ST15
Emission Inventories

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RI-URBANS (101036245)

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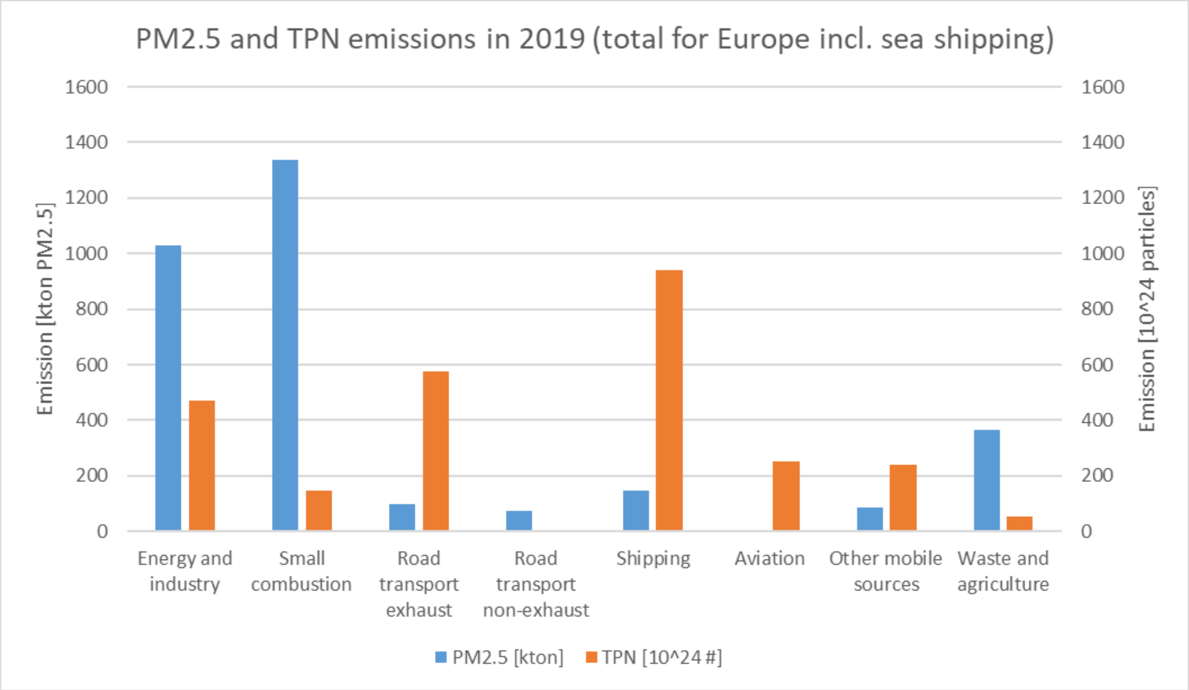
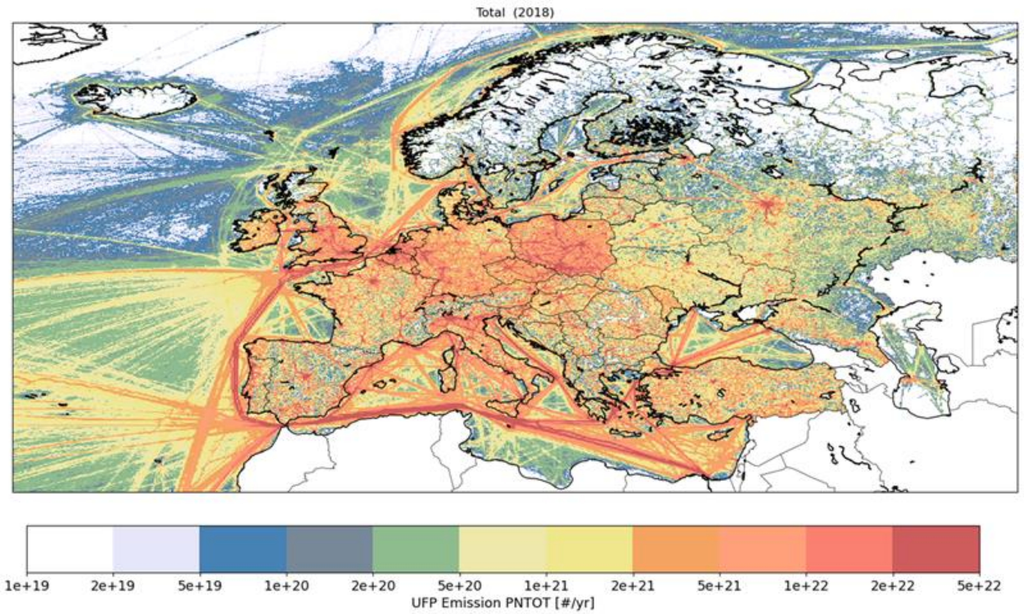
European emission inventories

- Improving existing inventories (~6km resolution), focus on year 2019
  - Consistency in road transport by implementing a full bottom-up model covering both exhaust & non-exhaust sources
  - New element: Ultrafine particle emissions inventory





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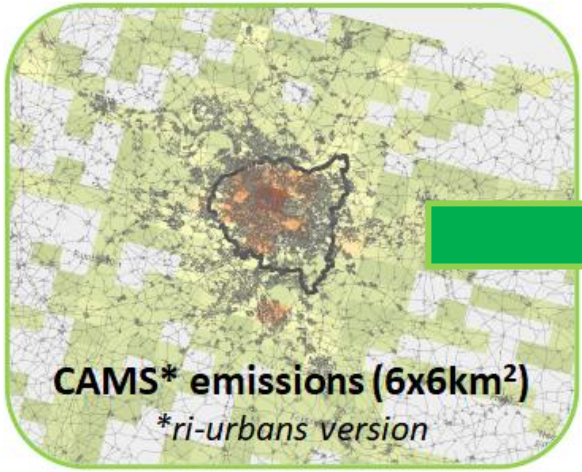
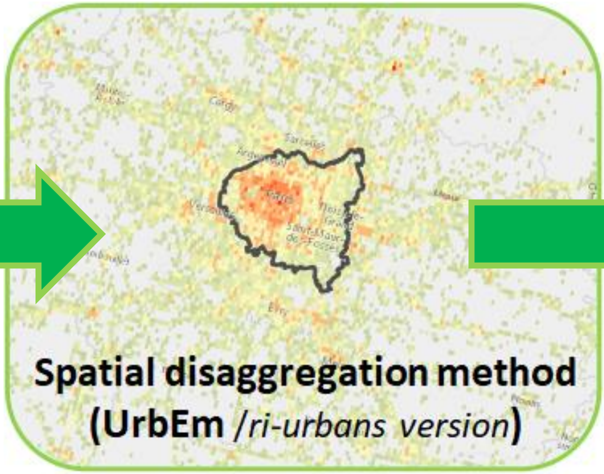
Zooming in over cities





1. Amsterdam
2. Athens**
3. Barcelona
4. Birmingham
5. Bologna
6. Hamburg
7. Helsinki
8. London
9. Madrid
10. Milan
11. Paris**
12. Rotterdam
13. Zurich

*** provided also for CTM simulations (NOA, FORTH)*

<u>Advantages</u>:

- Utilize (open, credible) CAMS-REG-AP data for urban purposes
- Combine with (open, credible) high-resolution source-specific spatial proxies
- Select the spatial resolution of the desired emission dataset: from 100m to CAMS cell dimensions
- Remain consistent with the attributes of the original CAMS dataset (pollutants, source sectors, projection system)
- Study AQ model results for >1 European cities with consistent emission inputs

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[Ramacher et al. (2021)](#)

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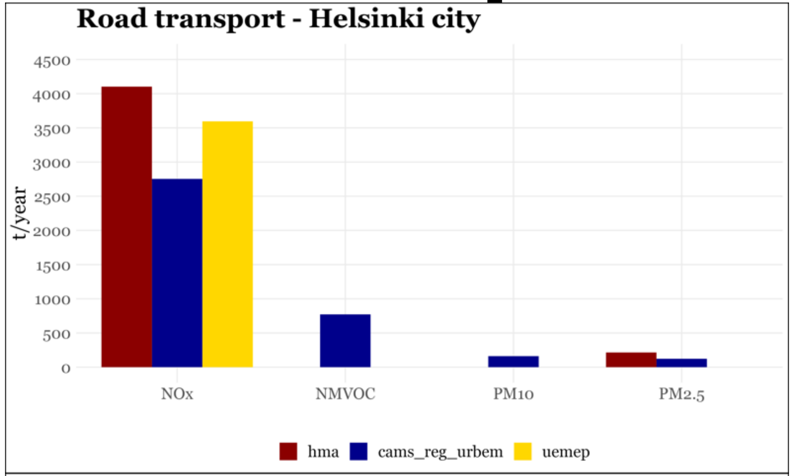
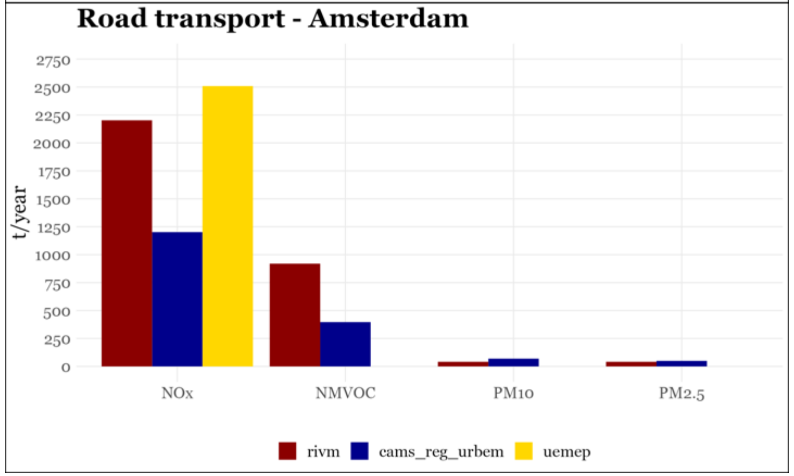
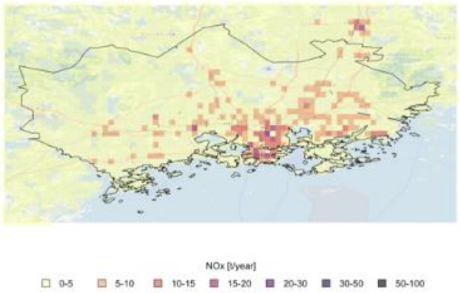
Intercomparison: road transport





CAMS-REG-UrbEm



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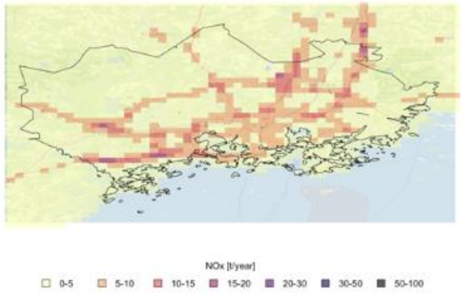
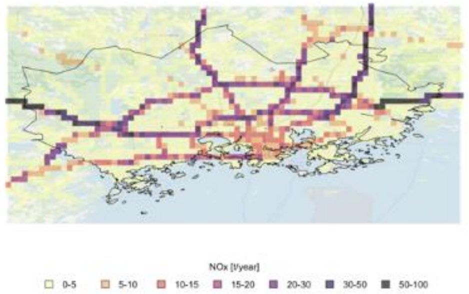
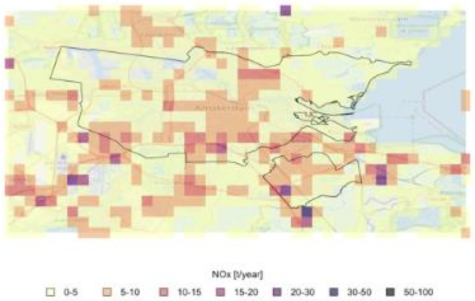


FMI



CAMS-REG-UrbEm



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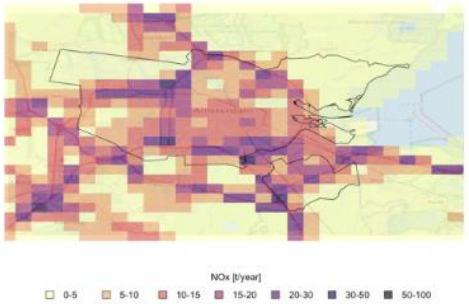
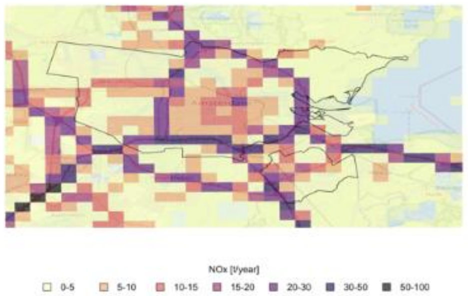


RIVM



Conclusion: issues in spatial distribution of road transport emissions in CAMS-REG-UrbEm + underallocation of emissions to urban areas

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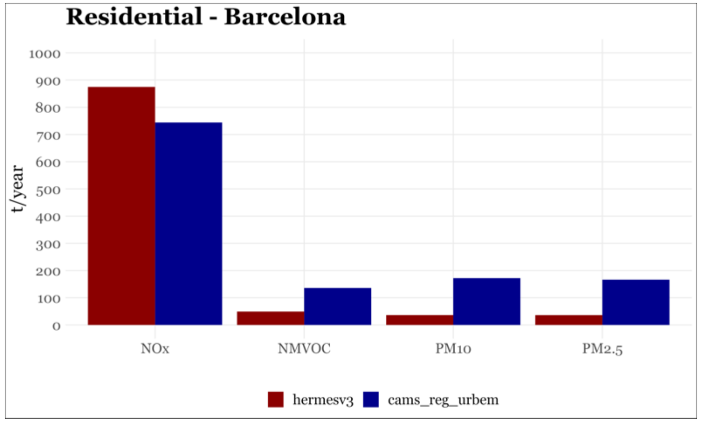
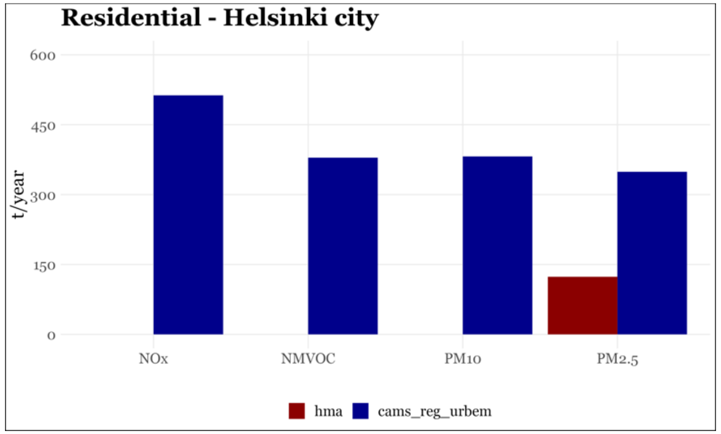
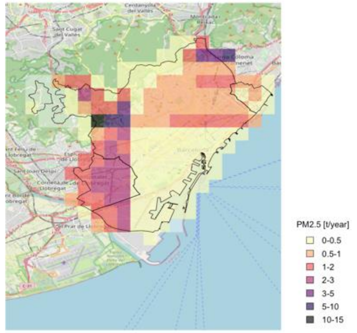
Intercomparison: residential combustion

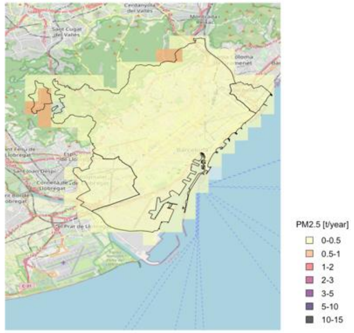
- Differences in both absolute values and spatial patterns
  - Allocation of emissions urban vs. rural
  - Use of different emission factors
- European cities may differ quite a lot
  - Cultural habits
  - Local policies w.r.t. wood use in urban areas



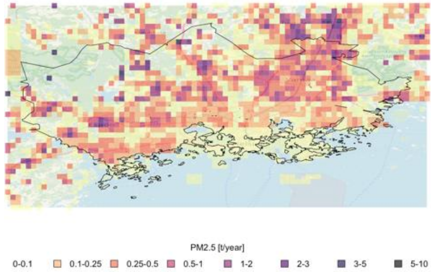


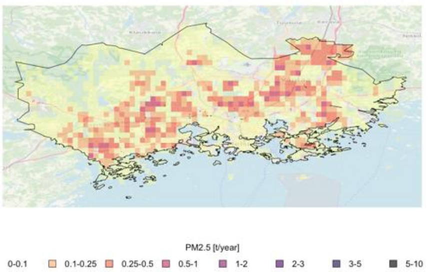
CAMS-REG-UrbEm **BSC**





CAMS-REG-UrbEm **FMI**





Conclusion: spatial distribution generally overallocating emissions in cities, but situation very different from city to city

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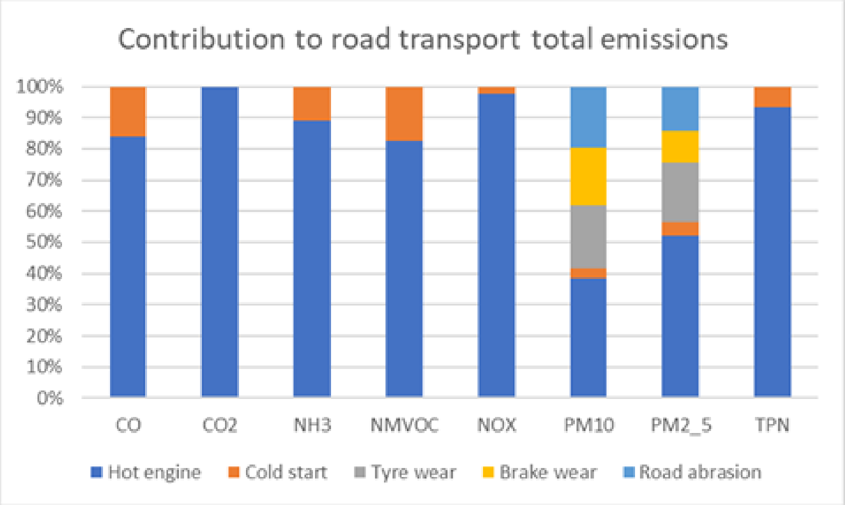
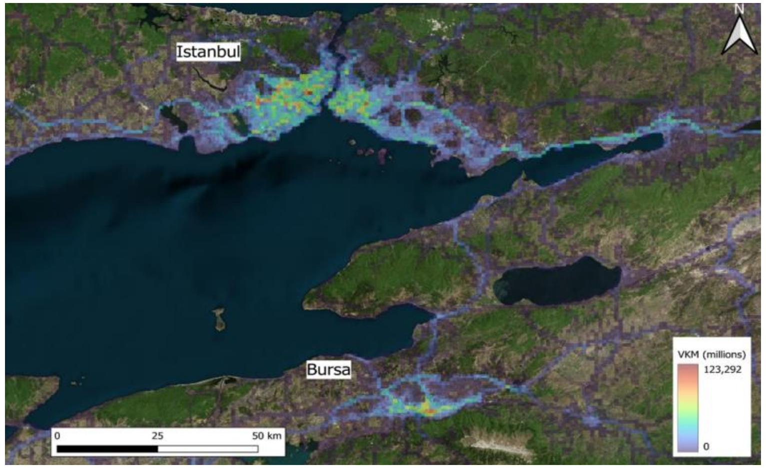
Updates to EU emission estimates

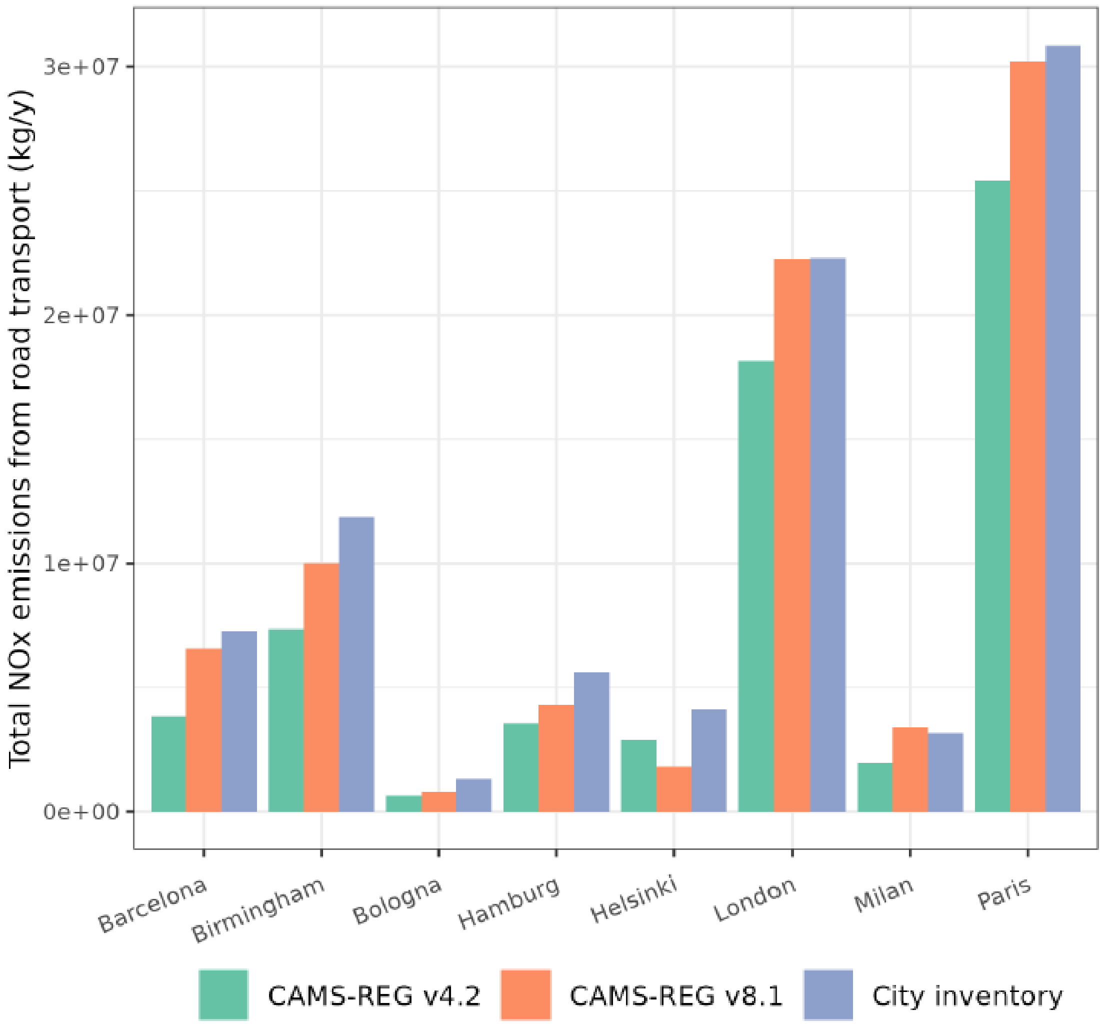
- Updated UFP (TPN) emissions (based on new literature research)
- Specific updated calculations for non-exhaust contributors to PM mass based on EMEP/EEA Guidebook approach
- Explicit accounting of cold start emissions, 95% allocated to urban areas
- Fully updated spatial distribution map
- Open Street Map for locations of all roads
- Open Transport Map (Jedlička et al., 2016) for intensities
- Random forest model used based on multiple predictors (e.g. land use, administrative units, road characteristics as in OSM, etc.) to assess intensities for missing roads





Results

- For most cities comparison improves significantly, also the spatial patterns
- Scope of city inventories differs
- Improvements have been integrated in CAMS inventories (CAMS-REG-v8.1)



Hohenberger et al. (2025), submitted

Conclusions

- Emission inventories from CAMS-REG are improved with a focus on urban areas: in particular focusing on road transport and ultrafine particles
- The UrbEm downscaling tool is further developed, which can be used as a default to get high resolution emissions for a city or urban area
- Initial comparisons between downscaled CAMS-REG and bottom-up city inventories showed large discrepancies for road transport and residential combustion
- For road transport, updated emission estimates and spatial distribution proxies have significantly improved the comparison, resulting in a better EU wide emission map for this sector which has been implemented in the CAMS-REG emission inventory

Challenges & Next Steps

- Consistency of emission inventories across scales (regional to city level)
- Ultrafine particles: improve our understanding of UFP by combining knowledge on measurements & modelling
  - Focus on road transport & other mobile sources
- Semi-volatiles (IVOC & SVOCs)
- Wood combustion: look into apparent overestimation of emission representation in urban areas