

CHRISTIAN ASKER

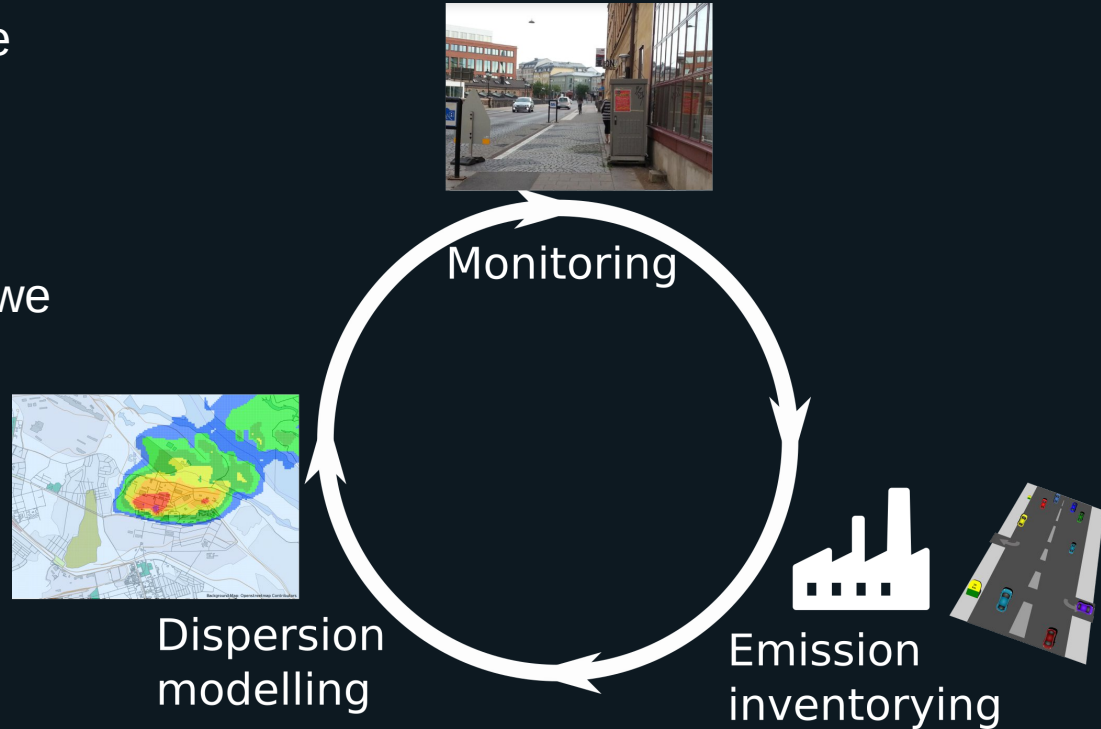
EMISSION DATA FOR
WESTERN BALKANS

Background



Why do we need emission data?

- Air-quality management cycle
 - Monitoring
 - Emission inventorying
 - Dispersion modelling
- To understand the situation, we need emission data
- Scenarios (what-if)
- AQ action plans!



Traffic emissions

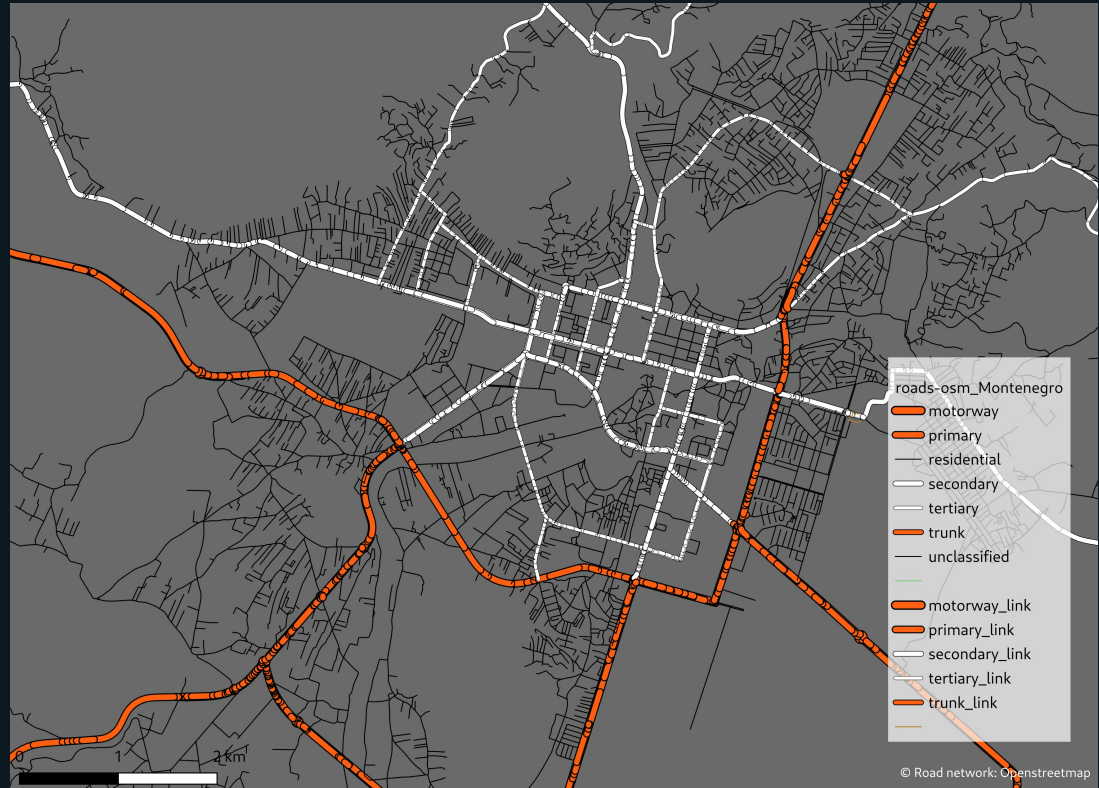


What do we need to calculate traffic emissions?

- Road network (gis)
 - Road type/category
- Traffic data
 - For all roads?
- Vehicle fleet
 - Passenger car
 - Light truck
 - Heavy truck
 - Bus (several types)
 - Motorcycles
 - etc
- Age of vehicles (euro4, euro5, etc)
- Fuels
 - Petrol
 - Diesel
 - gas
 - Hybrid
 - electric
- Emission factors!
 - For each type of vehicle, fuel and road category, etc

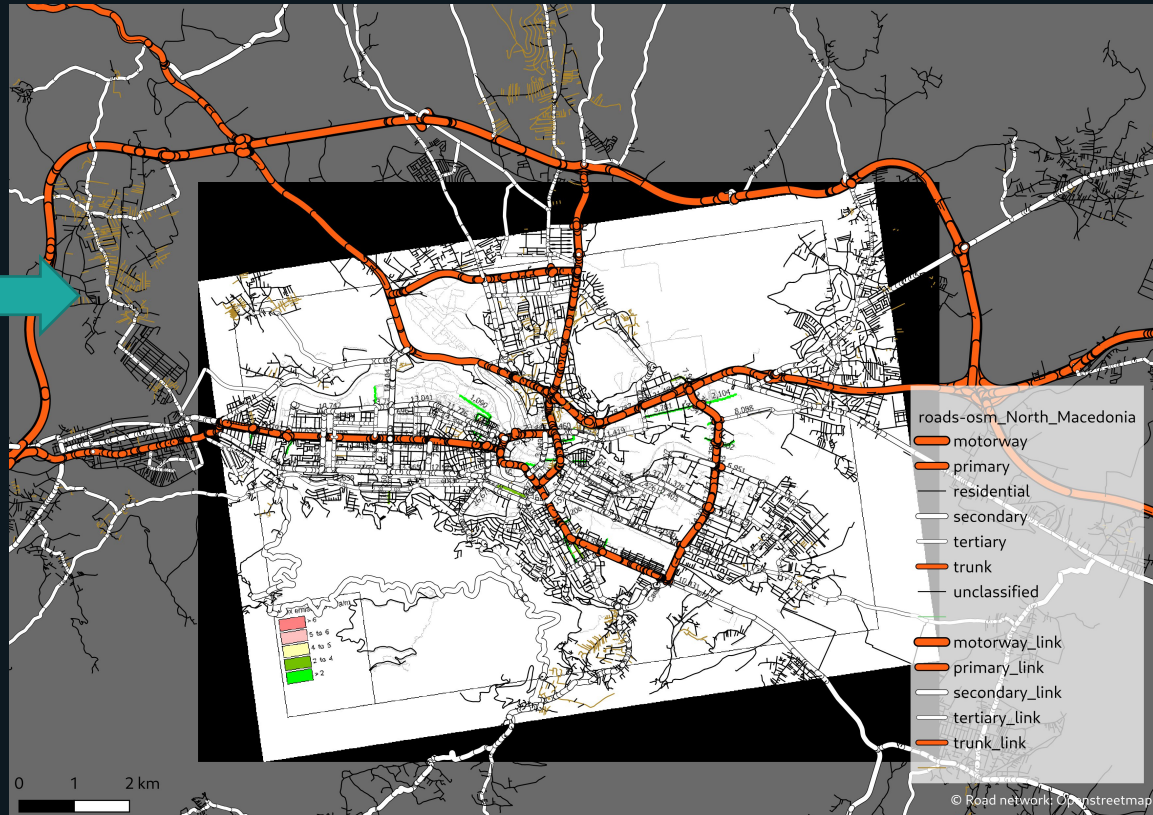
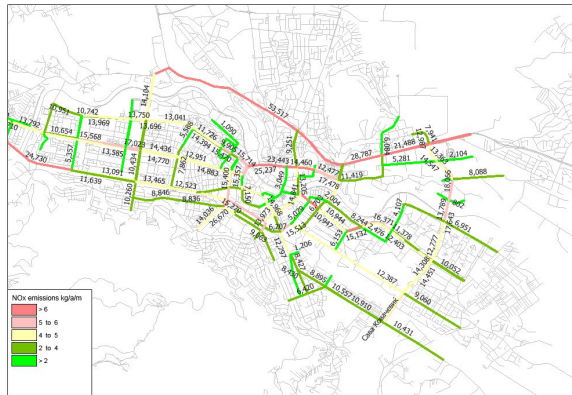
Road network: OpenStreetMap (OSM)

- For each economy we can download OpenStreetMap data
- We remove the smallest roads
- Urban areas from OSM
 - Joined with road network
- BUT: no traffic data!

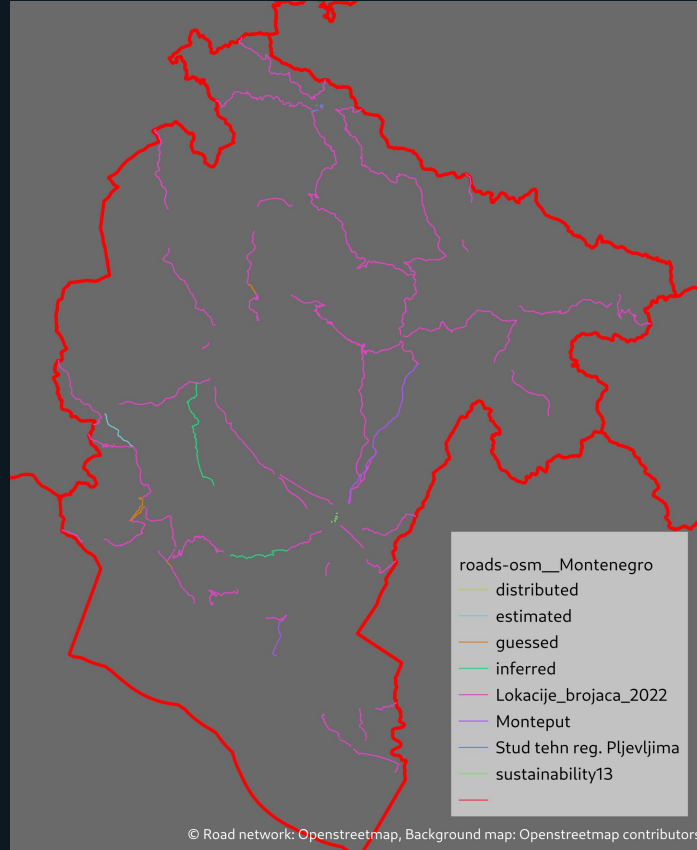
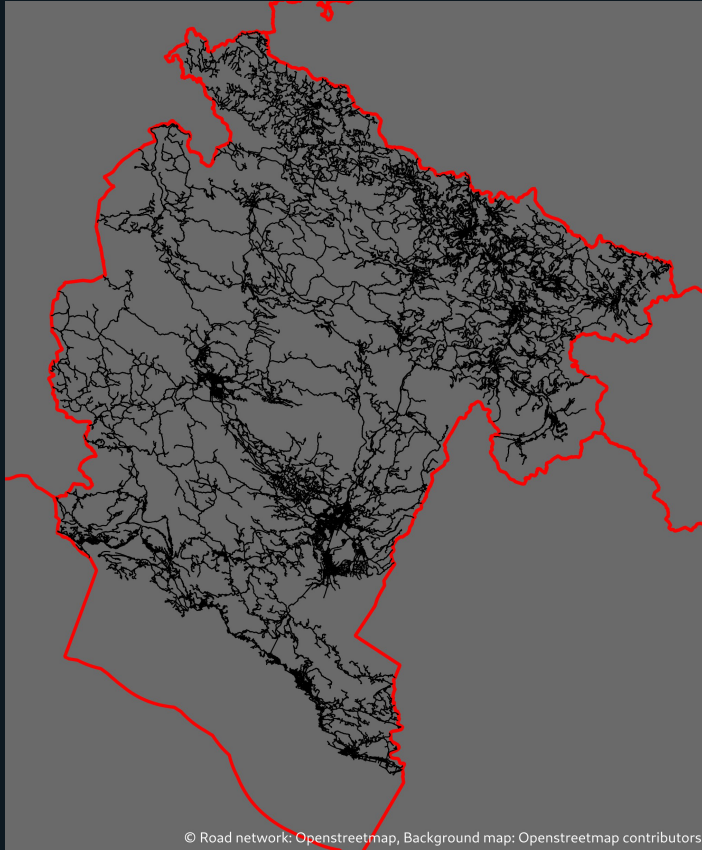


Traffic data?

- Measurements on some roads
- Accuracy of measurements?
- Where are they valid?
- Data only for a few roads

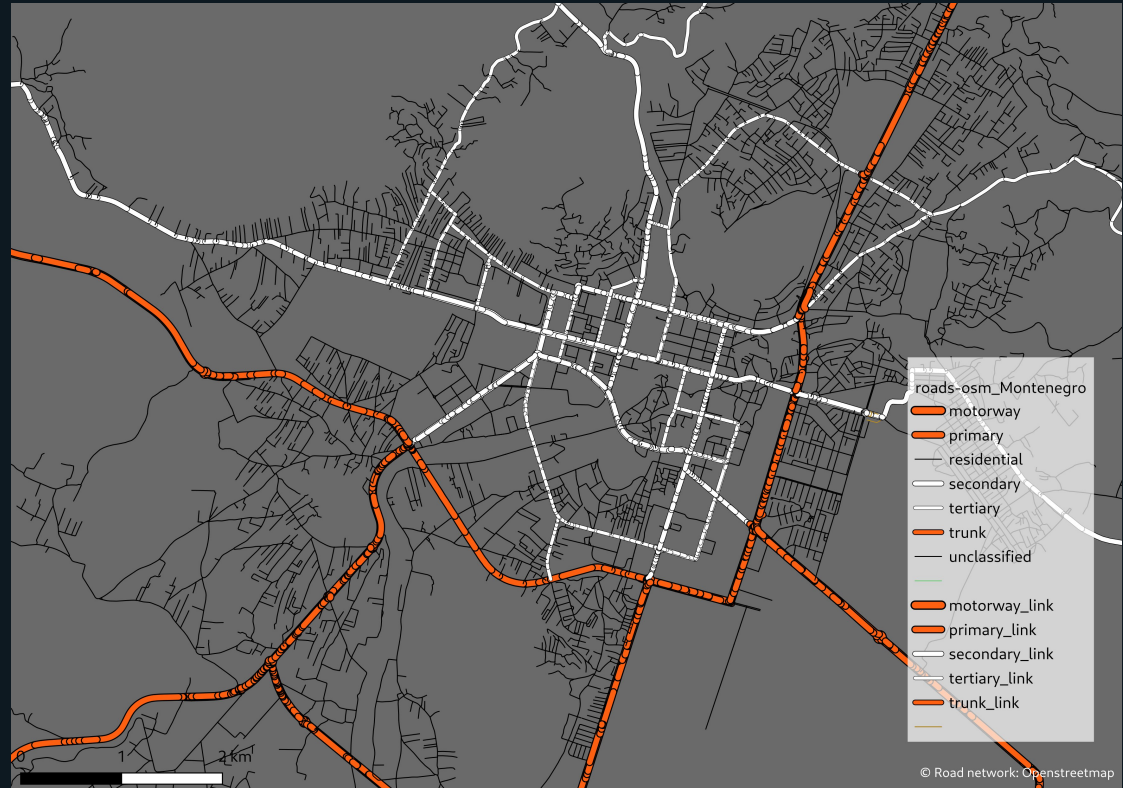


Traffic data?



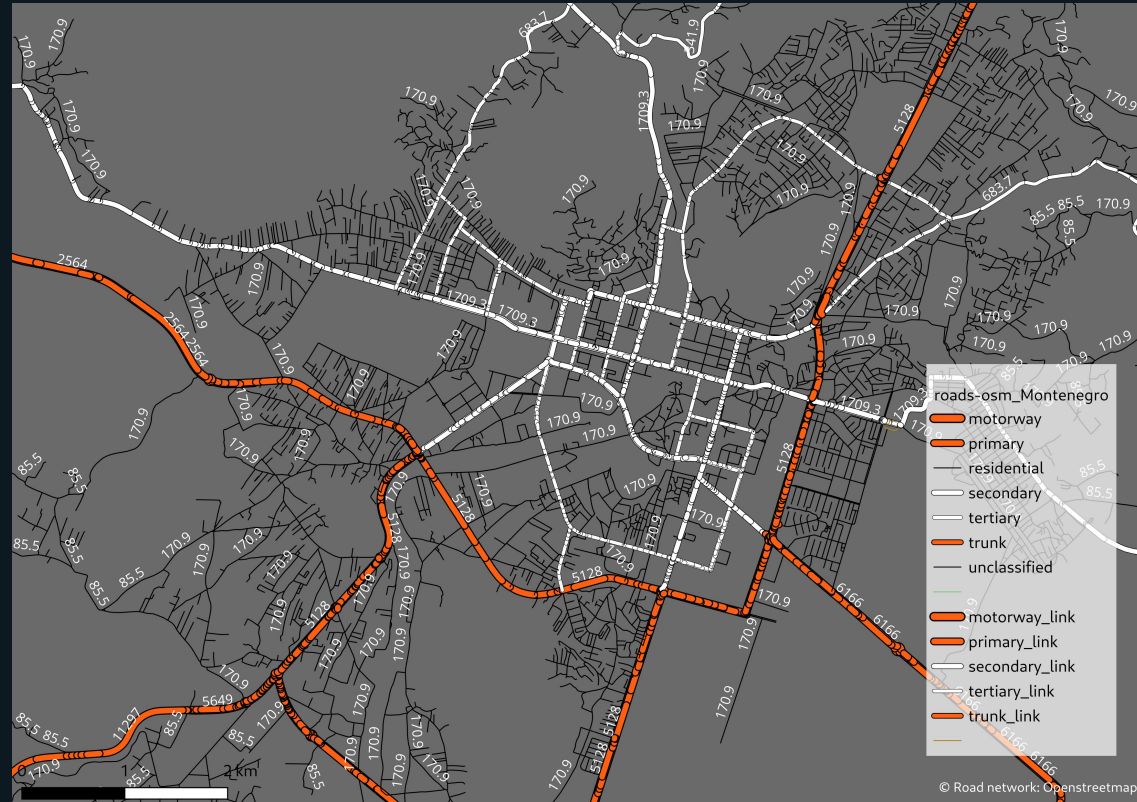
Traffic models?

- Traffic models require more information
 - Residential areas
 - Work areas
- Measurements of traffic



What can we do?

- **Some** roads have measurements
- **traffic work** for each economy
 - Traffic * road length
 - Eurostat
- Distribute traffic using weights for different road types
 - Urban / rural
 - Road category
- **Only assumptions!**



A decorative graphic consisting of several white, wavy, vertical lines of varying thicknesses, resembling smoke or steam, set against a dark blue background. The lines originate from the left edge and flow downwards and slightly to the right.

Residential heating emissions

Residential heating types

- District heating
 - Large point sources
- Condominium
 - Point sources
 - Eg Toplane Sarajevo
- Local space (individual house)

Residential heating types

- How many residential houses are there in each area?
- How much energy do they need for heating?
 - What fuels are used and how much?
- How can we find out?
 - Official building registry
 - Other data sources

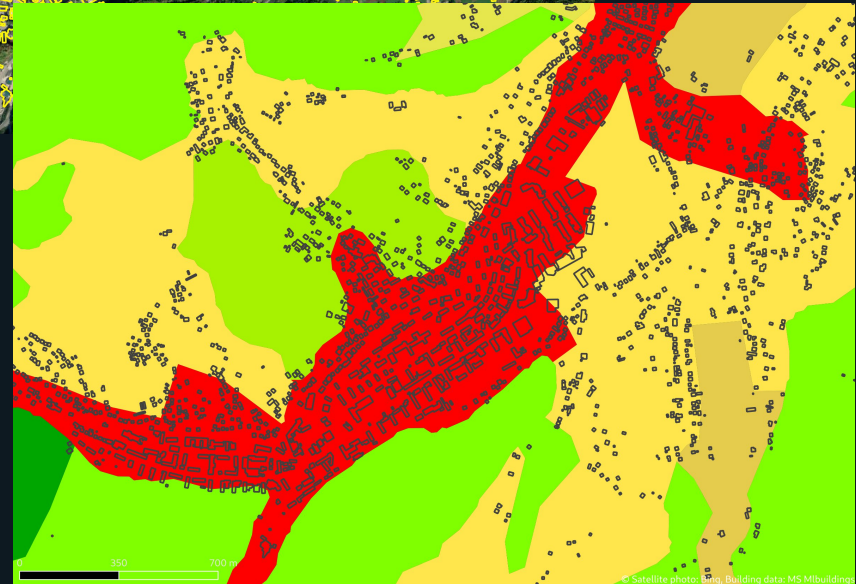
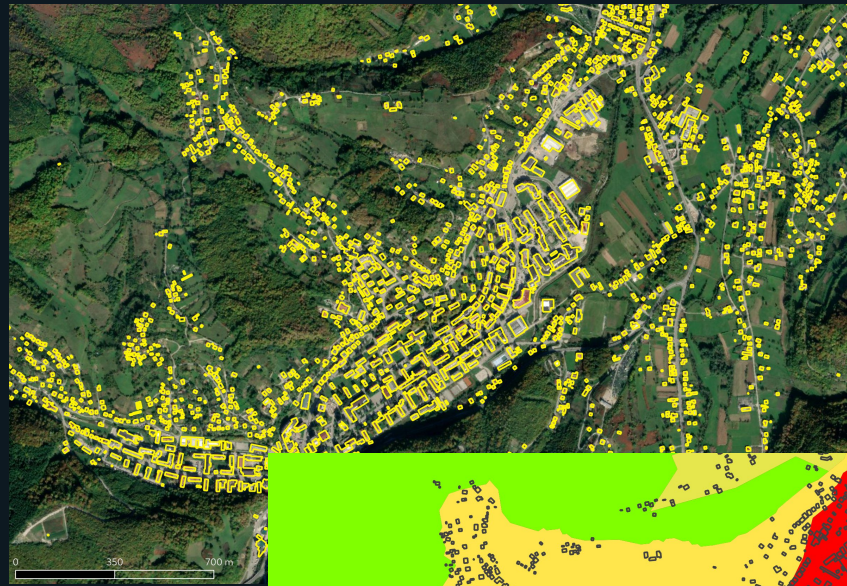
Buildings dataset

- Microsoft ML buildings dataset
- AI trained to detect buildings from satellite imagery
- Free, open data
- Building “footprints”
- Openstreetmap to fill gaps
- Which buildings are houses?



Buildings dataset

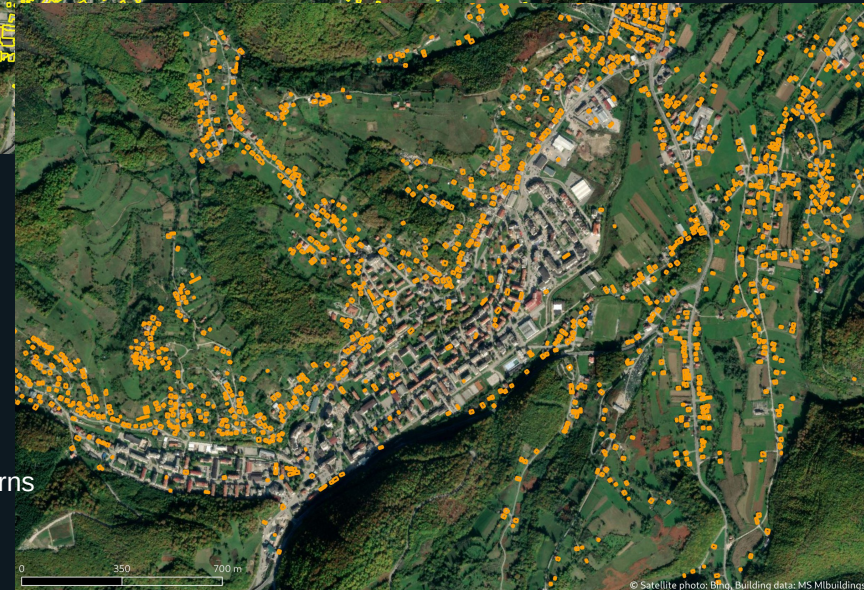
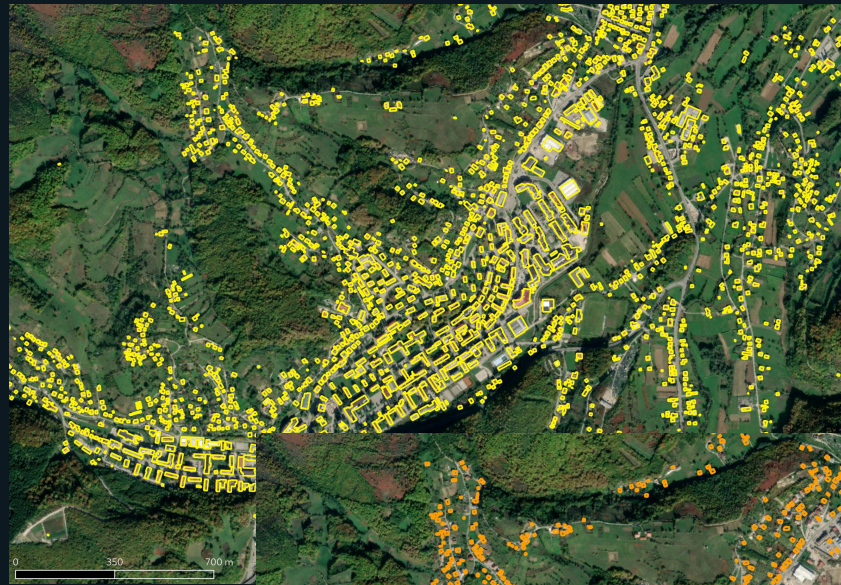
- Combine with Corine and UrbanAtlas datasets
- Filter out all buildings on e.g. industrial areas etc
- Filter out (remove)
 - small (<50 sqm)
 - large (>200 sqm)
 - etc



Buildings dataset

- Combine with Corine and UrbanAtlas datasets

- 11100 Continous urban fabric
- 11200 Discontinuous urban fabric
- 11210 Discontinuous Dense Urban Fabric
- 11220 Discontinuous Medium Density Urban Fabric
- 11230 Discontinuous Low Density Urban Fabric
- 11240 Discontinuous very low density urban fabric
- 11300 Isolated structures
- 21000 Arable land
- 21100 Non-irrigated arable land
- 21200 Permanently irrigated land
- 21300 Rice fields
- 22000 Permanent crops
- 22100 Vineyards
- 22200 Fruit trees and berry plantations
- 22300 Olive groves
- 23000 Pastures
- 23100 Pastures
- 24000 Complex and mixed cultivation patterns
- 24100 Annual crops associated with permanent crops
- 24200 Complex cultivation patterns



Buildings dataset

- Problem in rural areas
- Mix of housing/farm buildings
- NN analysis for rural areas:
 - Buildings within 20 m
 - Remove every 2nd building
- Done for BiH and Serbia



Buildings dataset

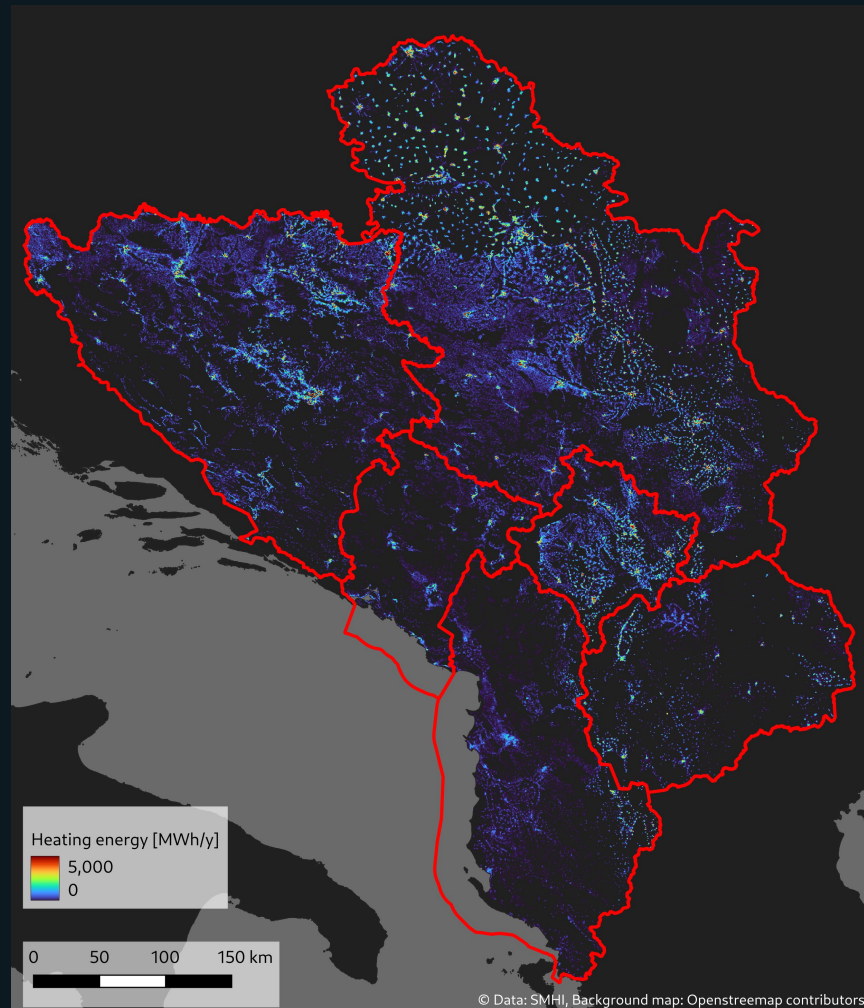
- Bad building detections
- Strumica-region (NM)
- Agricultural structures
- Solution:
 - Calculate width/height
 - Remove all buildings that are very “long” compared to width



Energy for heating

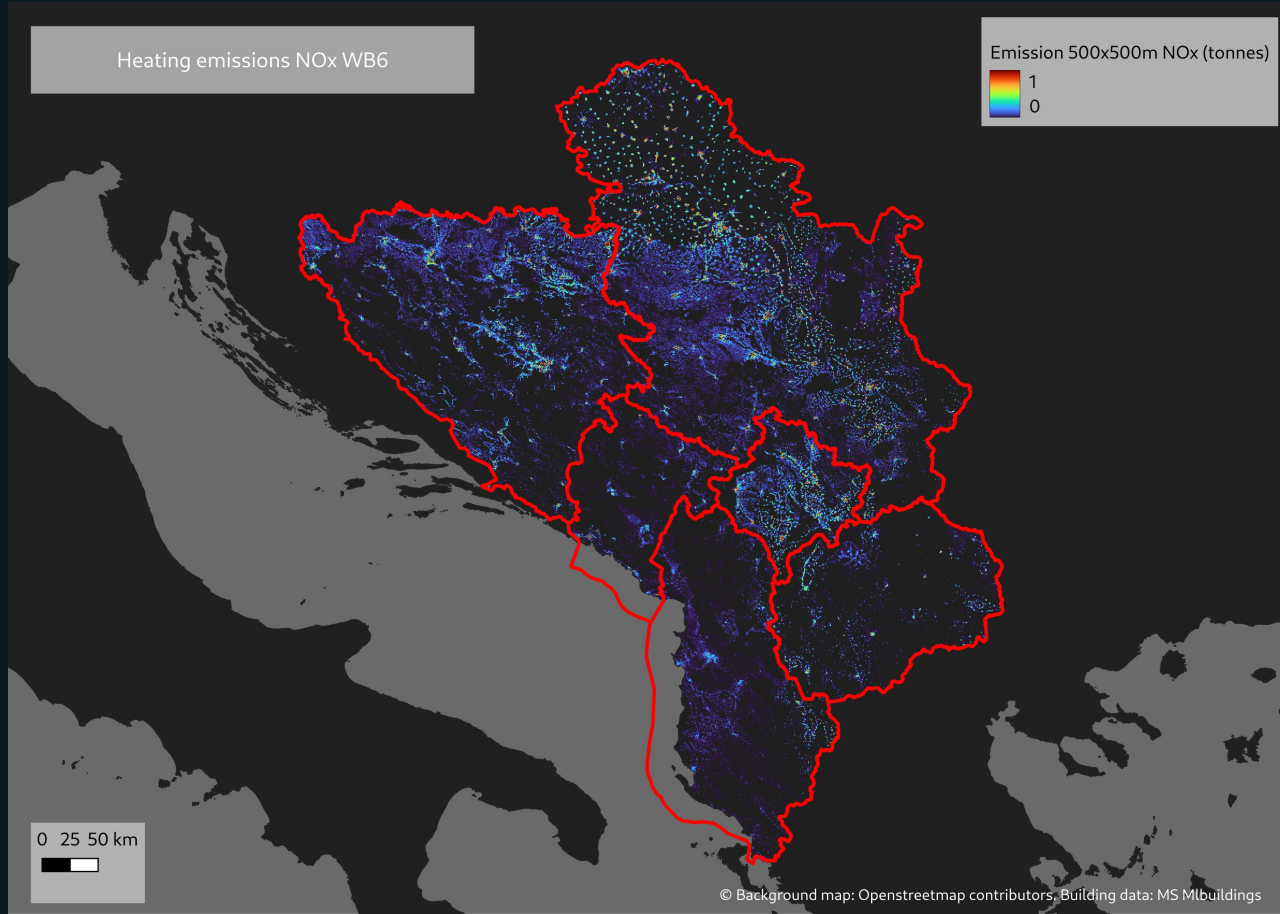
- Data from
 - building typology reports
 - local statistics
 - peer-reviewed articles
- Adjustments for climate zones when data available for this

- Next: Emissions
 - EEA database
 - Emission factors
 - Appliances



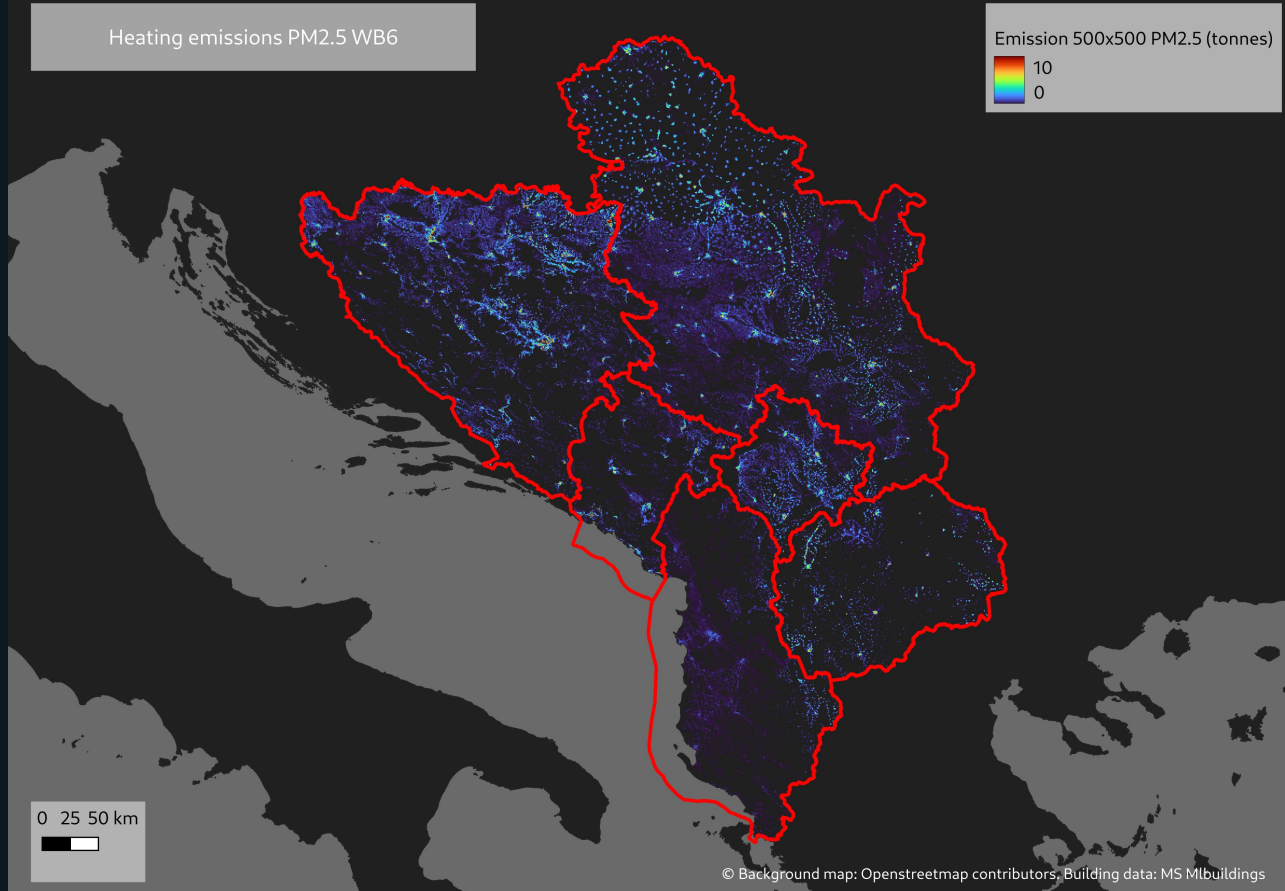
All references to Kosovo in this document shall be understood to be in the context of the United Nations Security Council resolution 1244 (1999)

Result: NOx emissions



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Result: PM2.5 emissions



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Result: comparison for Western Balkans

Dataset	Emission NOx (t)	Emission PM2.5 (t)
EDGAR	15175	52427
CAMS-REG	5963	57245
This work	18866	122145

- Regional differences
- Difference NOx - PM2.5 : emission factors?

EDGAR v6.1 (https://edgar.jrc.ec.europa.eu/dataset_ap61)

CAMS-reg-v4.2 (doi: 10.5194/essd-14-491-2022)

Reliability of emission results?

- Too many buildings? (BiH)
- But: apartment blocks not included
- We do not include the size of the buildings for energy estimation
- EEA Emission Factors
 - Representative of WB?
 - Local fuels?



Improvements?

- How can we include apartment buildings?
- Better filtering of buildings?
- **Heating data**
 - **More surveys?**
- Appliance composition data
- Emission Factors

