

# **How to map alternative travel patterns that benefit environment and communities of the Nordic countries using geospatial technologies**

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<b>Report/thesis title</b> How to map alternative travel patterns that benefit environment and communities of the Nordic countries using geospatial technologies	<b>Number of pages and appendix pages</b> 29 + 24
<p>The thesis project is an attempt to prototype and test a web service and a navigation tool for cycling travelers, using open geospatial data and GIS (geographic information system) software to illustrate how digital mapping and open data may encourage active transport mode use and facilitate less impactful ways of traveling.</p> <p>The bigger goal is to demonstrate sustainable travel options' ability to change existing travel patterns and diminish the disruption of communities and the negative environmental impact caused by excessive tourism activities.</p> <p>The project process is built around discovering digital tools and open data potentially helpful to travelers roaming the region using a bicycle as the main transport mode, while at the same time acquiring skills and knowledge necessary to map infrastructure available to cyclists: suitable cycling routes and paths and amenities for rest and resupply along them and beyond.</p> <p>Starting in spring 2018, using ArcGIS software designed to manipulate and analyze geospatial data a map was created in the form of a web application that may be used via smartphones for planning and navigation purposes. To make the project feasible and focus the study and limit data research, the test area is set to be South-Western Finland.</p> <p>Later the web app was tested during 2018 cycling season by several travelers in Finland going between Turku and Helsinki, as well as by prospective travelers who planned but postponed their tours to future years.</p> <p>The results and observations of the prototyping and testing processes presented in this report suggest the future development of the concept. These would take the initial project into a properly functioning application or a set of applications facilitating zero-impact travel practices in the Nordic countries.</p>	
<b>Keywords</b> Cycling tourism, digital mapping, geospatial data, GIS, navigation, sustainable transport	

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# 1 Setting the stage

There's no travel without maps. And there's no navigation without data that is displayed on a map in the form of geographic/location information, points of interest and things that belong to places. Data is an infrastructure that helps us navigate and explore the world around us. Where we go and what places we want to visit often depends on how extensive and accurate the data representing a chosen area is.

People tend to travel to well-known, extensively explored and widely promoted places with a range of services and attractions available. That leads to popular destinations being overcrowded and to higher emissions caused by the tourism-related activities concentrated in one area and to communities being sensitive to the environmental impact. (UNWTO World Tourism Organization 2017.) Oversaturation of some places in terms of mass tourism affects the quality of life of its residents. The same attractions are promoted year by year, the same infrastructure is offered to tourists and residents, and locals no longer feel like their cities belong to them. (Hunt E. 2017.) This may result in stress and hatred towards tourists as can be seen in Barcelona with "Tourism kills the city" signs displayed around the city. Another example can be observed in Stavanger where residents feel harassed by cruise ships tourists peeking into their windows and mailboxes as reported by Brune (2018).



Picture 1. Tourism Kills the City. Barcelona. Source: author's personal photo library.

Our environment and our communities are becoming fragile and less comfortable to live in, partly as a result of people intensively traveling around the same areas. UNWTO is certain that tourism is a major contributor to the climate change and environmental disrupt. (UNWTO 2017, 30-37.) And while national tourism boards and local authorities are seeking to make tourism more sustainable and less of a burden on cities, I'm also looking for a way to help it locally, step by step, or to be precise, wheel by wheel.

There's an inevitable need for greener and less impactful travel options. And there's a clear development gap between oversaturated and less explored areas, whose growth would potentially ease overcrowding of popular destinations and would develop local communities and businesses outside of main tourist paths if financing for sustainable tourism projects increased. (UNWTO 2018, 12-13.)

There are several ways to make this feasible. While we cannot seriously decrease tourism-related activities causing high emissions and turmoil in communities, we are able to promote environment-friendly and community-friendly travel practices. More importantly, to facilitate them and support their development.

Sustainability is the foundation of the better world, and the tourism sector with its 1.2 billion tourists crossing borders each year has a great capacity to contribute to the sustainable development goals (SDGs) that are set to be achieved by 2030 while preserving biodiversity and the ecosystems on which the livelihoods of local communities depend. (UNWTO 2018, 6-7.)

How can we make it happen? There are growing trends in human-centered mobility, integrating smart-technologies and GIS (geographic information system) mapping tools for planning and visualization. They are able to make transport systems more flexible and seamless and resilient to current and future travel patterns. It was roughly estimated that \$720 billion to \$920 billion USD could be generated across the globe every year by utilizing open data to develop new digital transport applications. Following the trends, it is clearly visible how user-centric and personalized services featuring open location data that help to move around may actually influence travel choices. (Mitchell, Claris & Edge 2016, 34-35.)

But not solely economic growth is the main benefit of these trends and incorporated technologies. I believe an infrastructure built with a user (a human being) and their wellbeing in mind – is the one that is more beneficial to our society and its future. Utilizing human-centered mobility principles we can move forward, guide and spread out the flows

of travelers to the areas that actually need them while offering travel options that are more beneficial and less harmful to the livelihood of local communities. Geography once again makes all the difference.

“The challenges we face, from our local neighborhoods to our world as a whole, all share the common tenets of geography: they are happening somewhere, which places them squarely on the map” (Harder & Brown 2017). Therefore, I propose that the first step towards future travel trends is to engage geospatial technologies and GIS digital tools, in particular, utilizing open location data and bringing it together with sustainable travel practices.

I've been following a growing travel trend that could become a great alternative to existing travel options. It is cycling tourism that may take different forms while still being an eco-friendly, healthy and joyful way to explore new places.

Forms of cycling tourism are wide open, and this mode of transport is accessible to the vast majority of individuals, be that a wealthy family on retirement with credit cards, or a group of students/low incomers exploring locally public lands and national parks. Or an introvert individual seeking for a slow-paced way of enjoying nature and being outdoors on their own.

By combining geospatial technologies with open location data we may create a map and a navigation tool that would enable traveling locally and abroad using active and zero-emissions transport in a comfortable, safe, and enjoyable way. Such as traveling on a bicycle.

Why is open data so important for alternative travel practices? Data can be perceived as an infrastructure, a user interface of reality. What kind of data we have influences the routes we choose. Being a solo bike traveler looking at a map on your smartphone you would rather choose a destination with some clearly marked infrastructure for you to use and or to simply be around. For example, campsites, groceries, attractions or repair services. If you have no available data about a route you plan to take, or the data is too broad and confusing, it may cause you stress and discomfort and make you feel unsafe, or worse yet, make you switch to less environment-friendly means of transportation.

There's clearly a need for specific data dedicated to cyclists. I'm talking about data gathered in the Nordic countries as a prospective region to facilitate environmentally friendly tourism practices. And this data could be featured on a map with an easy-to-use

navigation service to encourage tourists to choose active transport and less impactful ways of exploring the region. That's where GIS tools meet open location data to create a comprehensible and handy tool that would make one's local or long-haul bike ride more comfortable and enjoyable.

Smart tourism is one of the key concepts of the future travel industry as it was concluded in one of the recent UNWTO reports (UNWTO 2017, 100-105). In this report, I aim to combine modern geospatial technologies and sustainable travel trends to make them serve a cause I believe in — to make this world more accessible and friendly.

Thus, the goal of this thesis is to prototype and test a web service featuring infrastructure needed for comfortable and safe travel in the Nordic countries. At the same time this would facilitate an environmentally friendly way to explore the region using a bicycle as the main transport mode and would potentially boost economic development of local communities by bringing tourists to remote and less explored areas.

In practice it means that an easy-to-use navigation tool will be prototyped in the form of a web application featuring cycling-related infrastructure. It will have dedicated and suitable routes and paths for cycling, along with rest and resupply amenities. For the sake of feasibility, the test area chosen is South-Western Finland and the set of amenities is limited to a few available options to simply illustrate the potential of the tool when further developed.

## 1.1 Workflow and timeline

The project process consists of 4 major activities:

- theoretical framework establishing
- data research and mapping
- web app prototyping
- app testing.

The theoretical framework aims to create a setting for the project objectives. It is composed of industry papers and reports, such as recent UNWTO (World Tourism Organization) publications, GIS software guidelines and tutorials, as well as benchmarked existing navigation solutions.

The timeline is organized to allow the establishing of the theoretical framework and analysis/report. It is built around the main cycling season in Finland when the app is tested and troubleshooting is performed.

Table 1. A planned workflow & timeline, January 2018

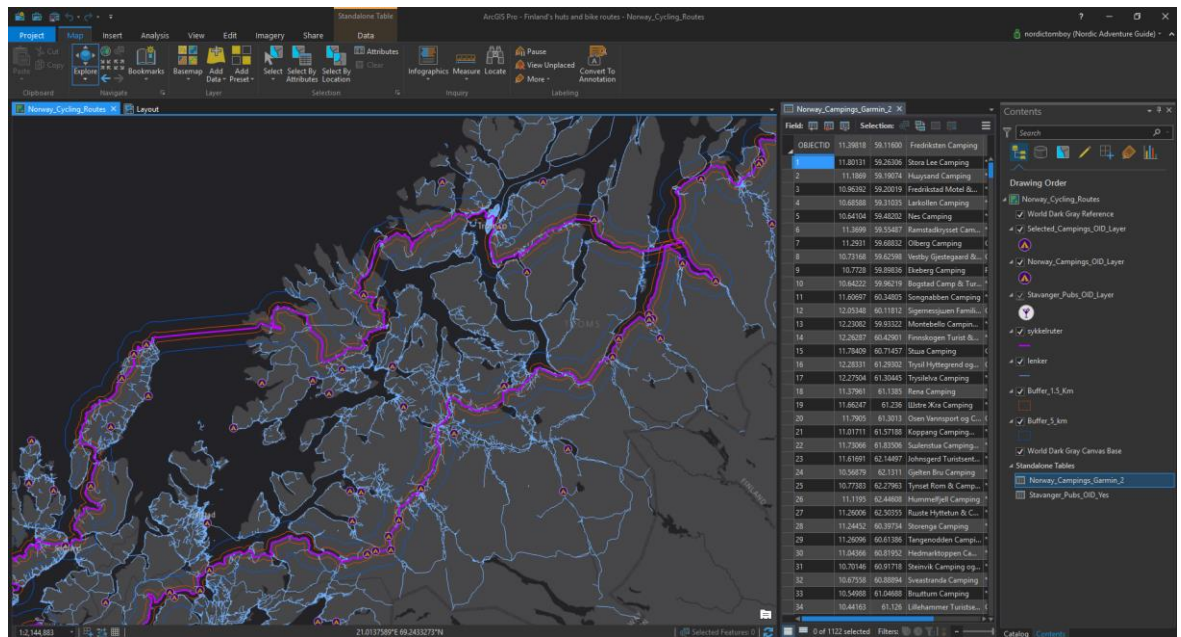
2018	Framework	Data Research	Prototyping
Jan	Searching for books, articles, software guidelines/tutorials		
Feb	Benchmarking (concepts and existing navigation solutions)	Open datasets searching for geoprocessing and analysis	
Mar		Qualitative research (interviews, contextual interviews)	GIS workflow creation utilizing digital mapping tools
Apr			
May			Web app prototyping
Jun			How-to-use-it guide designing
Jul			
Aug			Web app testing
Sep			Results analysis
Oct			Report finalizing
Nov			Submitting the thesis to a supervisor

The methods and tools chosen for the service design process are numerous. They include benchmarking, contextual interviews of end-users (cyclists) in a relevant environment, committed observations, net scouting, trend scouting, blueprinting and experience



prototyping, retrospective testing. (Moritz 2005.) The chosen methods and tools are meant to help with discovering existing navigation solutions and their issues and prototyping of the web service from the end-user perspective.

The digital tools chosen to visualize and analyze location data belong to Esri (Environmental Systems Research Institute) GIS mapping platform. The platform offers desktop software and online tools that can be used to visualize and analyze geo-referenced data and to build web and mobile applications.



Picture 2. ArcGIS Pro desktop software utilized to bring two sets of location data together

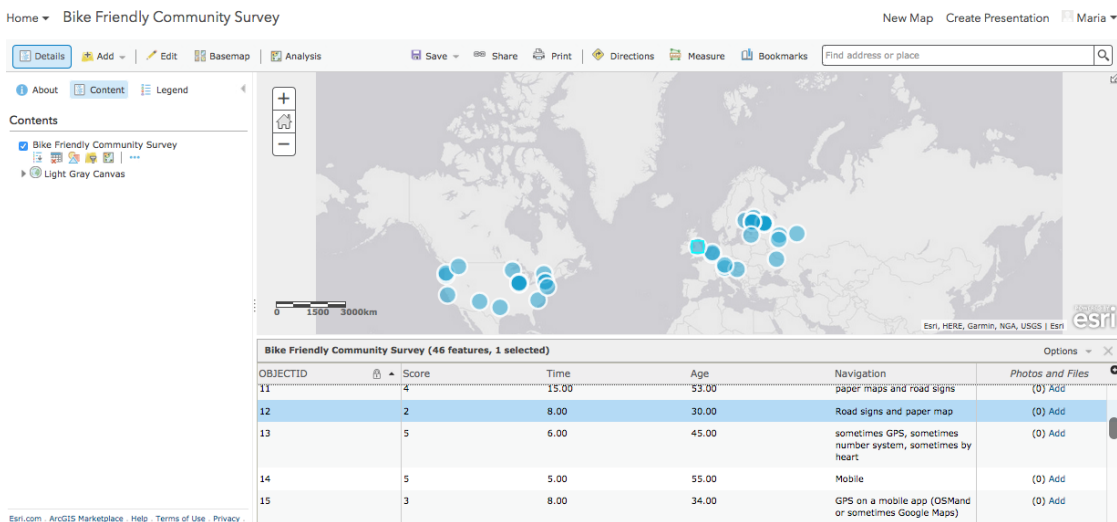
The above example displays how two different sets of georeferenced (location) data can be brought together so they can be analyzed mutually. As visualized above, combining locations of campsites in Norway and bike-suitable routes datasets it is easy to draw buffers along these routes to define those POIs (points-of-interest) that are reachable within certain distances and accessible for cyclists traveling along them.

This kind of simple analysis also gives additional data – locations reachable for an end-user, for example – a cyclist. ArcGIS software is able not only to analyze given data but to visualize data useful for specific users. This may be used to create a web map for planning and navigation purposes.



Picture 3. A web application built with ArcGIS Online software

The example above illustrates how location data can be represented on a map for analysis and visualization purposes using ArcGIS Online. The screenshot is made from the actual web application configured for a research project course within my degree program. It represents data collected via a survey form built using GeoForm tool of the ArcGIS platform. The entries of the survey are sorted in the form of a table (entry ID, number of respondents, score given to their communities in terms of bike-friendliness, age of respondents, what they use for navigation). This information is visualized as dots on the map, each for one entry or clusters combining a few dots together. Even after initially analysing the data I can clearly see where respondents mostly rely on GPS technologies rather than paper maps. I can also tell how bike-friendly their communities are perceived and how much time they cycle on average. For the purpose of this thesis project, listed geospatial software solutions of the ArcGIS platform are used to apply location intelligence to map the cycling tourism experience.



Picture 4. A screenshot of the survey entries made via GeoForm tool

## 1.2 Objectives and key concepts

The main project goals and objectives were listed process wise according to the planned workflow and perceived as a roadmap to follow or a sequence of steps to be taken in order to get a desirable outcome. Throughout the project process, some changes occurred to the project when adapted to real-life situations and during testing.

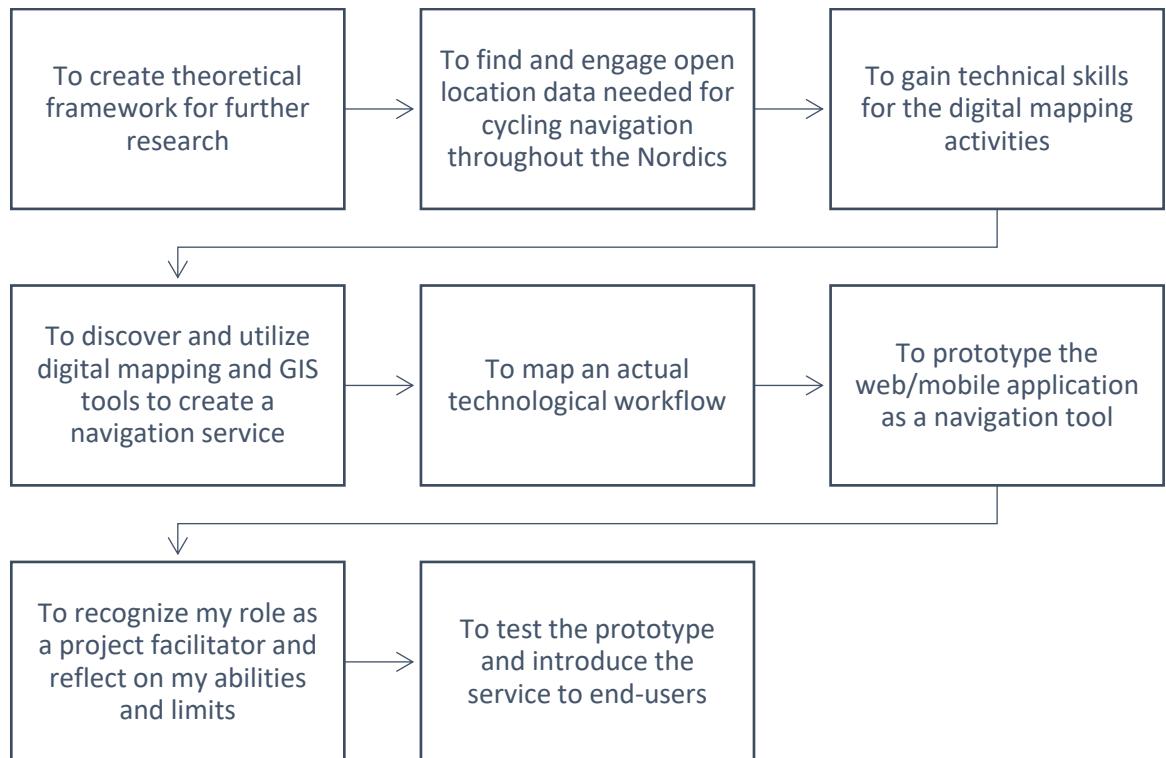


Figure 1. Thesis objectives, January 2018

Key concepts that will be introduced in the thesis are identified as follows:

**Cycling tourism** can be broadly defined as any travel-related activity for the purpose of pleasure which incorporates a bicycle. If seeking a more narrowed definition then bicycle touring means self-contained cycling trips for pleasure, adventure, and autonomy rather than sport, commuting, or exercise. Touring can range from single to multi-day trips, even years. Tours may be planned by the participant or organized by a holiday business, a club, or a charity as a fund-raising venture. (Wikipedia 2017.) For the purpose of this thesis, cycling tourism is considered to be a way to travel locally and abroad for leisure using a bicycle as the main mean of transportation.

**Geospatial technologies** is a term used to describe modern tools for gathering, analyzing and manipulating of geographic (location) data that are presented by the following technologies: remote sensing, Geographic Information System (GIS), Global

Positioning System (GPS), internet mapping technologies and software used to visualize, utilize and share location data. (American Association for the Advancement of Science 2018).

**Geographic Information Systems (GIS)** is a suite of software tools for mapping and analyzing data which is georeferenced meaning when assigned a specific location on the surface of the Earth, also known as geospatial data (American Association for the Advancement of Science 2018). Using GIS to interpret and analyze location data we may clearly see patterns and relationships between objects and events and then predict and meet trends in almost any industry to get economic and environmental benefits (ESRI 2018).

**Digital mapping tools** are software-based tools used to gain a visual understanding of data and processes that are georeferenced. Digital mapping tools will be widely used for the purpose of this thesis to visualize background data for cycling navigation and create a visual database of the cycling-related POIs covering the Nordic countries.

**Human-centred mobility** as understood in engineering of urban infrastructure and transportation systems is a concept according to Mitchell, Claris & Edge (2016, 33-35), that puts a user (a human being) at the center of planning and design processes for better decision making and understanding of their needs and making their journeys seamless, comfortable, accessible, while navigating them through infrastructure that is meant to be livable and to “encourage people to seek alternative methods of transport and pursue healthier lifestyle choices”.

**Smart technologies** in the context of sustainable tourism are understood as ICT capacities that enable development of destinations by engaging modern software, applications, and digital tools that would make sustainable development goals economically viable (UNWTO 2017).

## **2 Theoretical framework and benchmarking**

In search of best navigation practices, I came across multiple services and applications that needed to be tested and analyzed for better understanding of what can be of a help for users planning a trip or navigating themselves while being on the road. I researched what the limitations and shortcomings are of such services and what makes them complicated to use. I also used insights from my own cycle travel experience and those of fellow travelers gained from qualitative research conducted before the actual prototyping phase. In the end, all of the above proved useful for designing a solution potentially capable of changing one's travel experience.

### **2.1 Preliminary research before prototyping**

Before designing the actual solution and configuring the web application, I had done preliminary qualitative research to figure out what navigation issues could be resolved with the web app I planned to prototype. The questionnaire was created to get insights and perspectives of travelers besides myself.

The questionnaire was designed to get respondents to share their background in cycling travel and their thoughts on how to improve their experience in the future. The form of the questions and illustrations from my own long-haul cycling trips were supposed to create a certain atmosphere that would make respondents want to share more openly. Before choosing a testing group of cyclists who would answer these questions, I had scouted several specific cycling touring communities looking for people traveling in different parts of the world. I then found a group of unrelated cyclists planning a trip to Finland in summer 2018 and asked them to participate in my research. It was assumed that this way of building an app would gain more insights on how to tailor specific experiences for a target group of travelers.

The questions were meant to discover the test group's previous travel experience, possible navigation issues, what they were looking for going to Finland and what services/attractions they were interested in. Their full responses can be found in Appendix 2. Preliminary qualitative research, Q&A, Test Group I.

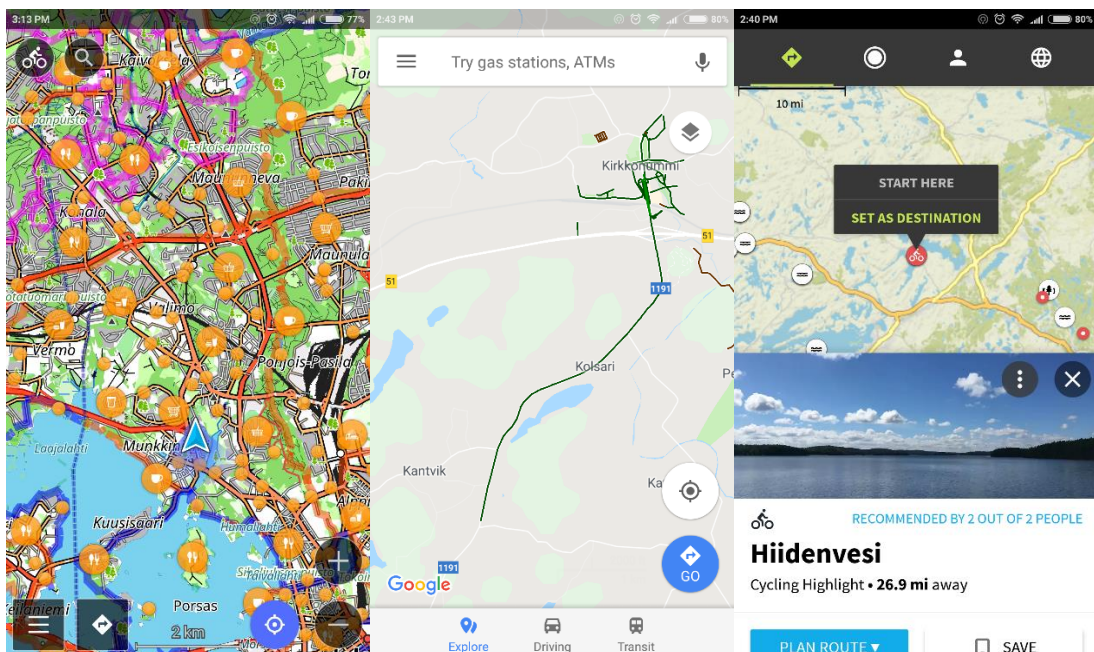
I concluded, based on their responses and scouting of the cycling community in general, that most of the existing navigation tools are not or poorly designed for cycling purposes. First, they do not offer a good overview of cyclist-friendly routes and paths. Second, they do not display sufficient infrastructure needed for long-haul touring.

Out of the existing navigation services suitable for cycling I chose to review the most popular ones. The list includes Google Maps, OsmAnd, Maps.me, Komoot, and several others not widely promoted within the bike travelers' community.

Though all of them have some features and tools useful for cyclists, such as several different basemaps to switch between, offline maps, POIs by request (for example, accommodation, cafés, and restaurants, healthcare, leisure, sport, sightseeing and tourism). But even with those features, most of the apps proved to be weak options for cycling since they offer poor data and functionality. My task was to take these weak points and illustrate in my prototype how even a few improvements of existing apps may change someone's travel experience.

The characteristics I discovered among even the best applications that make them fall short for cycle travel in Finland are:

- poor visual representation of data
- insufficient data for long-haul cycling tours.



Picture 5. Screenshots of OsmAnd, Goggle Maps, Komoot apps.

Apps like Google Maps and OsmAnd have a great amount of data listing all kind of amenities possibly needed to a cyclist/traveler. But large sets of data mapped all at the same time, combined with not clear basemaps, or not enough specific data available for cyclists (designated routes, campsites, food services), may cause difficulties when using

on the road. As I'd learned from my own cycle travel experience and from responses of my test group, the navigation for cyclists varies from general travel navigation.

Cyclists tend to seek destinations to cover their basic needs: places to rest and sleep on their way like campsites and shelters, places to get ready-made food or groceries to prepare food themselves, natural-based attractions and not-so-popular tourist attractions. One of the main purposes of cycle travel is to experience the wilderness and being on your own and not spending fortunes on highly priced hotels and entertainments.

There are cyclists seeking more conventional experiences, of course, like staying in hotels and dining at restaurants. But they are fewer in number and their needs are usually prearranged.

Wild camping is the most popular option for cyclists who travel with their own camping gear, thus there is a clear need to facilitate more comfortable overnight staying along scenic and popular routes. Apps like Google Maps featuring amenities and businesses of any kind that average user might need are mostly missing local info of shelters and huts meant for backpackers, or that info is not easy to distinguish from all the overwhelming data unless users search upon certain facilities. Some other apps may feature crowdsourced data in a form of POIs meant for cyclists, which either aren't interactive or aren't relevant. They don't give any additional info when clicked on or do not offer shelters/campgrounds/resupply options but rather just nice viewpoints and destinations suitable for one-day local rides.

The main feature to be designed when prototyping a navigation service is a clear visual representation of the main cycling-related data in an area: routes and useful POIs along the way and possibly beyond, thus not to limit travelers' choices. Tailored, specifically designated data useful for the target group of travelers must be easy to read, understand, use, and rely upon when traveling or planning a route. It must include, but not to be limited to, places where cyclists may find ready-made food to eat or groceries to prepare meals, good safe places to sleep in the wilderness, affordable accommodation services like campgrounds and hostels.

This concept, titled for testing purposes Ride Eat Sleep, is meant to prove how designing a navigation service dedicated to accommodating needs of a certain target group of travelers may improve data quality and its visual representation thus changing user experience and the way people find comfortable and safe to explore places outside of main tourist paths using active transportation and practicing zero-impact way of traveling.

## **3 Ride Eat Sleep web application prototyping and testing**

### **3.1 Overview**

The application prototyping phase started with discovering data and geoprocessing tools needed to create a workflow for further analysis and building an application. The first big challenge was to find open data to map: cycling routes around the Nordics and services/facilities along them. Next, the actual mapping part was about obtaining the skills needed to utilize ArcGIS Pro desktop software to visualize the data. To create an actual web application for users to test, ArcGIS Online tools were applied.

To facilitate a smooth testing a how-to-use-it guide was created via the Web App Builder for ArcGIS. The guide was meant to give a general idea of the app's features and limitations while giving step-by-step guidelines of how to use it on a smartphone as well as basic recommendations for cycling travelers visiting Finland. The app testing was done by a final test group of cyclists and the feedback was collected via a feedback form to examine and rely upon when evaluating the project results and suggesting further development steps.

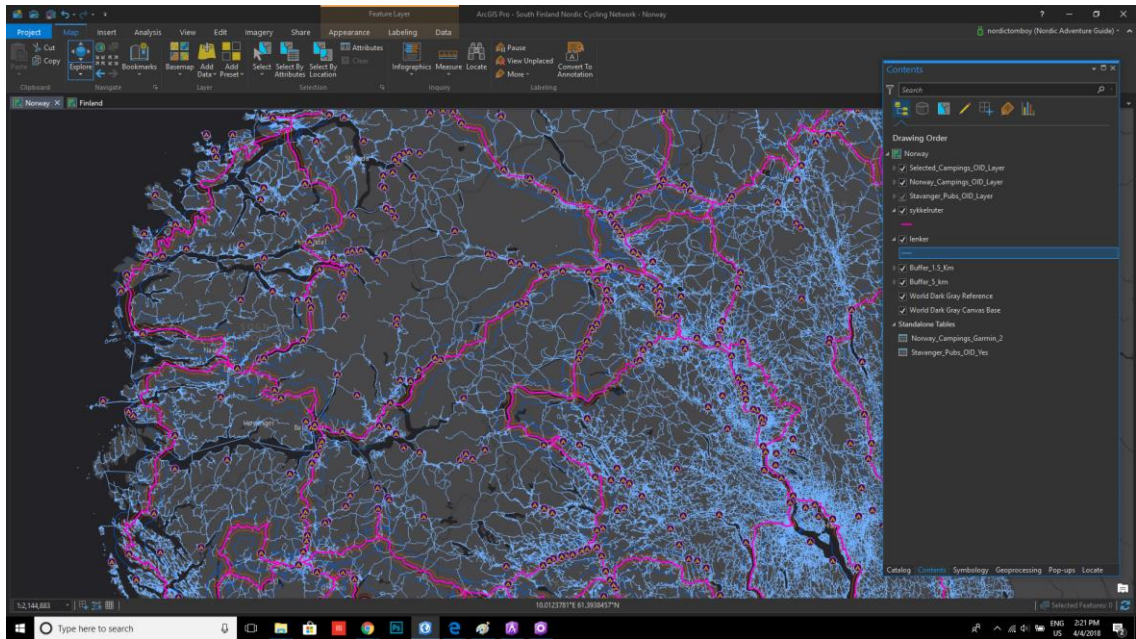
The project was started in April 2018 with discovering data and first mapping attempts. The app was meant to be ready to test by July 2018 at the latest, but due to technical challenges and limited time resources it was launched in August 2018 leaving short time window for testing purposes since cycling season in Finland was about to end. Plans of the initial testing group changed too. Out of 5 cyclists chosen to test the app, only one managed to set on a long-haul tour to Finland and test the app in real travel conditions. Fortunately, other travelers got to use the app for planning future bicycle journeys and one-day rides. The feedback I collected and examined is considered a source of user insights for further development.

### **3.2 Open data scouting**

At first, the idea to create an app featuring all cycling routes and cycling-related amenities around the whole Nordic region was more appealing and led to a discovery of massive amount of data covering some parts of the region and leaving blank others. Available open data in the region that not restricted in use due to licensing, and cycling-related data, in particular, was scarce and insufficient at most parts. The decision was made to choose a limited test area to map for several reasons. First, focusing on one relatively small area

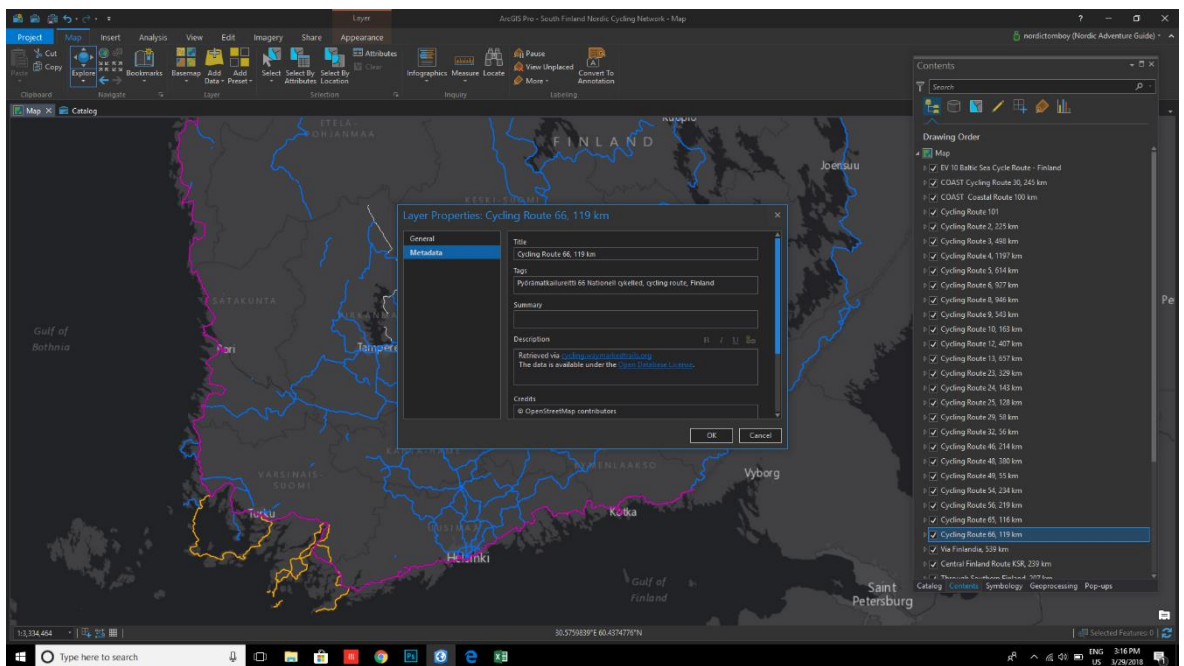


would make the project more feasible and shorten the prototyping-to-testing phase since less data was needed. In addition, an app displaying a large amount of data would be much slower to use on a device and would make testing more problematic.



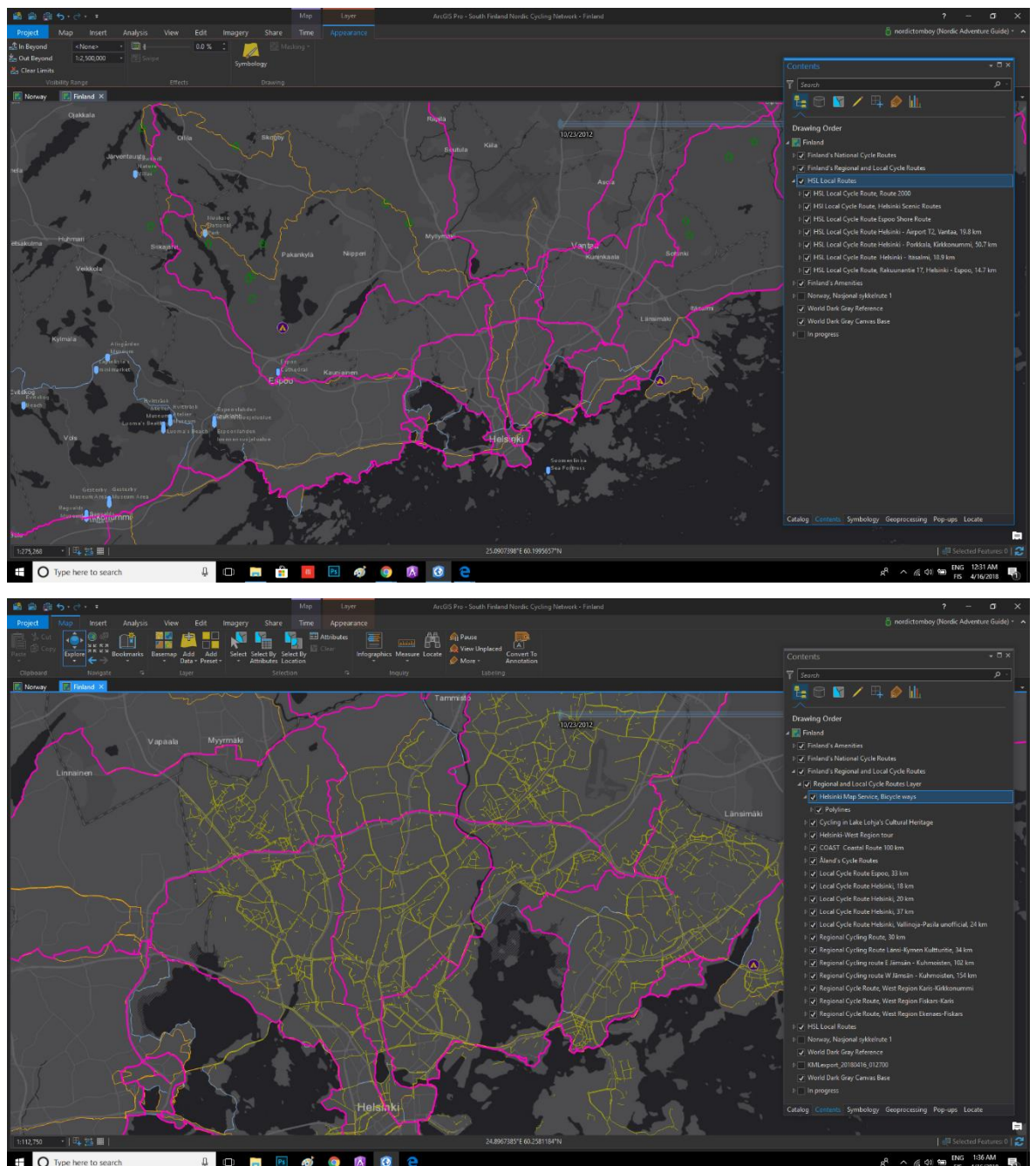
Picture 6. The large amount of data covering Norway: cycling routes and campsites.

The focus was first shifted to Finland and then to South-Western Finland in particular. Then the cycling routes and paths were searched upon and visualized using geoprocessing tools of ArcGIS Pro desktop software.



Picture 7. Adding main national and regional cycling routes. Data source: OpenStreetMap.

Main cycling routes of Finland, e.g. national and regional routes and paths were extracted from OpenCycleMap that is a part of OpenStreetMap Foundation, the biggest crowdsourced data source's owner. The data is open, created by OpenStreetMap contributors and licensed under the Open Data Commons Open Database License (ODbL), which makes the data available to be used in other maps and applications if credited. That data had become a frame on which all the additional data was ultimately added.



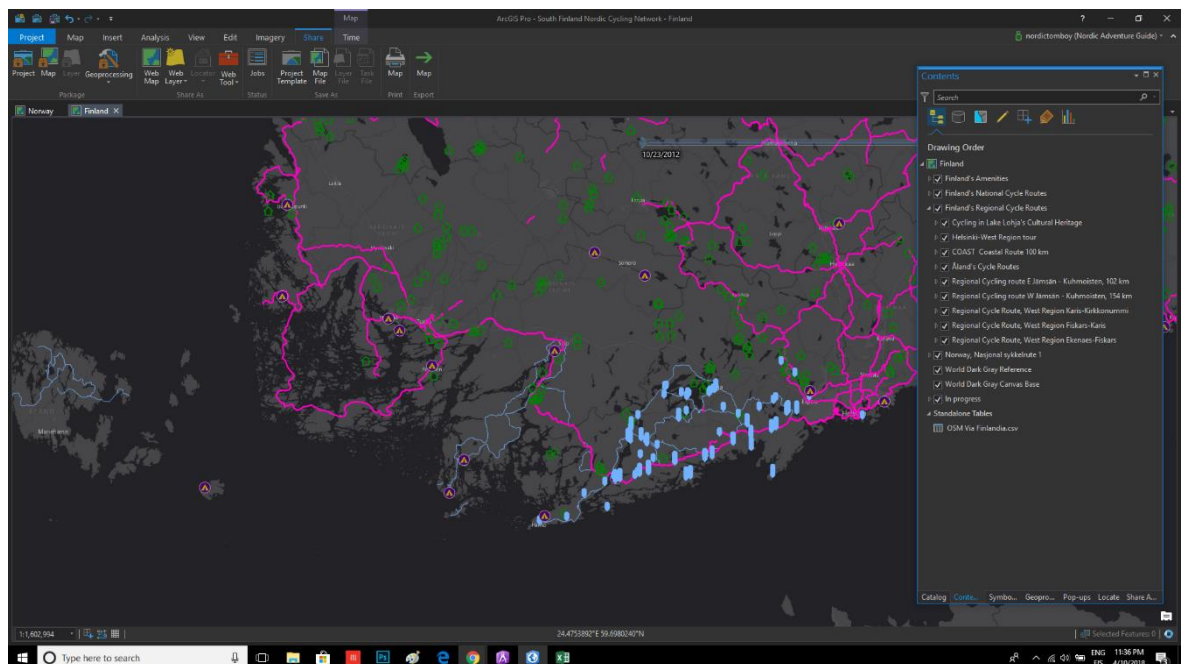
Picture 8. Adding additional routes and paths. Data source: HSL.fi, Helsinki Map Service.

Due to the lack of comprehensive open data licensed to be used freely, some of the later data mapped to the prototype is copyrighted such as cycle routes extracted from HSL.fi, Helsinki Map Service, lean-to shelters from Laavu.org. For the prototyping and testing purposes it is justifiable to use such data with some restrictions but if launching an app for a wider audience, the licensing restrictions should be considered and worked around.

### 3.3 Geoprocessing and mapping

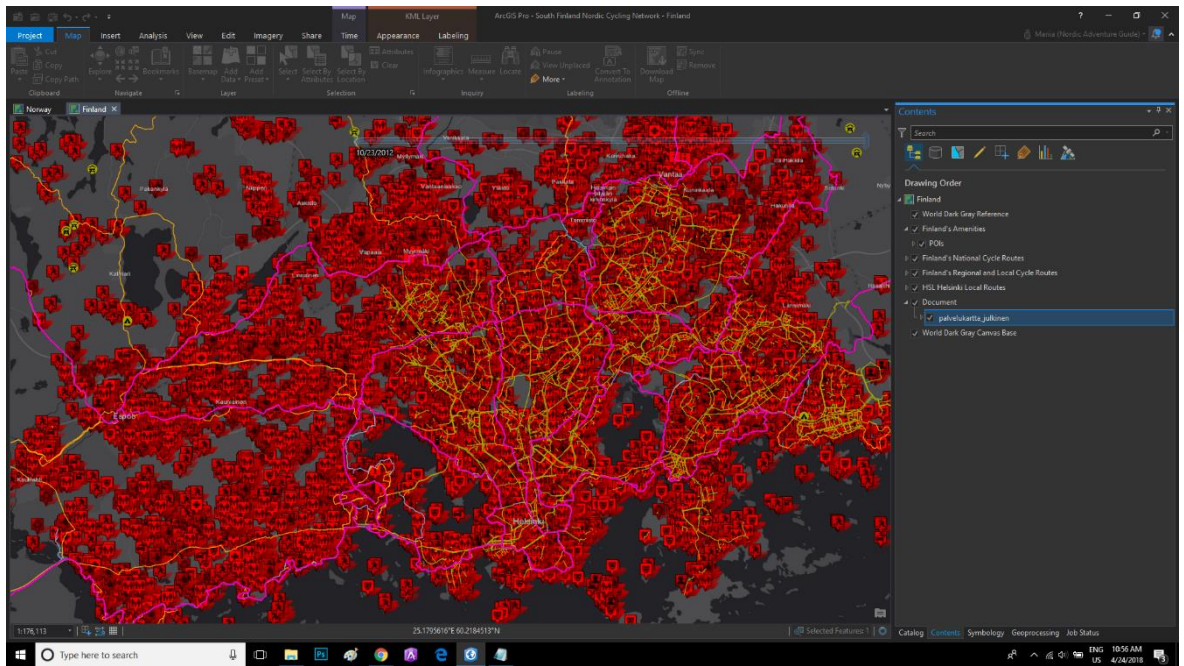
Since the project was meant to test the concept of cycling as an adventure tourism practice rather than testing an actual tech solution, somewhat simple geoprocessing tools were learned and applied to map a curated set of data and to create a web map to be viewed online.

Initially, different sets of data were combined on a map being symbolized chaotically and covering the full extent of available data in Finland: cycling routes and paths, campsites, lean-to shelters, interesting POIs to visit, such as historical sights, beaches, family-run services like cafés.



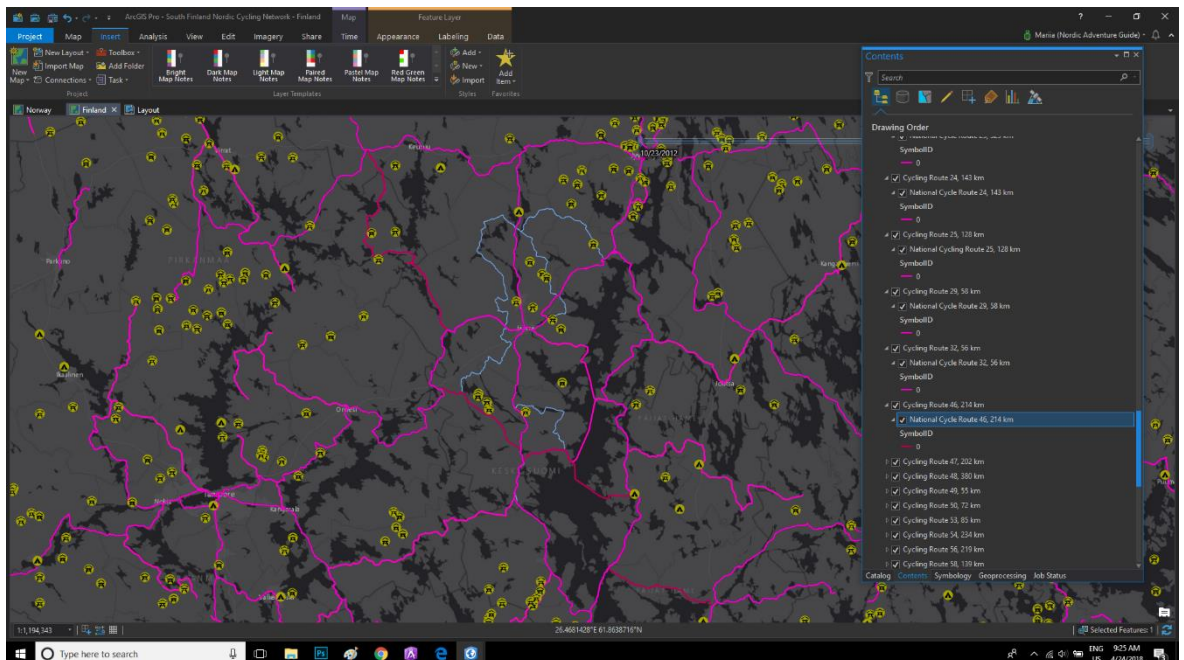
Picture 9. Chaotically symbolized different sets of data.

The more data used, the more cluttered and harder to read the map became. At some point, proper mapping practices were discovered and implemented, such as limiting data to that of importance, using scale visibility to show information only when it's required, using clustering to group POIs (Gerrow-Wilcox 2017).



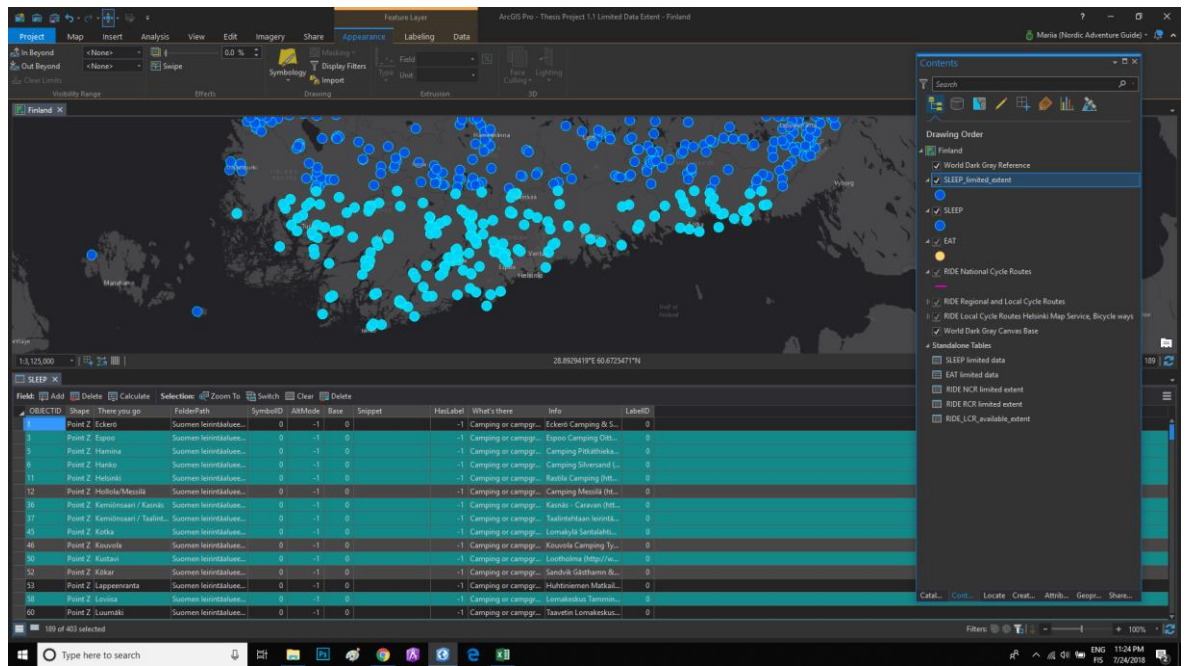
Picture 10. A large number of points cluttering the map before applying proper mapping practices.

Even limited to one layer of useful data (campsites and shelters combined), the map seemed cluttered and chaotic and made navigation troublesome in terms of judging destinations based on the infrastructure available.



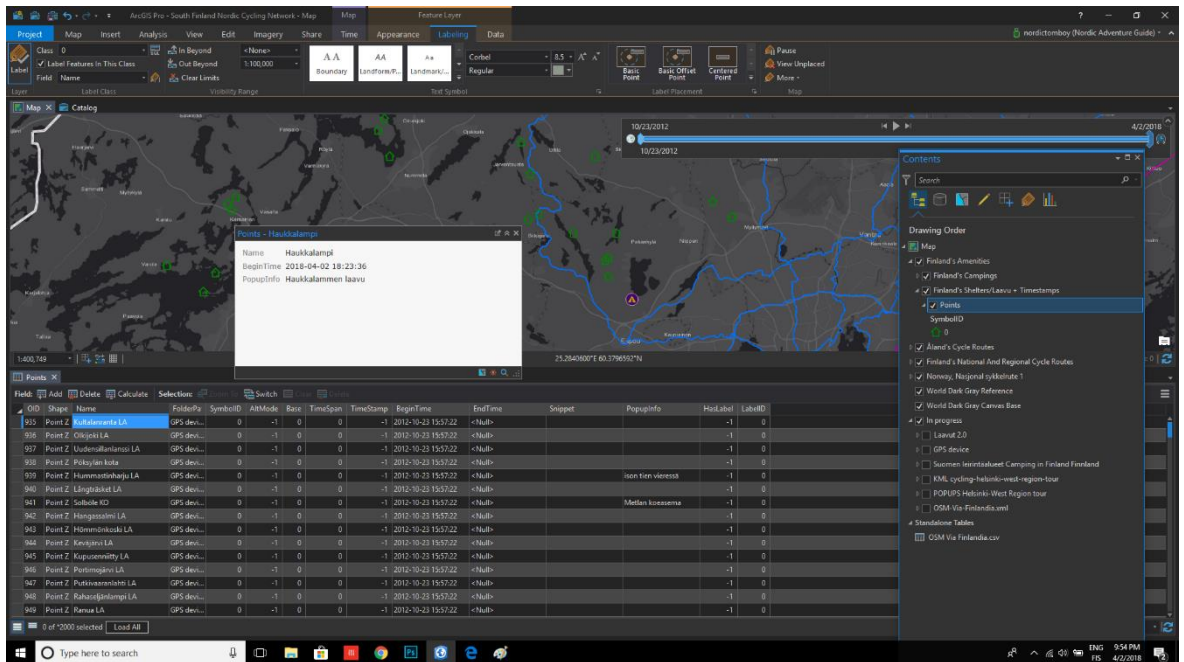
Picture 11. Data before clustering, routes and campsites/shelters.

The data was finally limited to clear up the concept of Ride Eat Sleep navigation. Based on the level of importance POIs were chosen to be showcased on the map: shelters for wild camping, campgrounds and some hotels, resupply stops like grocery stores, supermarkets, eateries and cafés, and kiosks to provide cyclists with options to rest and to get ready-made food and groceries on their way. The extent of available data was set to cover a limited part of Southern Finland for testing purposes. It was discovered that large data is being drawn slowly and sometimes with errors on devices and even on a desktop when not optimized (Gerrow-Wilcox 2017).



Picture 12. Limiting data layers to a cropped extent.

Then the pop-up windows of POIs were configured to show only needed info about places and the data layers were cut off of excess info such as timestamps that tell users when places were added to a dataset. The pop-ups of layers with routes were also turned off since they do not offer any useful info to the average cycle tourist. For example, original names in Finnish and routes' numbers.



Picture 13. Configuring pop-up windows of points (POIs) and polylines (routes).

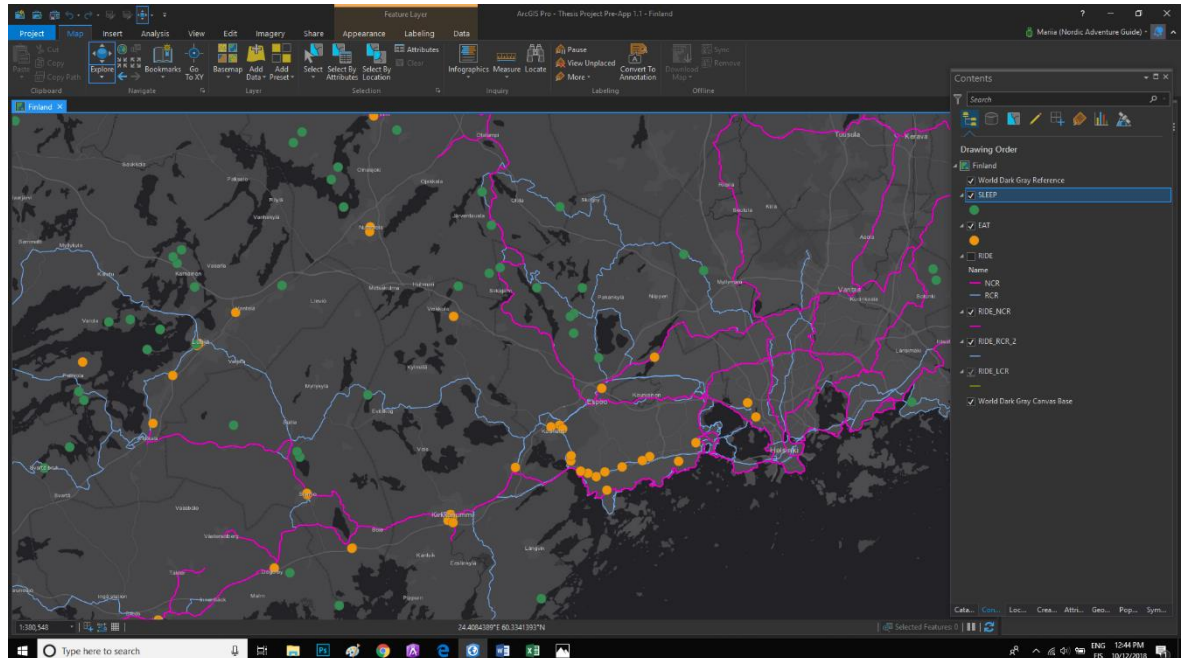
Using SLEEP feature class visualizing shelters and campsites as a template, another feature class named EAT was created with the same parameters (geometry type, coordinate system, attribute table). Points representing POIs of the EAT class were manually added to the map, 90 in total. In addition, its attribute table was configured based on the details available about places (name, type, open hours and services, address). The sources of EAT points were local map services and at times Google Maps. Then the info was vetted via places' own websites when available.

Hundreds of separate layers representing single routes and paths across Finland were merged together using geoprocessing tools into only three layers (National "NCR", Regional "RCR", Local "LCR" routes) allowing faster drawing on a web map yet to be created.

Polylines representing cycle routes were generalized using geoprocessing editing tools meaning their geometry was being simplified for faster drawing on a user's device. For the map scale in which it was meant to be seen some excess details could be simplified and overlooked without losing necessary information (Radich & Munn 2017).

Layers of added data were set to be drawn at larger scales to optimize map content for better performance online. It means that users may see them only when zooming in to certain map scales.

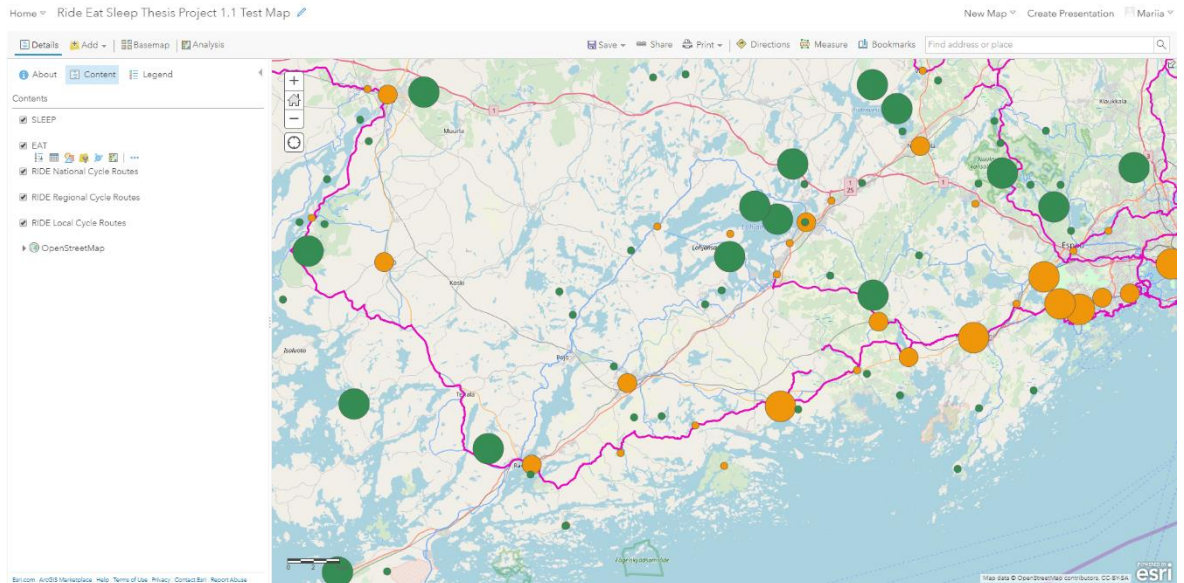
POIs of both feature classes were symbolized using unique values symbology displayed as simple dots of two colors (green for SLEEP, yellow for EAT feature classes) later on to be clustered into bigger “bubbles” via ArcGIS Online tools. Thus, the map was finalized as a project in ArcGIS Pro desktop software, but not yet shared as a web map.



Picture 14. Finalizing the map: a limited extent of data, merged routes, symbolized POIs using unique values symbology.

### 3.4 Web application and how-to-use-it guide launching

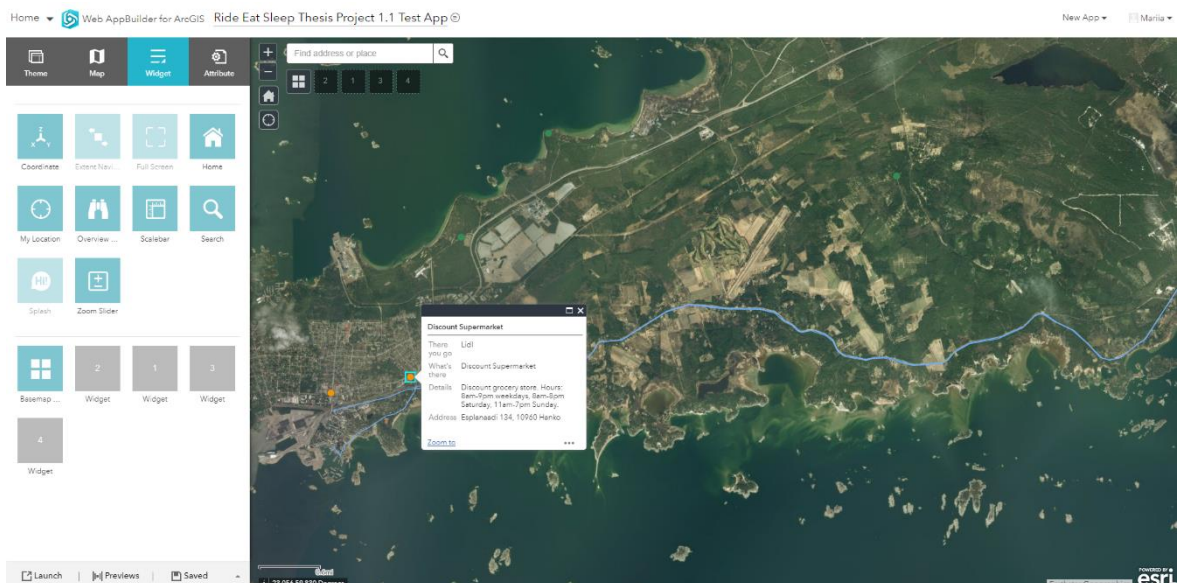
When the map was ready to be shared online, separate feature layers (EAT, SLEEP, RIDE\_NCR, RIDE\_RCR, RIDE\_LCR) were uploaded into ArcGIS Online server as hosted tile and feature layers. These both types are needed for web map optimization. The layers were then added to a web map created via ArcGIS Online and were given certain settings for better visualization and reading of the map. Clustering was applied to point layers aggregating dots located nearby into groupings of points or clusters. Smaller bubbles symbolized clusters of dots representing fewer points clustered within them compared to larger symbols.



Picture 15. Configuring web map by adding data as separate layers and clustering. OpenStreetMap is set as the basemap.

Sharing separate layers of data and then combining them onto an online map instead of sharing the whole map project from ArcGIS Pro as a web map has its own practical advantages. One is that it allows better performance of the map as a web application.

As the next step a web mapping application titled Ride Eat Sleep was configured. The visual attributes and widgets were set so they do not disturb users from reading the data and don't influence the app's performance. There are Zoom In/Zoom out, My Location, Default extent, Search, Coordinates, Scalebar, and Basemap Gallery widgets. Each performing its simple function while not overwhelming the map.



Picture 16. Configuring web app by customizing widgets and styles.



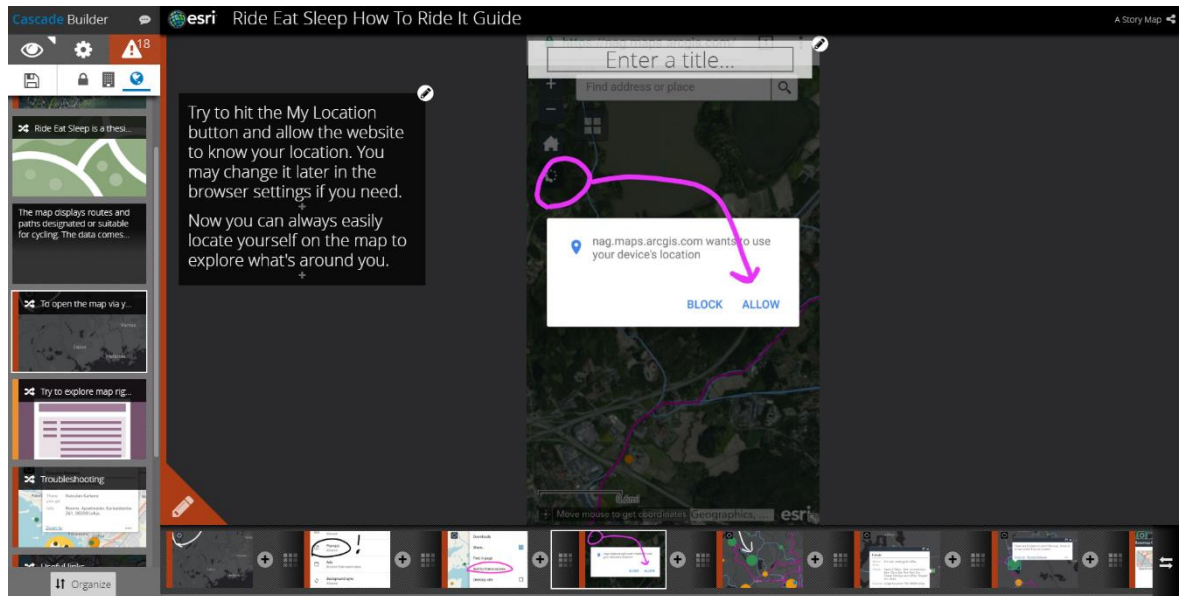
The basemap gallery was customized to have only a few options for a user to choose between: the default simplified Dark Gray Canvas, OpenStreetMap, and Imagery. OpenStreetMap gives a user richer context and additional POIs, routes, and other geographic data that is crowdsourced and gets contributed and updated by the huge OSM community. Imagery provides satellite and aerial imagery contributed by Esri, DigitalGlobe, Earthstar Geographics, and others. By changing basemaps users may change their perspective of the area, having more or fewer background data if needed.

Then via the Web App Builder for ArcGIS, a Ride Eat Sleep How To Ride It Guide was configured as a web application. The aim of this additional application was to give users an overview of the app they were about to use, its features and limitations, and additional info they might find useful when traveling to Finland. The app included step by step instructions of how to use it on their devices, how to add it on phones' home screens, to allow pop-ups, to set up location settings, to browse the map and understand its symbols, to change the basemap to get more/fewer background data. The troubleshooting part described the most common problems with using the app. They were: not allowing pop-up windows and missing location permission.

At the end of the guide useful links were presented to make one's travel smooth: OsmAnd for general navigation, the emergency app to install and feel safe, Openpoimap for additional POIs, OpenCycleMap for more cycling data, the sightseeing POIs map for those interested in history. The feedback form was also available to the test group cyclists via the guide. It allowed me to learn about their general cycling experience in Finland and elsewhere, as well as about their discoveries and troubles with the Ride Eat Sleep app.



Picture 17. Configuring Ride Eat Sleep How To Ride It Guide.



Picture 17. Configuring Ride Eat Sleep How To Ride It Guide.

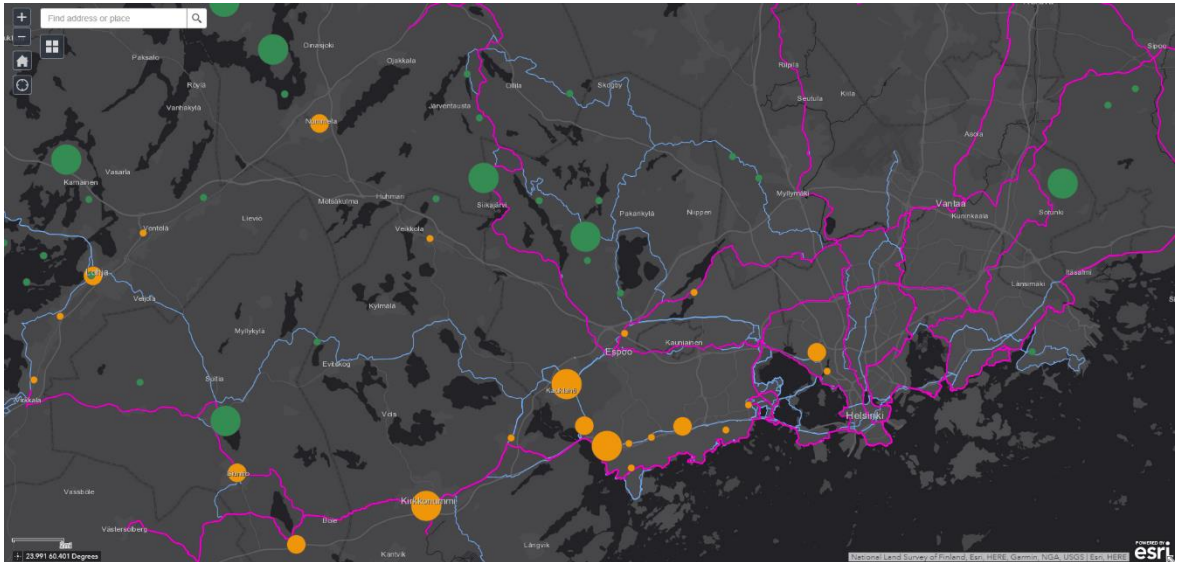
The full Guide may be viewed as the web app's screenshots in Appendix 3. Ride Eat Sleep How To Ride It Guide.

When both the web app and the guide were ready to be tested in real travel conditions, the letters were sent to the testing group. The next steps were: to explore the guide, to browse to the web app link via their phones, to set a quick access from a phone's home screen and to fill in the feedback form after the app is used.

### 3.5 Testing and feedback

The testing phase was meant to be done by the Test Group I cyclists in real travel conditions in South-Western Finland. It was recommended to participants to use other means of navigation rather than the Ride Eat Sleep app that must be used only for testing purposes and cannot be fully relied upon for safety reasons. It was also stressed how important is it to use common sense when exploring mapped routes and approaching points on the map.

It was highlighted in the Guide that the map displays routes and paths designated or suitable for cycling. They were also told the data comes from different sources: Open Street Map community, Helsinki Regional Transport Authority (HSL) open road data, Helsinki Map Service, and others. And that the guide doesn't cover all the existing cycling routes but simply aims to offer an overview of main cycling paths.



Picture 18. The Ride Eat Sleep App screenshot from a desktop.

The guide also provided other useful information:

It is advisable to use common sense when following displayed routes and approaching resupply/rest stops. Roadworks, weather, constructions, accidents, road network changes may affect their suitability for cycling.

Resupply and rest stops datasets do not include all the existing entities but chosen ones to map a reachable infrastructure in mostly remote and sparsely populated areas for a traveling cyclist to get basic needs covered: food and rest. It is advisable to keep in mind that working hours may change, and something might be out of date.

The places chosen to be displayed on the map is a testing group of possible POIs (points of interest) needed for comfortable cycling travel experience. For the sake of simplification and feasibility, at this point, the data displayed is limited and offers only a few of all available options in the area. Please be advised to explore the areas you're traveling through by yourself. If you see several resupply spots close by, it usually means that there are more places in proximity that you may find useful.

Please note that due to technical limitations there is no routing tool in the app so far. You have the freedom to follow or not displayed cycling routes, to visit places marked if they happen to be on your way. The aim of the app by now is to simply give you a visible infrastructure in seemingly blank remote areas.

(Arbenina 2018)

During the summer cycling season of 2018, it was reported that the Test Group I was partly unavailable for testing the app on the road due to change of travel plans. Using personal contacts in cycling travel communities I found replacements for the missing participants. Part of the Test Group II went traveling to Finland and tested the app while navigating. Other participants tried out the app for planning purposes and shared their feedback from that perspective. Additionally, several other Finland based cyclists made short one day trips hitting the mapped roads and a few shelters on the way.

Though the feedback form embedded to the Guide app was focused mainly on features of the Ride Eat Sleep App and its use by a test group, it also covered general navigation issues of cycle travel due to the Test Group II being partly different from the Test Group I. That was an opportunity to collect more user insights combining both groups' responses and rely upon them for future development. The feedback form can be seen in Appendix 4. Ride Eat Sleep Web App Feedback Form.

The testing phase took place between August and October 2018 when cyclists traveled, accessed the app, and shared their experience and thoughts.

The cyclists testing the app on the road were contacted several times during their trips to ensure they were doing well and advice on technical issues. I stayed in contact with them during the project course via social media and personally met two travelers in Helsinki where they were offered incentives for participation (meals). Additional verbal feedback was given on those meetings and considered as the project outcome.

Some similar observations were found in Test Group II's written and verbal responses, which could be of use when developing the prototype into a mobile application. They noted the prototype was lacking shelter and shops differentiation: what kind of shelter facilities were presented (cooking/sleep shelter, restroom, firewood, etc.), shop types for those not familiar with Finnish shop brands. They also noted more route information would be of use if supplemented with the feature to add/remove detailed routes. While the color scheme of the map was perceived positively, the blue colored routes were found a bit confusing due to them resembling rivers. The classic mapping practices in terms of symbolizing and coloring must be implemented when developing an app for an audience used to paper maps.

The legend feature was purposefully omitted when prototyping to avoid the map being cluttered with excess details. Turned out, it was missed by one of the cyclists and could be added to clarify the map symbols. Some minor technical issues like troubles with

locating a device via My Location button were experienced but the phone settings were to blame. These troubleshooting recommendations were added to the Guide for the next users to be aware of.

Of note, the changing basemaps feature was received very well, pointing out the OpenStreetMap basemap being the most informative and useful for planning purposes. The concept, in general, got positive reviews though some highlighted the need of additional info crucial for cycle travel such as water sources or just giving a fresh perspective such as local events when going through places.

It was also emphasized that the basic purpose of the app would be, as it had been expected when prototyping, to complement classic means of navigation as paper maps or to get basic needs covered as routes and accommodation while leaving the entertainment and exploring local sights and cultural attractions to users themselves. Apps as Ride Eat Sleep prototype are needed mostly to map non-urban rural spaces with infrastructure and info available about it to make the travel comfortable and stress-free.

The full responses of the Test Group II may be found in Appendix 5. Test Group II App Feedback.

## **4 Development of mapping solutions to facilitate alternative travel practices**

When thinking about GIS and geospatial technologies in general, the possible implementations of them in the travel and tourism industry are so wide that cannot be comprehended and described just by one academic paper. For the purpose of this thesis, the non-coding digital mapping solutions were chosen to be discovered and tested. In particular, ArcGIS desktop software and online tools giving handy instruments to visualize location data for travel navigation and present it to end-users. Additionally, the tools can be used to bring together geospatial data for planning and implementing low-carbon sustainable strategies towards less impactful travel practices.

For the geoprocessing and analysis purpose, the ArcGIS tools might be used to measure accessibility through sustainable mobility infrastructure available to active transport users in Finland. In practice it means, that thoroughly collected and mapped, the road and other location data describing sustainable mobility options such as cycling, walking, hiking might be visualized, measured, and considered when developing travel facilities in the region: routes and trails, wilderness huts and lean-to shelters, commercial facilities like campgrounds and hotels.

This data, when visualized in detail, can be of use when making decisions of what areas demand the development, to what areas tourists must be drawn and where new attractions should be created. Also, where local businesses need to be supported to give tourists minimum required supplies to facilitate their presence and make them contribute to the local economy.

From the local perspective, transportation and tourism authorities of Finland seemingly lack this data visualized. This needs to be investigated in order to spread the main tourist flows from Helsinki to remote areas. In turn making them attractive by providing tourists with general travel facilities and creating pulling attractions.

But creation of more facilities and building more roads and trails should not be the main and only outcome. The existing travel infrastructure must also be visualized to fill in blank areas on a map thereby giving travelers a context and an overview of their surroundings based on their specific needs.

When considered from an end-user perspective, ArcGIS tools are affordable technological solutions to change one's travel experience. A hotel, as an example, may use the tools to create tailored large-scale maps to navigate guests around the hotel location to access chosen attractions and affiliated services, with which it can be partnered up to boost local services cooperation for mutual economic benefits. A guest of a hotel might be guided to dine at certain pre-mapped restaurants or to use certain pre-mapped coworking facilities, car/bike rental services, and shops. The main advantage of these tools is their simplicity and that even with limited resources it is possible to develop an application for guests to change their perspective and travel experience while providing a modern technological solution instead of dusty and outdated paper maps. Smart technologies don't have to be extremely expensive to be usable.

Using ArcGIS capacities, we can change the existing travel patterns and facilitate more environment-friendly travel habits while contributing to the holistic customer experience. The experience that is based on customer-relevant sustainable product design principles and is able to encourage sustainable travel behavior (Font & McCabe 2017, 875-878). Easy-to-use navigation tools like the one prototyped for the purpose of this thesis may create tailored travel experiences for cyclists, hikers, backpackers, one-day visitors, even business travelers in the Nordic countries.

From a perspective of DMO, the tools might be used to create applications to offer tourists diverse travel paths pulling them from overcrowded attractions and city streets offering curated sets of routes and POIs and guiding them towards less impacted areas and promoting zero-impact practices. Pre-mapped experiences be that cycling tours around the city for all ages and physical capabilities, hiking trails for families, or bar-hopping for youngsters, are usually welcomed and searched upon actively. And since more and more people nowadays rely on their smartphones for navigation, tourist info points must offer tailored sets of apps instead of printed maps and brochures wasting paper and ending up in trash cans at best.

There is a reason why there need to be several tailored apps complementing general data sources like Google Maps that almost every traveler has on its phone. The lack of simplicity and the overwhelming amount of data make this big data sources time-consuming to use. The data is often shown if only searched upon, apps are exclusive and hard to comprehend leaving out big groups of travelers that aren't used to mobile technologies or aren't aware of their own preferences.

Thus, with digital tools like ArcGIS both can be done: the tourism industry's potential can be mapped, visualized, measured against sustainability goals, and data infrastructure may be created to engage and guide end-users while ensuring the region development with environmental and community wellbeing in mind.

These tourism products in a form of navigation applications may have a real impact on the travel practices of tourists and commuters. Especially if more advanced technologies implemented allowing multi-modal trip planning, integrated with on demand mobility options such as bike sharing and real-time transport data access, as well as crowdsourcing the data and providing the travellers with financial incentives for using alternative modes or routes. (Franckx & Mayeres 2015, 2016.) For example, discounts or bonuses for cyclists using services along their routes that would influence their travel choices.

It was globally agreed that people-centered universal agenda of placing people first and facilitating sustainable tourism that creates jobs and promotes local culture has transformational potential on livelihoods and prosperity in rural communities as well as on balanced urban sprawl (Schwab et al. 2017).

The project planned and executed resonates with global SDGs and human-centered mobility trends. The application prototyped and tested is a practical example of how even simple-to-implement digital mapping tools could be a change that even a small and restricted in resources business, service, DMO, local transportation or tourism organization may execute to guide travelers and local commuters to routes and places that lack them and may offer specific experiences that are safe and beneficial to those who travel and host.



## 5 Appendices

### 5.1 Appendix 1. Preliminary qualitative research questionnaire

“ Hi there) First I'd like to introduce myself so you know that there's a real person behind this project.

My name is Maria Arbenina and I'm a student of Haaga-Helia UAS in Helsinki writing my thesis related to developing opportunities for the cycling tourism in the Nordic countries. It's titled as "How to map alternative travel patterns that benefit environment and communities of the Nordic countries using geospatial technologies". In other words, I want to use modern mapping tools to show how to facilitate traveling on a bike in the region.

The project is meant to be more than just a thesis paper. And I hope one day to use my findings to facilitate the so-called Nordic Cycling Network to make traveling on a bike in the region more comfortable, enjoyable and safe.

Glad to have you on board ;)

[Continue](#) press ENTER

1+ Type your name here so I could ask you later via Facebook if I have some additional question.


0 of 9 answered Powered by Typetorm

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[Continue](#) press ENTER

1+ Type your name here so I could ask you later via Facebook if I have some additional question.

And let's get started;) When do you plan to go to Finland for your trip? Approximately,




0 of 9 answered Powered by Typetorm

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2+ Where would you like to go to Finland?

Any info helps me to get insights for your trip. Your possible starting point, planned destinations, an approximate route you'd like to cover. The more precise info you can give, the better. But don't worry if you don't know it yet, just draw an area of your interest to me. Let's say Åland islands, or Turku Archipelago, or Helsinki to Porvoo and back. Like that.



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3 → What is your normal pace? The average km/day you feel comfortable to cover. (That's me on the pick and I'm pretty slow, so don't hesitate to tell me your speed preferences, it's not a matter of competing. I need it to draw an area of your possible reach around your route).



0 of 9 answered

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4 → How do you usually navigate yourself? What apps do you use? Do you follow road signs or bring a paper map on a trip? And one more thing: what info/features you feel like you lack from using your usual apps/maps?



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5 → Here I'd like to hear about your travel experience so far in terms of possible navigation issues you might had before. If you were not able to find a place to sleep nearby, missed a turn and ended up in the middle of nowhere, needed to catch a bus to go through a no-bikes-allowed tunnel (happened to me). Things like that or anything you find related.



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6 → How do you prefer to camp? Wild camping, bed&breakfast/hotels, warmshowers? I'm asking that because I'll be looking for free/discounted accommodation options along your route.



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0 of 9 answered

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7 → What kind of attractions are you interested in? Scenic views, historic sights, weird things to look at, local events, off-bike activities?



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8 → What is the biggest struggle you have traveling on a bike? Or maybe it's easier for you to describe a perfect cycling experience you'd like to have. Feel free to express your thoughts.



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9 → What do you expect from your planned trip to Finland? How do you think it's going to be for you there?

0 of 9 answered

Powered by Typeform



8 → What do you expect from your planned trip to Finland? How do you think it's going to be for you there?

This is the last one, so you can type here any other additional info you find interesting. Thank you and see you in Finland this summer! ;)



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OK ✓ press ENTER

0 of 9 answered

Powered by Typeform



## 5.2 Appendix 2. Preliminary research, Q&A, Test Group I

Test group	<p>Where would you like to go to Finland? Any info helps me to get insights for your trip. Your possible starting point, planned destinations, an approximate route you'd like to cover. The more precise info you can give, the better. But don't worry if you don't know it yet, just draw an area of your interest to me. Let's say Åland islands, or Turku Archipelago, or Helsinki to Porvoo and back. Like that.</p>	<p>What is your normal pace? The average km/day you feel comfortable to cover. (That's me on the pick and I'm pretty slow, so don't hesitate to tell me your speed preferences, it's not a matter of competing, I need it to draw an area of your possible reach around your route).</p>
Cyclist 1	<p>Riding from Nordkapp &amp; should be following the route down the western part of Finland next to the Gulf of Bothnia &amp; then plan to visit the Turku Archipelago, before heading to Helsinki &amp; then onwards to Estonia</p>	<p>100km a day, but like taking rest days along the way when needed or I see places I like</p>
Cyclist 2	<p>Helsinki-Oulu via Finlandia</p>	<p>60</p>
Cyclist 3	<p>from Helsinki to Turku Archipelago</p>	<p>60-70km per day</p>
Cyclist 4	<p>Helsinki to Turku by the coast Since I'm coming from Estonia, my starting point will definitely be in Helsinki. I really want to see the Barents Sea, so I will be heading north possibly via eastern Finland, because I want to see the periphery of the country. Destination in Norway is possibly Bugoynes.</p>	<p>60 -90 km If I do this solo (most likely) I will probably average around 15 km/h and 100-150km per day. If my girlfriend decides to come along, it will probably be an average of 12km/h and 90-120/day.</p>
Cyclist 5		
Test group	<p>How do you usually navigate yourself? What apps do you use? Do you follow road signs or bring a paper map on a trip? And one more thing: what info/features you feel like you lack from using your usual apps/maps?</p>	<p>Here I'd like to hear about your travel experience so far in terms of possible navigation issues you might had before. If you were not able to find a place to sleep nearby, missed a turn and ended up in the middle of nowhere, needed to catch a bus to go through a no-bikes-allowed tunnel (happened to me;). Things like that or anything you find related.</p>
Cyclist 1	<p>I've settled on using Komoot for route planning + navigation &amp; also record my route on Strava. I use a iPhone 6 charged via a Son28 dynamo &amp; keep iPhone in a Ortlieb smartphone case on top of handlebar bag. I've not used Komoot recently, but they added more points of interest &amp; maybe this area could be Improved with more local knowledge</p>	<p>Sometimes Komoot routes you on roads of tracks that are not suitable for bikes! Google Maps is worse in this respect &amp; advice of help in making sure the route you are following is good for a road bike &amp; making sure tunnels etc. are okay for bikes</p>
Cyclist 2	<p>Street/bike route signs, phone maps</p>	<p>Lost trail signage and went the wrong way for a few kms</p>

Cyclist 3	<p>I use maps.me, Google maps, Komoot, iOverlander combined. the first two for daily navigation, Komoot for road and elevation info, and the last one for camping spots, highlights, points of interest. iOverlander is good, better than using nothing but it would be really great to combine all of those apps' features into one application</p>	<p>most navigation tools I used were not really designed for cycling, and if so not for touring. yes, many times I ended up on a horrible highway without a way out, other times the map was not recognizing some path as suitable for bicycle while it was perfectly good to go on</p>
Cyclist 4	<p>Garmin edge tour, phone, free paper maps from local tourist offices</p> <p>When touring in Europe I used OsmAnd almost all the time. We were pretty satisfied with it, but the shops system could have been better. The elevation lines are really great as well, but probably won't be an issue in Finland. If you want to take on the whole Scandinavia, then you should add the possibility of elevation lines as well.</p>	<p>Never had a navigation problem. Stop when tired and Sleep in tent</p>
	<p>Another feature that we loved in Spain is what google had for cycling routes on google maps was elevation profile. When going through mountains it is sometimes pretty good to take a good look at elevation profiles of different routes. But again, I guess it's not really necessary in Finland.</p>	<p>Haven't really had such problems that could be avoided other than the tunnel thing. It is very important to mark the tunnels through which you can't cycle. We had to do a 300m climb plus go 15 km around to get past a tunnel that we weren't allowed to cycle through. Marking the tunnel lengths/lighting would be nice as well, because in Montenegro this was a really big issue: unlit long tunnels with huge potholes all over the road.</p>
Cyclist 5	<p>As far as maps go in general for a tour only in Finland I would not mind using paper map, but the more countries the tour involves, the more trouble it would be to get good paper maps, so I used OsmAnd to cut costs and save myself trouble. In short: both are fine, just multi country touring is easier with apps.</p>	

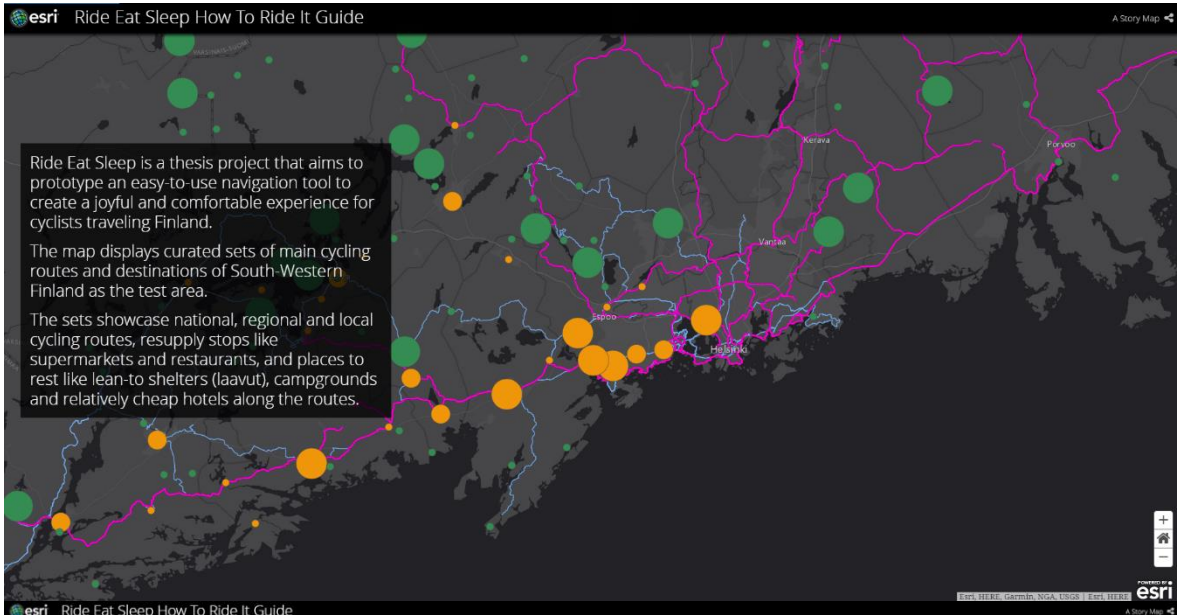
Test group	How do you prefer to camp? Wild camping, bed&breakfast/hotels, warmshowers? I'm asking that because I'll be looking for free/discounted accommodation options along your route.	What kind of attractions are you interested in? Scenic views, historic sights, weird things to look at, local events, off-bike activities?
Cyclist 1	Wild Camping mostly, but also have used campsites, Warmshowers & Airbnb	Scenic views, historic sights. I'm a keen photographer, so help in finding the better route for great photo opportunities would be good
Cyclist 2	Wild camping, campsites & hostels	Nature, historical sights and whatever weird thing I find by accident
Cyclist 3	wild camping on daily basis and camping spots or budget hostel once in a couple of days to take a shower ;)	scenic views, wildlife, weird things to look at, escape into nature, but also nice little towns and interesting non-touristic points in the cities
Cyclist 4	Tent, wild camping, campsite. Hotels in big cities.	Yes, the above
Cyclist 5	Definitely prefer wild camping over anything else. Occasionally I like to use Airbnb to get washed up and charge powerbanks. Warmshowers is a great way to meet fellow cyclists as well, but not very fitting to me since I can't stand planning my route too far ahead.	I'm mostly drawn to scenic views and backcountry places like roads going through small and maybe even forgotten villages. I really enjoy border areas of countries because they are usually not so well developed and more wild. That's what I enjoy.
Test group	What is the biggest struggle you have traveling on a bike? Or maybe it's easier for you to describe a perfect cycling experience you'd like to have. Feel free to express your thoughts.	What do you expect from your planned trip to Finland? How do you think it's going to be for you there? This is the last one, so you can type here any other additional info you find interesting. Thank you and see you in Finland this summer! ;)
Cyclist 1	In foreign countries I've sometimes struggled to find the types of food I like to eat or cook & also struggled to find shops that sell the screw top butane stove cartridges. My ideal cycling day would end with a wild camping spot with great views 🍷👍	After the Norway coast, I think it might be a log of flatter roads with plenty of lakes & forests. I hope the biting insects aren't as bad as in Scotland! Do you have midges?

Cyclist 2	Biggest struggle: TRAFFIC! Ideal would be quiet country tracks, marked off-road cycle paths through a stunning area (e.g. Alps2Ocean Trail, New Zealand)	I expect quiet countryside, meeting few but interesting people, immersing into natural landscapes and finding the odd hidden gem.
Cyclist 3	in my experience there was always some struggles and they came a bit unpredicted because every place I have visited so far had some specific to itself challenge. I believe it's a part of the journey. I never toured in Finland yet and it's a bit hard to say what would be the biggest struggle, but what I might be afraid it's the climate. maybe a useful app feature would be also a weather warnings?	I visited Finland before (not on a bike) and certainly the country has to offer extraordinary natural beauty. so, I expect that for sure. while my visit I also noticed and used some free wild facilities like fire place-huts with supplied wood, outdoor saunas just in the middle of nature. it would definitely be great to know where they are and plan the trip around them. besides, the reason I mostly like cycle touring is the ability to discover a new place from a different perspective, not only jumping from a hot spot to another from your guide book but the chance to see what's in between those spots, where the real normal life happens.
Cyclist 4	No struggle really. I cope with everything and always manage, never complain	It will be good. Finns are not stressful. I'm looking forward to the islands, just not sure about cycling routes through the archipelago.
Cyclist 5	My biggest struggles are gear related which is not really relevant for your survey I guess. The cycling part I really enjoy. I guess the hardest thing for me would be to cycle for a long period of time without eating, I get really dizzy. So, having shops at reasonable intervals is nice. But perfect cycling scenario is cycling on a small country road, ideally unpaved road through scenic forest or next to a river. Something like that.	I expect to see vast forests which I really love and loads of lakes. I am sure I will have a good time and I will probably feel at home, because Finland is not too different from Estonia. I hope I helped and if you have any additional questions, feel free to ask me.



### 5.3 Appendix 3. Ride Eat Sleep How To Ride It Guide





Ride Eat Sleep is a thesis project that aims to prototype an easy-to-use navigation tool to create a joyful and comfortable experience for cyclists traveling Finland.

The map displays curated sets of main cycling routes and destinations of South-Western Finland as the test area.

The sets showcase national, regional and local cycling routes, resupply stops like supermarkets and restaurants, and places to rest like lean-to shelters (laavut), campgrounds and relatively cheap hotels along the routes.

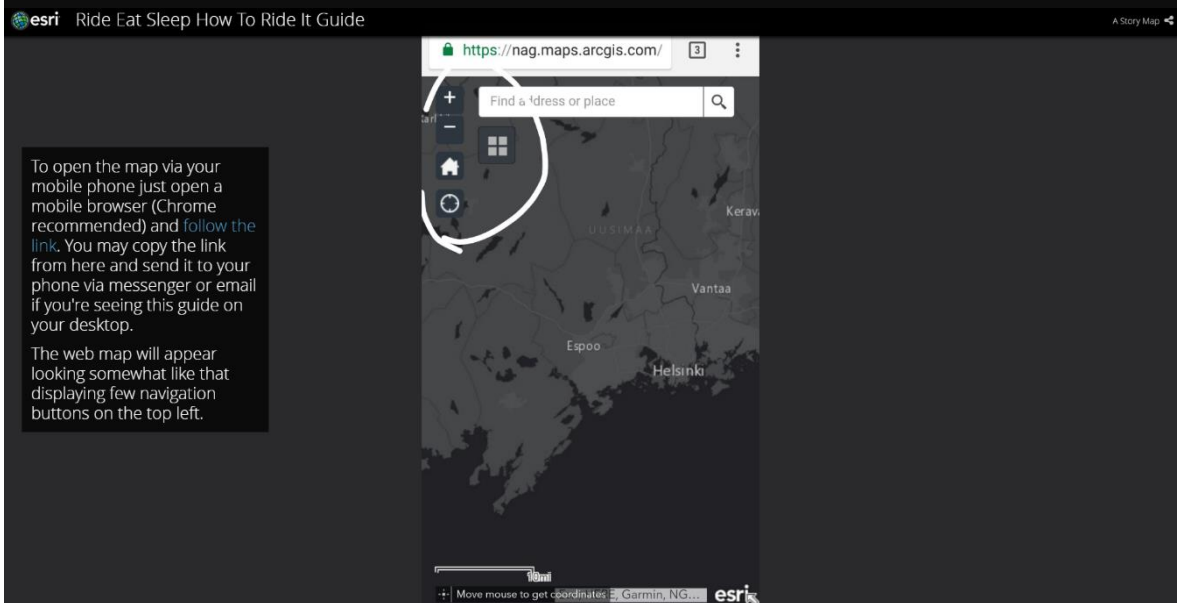
The map displays routes and paths designated or suitable for cycling. The data comes from different sources: Open Street Map community, Helsinki Regional Transport Authority (HSL) open road data, Helsinki Map Service, and others. It doesn't cover all the existing cycling routes but simply aims to offer an overview of main cycling paths.

It is advisable to use common sense when following displayed routes and approaching resupply/rest stops. Roadworks, weather, constructions, accidents, road network changes may affect their suitability for cycling.

Resupply and rest stops datasets do not include all the existing entities but chosen ones to map a reachable infrastructure in mostly remote and sparsely populated areas for a traveling cyclist to get basic needs covered: food and rest. It is advisable to keep in mind that working hours may change and something might be out of date.

The places chosen to be displayed on the map is a testing group of possible POIs (points of interest) needed for comfortable cycling travel experience. For the sake of simplification and feasibility, at this point, the data displayed is limited and offers only a few of all available options in the area. Please be advised to explore the areas you're traveling through by yourself. If you see several resupply spots close by, it usually means that there are more places in proximity that you may find useful.

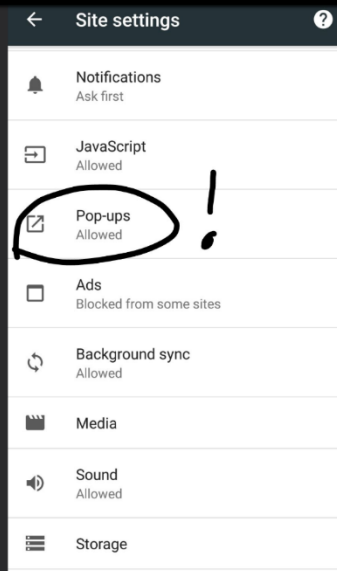
Please note that due to technical limitations there is no routing tool in the app so far. You have a freedom to follow or not displayed cycling routes, to visit places marked if they happen to be on your way. The aim of the app by now is to simply give you a visible infrastructure in seemingly blank remote areas.



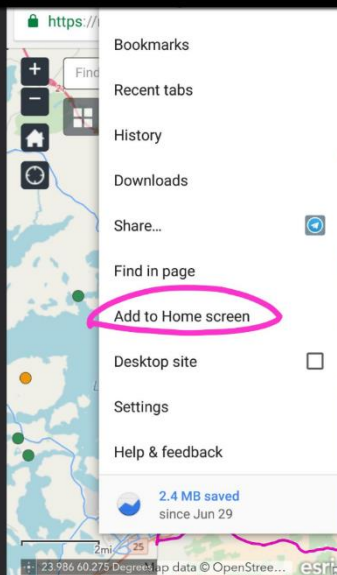
To open the map via your mobile phone just open a mobile browser (Chrome recommended) and follow the link. You may copy the link from here and send it to your phone via messenger or email if you're seeing this guide on your desktop.

The web map will appear looking somewhat like that displaying few navigation buttons on the top left.

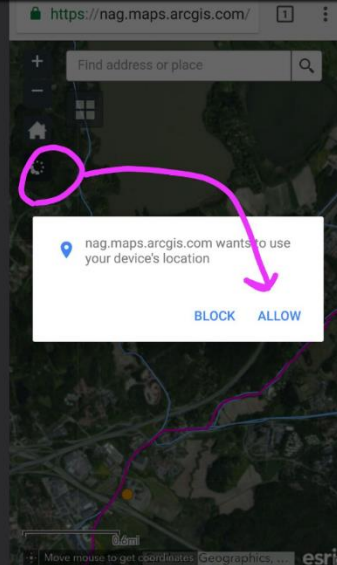
Before continuing with exploring the map it is highly advisable to make sure that Pop-ups are allowed in the site settings of your browser. Otherwise, you won't get proper experience using the map ;)



Then for your convenience, it's recommended to add the page to your phone's home screen. This way you may use the web map like any other app on your phone—easy and fast.

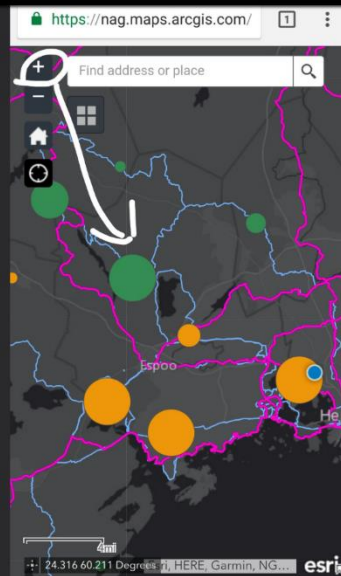


Try to hit the My Location button and allow the website to know your location. You may change it later in the browser settings if you need. Now you can always easily locate yourself on the map to explore what's around you.



When you're ready to explore the map try to zoom in and pan the map. As you zoom in or out of the map, the map extent changes, providing you with more or fewer details.

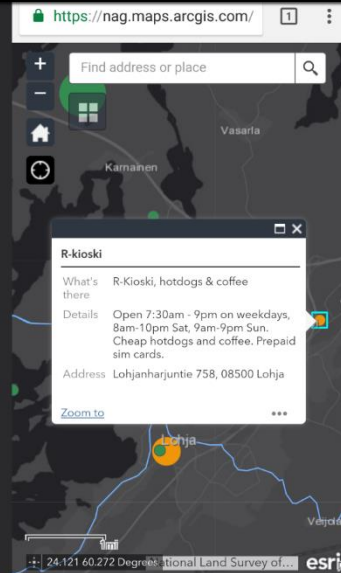
You'll see colorful bubbles and dots, green and yellow. Try to tap them.



The small dots give you location info in pop up windows.

Yellow ones are resupply stops (supermarkets and cafes), locations where you can get food and sometimes get to use restrooms.

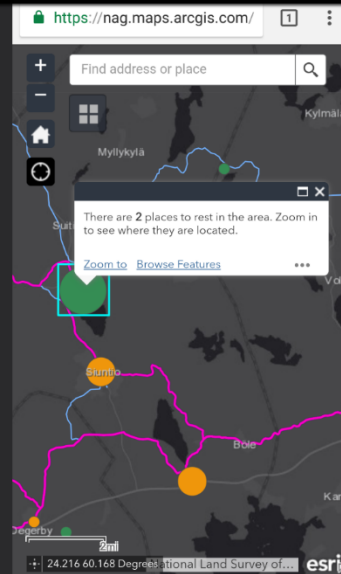
Green ones are places to rest or sleep: lean-to shelters (laavut) with wood and fireplaces, few hotels, some campgrounds.



The big bubbles (or clusters) give you an overview of the area, suggesting that there are few places in there, 2 and more.

You may tap the clusters and see how many of them are in the area, then zoom to and locate them.

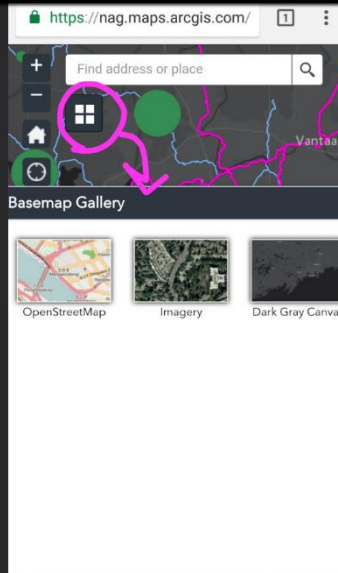
Or you just zoom in with navigation buttons or your fingers to explore the area closer.



Here is another feature that might be useful. Tap a basemap gallery icon and change the simplified and clear Dark Gray Canvas basemap to another one.

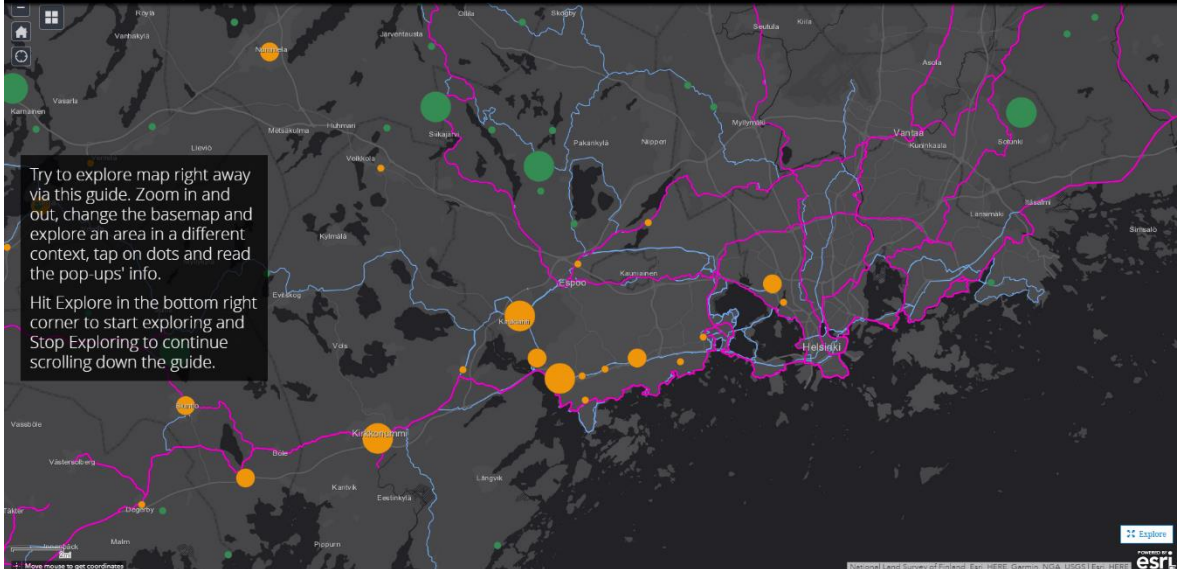
OpenStreetMap gives you more rich context and additional POIs, routes, and other geographic data that's crowdsourced and gets contributed and updated by the huge OSM community.

Imagery provides satellite and aerial imagery contributed by Esri, DigitalGlobe, Earthstar Geographics and others. Changing basemaps you change your perspective of the area. Try it!

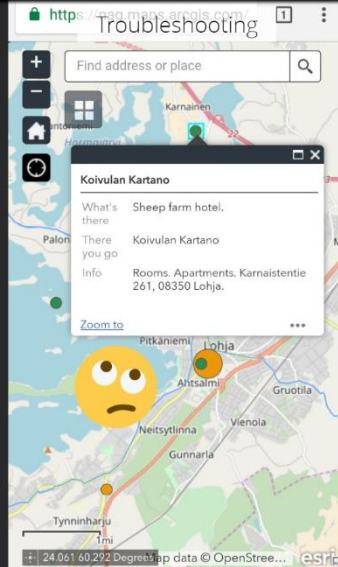


Try to explore map right away via this guide. Zoom in and out, change the basemap and explore an area in a different context, tap on dots and read the pop-ups' info.

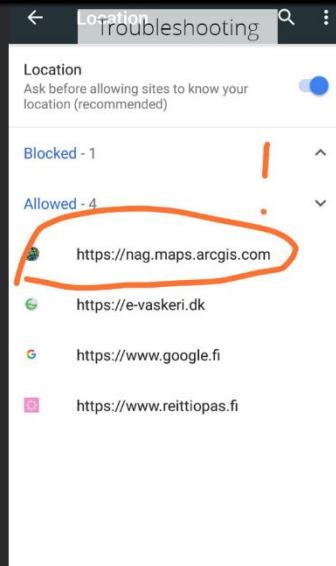
Hit Explore in the bottom right corner to start exploring and Stop Exploring to continue scrolling down the guide.



If you have problems with opening pop-ups with info about places on your mobile phone, please check if pop-ups are allowed in the browser settings.



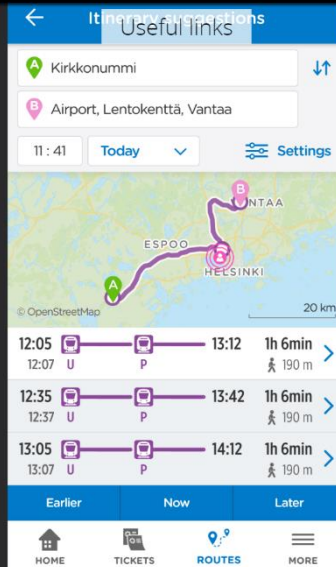
If you have troubles with locating yourself on the map, please check in the browser settings if the site is allowed to know your location.



There are several apps I would suggest to use while traveling in Southern Finland despite you testing the Ride Eat Sleep app's prototype. Except having must have Google Maps on your phone, I'd recommend installing OsmAnd for navigating yourself. This one has lots of options to configure your maps, navigate, and use maps offline.



If you start or finish your trip in Helsinki metropolitan area you might want to catch a ride on a commuter train with your bike. Using HSL app you can plan your trip and buy a single or a day ticket for public transport in and around Helsinki.







Following this link, you can find a feedback form that you may use for sharing your experience with the app and your general thoughts about cycling navigation issues. You can also click Explore in the bottom right corner and fill it in right here.

I'm looking forward to learning about it!

Have fun out there!

“ Hi there) Thanks for helping me to figure out the way to make travel experience of cyclists in Finland more enjoyable, easy and safe. Please use this form to let me know what do you think of the app concept, it's usefulness for your travel, your cycling travel experience in general and any navigation issues/needs you've encountered so far. Let's get it started. What do you think about having a map of places to sleep/rest and resupply/eat in the area you're traveling?

[Continue](#) PRESS ENTER

- 1\* Would it be useful for you to have places to explore/visit marked on the map? What kind of places? Example: general tourist attractions, bike shops/services, museums, swimming pools, libraries, active holiday services like kayaking, paddling, etc.

Type your answer here...

0 of 9 answered

Powered by [Typeform](#)

[Explore](#)



## 5.4 Appendix 4. Ride Eat Sleep Web App Feedback Form

Hi there) Thanks for helping me to figure out the way to make travel experience of cyclists in Finland more enjoyable, easy and safe. Please use this form to let me know what do you think of the app concept, it's usefulness for your travel, your cycling travel experience in general and any navigation issues/needs you've encountered so far. Let's get it started. What do you think about having a map of places to sleep/rest and resupply/eat in the area you're traveling?

[Continue](#) press ENTER

1 → Would it be useful for you to have places to explore/visit marked on the map? What kind of places? Example: general tourist attractions, bike shops/services, museums, swimming pools, libraries, active holiday services like kayaking, paddling, etc.

Type your answer here...

SHIFT + ENTER to make a line break

---

0 of 9 answered Powered by Typeform

about having a map of places to sleep/rest and resupply/eat in the area you're traveling?

[Continue](#) press ENTER

1 → Would it be useful for you to have places to explore/visit marked on the map? What kind of places? Example: general tourist attractions, bike shops/services, museums, swimming pools, libraries, active holiday services like kayaking, paddling, etc.

|

SHIFT + ENTER to make a line break

2 → Was it easy for you to use the map in terms of having clear features and navigation buttons? What kind of features did you miss that would be really useful but still not making the app overcomplicated?

Type your answer here...

SHIFT + ENTER to make a line break

---

3 → If you changed the basemaps while using the map did another

0 of 9 answered Powered by Typeform

special, less technical, more regular user needs, museums, swimming pools, libraries, active holiday services like kayaking, paddling, etc.

Type your answer here...

SHIFT + ENTER to make a line break

2 → Was it easy for you to use the map in terms of having clear features and navigation buttons? What kind of features did you miss that would be really useful but still not making the app overcomplicated?

SHIFT + ENTER to make a line break

3 → If you changed the basemaps while using the map did another basemap give you a different context/perspective of the area? Did you find something useful with this feature? Like unexpected route or a water source, grocery store or an interesting place to visit?

Type your answer here...

SHIFT + ENTER to make a line break

---

0 of 9 answered Powered by Typeform

Type your answer here...

SHIFT + ENTER to make a line break

- 3 → If you changed the basemaps while using the map did another basemap give you a different context/perspective of the area? Did you find something useful with this feature? Like unexpected route or a water source, grocery store or an interesting place to visit?

SHIFT + ENTER to make a line break

- 4 → If you visited some places of the map to eat or to get some rest, what was your experience there? Be as much specific as you want)

Type your answer here...

SHIFT + ENTER to make a line break

- 5 → If you followed some of the routes of the map what was your experience? Did you find it useful to have marked only some major bike routes or you felt the need to have as much bike network as possible before your eyes?

0 of 9 answered

Powered by Typeform

- 3 → If you changed the basemaps while using the map did another basemap give you a different context/perspective of the area? Did you find something useful with this feature? Like unexpected route or a water source, grocery store or an interesting place to visit?

Type your answer here...

SHIFT + ENTER to make a line break

- 4 → If you visited some places of the map to eat or to get some rest, what was your experience there? Be as much specific as you want)

SHIFT + ENTER to make a line break

- 5 → If you followed some of the routes of the map what was your experience? Did you find it useful to have marked only some major bike routes or you felt the need to have as much bike network as possible before your eyes?

Type your answer here...

SHIFT + ENTER to make a line break

0 of 9 answered

Powered by Typeform

- 4 → If you visited some places of the map to eat or to get some rest, what was your experience there? Be as much specific as you want)

Type your answer here...

SHIFT + ENTER to make a line break

- 5 → If you followed some of the routes of the map what was your experience? Did you find it useful to have marked only some major bike routes or you felt the need to have as much bike network as possible before your eyes?

SHIFT + ENTER to make a line break

- 6 → Was the symbology clear enough? I mean colorful bike routes (pink for national cycle routes, blue/green for regional/local) and contrast POIs (yellow/green dots for resupply/sleep places).

Type your answer here...

SHIFT + ENTER to make a line break

- 7 → If you used other apps to navigate yourself what was your

0 of 9 answered

Powered by Typeform

major bike routes or you felt the need to have as much bike network as possible before your eyes?

Type your answer here...

SHIFT + ENTER to make a line break

6 → Was the symbology clear enough? I mean colorful bike routes (pink for national cycle routes, blue/green for regional/local) and contrast POIs (yellow/green dots for resupply/sleep places).

Type your answer here...

SHIFT + ENTER to make a line break

7 → If you used other apps to navigate yourself what was your experience with them? Did you feel the lack of something using them? Some data or app features maybe? You can describe here your perfect navigation app as you see it ;)

Type your answer here...

SHIFT + ENTER to make a line break

0 of 9 answered

Powered by Typeform

(pink for national cycle routes, blue/green for regional/local) and contrast POIs (yellow/green dots for resupply/sleep places).

Type your answer here...

SHIFT + ENTER to make a line break

7 → If you used other apps to navigate yourself what was your experience with them? Did you feel the lack of something using them? Some data or app features maybe? You can describe here your perfect navigation app as you see it ;)

Type your answer here...

SHIFT + ENTER to make a line break

8 → Feel free to express any other thoughts on navigation while bike touring related to the app or not.

Type your answer here...

SHIFT + ENTER to make a line break

9 → If you don't mind me contacting you with additional questions about your experience, please let me know what is the best way

0 of 9 answered

Powered by Typeform

...you have other apps to manage your own navigation experience with them? Did you feel the lack of something using them? Some data or app features maybe? You can describe here your perfect navigation app as you see it :)

Type your answer here...

SHIFT + ENTER to make a line break

8 → Feel free to express any other thoughts on navigation while bike touring related to the app or not.

SHIFT + ENTER to make a line break

9 → If you don't mind me contacting you with additional questions about your experience, please let me know what is the best way to do that. A messenger, or an email, or any other channel.

Type your answer here...

SHIFT + ENTER to make a line break

0 of 9 answered

Powered by Typeform

SHIFT + ENTER to make a line break

8 → Feel free to express any other thoughts on navigation while bike touring related to the app or not.

Type your answer here...

SHIFT + ENTER to make a line break

9 → If you don't mind me contacting you with additional questions about your experience, please let me know what is the best way to do that. A messenger, or an email, or any other channel.

SHIFT + ENTER to make a line break

OK ✓ press ENTER

0 of 9 answered

Powered by Typeform

## 5.5 Appendix 5. Test Group II App Feedback

Would it be useful for you to have places to explore/visit marked on the map? What kind of places? Example: general tourist attractions, bike shops/services, museums, swimming pools, libraries, active holiday services like kayaking, paddling, etc.

Was it easy for you to use the map in terms of having clear features and navigation buttons? What kind of features did you miss that would be really useful but still not making the app overcomplicated?

libraries, water taps, historical or cultural sights

has all it needs, easy enough :)

All of these places you mention. As for my basic accommodation needs, detailed information regarding campsites, type (small/rural/large/price/facilities) would be useful. Maybe the sign for this could be a green triangle (for ridge tent) as well as the green circle?

As I am a new user of any tablet or online travel app, google being my only use before now. This was a learning experience for me as a novice coming from traditional sources, i.e. paper maps. Once I had played around a little with the map and features I did find it easy to use. Colour differentiation was good and made it easy to distinguish points of interest. I would have liked maybe a legend pop up that I could use to tell me what certain things meant, type of road, trail or path if I needed reminding or more detail. I found the features and so on easier to use when the tablet was accessing better internet reception, but that is to be expected. In any case if I were to go cycle touring I would plan in advance my main needs to anticipate some total app/phone failure or breakage, reverting back to phone free/old school touring if needed. I liked the ability to switch between basemaps.

Mainly I seek good accommodation, which for me is small campsites, farm campsites or even somewhere with minimal facilities for the night to camp. My other basic need will be finding food, a market or a supermarket. Points of interest for me include archaeological sites, historical sites, places to swim outdoors in summer. For emergencies I would like to be able to find a pharmacy or a bike shop. Primarily my cycle tours involve being in nature without going to large cities. As I am a traditional cycle tourist using paper maps I do tend to prepare before I go, but not too much as I like to leave an element of chance. An app would help to reduce the likelihood of having difficult situations though. I would also like to find out during a cycle tour if there are any special social events going on locally such as a music or cultural festival so that I can meet local people socially without missing a good night out!

Yes. general tourist attractions, bike shops/services, museums, groceries stores.

I was able to use the app guide and access the map on a desktop, but not on a phone. On the desktop I felt the map was well presented and I could clearly identify what was on the map. Additional features for me would be able to record my preferences, have it emailed to me so that I can print it off for backup.

Altimetric road profile

If you changed the basemaps while using the map did another basemap give you a different context/perspective of the area? Did you find something useful with this feature? Like unexpected route or a water source, grocery store or an interesting place to visit?

If you visited some places of the map to eat or to get some rest, what was your experience there? Be as much specific as you want)

Beaches

Changing the basemaps allowed me to revert/refer back to the route generally with the grey canvas map, and then to return to the coloured open street map for more detail. Personally, I preferred spending most of my time on the open street map as this closely resembles the paper maps I am used to (uk ordnance survey). But the grey map was good for overall route planning. I thought that the trail colours on the grey canvas map might be better to be the same as the open cycle map, and blue was potentially possible to confuse with a river. But that is because I have used outdoor maps a lot. I liked the the way it was easy to change between base maps using the little grid to select. As I used the open street map primarily I knew it would be more informative/useful, being similar to standard map.

It was always quite a surprise what kind of shelter facilities I would find (until I started googling them directly) - i.e. cooking shelter, sleep shelter, toilet or not, firewood or not.

For shops, perhaps some indicator on the shop type might help - small shop, big store for those who are less familiar with Finnish shop brands.

I did try to get some info using the pop ups and then zooming in. It was a good basis for finding rest/food. Maybe there could be a website link for the shop if available. For the popup it was clear to me what "what's there" meant and "info" but I wasn't sure what "there you go" meant, maybe it isn't needed. As a start I thought that was a good idea and further details, such as suitability for camping/permission required might be useful. Overall, I found the green and orange circles intuitive easy to use.

I did not use the map in this way however if I were to go cycle touring with this resource I am sure it would be very helpful, as finding water is a common problem. As I mentioned above my expected use of such an app would be in preparation for a cycle tour and also en route to make decisions based on my needs at that time. Main my planning is minimal, but it would be interesting to see how much more I would discover. My map planning stage basically involves highlighting my initial route on a map with a highlighter pen usually a couple of routes for choice. These are based on road safety the gradient of the hills the attractiveness of the route and I usually bypass cities. However, I think that if I did have more knowledge to hand this would enable me

I have no experience to speak

Whilst I only saw the guide on a desktop I was able to zoom in on the map. I was able to explore a few of the features and I thought it was adequate without being overcomplicated.

I have no experience to speak

If you followed some of the routes of the map what was your experience? Did you find it useful to have marked only some major bike routes or you felt the need to have as much bike network as possible before your eyes?

I did not follow routes/ it seemed like all Finnish bike routes are deliberately marked only online but not in reality (no signage, no difference to other roads which would make them bike route-specific). The only point where mapped routes or bike path markings were useful was Helsinki, I used opencyclemap there to avoid road riding

Was the symbology clear enough? I mean colorful bike routes (pink for national cycle routes, blue/green for regional/local) and contrast POIs (yellow/green dots for resupply/sleep places).

Yes. Further disambiguation on shelter or shop types could help but is not critical

Personally, I find as much info as possible would suit me or seeing as it is an app, the ability to add or remove detailed routes, if for example they obscured or hid the map if there were many of them. I generally find the more route info the better as I can get lost navigating by bike in urban spaces especially. In fact, this kind of app would have helped me navigating across Strasbourg 3yrs ago as the cycle route signposts (Switzerland to Holland trail) were inadequate so I got lost!

The contrast was good however as I mentioned earlier I would prefer blue only for rivers or streams. On some paper maps such as ordnance survey dotted routes are used to avoid confusion, but it might depend on what the local Finnish maps use, for cross-reference. Yellow and green circles were excellently contrasting. Again, for camp grounds maybe green triangles could indicate a camp ground, just an idea, but I liked the colour scheme.

In my experience having full cycle routes marked on the map is very useful especially when there is distinction between the national route and a local route network. The main reasons for this include needing to deviate from the main route in order to find accommodation or go on a visit or find a supermarket. As I normally use a map without cycle routes marked this would be a major advantage using an app especially in combination with the ability to find other minor roads and tracks if that is at all possible.

Only the best routes.

Having had a good look at the desktop app guide I would say that the symbology and choice of colour was appropriate and very usable. it might be worth considering offering a choice of colour background for personal preference. when I use an app or a website or a map I generally find it easier and more usable when there is similarity between the coding and conventions so that it is more intuitive. something I also consider is how different paper maps are between countries for example the ordnance Survey maps in the UK and the Michelin maps in France so maybe it would help if the design overall between the app the paper map had some similarity. In the past I have also used the National Cycle Network maps which usually use similar symbology.

Yes

If you used other apps to navigate yourself what was your experience with them? Did you feel the lack of something using them? Some data or app features maybe? You can describe here your perfect navigation app as you see it ;)

Feel free to express any other thoughts on navigation while bike touring related to the app or not.

I mainly use apps to check the map, plan the ride in my head and on paper (free regional maps), not with the app tools.

Road signage is always a great thing which is still missing in Finland (bike signs, distances and directions) except in metropolitan Helsinki, where there is at least signs in most places

As per my earlier answer

As per my earlier answer.



As I am rather traditional in my approach to cycle touring navigation I have mainly used paper Maps and Google Maps however I expect to use some sort of app on my next tour. If I were to consider my ideal navigation app for cycle touring it would complement my paper map which I would always take as a backup. as I am quite traditional in my approach to navigating like a lot of people still are I would probably not plan my trip in very great detail but make sure that my basic needs are covered such as my cycle route and accommodation. My ideal cycle route would be safe quiet and attractive maybe with or without hills depending on my energy level on that day. My main navigational difficulties involve finding my way through urban spaces so frequently I avoid large towns and cities because of this problem and because I prefer cycling away from traffic. So, if an app could offer me a special feature and allow me to navigate safely across a city that would be a tremendous help.

I have no experience to speak

As I mentioned above my preference is to navigate through non-urban rural spaces because it's easier and the environment it's more pleasant for cycling often but being able to navigate across cities would also be useful. I have often discussed using electronic navigation such as GPS versus maps with friends and most of us tend to prefer maps however there is a different group of cycle tourists who made prefer using an app, as well as those who prefer to combine them both. I think it depends maybe what sort of person you are whether you like to have things meticulously planned or not. I can see that there are advantages of both having things well planned and not planned because having all ones needs met can reduce the number of those difficult situations for example not finding water, appropriate accommodation or a bike shop. equally not having everything planned can mean that you can enjoy the challenge of discovering an area manually such as speaking to local people and practicing language. For me I will always use a paper map however I have had cycle tours where I have not prepared adequately and I have left too much to chance so I think having the app as a resource for pre-planning and on route planning would be very useful in my case.

Looks great!

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