4th International Workshop on Spatial Data Quality
Brussels, 2023

Assessment of OSM road network quality in comparison to Hellenic Cadastre open data

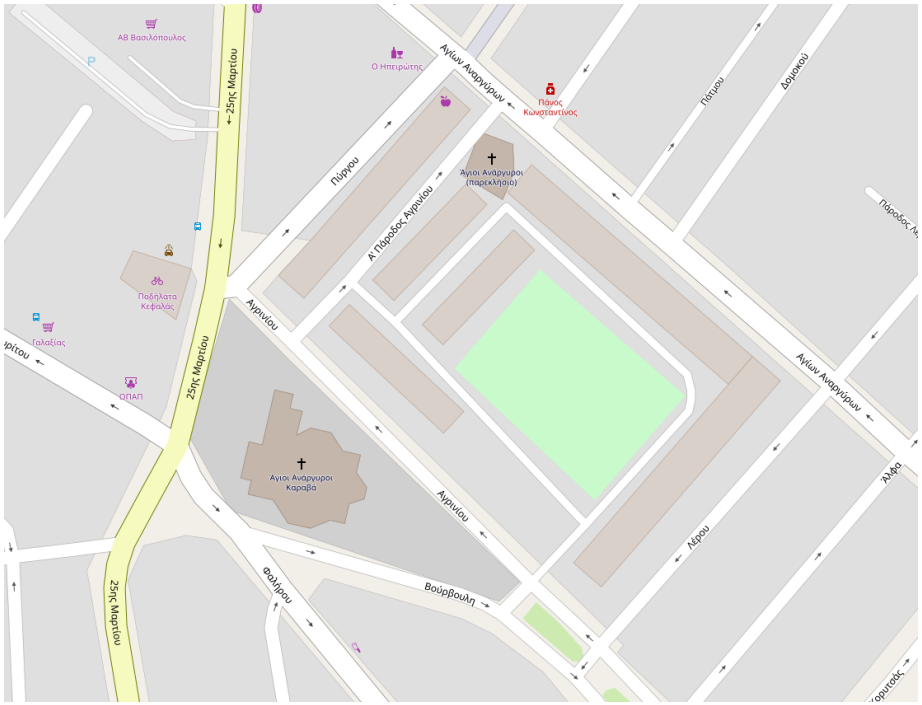
Asst. Prof. Dr Andriani Skopeliti
Savvas Vasileiadis

School of Rural, Surveying and Geoinformatics Engineering,
National Technical University of Athens, Greece

Introduction

- VGI quality assessment

- OSM road network



- Hellenic Cadastre (HC)

Open Street Map

- Road network: worldwide and multi-scale
- Maximum zoom level (value 19): approximately a 1:1000 scale map.
- Data: lines in geographic coordinates (WGS84)
- Accuracy influenced by users and data collection methods (e.g. GPS, heads-up digitization, aerial and satellite images, georectification etc)

Διαδρομή: Πέτρου Ράλλη (307311266)

Έκδοση #14

Updates @ Attica

Επεξεργάστηκε πάνω από 2 χρόνια πριν από Map-Finder
Ομάδα αλλαγών #103344970

Ετικέτες

highway	primary
int_name	Petrou Ralli
lanes	2
lit	yes
name	Πέτρου Ράλλη
oneway	yes
reg_ref	ΕΠ14
sidewalk	right
source:reg_ref	ΦΕΚ 47 Α/8.2.1956
surface	asphalt

Hellenic Cadastral

ΕΛΛΗΝΙΚΟ ΚΤΗΜΑΤΟΛΟΓΙΟ

- Parcel data:
  - cadastral diagrams at a 1:1000 scale for the urban areas and at 1:5000 scale for the rural areas.
  - Available as open data from the geoportal of the organization https://www.ktimanet.gr/geoportal/catalog/main/home.page
- Data are available as services but can be also downloaded as an ESRI shapefile at the HGRS87 (Hellenic Geodetic Reference System 1987).
- According to the accuracy report on parcel data, there is a RMSExy <= 0,71m for control points (RMSEx <= 0,50m, RMSEy <= 0,50m) and a 1,22 m horizontal accuracy at the 95% confidence level.

Data preparation – Preprocessing I

- Comparable Datasets
- Pre-processing involves the transformation of OSM data (geographic coordinates - WGS84) to HGRS87 (Transverse Mercator – GRS80).
- In the HC dataset, roads are captured as parcels i.e. polygons with a specific code (KAEK) that identifies them as roads. Only OSM road network lines that are inside the HC road polygons are examined. In this way, only corresponding features are compared.

Data preparation – Preprocessing II

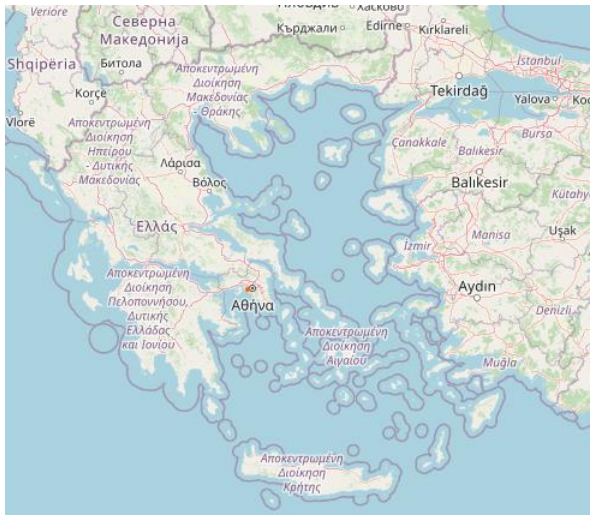
- Roads
  - In the HC dataset roads are captured as parcels i.e. polygons
  - Extraction of the medial axis/centerline of each parcel/polygon that represents the road axis.

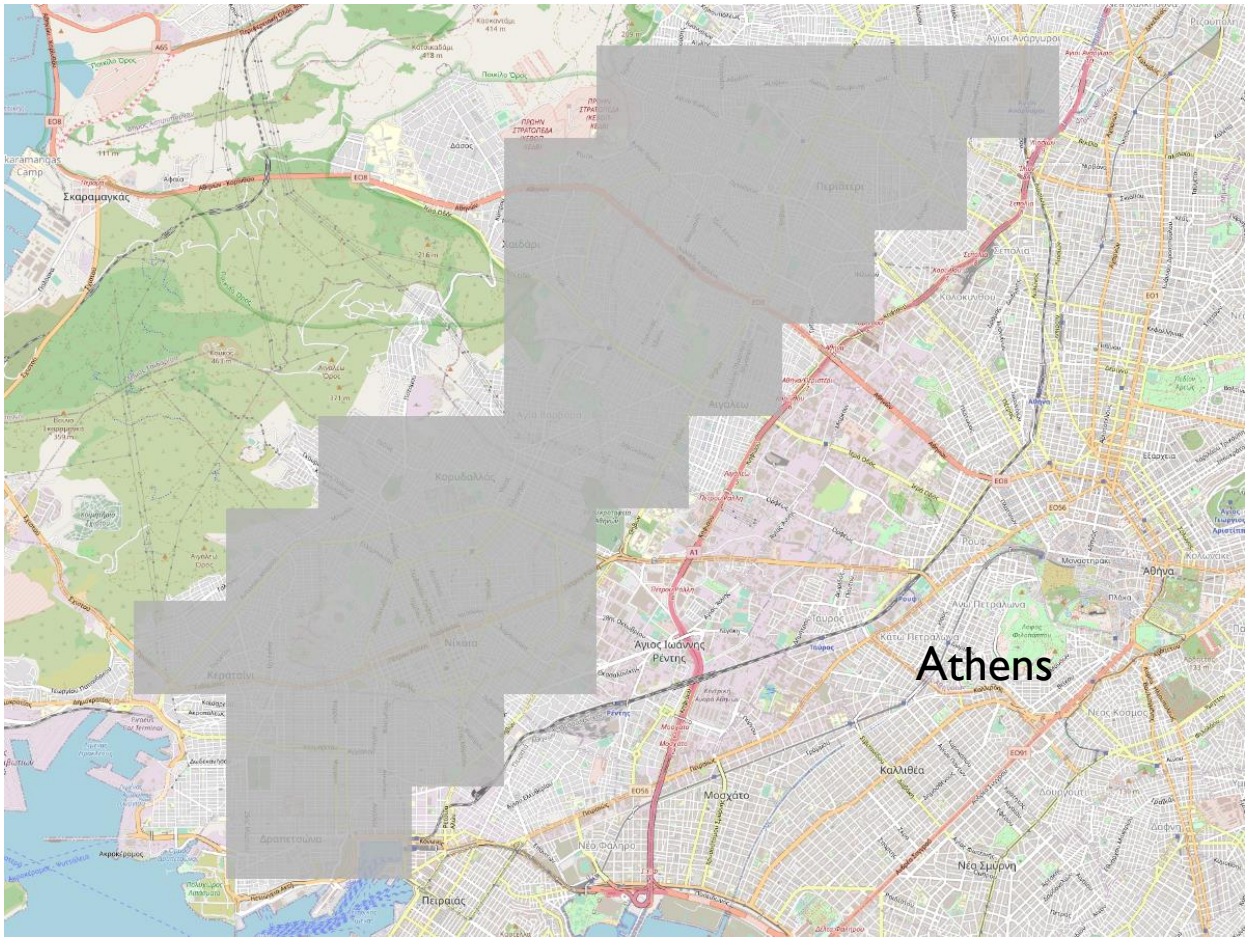
Quality Assessment

- Completeness – Percentage of Length
- Positional Accuracy
  - Feature:
    - Distance is calculated between the **vertices** of the OSM road network and the HC road network lines.
    - An average distance based on vertices is calculated for each **road line** as identified by a unique OSM ID code.
  - Global indicators:
    - Percentage of OSM road length with a given average distance e.g. 1 m, 2m, 5m from the HC dataset
    - Statistics of vertices distances
    - Statistics of lines average distances
  - Grid: Percentage of OSM road length in buffer zones of 1m, 2m, 3m, and 5m created around HC data computed for a 1km^2 cell grid covering the study area.
- Thematic accuracy – Not applicable

Case study

- A case study is conducted for a 35 km^2 area in western Athens.

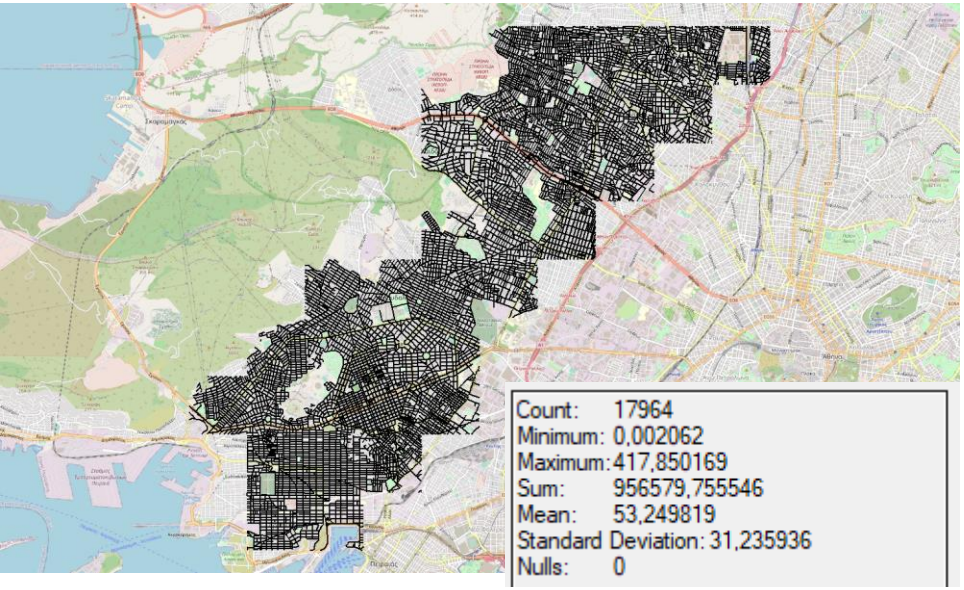




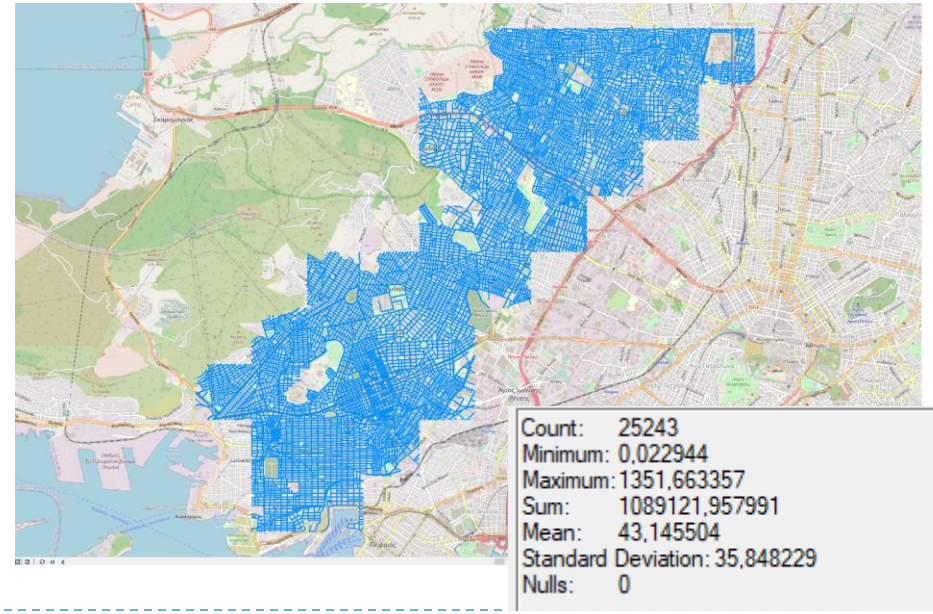
Completeness

- Indicator: % length
  - The OSM network has a length of 956 km and the HC network 1089 km.
  - The completeness is 88%.

OSM

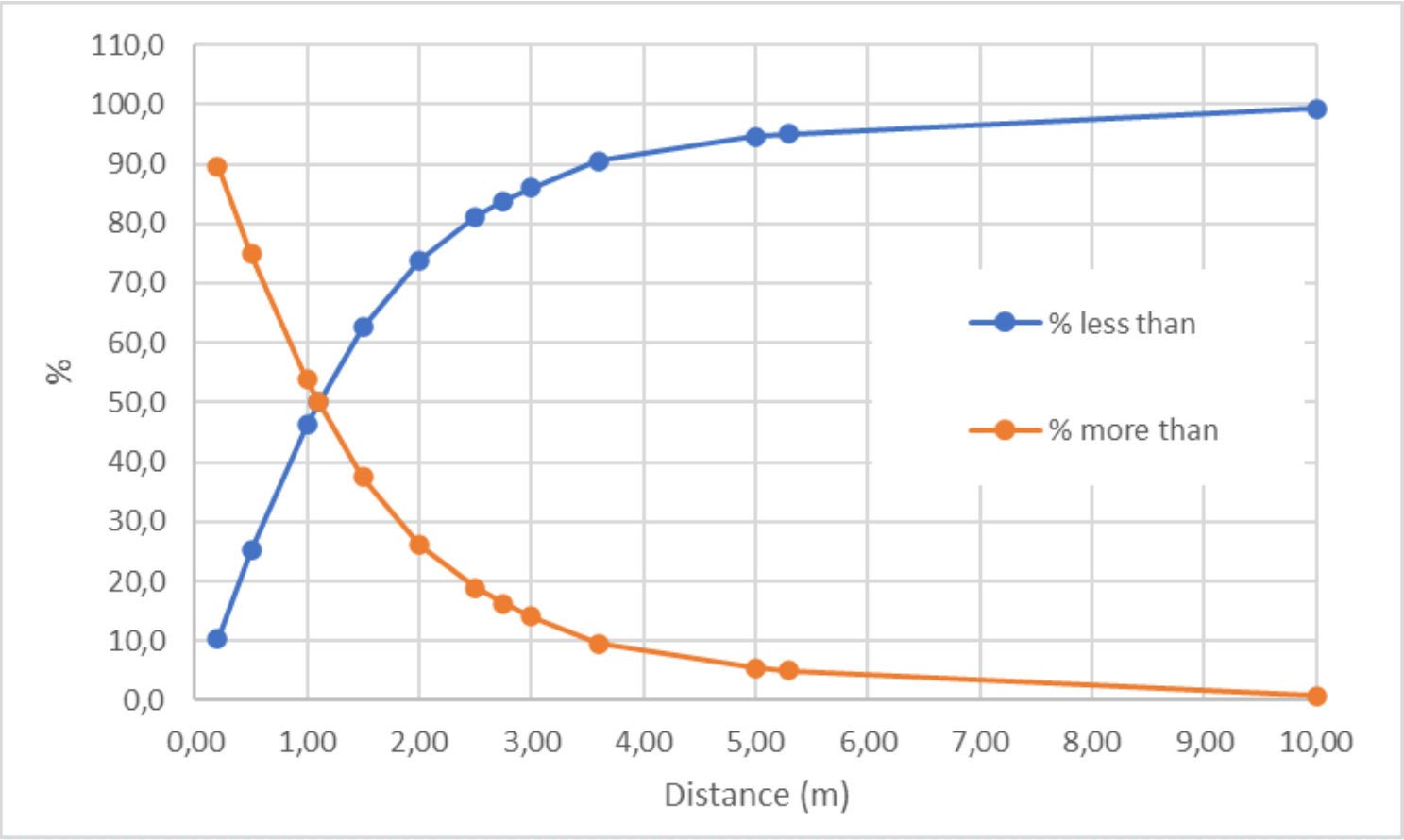


HC

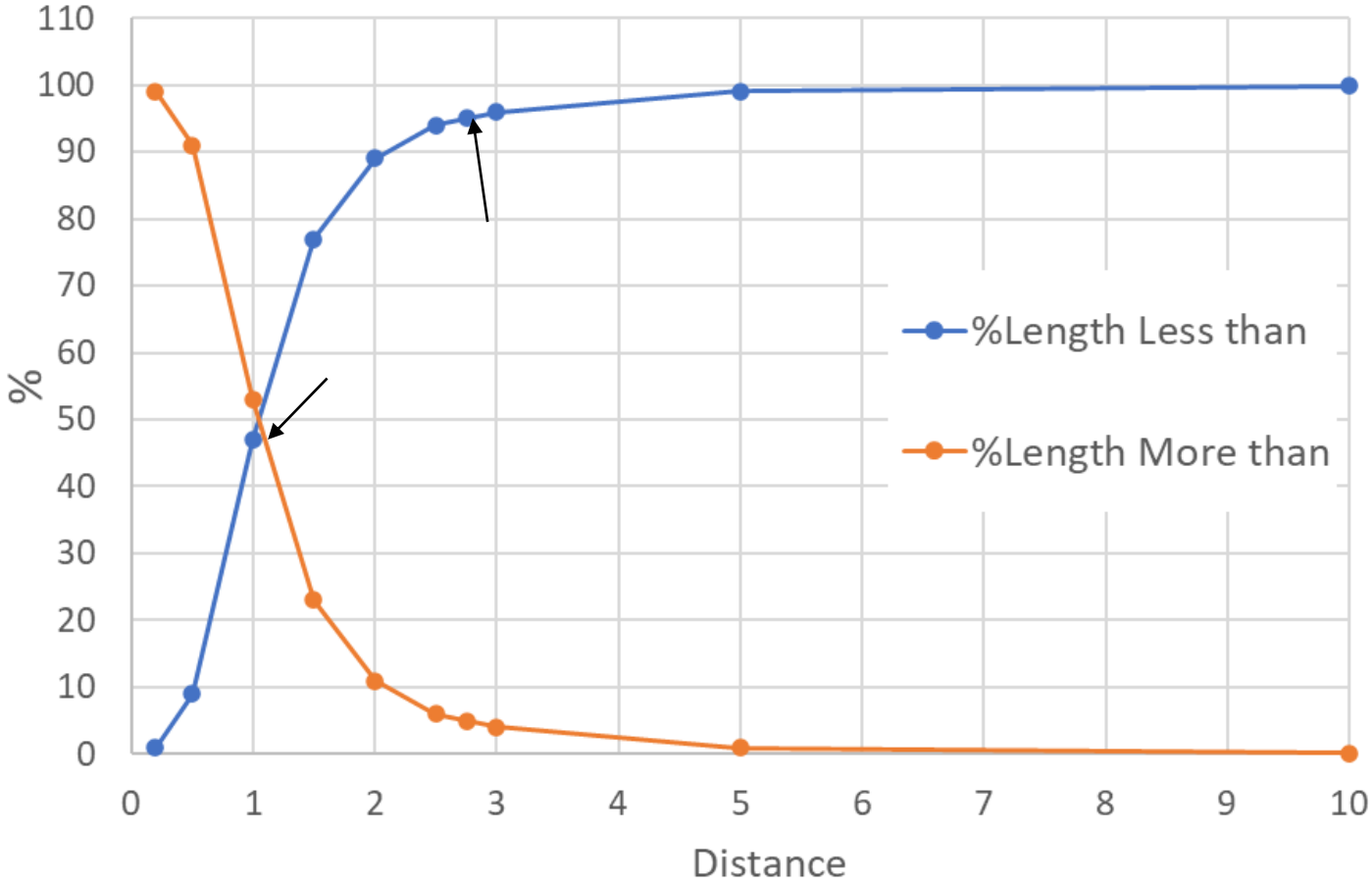


Global Indices I
% of Vertices – distance to HC

50% of the OSM vertices are 1.1 m away from the HC road lines, 90% are 3.6m and 95% are 5.3 m

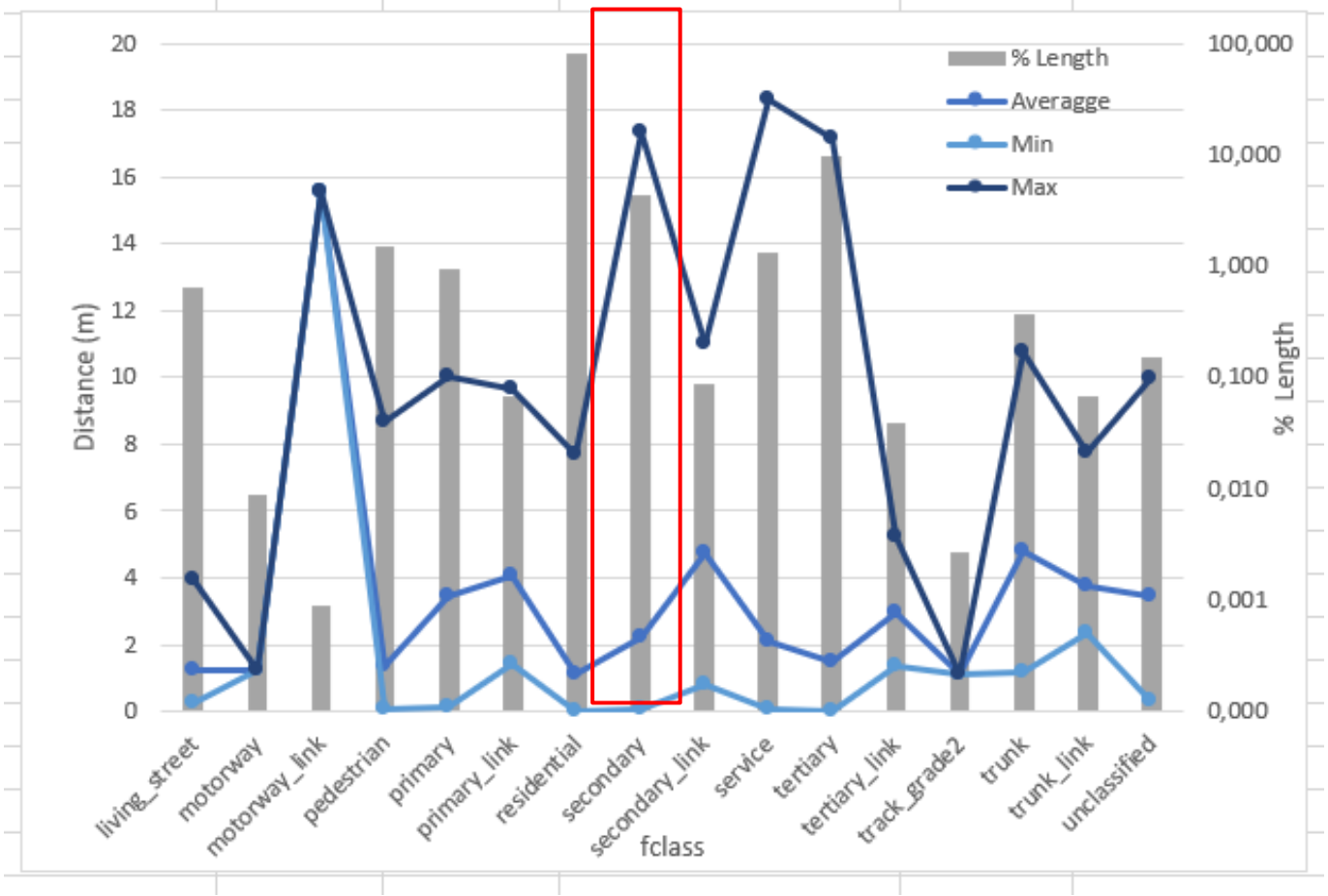


Global Indices II
% Length - average distance to HC



95% of the OSM road length has an average distance of less than 2,75 m and 50% less than1m from the HC dataset

Global Indices III
% Length (road classes) – average distance

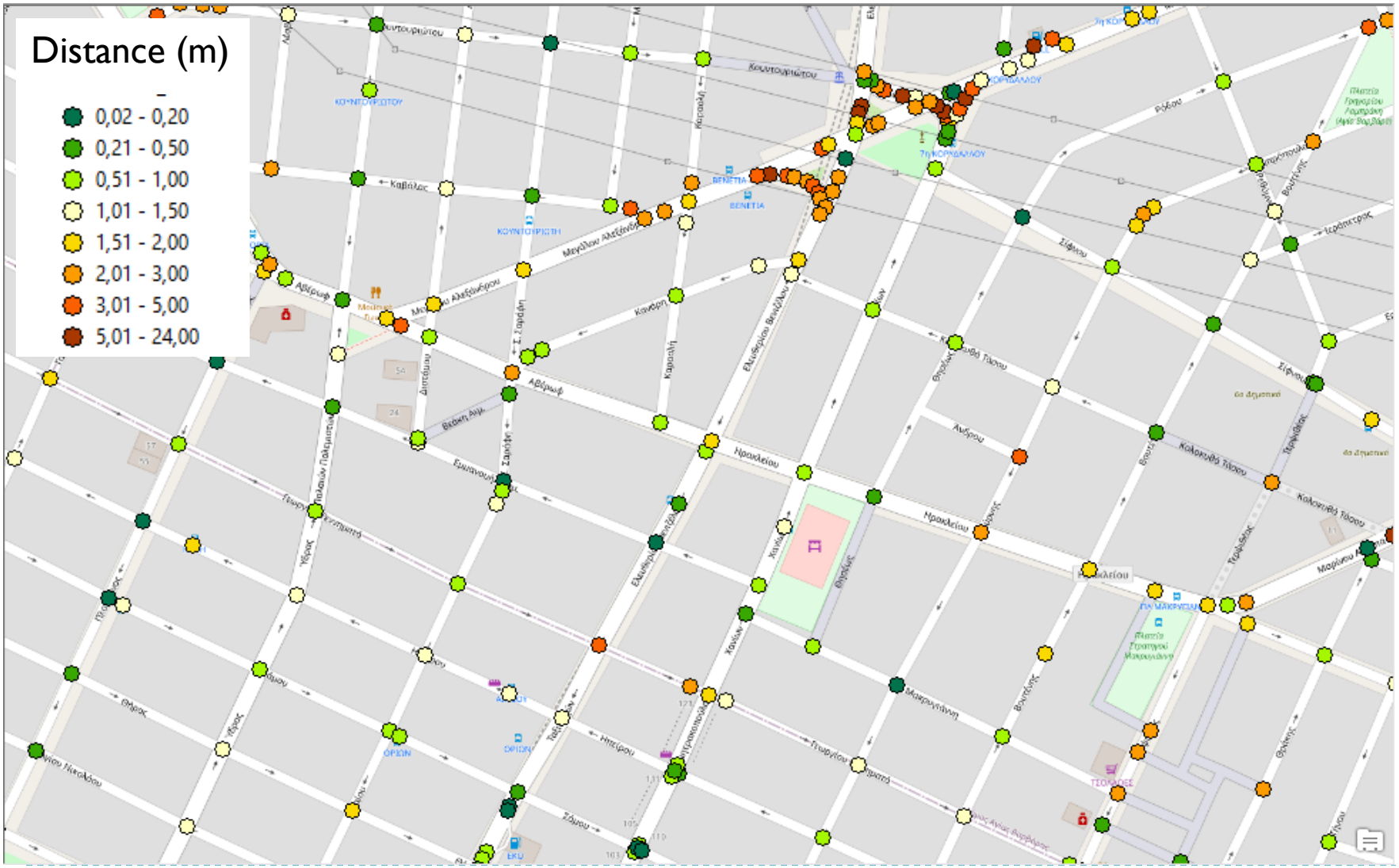


- The majority of roads (80% length) belongs to the "Secondary" class with average distance ranging from 0.03 m to 7.6 m (average 1.1m).

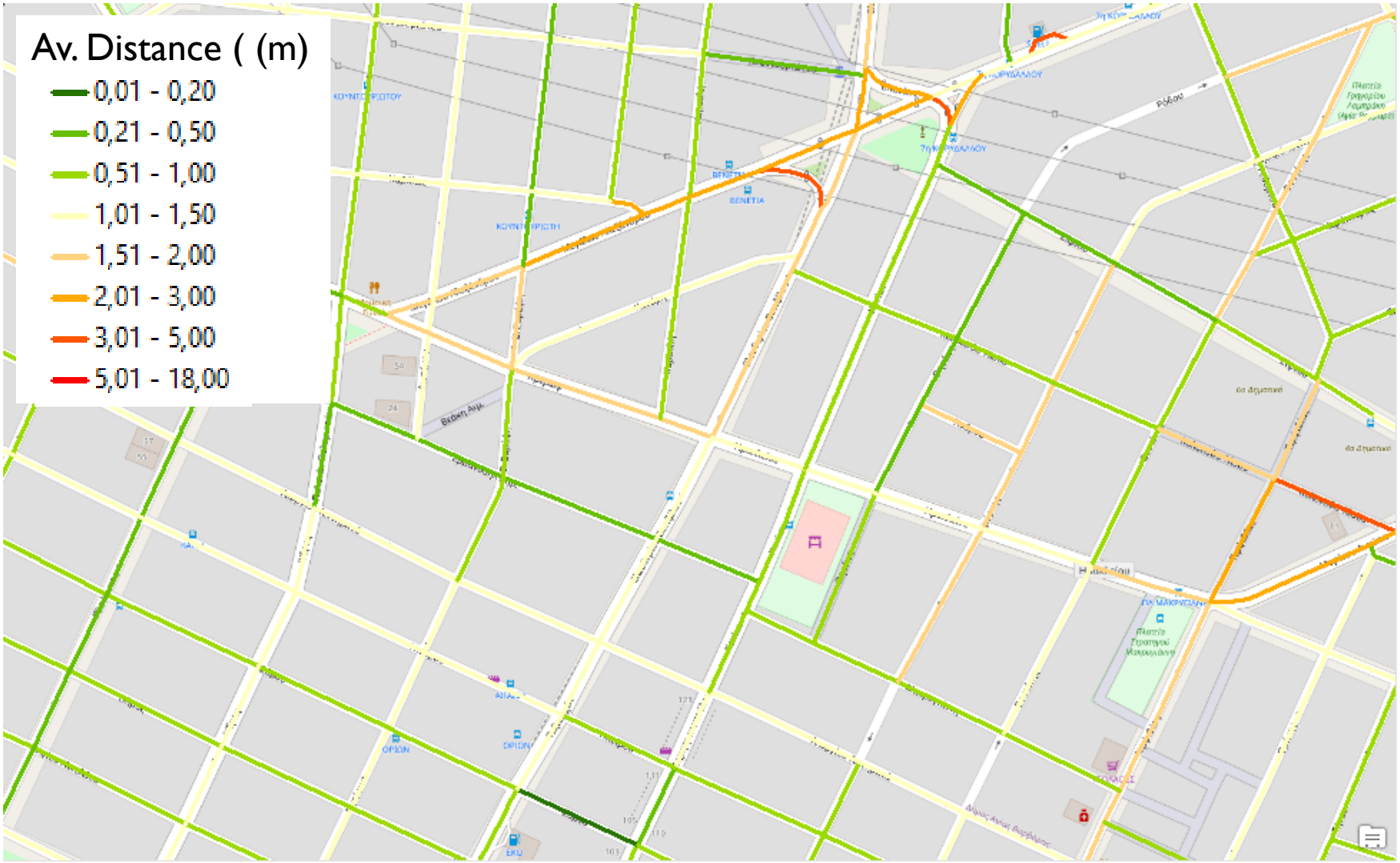
GeoVisualization

- OSM Positional accuracy:
  - At the vertex level: distance from HC road network
  - At the line level: average distance from HC road network based on vertices
  - At the cell level of a 1km^2 grid:
    - Average distance based on lines
    - Percentage of line length into buffer zone of 1, 2, 3 and 5 meters
- To communicate the quality assessment to the citizens, the results are visualized with web maps

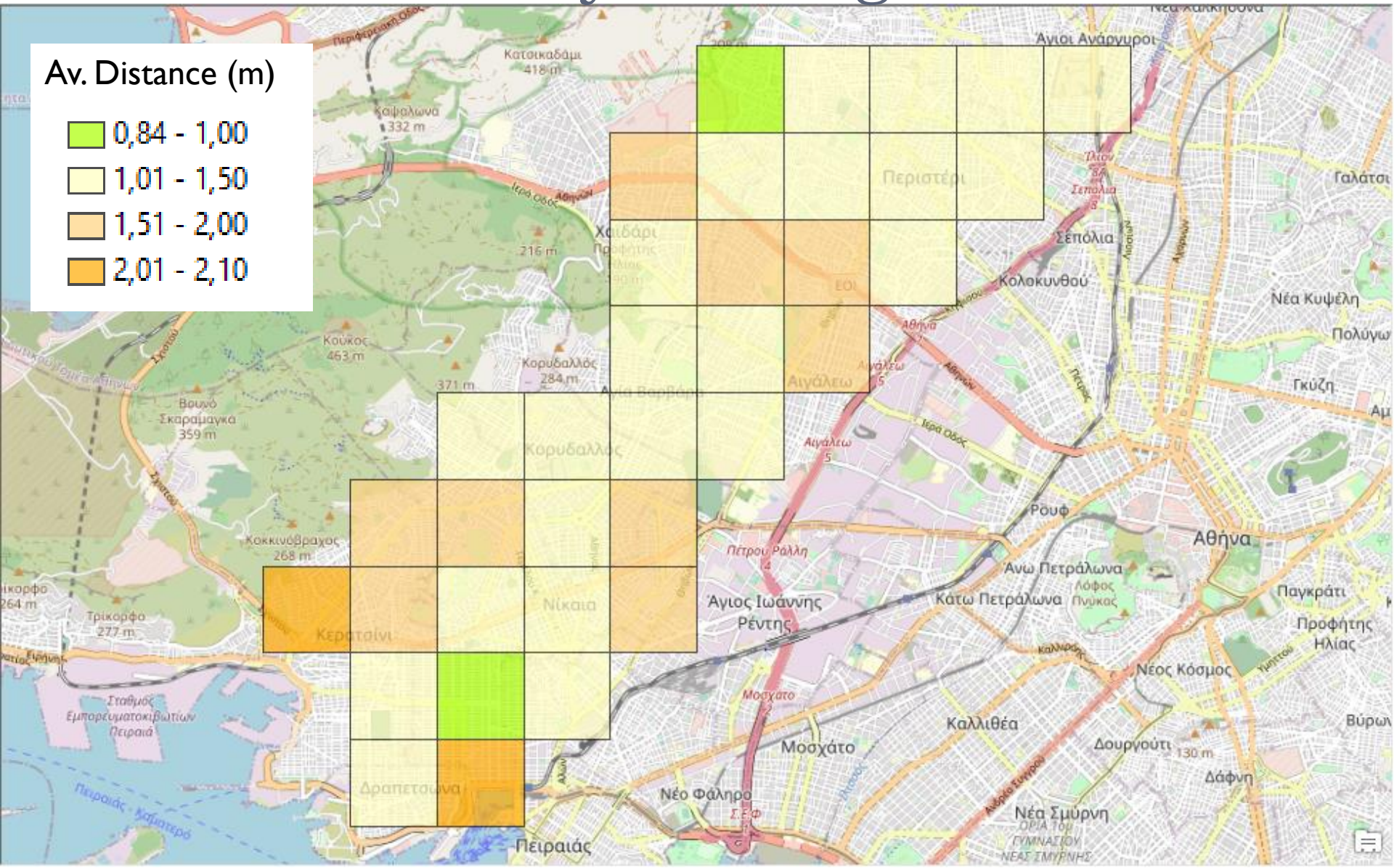
Positional Accuracy - Vertices



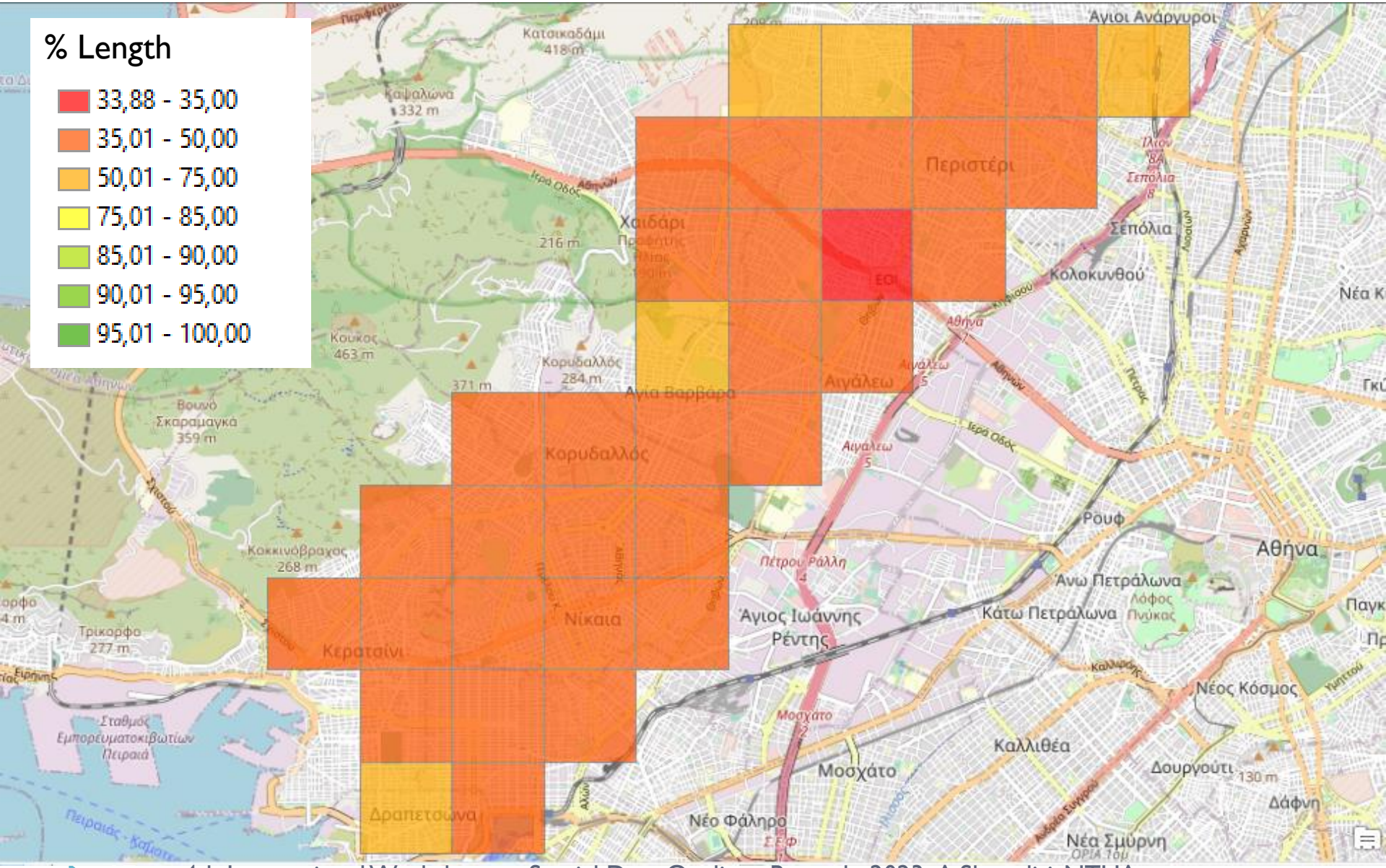
Positional Accuracy - Lines



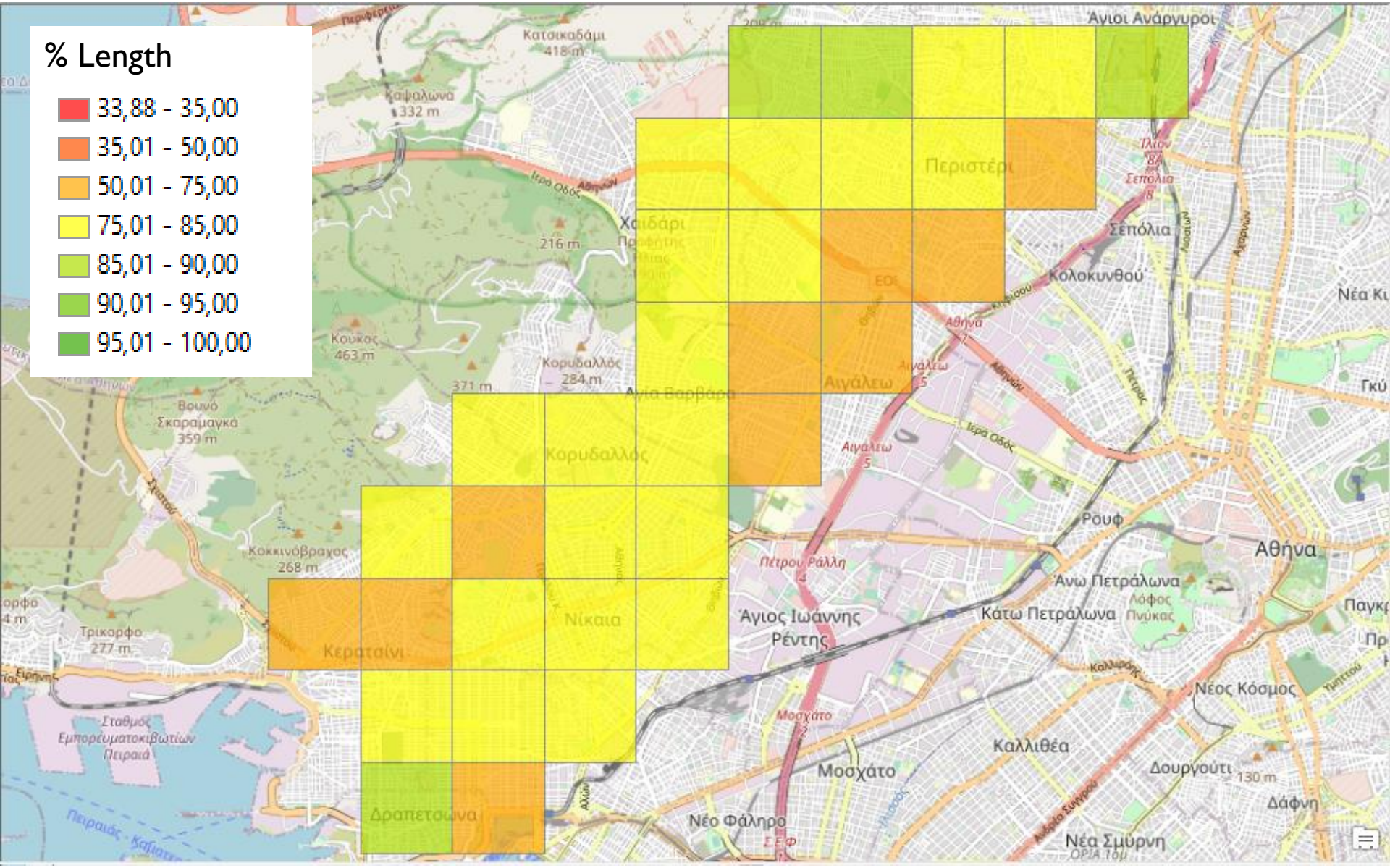
Positional Accuracy – Average Distance Grid



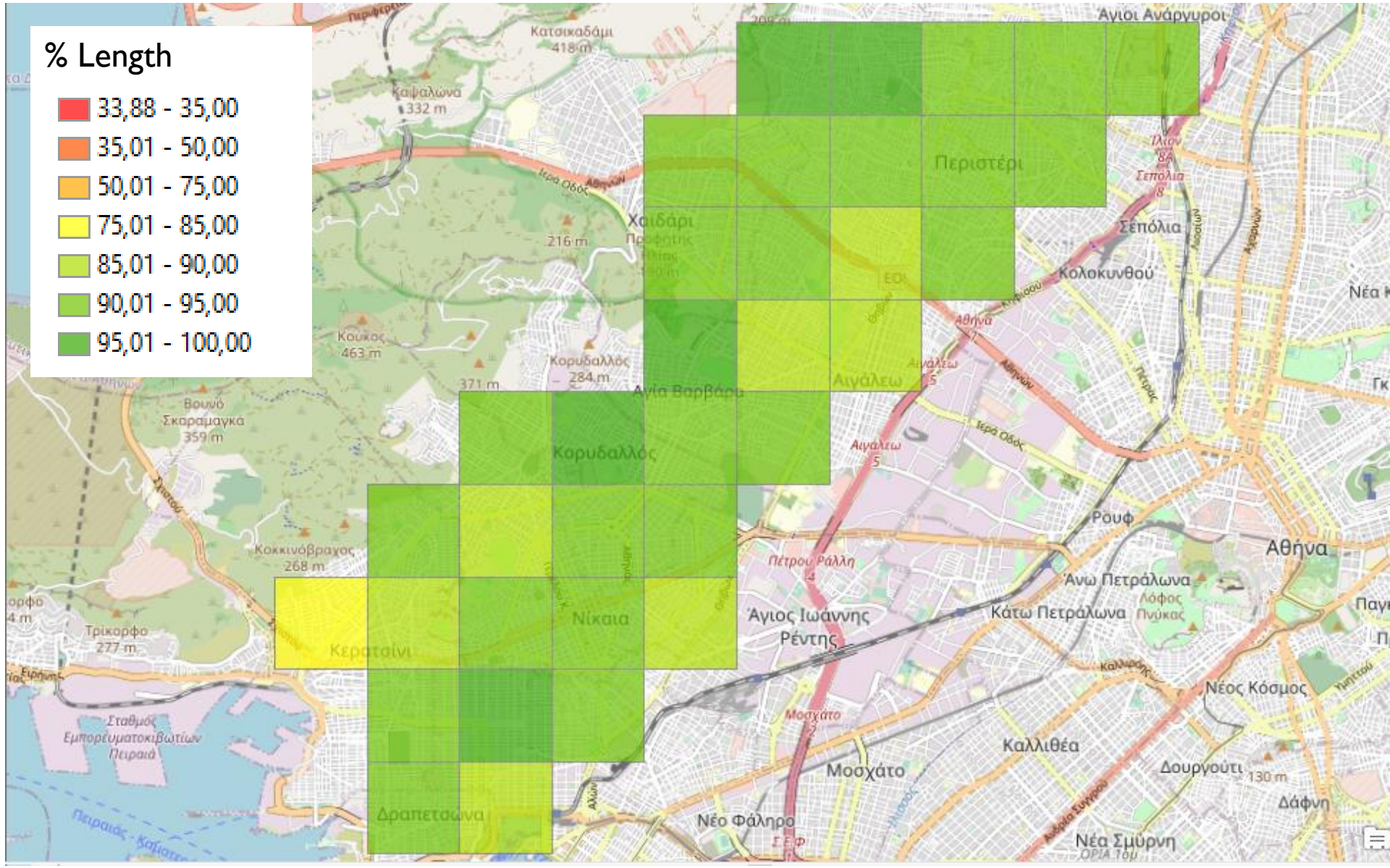
Positional Accuracy - %Length - Buffer 1m



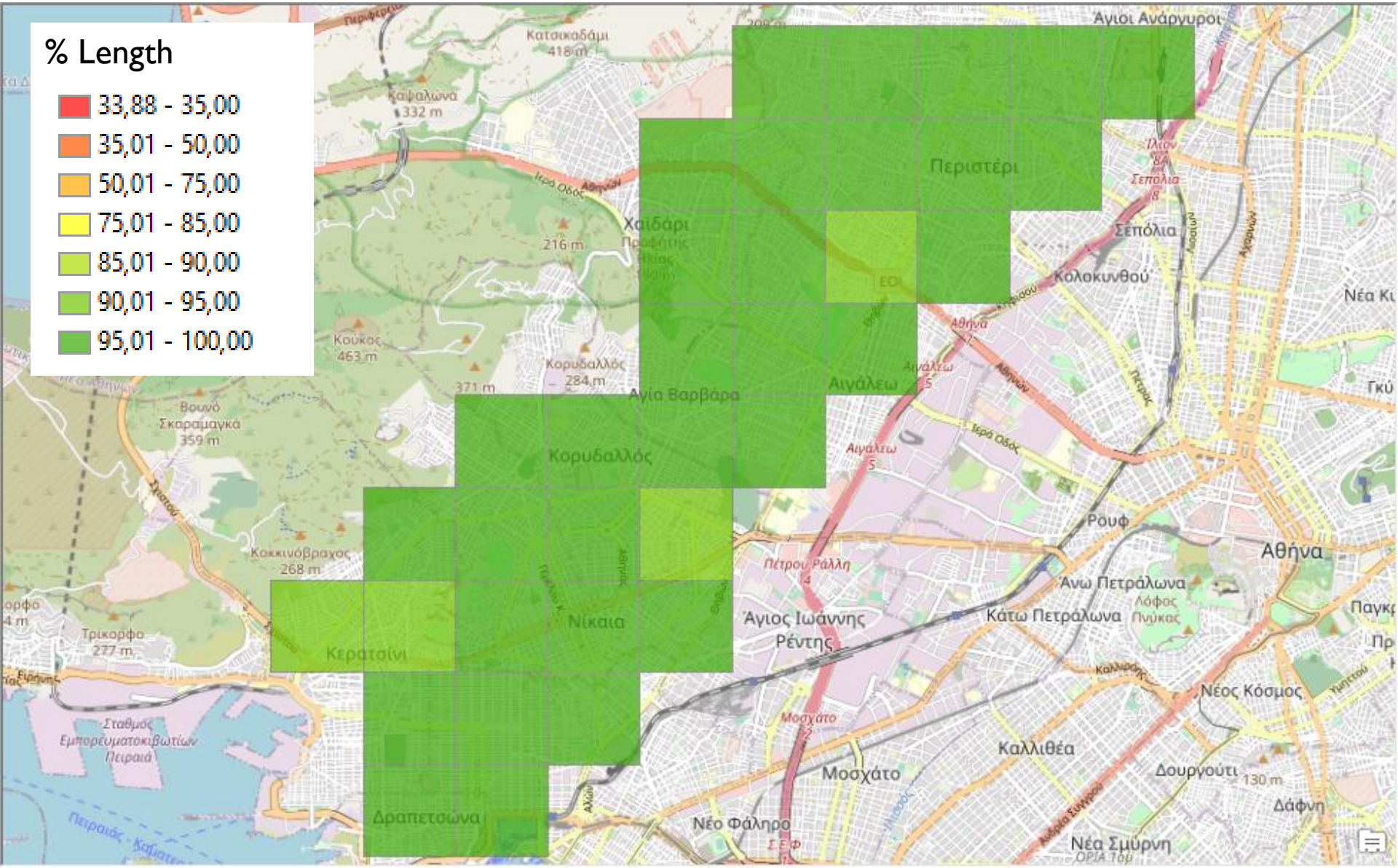
Positional Accuracy - %Length - Buffer 2m



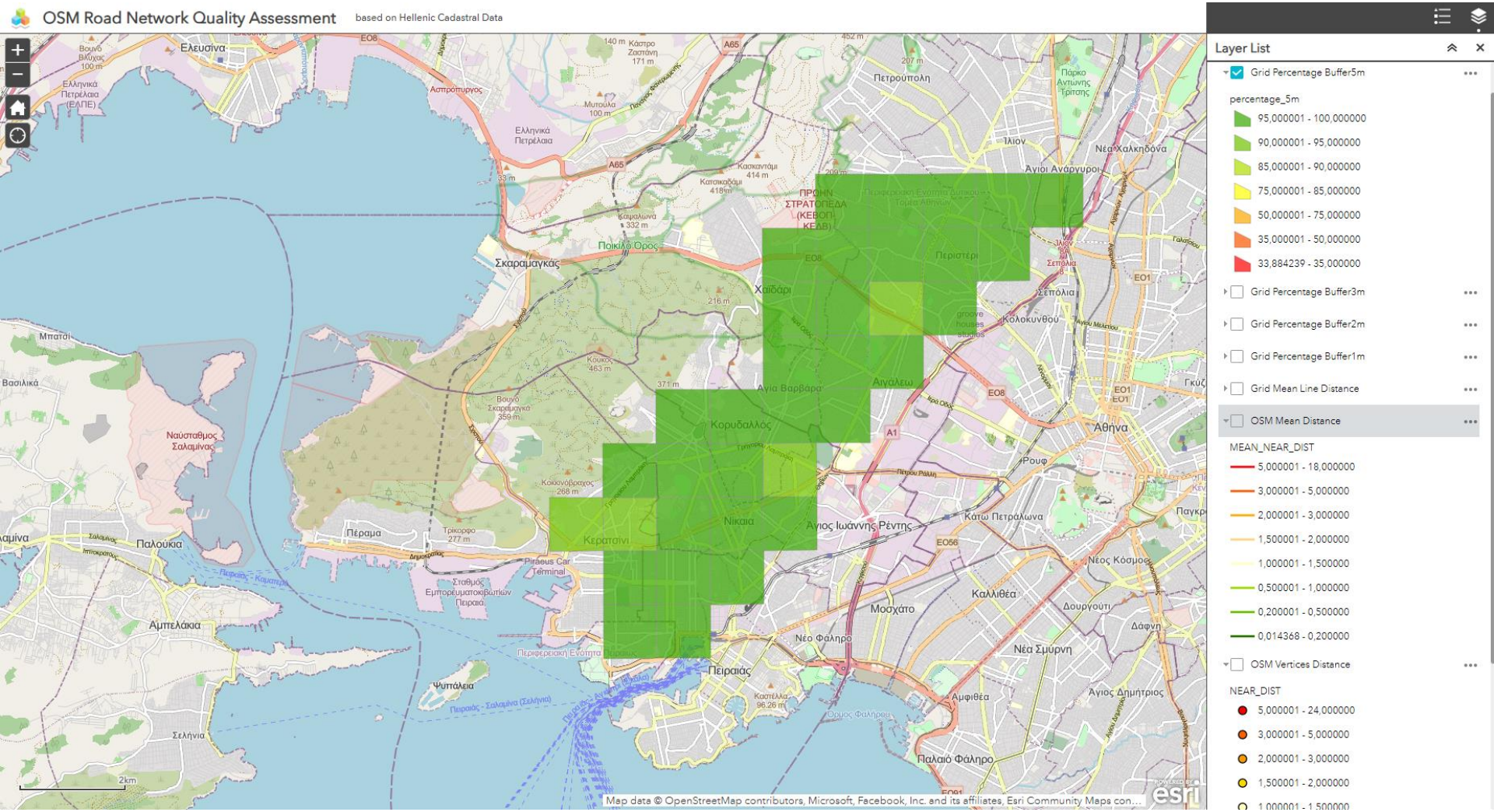
Positional Accuracy - %Length - Buffer 3m



Positional Accuracy - %Length - Buffer 5m



OSM Road Network Quality Visualization App



Conclusions

- Results are compatible with existing studies for Greece (Kounadi, 2009; Koukoletso, 2014)
- Overall the results showed that OSM is an accurate dataset that can be used with reliability for several purposes

Future plans

- Improve axis extraction algorithm from polygons
- Expand the case study area to Athens and other Greek cities
- Assess additional quality elements e.g. Thematic accuracy
- Consider other OSM data e.g. city blocks

4th International Workshop on Spatial Data Quality - Brussels, 2023

Thank you !!

Assessment of OSM road network quality in comparison to Hellenic Cadastre open data

Asst. Prof. Dr Andriani Skopeliti
Savvas Vasileiadis

School of Rural, Surveying and Geoinformatics Engineering,
National Technical University of Athens, Greece