Final report:

"Helsingin vihertiheys" map

Group: Vihreä Helsinki?

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Concept: "Helsingin vihertiheys"

The aim of our map was to visualize the accessibility and availability of green and recreational areas in Helsinki. With our map the user can visually evaluate the population density nearby the green areas. The need for accessibility evaluation rises from the master planning process in Helsinki. The overall goal of the Helsinki master plan is to densify the built city structure instead of dispersing it. In some locations, it means that green areas should be transformed to housing areas. In that sense, our map supports the impact assessment of the master plan.

The network of green and recreational areas in Helsinki is based on the large green belts that often calls as "vihersormet" in Finnish ("green fingers"). Altogether 40 % of the city area is some kind of greenery: parks, recreational areas, forests, etc. The share of forests is about 20 %. As the city structure is densifying, part of the new buildings are going to be located in the greenery areas.

Accessibility - especially the walking distance to the green area - is one of the quality indicators when assessing the value of the green areas. 150 meters is considered as a convenient distance to local parks and 300 meters to larger neighbourhood greeneries or forest parks. The amount of inhabitants living near the parks and green areas is an essential assessment criteria in two ways: it is desirable to have the greeneries close to the residents but on the other hand the green areas should be in balance with the population, so that the amount of users do not burden the green area and its ecology too much.

Users of the map

The primary user groups of the map are urban planners in Helsinki City Planning department and the policy and decision makers (i.e. members of the city planning board and the city council). The map may also be interesting from the citizens point of view. For example urban activists (such as the Urban Helsinki[1] activist group) have strived to influence to the contents of the master plan by for example creating an alternative plans in a do-it-yourself manner. The map can be a useful evaluation tool for them also.

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[1] http://www.urbanhelsinki.fi/

Map design

In our first map idea, we had an idea to calculate the number of inhabitants living next to the recreational areas. The initial map layout is shown in the picture 1. We realized soon, that calculating the number of inhabitants living near to the recreational areas would be difficult and also misleading due to the inaccuracy of the population data. The open population data is only available in square kilometers.


*Picture 1: The initial map layout*

In the final maps (pictures 2 & 3) we used Paavo data from Statistics Finland to visualize the population density in of Helsinki postal code areas. The different types of green and recreational areas are shown on the top of that analysis layer. To evaluate the distance of the green areas, the user can choose of two different buffer distances (150 m and 300 m). The buffer is formed and rendered to the map when the user have selected buffer function and clicked on a green area on the map (picture 4).

Picture 2: The final map in ArcGIS
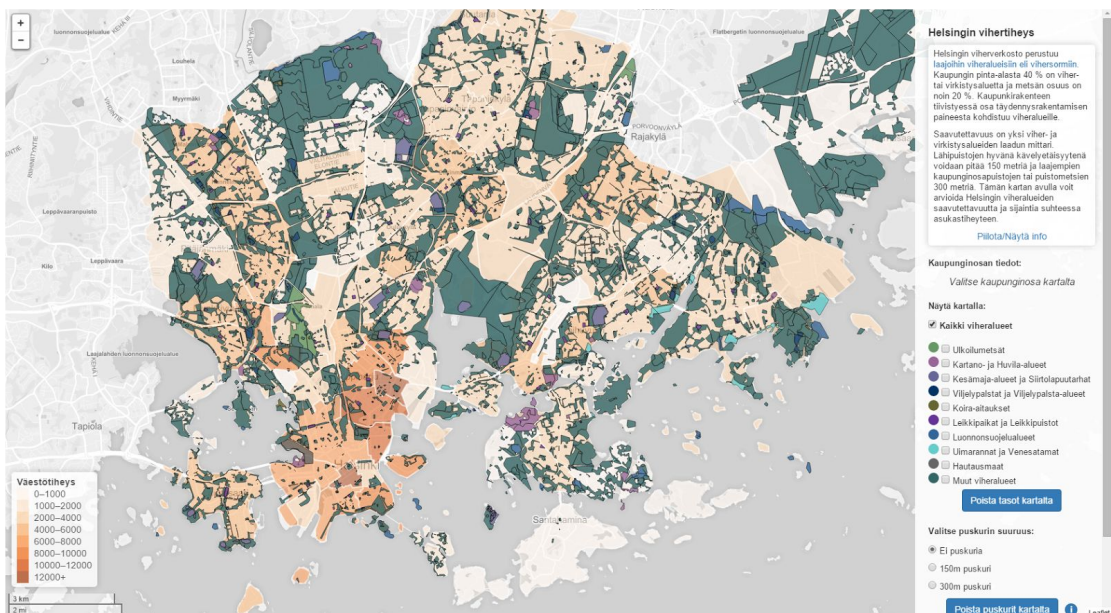
Picture 3: The final map in Leaflet
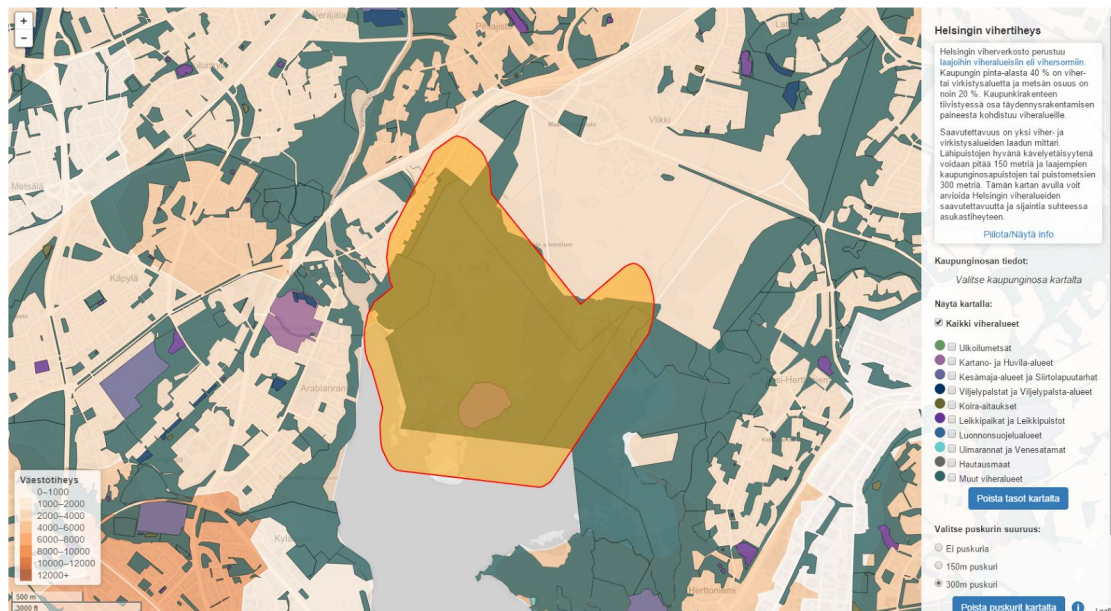
Picture 4: A buffer rendered on the map

Implementation of the maps

For the implementation of our maps we used Leaflet and Turf JavaScript libraries with Mapbox and ArcGIS Online. When we started to wonder what kind of map we would like to do, we started by looking datasets that already exists in WFS-format. We then found a dataset of green areas of Helsinki from Helsinki Region Infoshare webpage. Because we wanted to do a map, which is something more than pretty, we integrated the demographic data with the data of green areas. The maps are available at following addresses:

- Leaflet version: http://pesonet1.github.io/Leaflet/
- ArcGIS Online version:
  https://aalto.maps.arcgis.com/apps/webappviewer/index.html?id=9e7d33e66da5431c
  a1265bd966a1b511

Layout & visualisation

For the layout we wanted it to be as clear as possible. This is why, we decided to have a stable sidebar in the right side of the webpage. Also, we wanted that the layer information is easily accessible, so we presented greenery area information in popups and the population data (Paavo data) on the sidebar. The reason for using two different methods was to prohibit the interference between them. This means that user can easily see from which layer the information is shown.

For the visualisation we decided to have a basic basemap that looks clear and it is easy to interpret. The visual look of the basemap was set to greyish colors, since this helps the objects to "pop-out" better. Also, the same color scheme was used with the sidebar. The colors of the layers on the map we chose to have warm and cold colors. We decided to use the warm orange color for the demographic layer and the cold green/blue/purple colors for the park layers. We thought that these colors would suit well together and still are easily distinguished from each other. Also, for the layers we used a bit of transparency, because we wanted that the user can see the background map too. The background map has useful assets such as buildings, which can be considered as essential information for the user.

Functionalities

Because we wanted to make our maps useful, we added many functionalities to them that would suite the initial web map idea. The web map has a layer selector, where all of the different parts of greenery areas have their own layer. These layers can be selected on or off by the user (picture 5). To showcase all of the layers at the same time, a button to switch all greenery areas on was created. Also, user can make walking distance buffers around the green areas, to see how far away green areas are from the resident areas. From the maps user can get information about how much people are living near the greenery area by creating a buffer of the desired greenery area (i.e. visual interpretation). Buffers in Leaflet were done by using an external JavaScript library called Turf. This caused small problems, since Turf buffers are skewed towards the origo. Because of this, buffers are mostly skewed towards south-west and this needs to be taken into consider when inspecting the map.

Other functionalities that we added to the map was popups, which occur when user clicks a greenery area (i.e. when a buffer size is not selected). Then a popup is formed, which shows information about the specific greenery area. For the demographic layer, we decided to do this differently. The information of the demographic layer in shown on the sidebar. This is because we thought that two different popup functionalities would interfere each other and confuse the user. These functionalities are shown in picture 6.

The web map also has other minor functions such as, highlighting a greenery area when hovering over it, removing all visible layers button, removing all buffers button and panning to a different region by clicking the demographic layer.
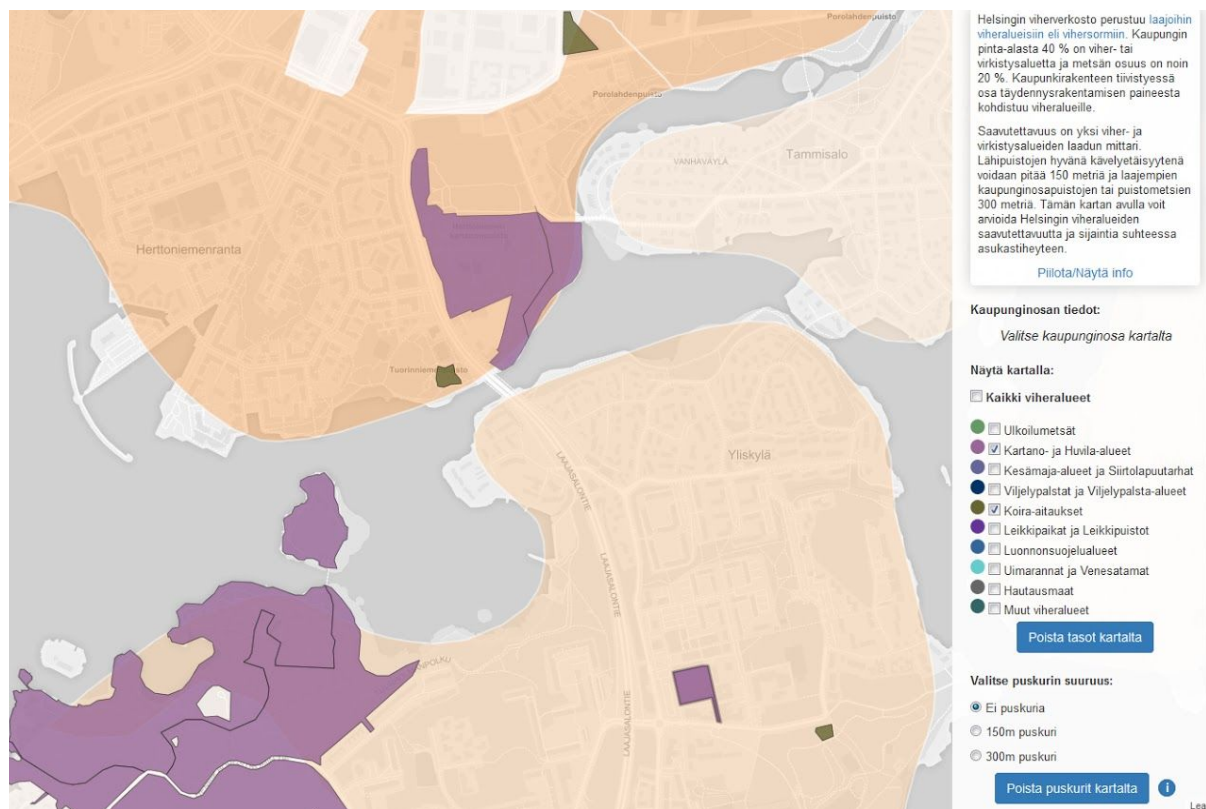
Picture 5: Layer selection in use:
The user has selected the manor house areas and dog parks to be shown on the map.
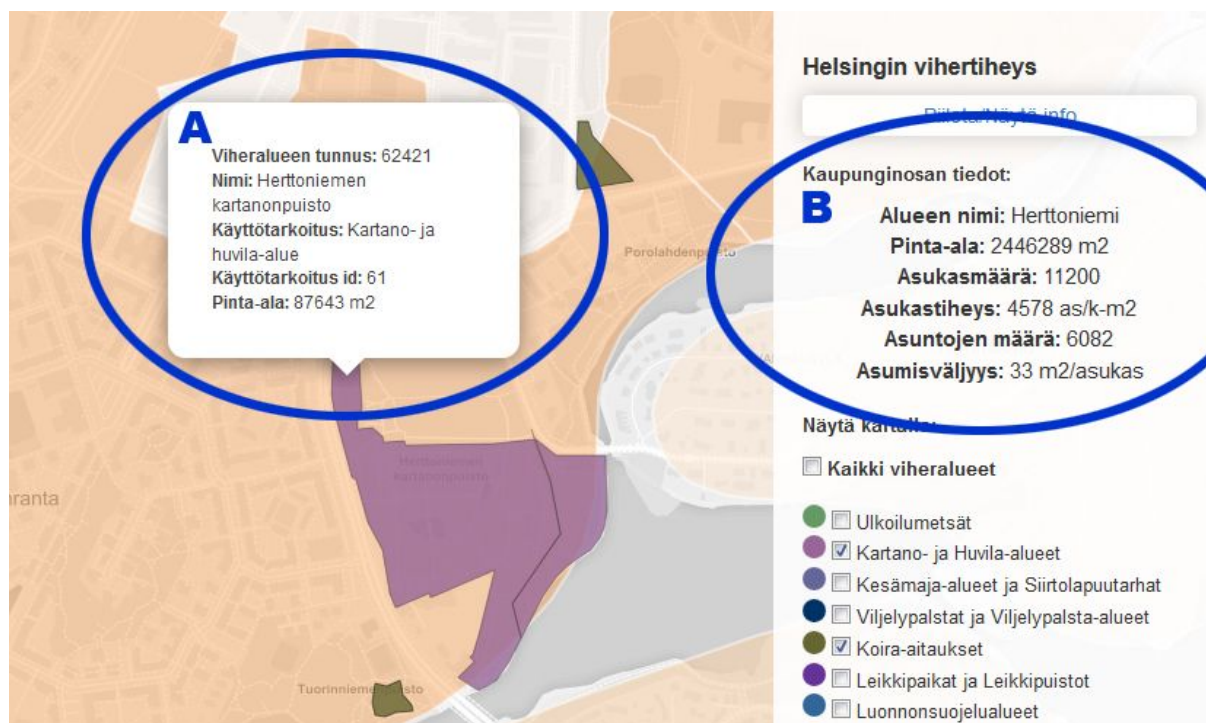
Picture 6: The attribute data of the green area shown in a pop-up (A) and
information about the selected city district displayed on the sidebar (B).

Draft evaluation

The comments that we got from other students were mostly positive but some negative comments were there too. When we posted our maps for commenting, we knew that there existed problems with them, "surprisingly" these came back as format of negative comments. Summary of the negative comments that we got:

- greenery areas could be in different colors,
- some kind of legend would be nice to have,
- layer selector should be implemented properly,
- and a zooming-function to a feature was annoying.

Because we knew all of the problems before, we fixed most of them during the comments round. In overall, there were more positive comments than negative ones. Most common comments were stating that our visualization was good. Also, other comments were; that our maps are pleasing to the eye, clear, understandable and easy to use. So we reached our goal to make a clear useful map.

Comparison of ArcGIS Online and Leaflet

Experiences & possibilities

The first experiences of using ArcGIS Online were awful. It has many restrictions regards to modification (i.e. changing colours of a buffer etc.). After some trying and testing, it came a little bit easier to use. Although, it has some pre made functions that are easy to use, still some manual work is needed for the visualisation of the map. But in ArcGIS Online, it was easy to get some kind of map even though all of the functionalities couldn't be implemented.

Leaflet in other hand is a flexible javascript library for web maps. It enables huge possibilities to create interactive maps and add functionalities to the map. The map that we produced doesn't exhibit all of the possibilities that it could offer. For example we could have added a functionality to add own greenery areas that could be pushed to a database and modified by different users. Also, the attribute information and the boundaries of the areas could be modified and these possible changes could be sent as a propose to the holder of the data. This wasn't possible due to the timeframe that was given for this project work, but it would have given the web map more depth.

Leaflet gives more freedom for the user in the sense of interface design. This is because the implementation of the web map can be developed with different languages, such as HTML, CSS and JavaScript. Also, some readymade frameworks can be used in the UI, such as Bootstrap, but in our case there were not much help from those. Although Leaflet requires more coding experience and can be considered as more laborious, it enables more freedom and takes you away from commercialized methods.

Limitations

We found many limitations with ArcGIS Online. For example there is no possibility to add hover function to the features or to change some of it's design (i.e. interface etc.). For using tools in the application user needs some skills or instructions, because the user interface is not intuitive. For example the buffer functionality is much more difficult to use than in our Leaflet map where user chooses what size of a buffer he wants and then clicks the map to show it. In ArcGIS Online user needs to do the buffer first and after that he has to do other analyses for getting the same information as in Leaflet map. ArcGIS Online also has other limitations. In ArcGIS Online user has to sign in for using analyse tool to make buffers. This is a big limitation, since regular users can't use the full application. Instead they have to create a username in ArcGIS Online before they get the full functionalities of the application.

We also had to crop the map area in ArcGIS Online. The amount of data was too big to be uploaded to the service. Therefore the map area is smaller in ArcGIS Online than in our Leaflet map. Also in ArcGIS Online the design opportunities for the map were limited. For example we couldn't get a stable sidebar in ArcGIS Online and theme color opportunities were limited. Overall, it is an easy tool for making maps even though there are some limitations.

The greatest limitation in Leaflet is the amount of time available for the map development. As we were using leaflet for the first time, it required quite a lot of time to study the javascript libraries. Also, it is good keep in mind that the Leaflet library itself can be considered as a limitation. By this we mean that many of the functionalities are not possible or easy to do with Leaflet compared to other JavaScript libraries. But this is not a problem when you are a professional developer, since you can get around these limitations by coding your own JavaScript code for your own needs. For more professional web developer Leaflet can be

considered as a good method to develop great web maps easily or for less experienced developer if the existing functionalities are enough.

Future development ideas

During the implementation of the maps some new development ideas came to our minds. For the assessment of Helsinki master plan, it would be useful to have the new master plan shown on the map. This would be possible if the city of Helsinki distributes the plan proposal as an open WFS or WMS service. At the moment the map is available in the GIS service of city of Helsinki (http://kartta.hel.fi/yleiskaava) but not as open data. Also, another future development possibility would be to add your own greenery areas or modify or comment the existing ones. This functionality would give more depth to the application. These modifications and add-on's could then be pushed to the holder of the data to be evaluated whether these changes are good or not.