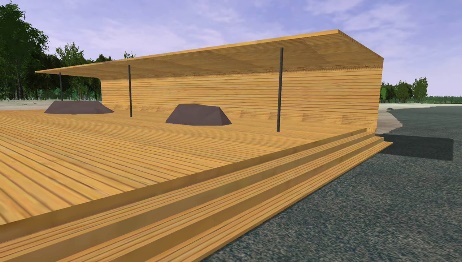
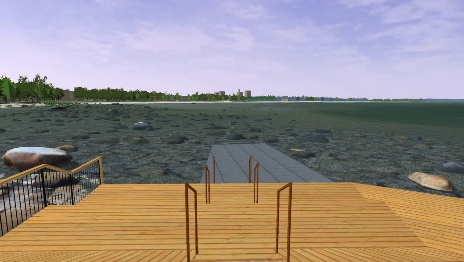
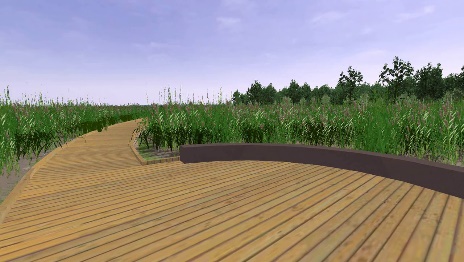
Pärast kõigi 9 variandi läbi hindamist

**<Q13> Please assess which of the designs is your most favourite.**

**<K13> Palun hinnake, milline kujundusvariant on Teie lemmik.**

**Пожалуйста обозначьте, какой из вариантов нравиться Вам больше всего?**

(näita siin pilte igast kujundusest koos raadionupuga vms)

**    
    
  **

**<Q14> Please assess which of the designs is your least favourite.**

**<K14> Palun hinnake, milline kujundusvariant meeldib Teile kõige vähem.**

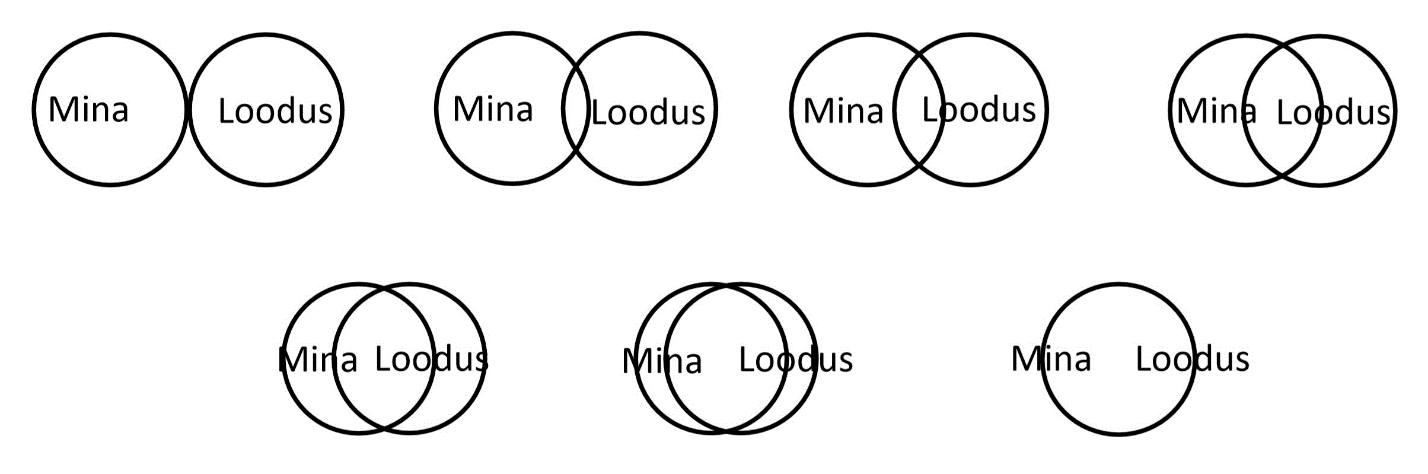
**Пожалуйста обозначьте, какой из вариантов нравиться Вам меньше всего?**

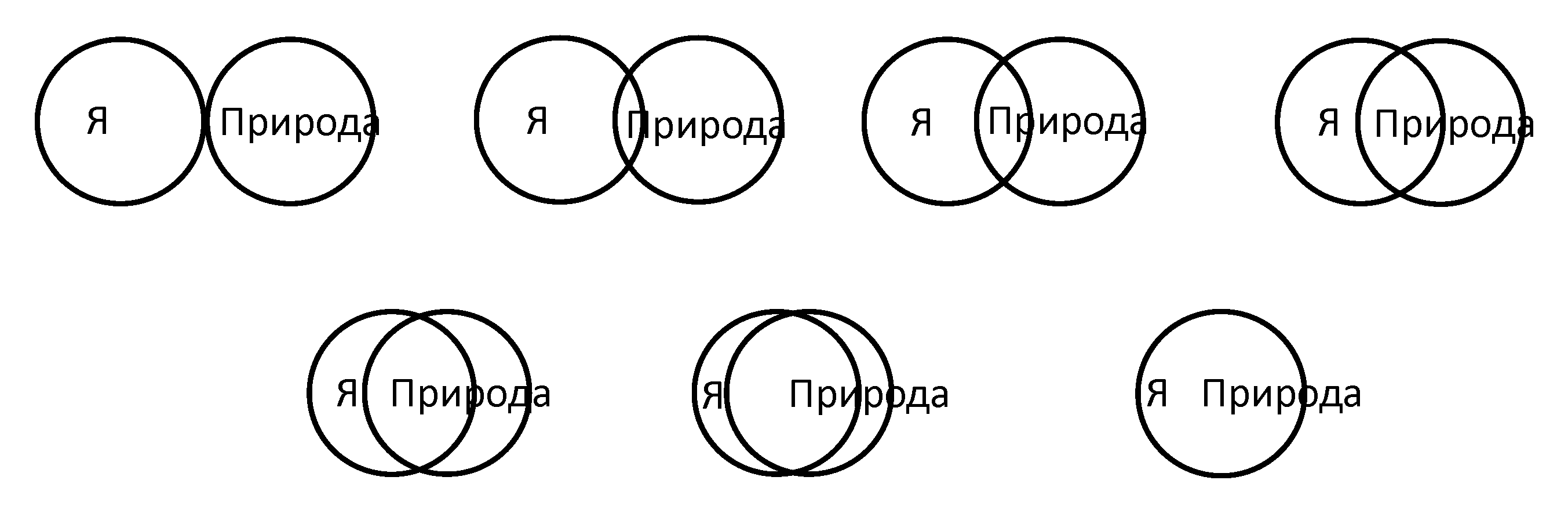
(näita siin pilte igast kujundusest koos raadionupuga vms)

**<Q17>** **Please indicate which of these seven diagrams below best describes your relationship with the natural environment. How interconnected are you with nature?**

**<K17> Palun märkige ära, milline neist seitsmest diagrammist iseloomustab kõige paremini Teie suhet loodusega. Kuivõrd seotud Te loodusega olete?**

**Пожалуйста, обозначьте одну из семи диаграмм, которая лучше всего отражает Ваше взаимоотношение с природой. Насколько связаны Вы с природой?**





Debrief

Thank you for your time!

We would like to remind you that the survey is completely anonymous and we have absolutely no possibility of identifying you personally. If you wish to get more information about the survey, please contact [simon.bell@emu.ee](file:///F:\Spring%202020\write%20up\simon.bell@emu.ee) or visit the web page for the consortium of the scientific institutions involved in this research project <https://bluehealth2020.eu/> . This survey was commissioned by the Chair of Landscape Architecture of Eesti Maaülikool.

Täname Teid meile pühendatud aja eest!

Tuletame Teile meelde, et uuring on täielikult anonüümne ning meil puudub igasugune võimalus tuvastada konkreetselt Teie isikut. Kui Te soovite saada rohkem teavet uuringu kohta, võtke ühendust [simon.bell@emu.ee](mailto:simon.bell@emu.ee) või külastage uuringuprojektis osalevate teadusasutuste ühist kodulehte <https://bluehealth2020.eu/>. Antud uuringu on tellinud Eesti Maaülikooli maastikuarhitektuuri õppetool.

Большое спасибо Вам за уделённое для нас время!

Напоминаем, что этот опрос полностью анонимный и по собранным данным будет совершенно невозможно определить Вашу личность. Если Вы желаете узнать больше информации об этом исследовании, то можете связаться по электронной почте [simon.bell@emu.ee](mailto:simon.bell@emu.ee) или посетите общий сайт научных учреждений участвующих в данном исследовании https://bluehealth2020.eu/. Данное исследование проводиться по заказу кафедры ландшафтной архитектуры Eesti Maaülikool.