

Route Evaluation and Optimization Tool Guide

The objective of the tool is to help companies to evaluate and to optimize the use of their fleets in an easy way. The evaluation can be done by analyzing the mileage covered by the vehicles with simple descriptive statistics; the optimization, by planning the routes for the trips with the help of MyMaps from Google.

Some of the features include:

- Evaluation of the mileage covered by the vehicles under different periods of time
- Evaluations or comparisons between different type of vehicles, Internal Combustion Engines (**ICE**) and Electric Vehicles (**EV**)
- Estimation of the greenhouse gas emissions per type of vehicle, based on the type of fuel, consumption and electricity provider
- Creation and optimization of the routes with the help of My Maps by Google
- Visualization of GPS Exchange Format (GPX) and Keyhole Markup Language (KML) formats
- Estimation of the energy consumption for a vehicle based on the planned route

The tool consists of 4 main tabs

1. Travels Tab

In this tab, historical data from the fleets can be loaded and visualized. Excel and comma separated values (CSV) files can be loaded for visualization. The following format of the data is accepted:

First row. Must contain the column named **Date**. Additional columns for the mileage must have the name of the vehicles specified by the user (can be any name, just avoid the use of spaces), below an example.

Additional rows: Date must have the **mm/dd/yyyy** format, mileage columns are numeric values (The example uses Km).

	A	B	C	D	E	F	V	W	X	Y
1	Date	IC1	IC2	IC3	IC4	IC5	EV1	EV2	EV3	EV4
14	5/13/2019	77,7	0	26,5	28,9	24,3	88,7	16,7	13,5	34,9
15	5/14/2019	47,6	0	33,8	58,3	75,2	48,3	26	111,6	36,9
16	5/15/2019	35,4	7,2	46,5	72,4	109,3	51,8	20,5	27,7	28
17	5/16/2019	29,3	0	0	128,1	13,2	54,2	18,6	31,1	25,2
18	5/17/2019	40,5	0	0	136,4	32,8	71,9	20,3	65	19,3
19	5/18/2019	0	0	0	77,7	0	0	0	0	0
20	5/19/2019	0	0	0	356,3	0	0	0	0	0
21	5/20/2019	43	0	30,8	44,2	22,4	85,9	16,6	39,7	41,5
22	5/21/2019	41,3	0	0	198,5	32,7	42,2	20,5	0	21,3
23	5/22/2019	27,1	35,1	0	45	30,6	98	20,5	43,7	14,1
24	5/23/2019	27,6	8	31,2	254,7	20,6	84,3	26,1	76,9	50,9
25	5/24/2019	40,8	12,4	33,4	81,2	84,7	78,6	20,3	0	29,1
26	5/25/2019	0	0	0	0	0	0	0	0	0
27	5/26/2019	0	0	0	207,4	0	0	0	0	0
28	5/27/2019	66,4	16,3	68	43,4	32,4	95,6	16,6	71	37,6
29	5/28/2019	65	0	40,8	58,8	95,2	69,9	17,8	77,6	39,7
30	5/29/2019	54,7	15,8	63,9	132,8	28	90	20,4	54,5	28,5

Excel file, example.

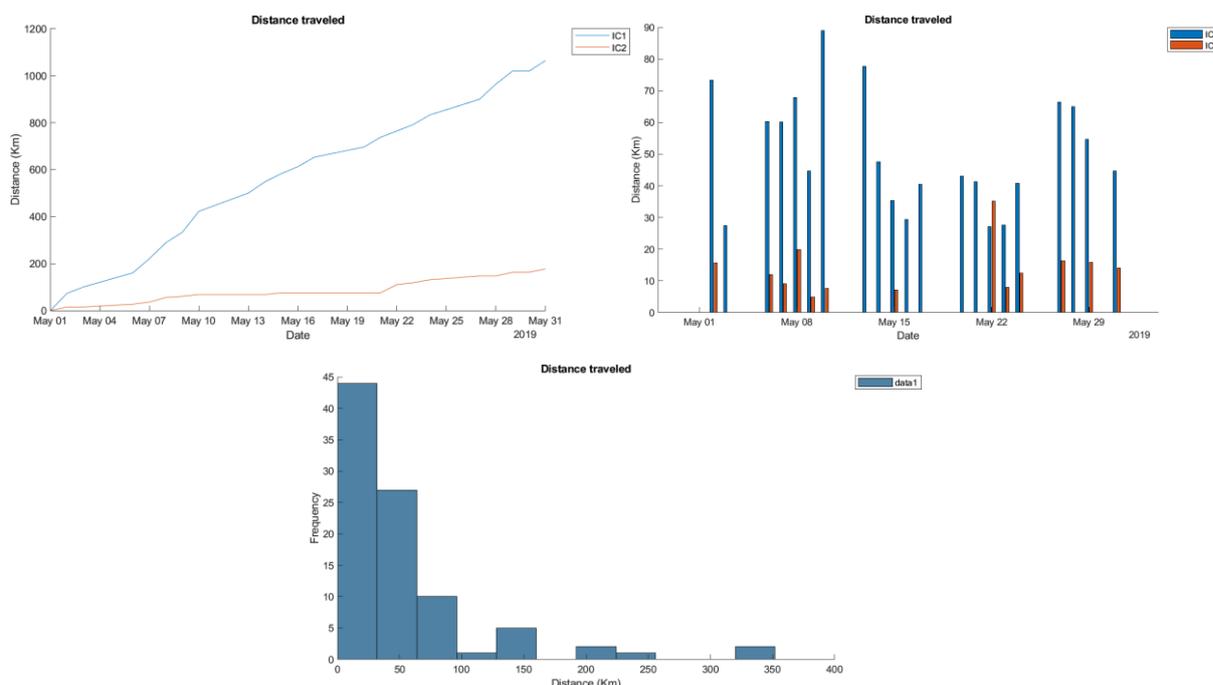
1	Date	IC1	IC2	IC3	IC4	IC5	IC6	IC7	IC8	IC9	IC10
2	5/1/2019	0	0	0	342.9	0	0	0	0	0	133.2
3	5/2/2019	73.4	15.6	18.3	119.6	87.1	60.8	118.5			
4	5/3/2019	27.5	0	25	47	40.8	52	73	51.1	47.5	35
5	5/4/2019	0	0	0	83.4	0	0	0	0	0	106.6
6	5/5/2019	0	0	0	219.6	0	0	0	0	1.8	0
7	5/6/2019	60.3	12	18.2	216	71	61.4	104.9	29.1		
8	5/7/2019	60.1	9	19.3	42.9	78.3	38	127.4	51	68	
9	5/8/2019	67.9	19.8	41.4	44.6	80	40.8	60.9	10		
0	5/9/2019	44.7	4.9	30	320.1	30.8	30	99.2	68.8		

CSV format example

To load the data, just click the load button and specify the file with the historical data, extension must be xlsx and csv.

The Travels tab also contains filters for time to help the sorting of the data according to the needs.

Three different plots are available to visualize the date (Daily, Cumulative, Histogram).

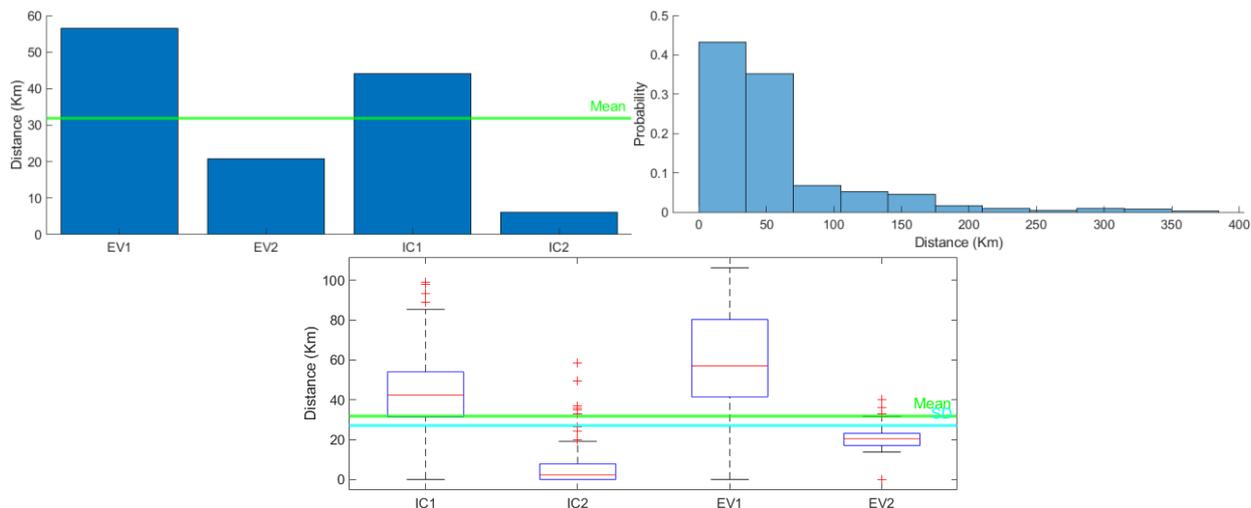


Plots available to visualize data

2. Evaluation

Evaluation tab, contains simple descriptive statistics to understand the data.

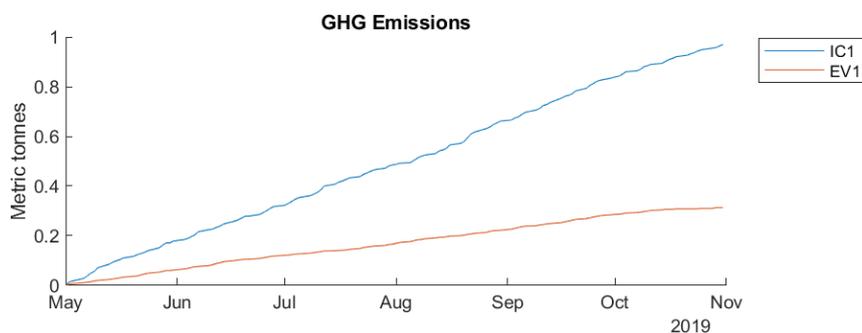
Average daily driving, Probability distribution and Box plots are available for this purpose. Once the data has been loaded in Travels tab, all the statistics plots can be used by just selecting the vehicles.



Evaluation tab, plots for statistics.

Evaluation tab also contains, the Green House Gas Emissions estimation. In this tab, the GHG emissions from ICE and Electric Vehicles can be compared.

Different type of fuels and energy providers are available to estimate the emissions with preloaded values. New values according to different locations can be defined in Settings Tab.



CO2 Emissions [gr CO2/L] & [gr CO2/kWh]

Petrol	<input type="text" value="2290"/>	Turku Energia	<input type="text" value="215"/>	CO@ emissions to produce 1 kWh of electricity
E10	<input type="text" value="2210"/>	Helen	<input type="text" value="191"/>	
Diesel	<input type="text" value="2660"/>			

GHG Emissions estimation and setting new values for the calculation.

3. Route Planner

In this tab, routes can be planned by using MyMaps from Google or if a route already exist it can be visualized.



Date	Map	Layer	Stops	Distance (Km)	Consumption (KWh)
08/24/2020	Week_1	Monday		2	8.4732
					1.6523

Example of a route planned with the APP.

To visualize a route, 2 different data formats can be used, GPX and KML data. Just click in Load a route and select a file with one of formats and the app will display the track in a map. Satellite maps can be displayed also by just ticking Satellite picture.

Name	Date modified	Type	Size
All	25.2.2021 13.23	File folder	
APP	25.2.2021 13.28	File folder	
T1.gpx	25.5.2020 0.56	GPX File	790 KB
T2.gpx	19.5.2020 0.15	GPX File	398 KB
Week_1.kml	27.5.2020 13.06	KML	105 KB
Week_2.kml	27.5.2020 12.30	KML	26 KB

File selection to visualize gpx and kml data

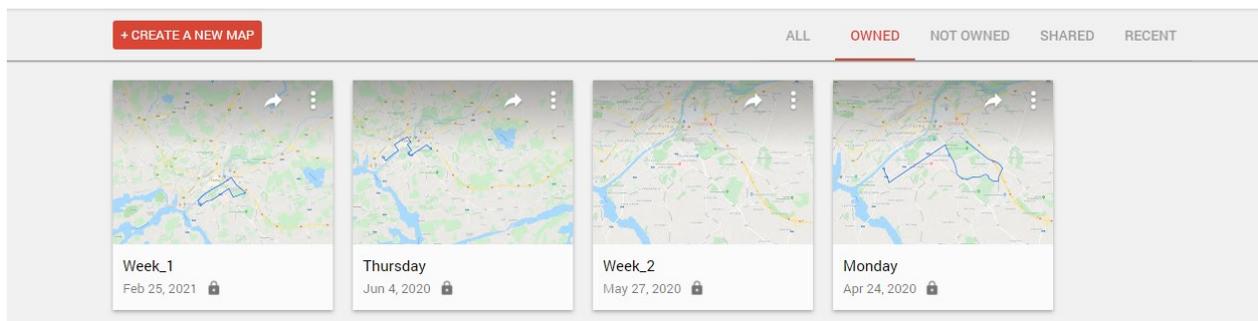


Create a new route.

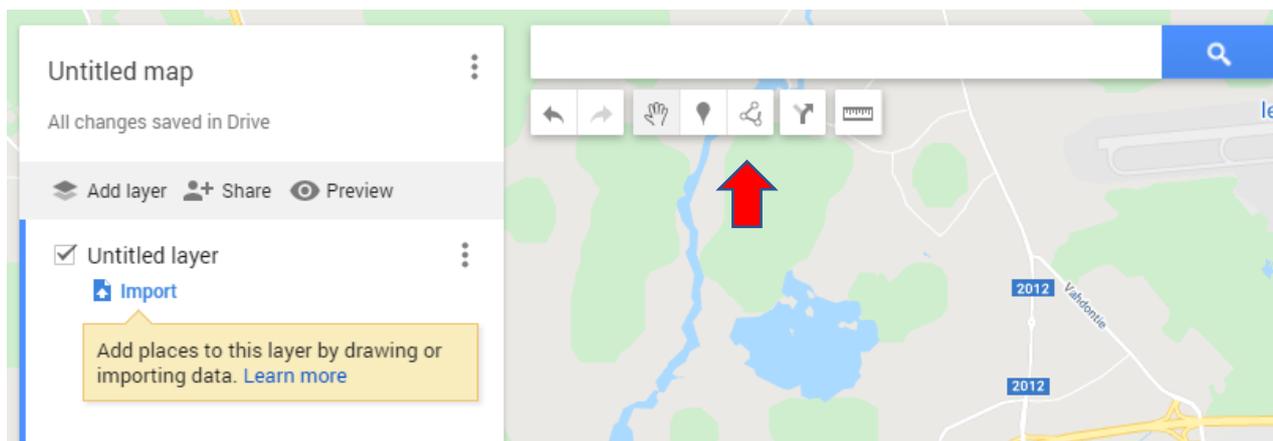
Steps:

1. Click create a new route
2. If the user is logged in Google, My Maps will open. Once is open click Create a New Map

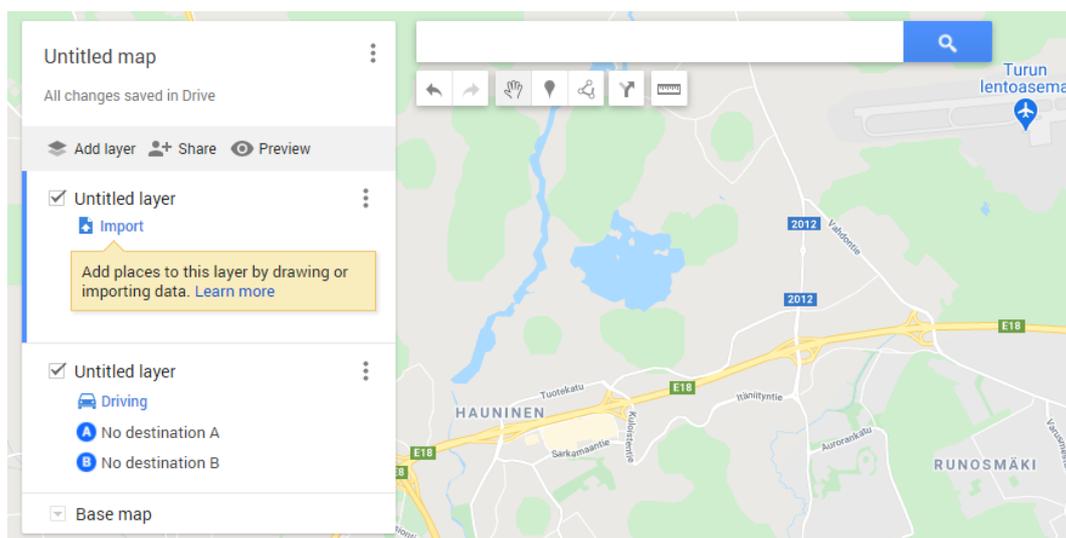
Google My Maps



3. With google map open, click in add directions button to create a route from point A to B.

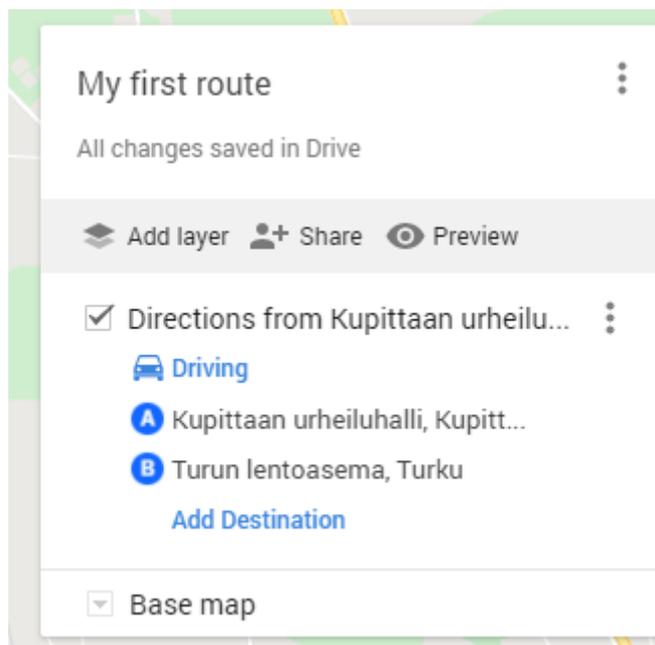


A new untitled layer will be added

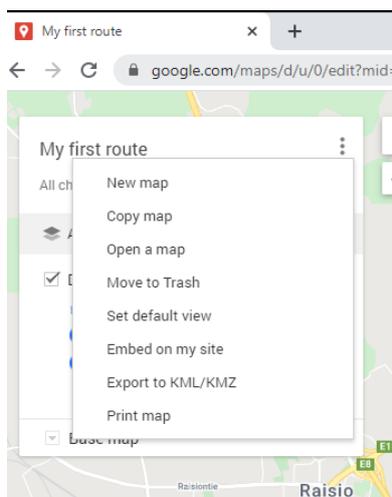


4. Change the name of the map by just clicking on Untitled map.

- Click on A in the Untitled layer to add the details for the first point, do the same for point B. The name of the layer will change according to the directions.

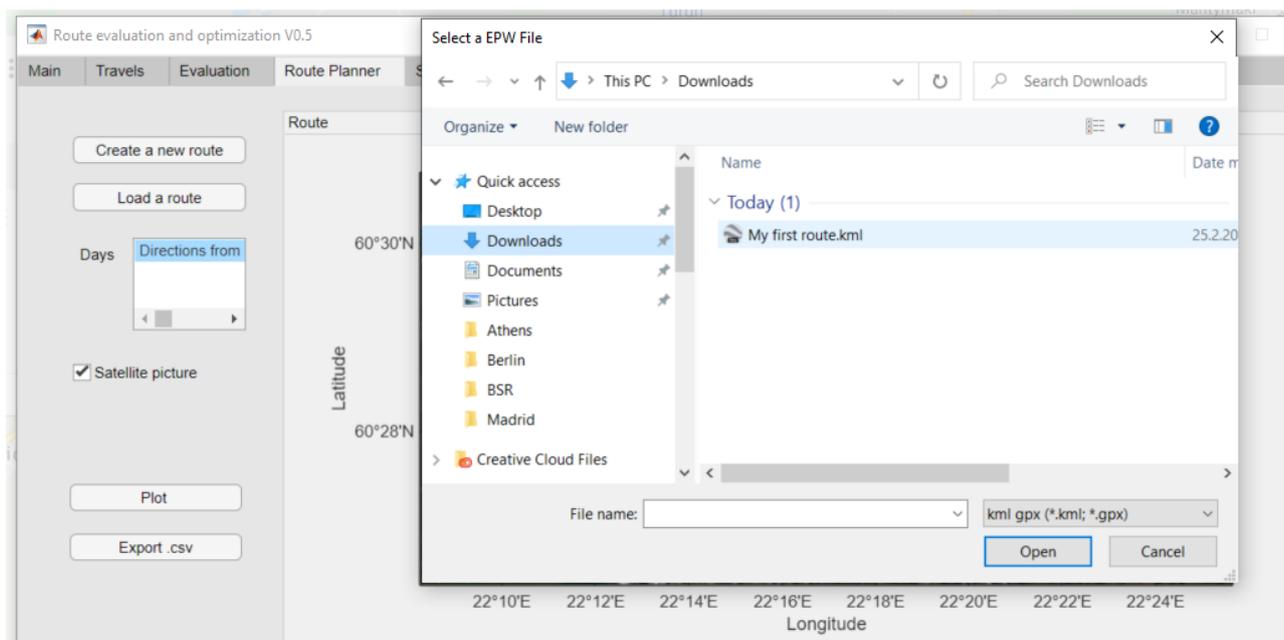


- At the side of the map's name. Click the edit button, located at the right corner to display the following menu:

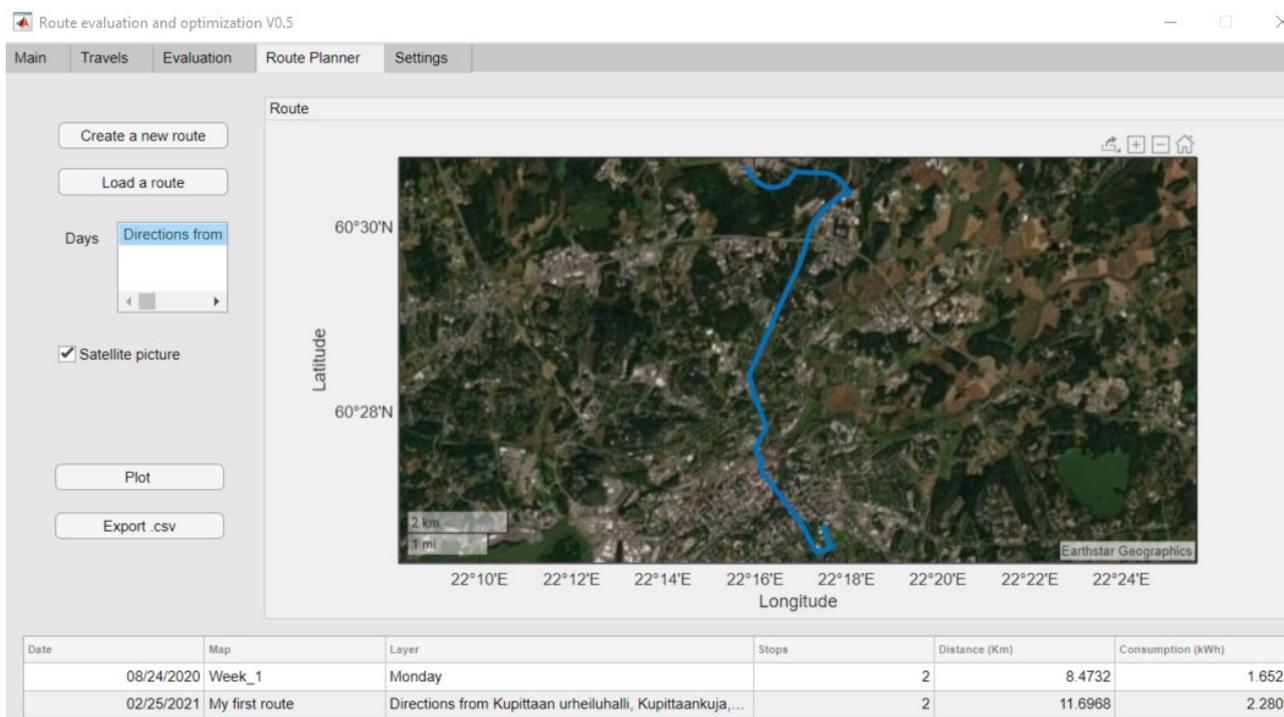


- Select Export to KML/KMZ. From the menu select directions from A to B, tick Export as KML instead of KMZ option and Click Download. The file will be in downloads folder.
- In the tool, select load a route. Look for the KML file in the downloads folder and click open.





9. Click plot to visualize the route in the map.



In the table at the bottom, the details about the route will be displayed. Table contains: Date when the route was created, name of the map, layer name (direction from A to B), as many as the user created in the map, number of stops, distance from A to B and the EV energy consumption estimation. This table can be exported as a csv file.