2020th Joint EIONET & UNECE
Task Force on Emission Inventories & Projections Meeting
Combustion & industry expert panel
World Wide Web, 13th May 2020

Emissions and projections of emissions in industrial, residential and service sectors: Final results of ClairCity project

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ClairCity overall objective

- *ClairCity is aimed at creating a major shift in public understanding towards the causes of poor air quality, inviting citizens to give their opinions on air pollution and carbon reduction to shape the cities of the future*
- *ClairCity will integrate and quantify citizens' behavior and activities to enrich city, national and EU level policy-making, resulting in improved air quality, reduced carbon emissions, improved public health outcomes and greater citizen awareness*

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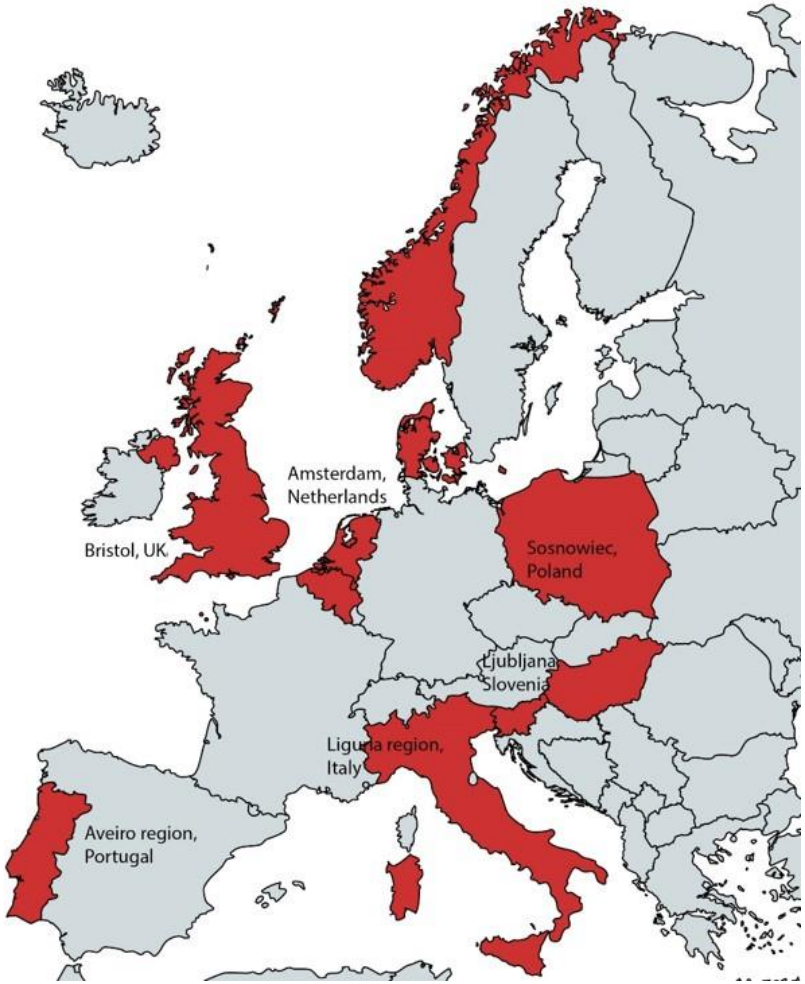
ClairCity Consortium



1. Trinomics B.V. (Project Coordinator – Netherlands)
2. University of the West of England, Bristol (Technical Lead – UK)
3. PBL Netherlands Environmental Assessment Agency (NL)
4. Statistics Netherlands CBS (Netherlands)
5. Technical University of Denmark (Denmark)
6. Norwegian Institute for Air Research (Norway)
7. REC Regional Environmental Centre (Hungary)
8. TECHNE Consulting (Italy)
9. Transport & Mobility Leuven (Belgium)
10. University of Aveiro (Portugal)
11. Municipality of Amsterdam (Netherlands)
12. Bristol City Council (UK)
13. Intermunicipal Community of Aveiro Region (Portugal)
14. Liguria Region (Italy)
15. Municipality of Ljubljana (Slovenia)
16. Sosnowiec City Council (Poland)

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ClairCity objectives

The overall objective will be achieved by through the following sub-objectives regarding behavior and policy, technical tool development, and dissemination and impact:

- ***Putting citizens behavior and practices at the heart of the debate on air quality and carbon management***
- ***Develop a suite of innovative toolkits for enhanced quantification, engagement and impact evaluation.***
- ***Integrate citizens behavior in city policies and ensure that future city policies are reflective of citizen's visions for their future city***
- ***Raise awareness of environment changes and their solutions***

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ClairCity main activities

- Through an innovative engagement and quantification toolkit, Clair-City will stimulate the public engagement necessary to allow citizens to define a range of future city scenarios for reducing their emissions to be used for supporting and informing the development of bespoke city policy packages out to 2050
- ClairCity will apportion air pollution emissions and concentrations, carbon footprints and health outcomes by city citizens' behavior and day-to-day activities in order to make these challenges relevant to how people chose to live, behave and interact within their city environment
- ClairCity will use six pilot cities/regions

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Domestic and service sectors emissions estimate modeling approach

- **Activity data**
  - are collected at most detailed available statistical administrative level (National, Level 0, 1, 2)
  - are evaluated at most detailed available statistical administrative level (Level 2)
- **Emissions**
  - are evaluated with EMEP/EEA Guidebook EF
  - are allocated inside the 0.05° model domains defined for modeling purpose with land use maps
  - are evaluated at hourly level with proxy variables

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Industrial sector emissions modeling approach

- **Emissions derived by single facility from:**
  - **European Pollutant Release and Transfer Register and national and local registers or emissions inventories (national, regional and local scale)**
  - **ad hoc estimates using available information and emission factors from EMEP/EEA Guidebook**
- **geographically allocated by coordinate of source**
- **when data on single facility are not know emissions are evaluated from statistical sources as area sources and allocated using land cover maps**
- **Large Point Sources (sources that emits more than 100 Mg of NO_x or PM_{10}) characterized stack by stacks**

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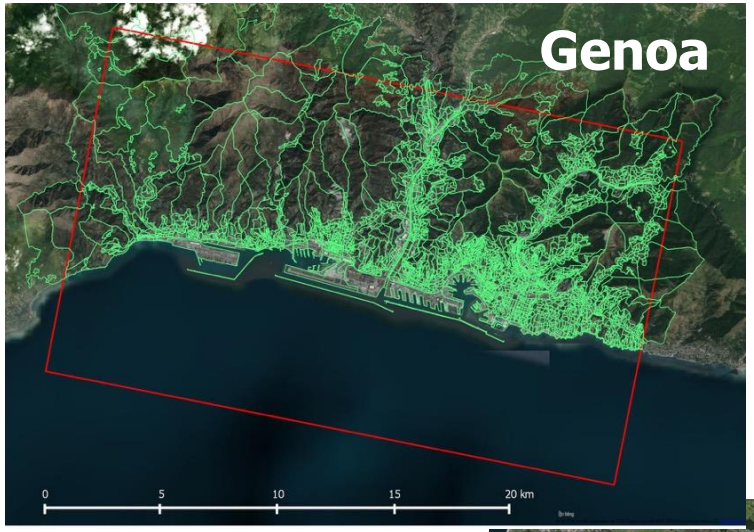
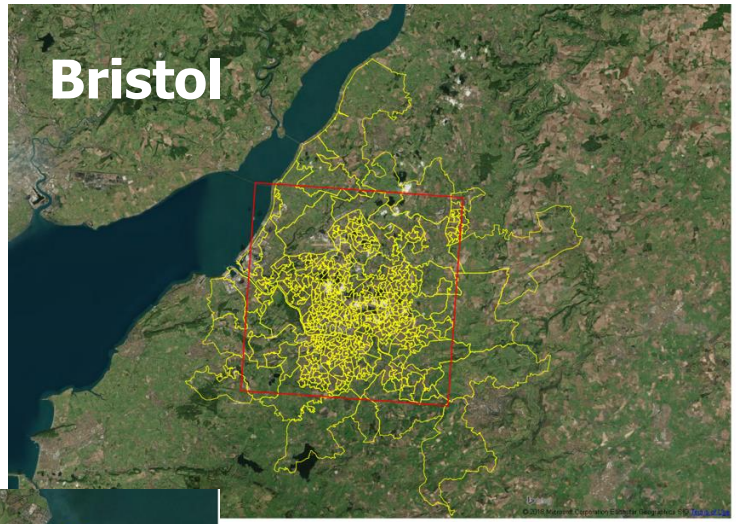
Level 2 – Emission estimate domain





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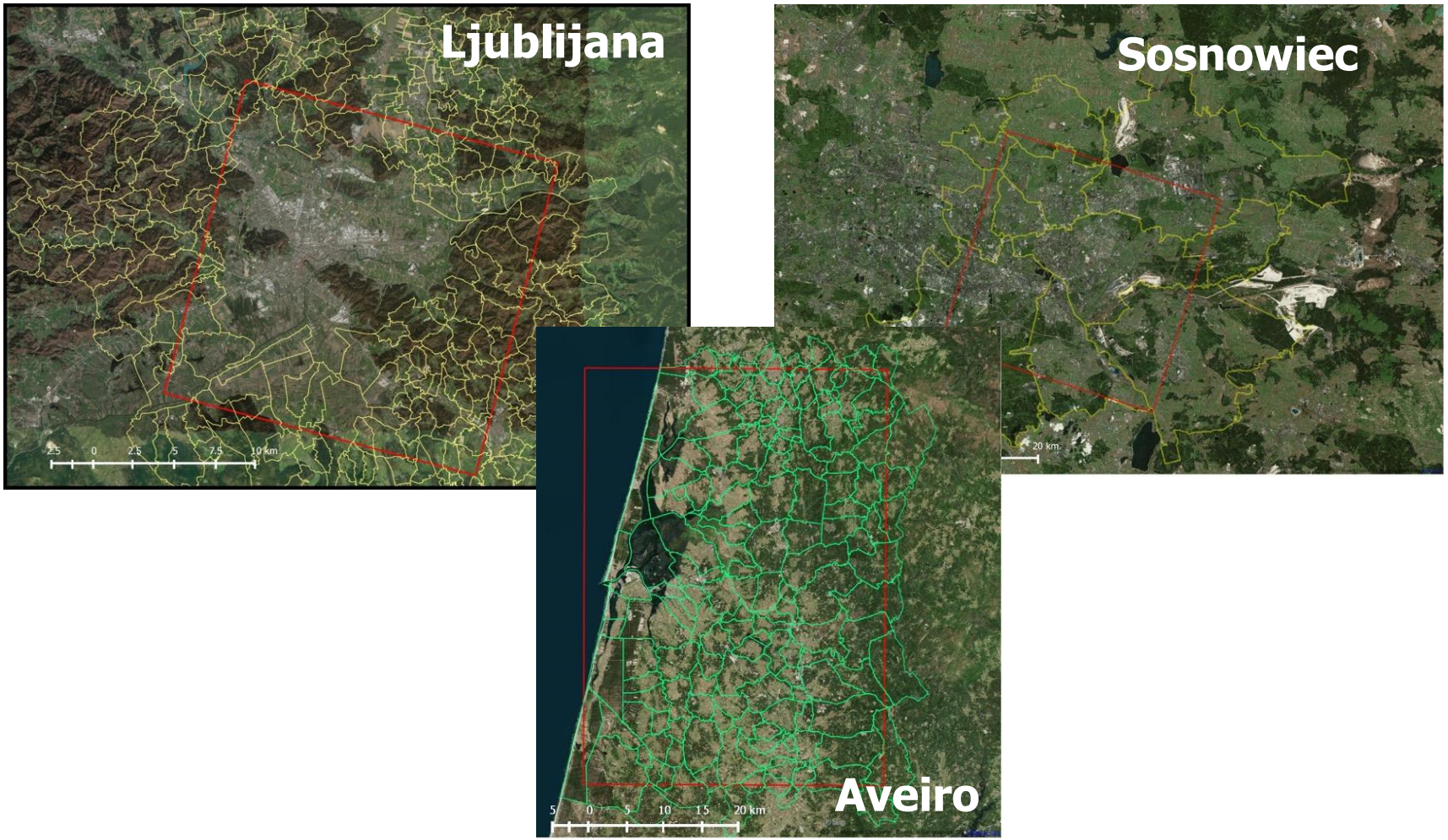

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Residential and Commercial modeling approach
Allocation to level 2 of data at level 0 or 1

When data are available only in aggregate figures (level 0 or 1) it is allocated to level 2 using a "proxy" variable available at level 2:

$$A^{L2}_i = A^{L0}_j * P^{L2}_i / \Sigma_i P^{L2}_i$$

where: A^{L2}_i P^{L2}_i are the indicator of the activity A and the proxy variable P in the level 2 territorial unit i, and A^{L0}_j is the indicator of the activity A in the level 0 territorial unit j

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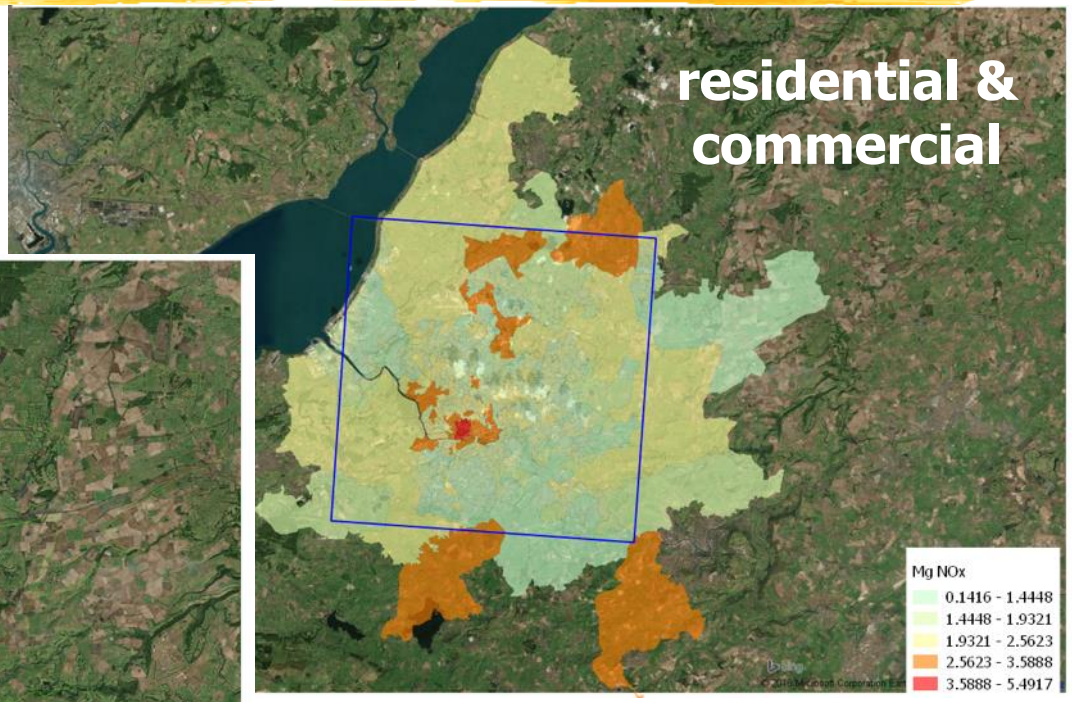
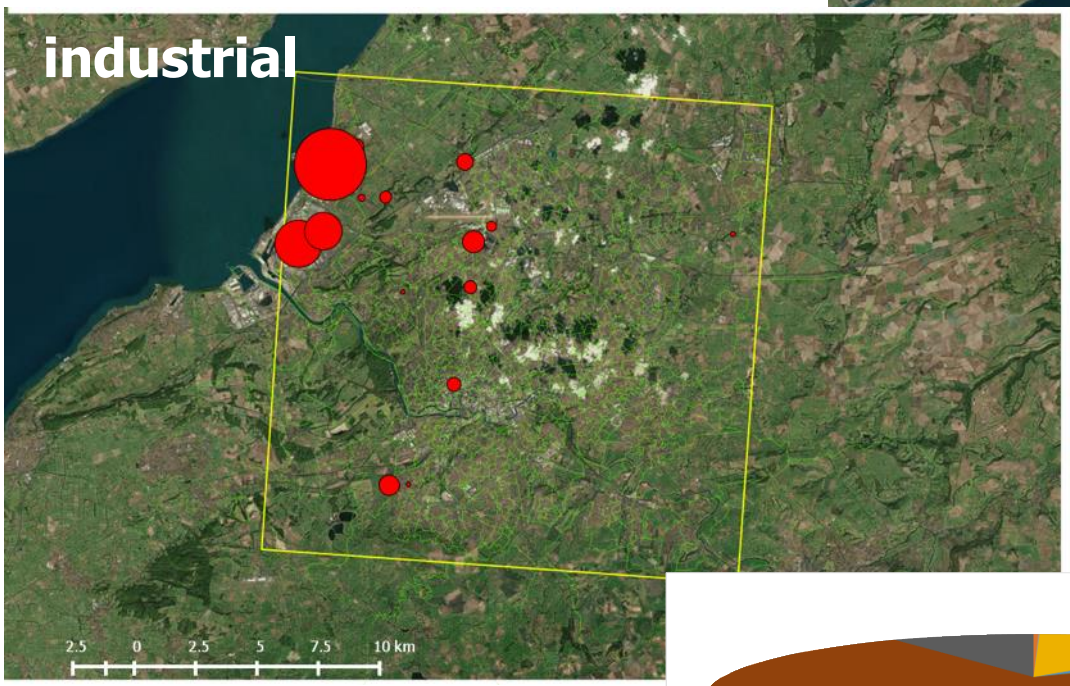
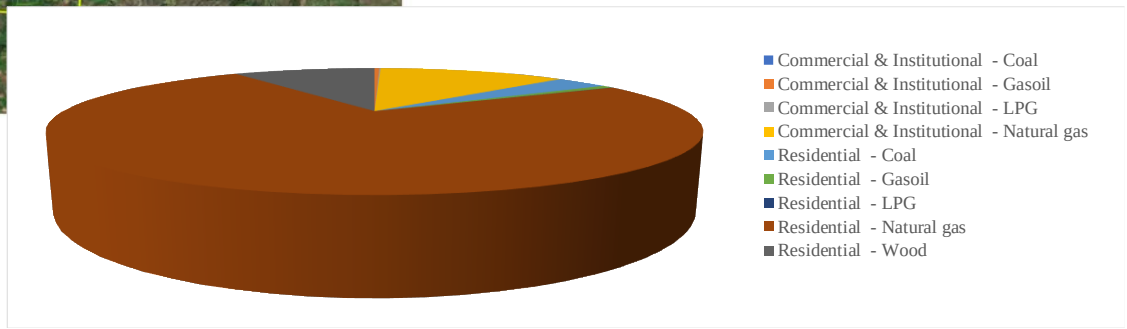
Bristol case study 2016 NOx emissions







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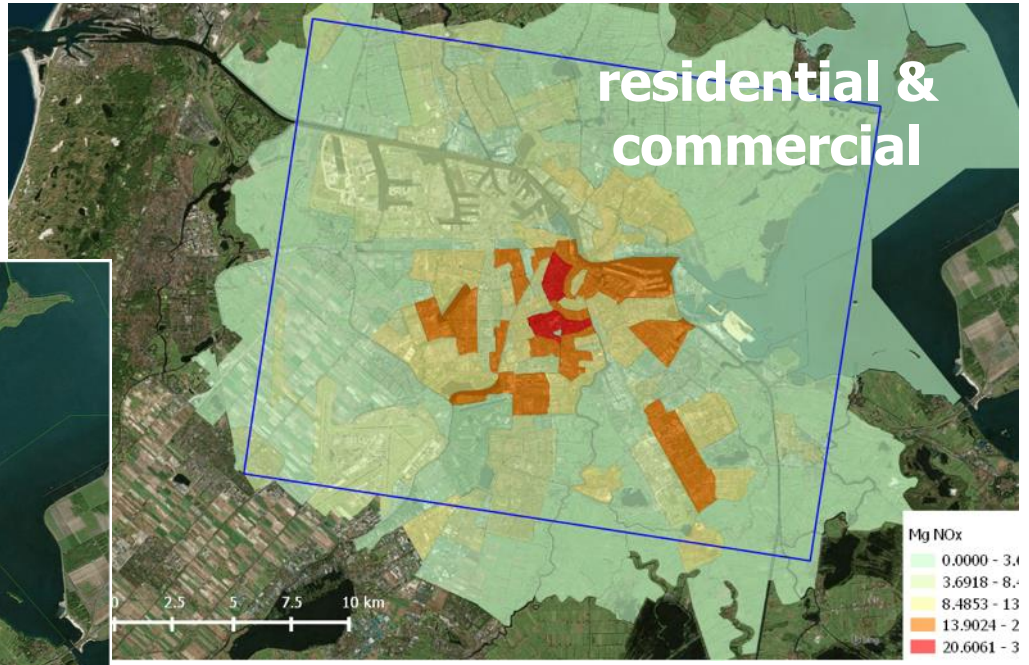
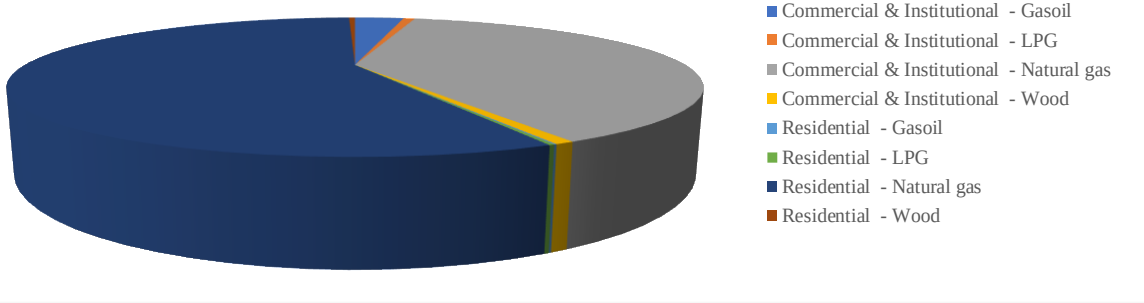
Amsterdam case study 2016 NOx emissions





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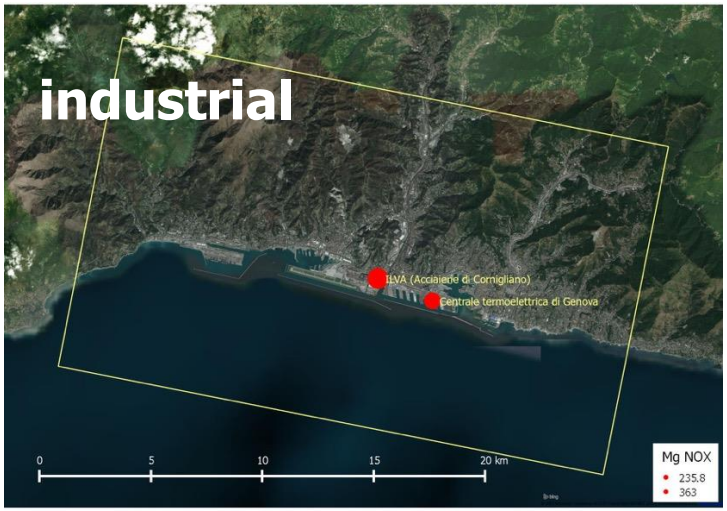
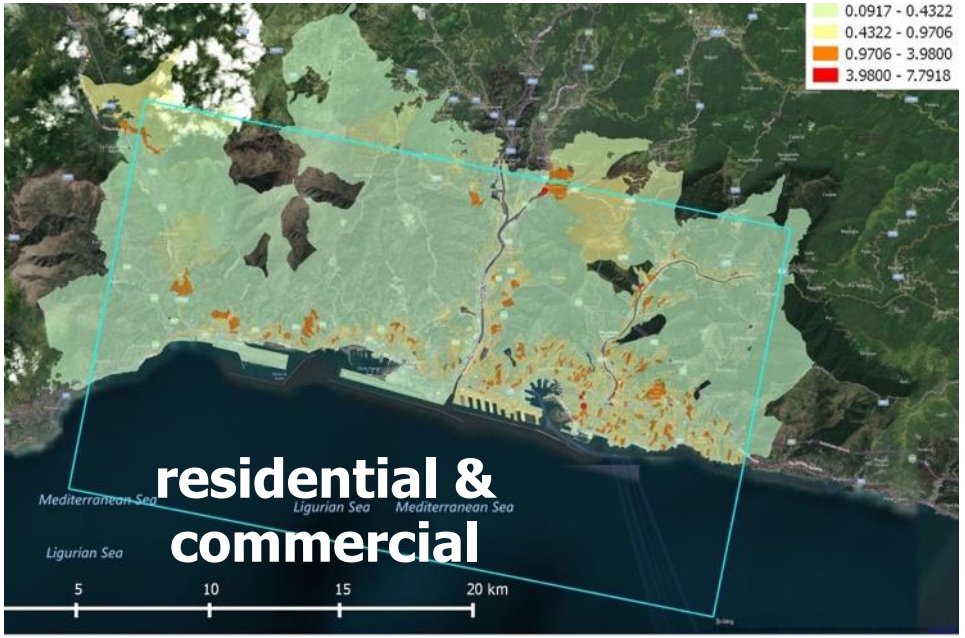
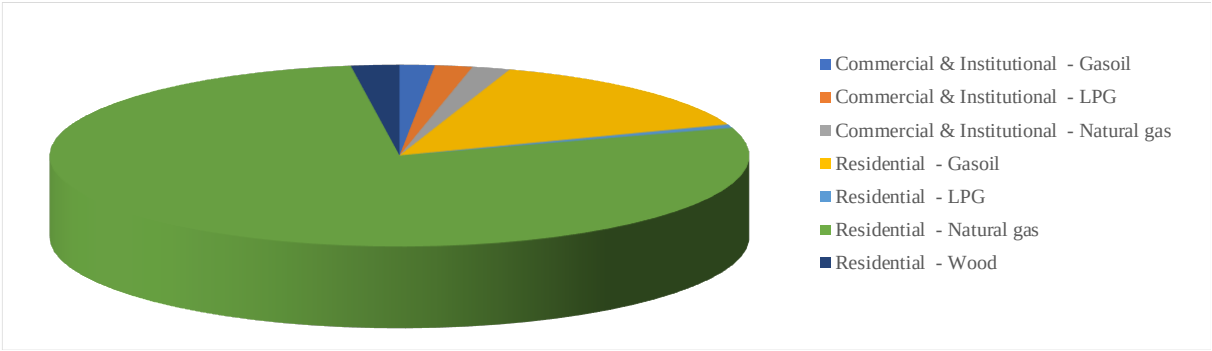




Genova case study 2016 NOx emissions



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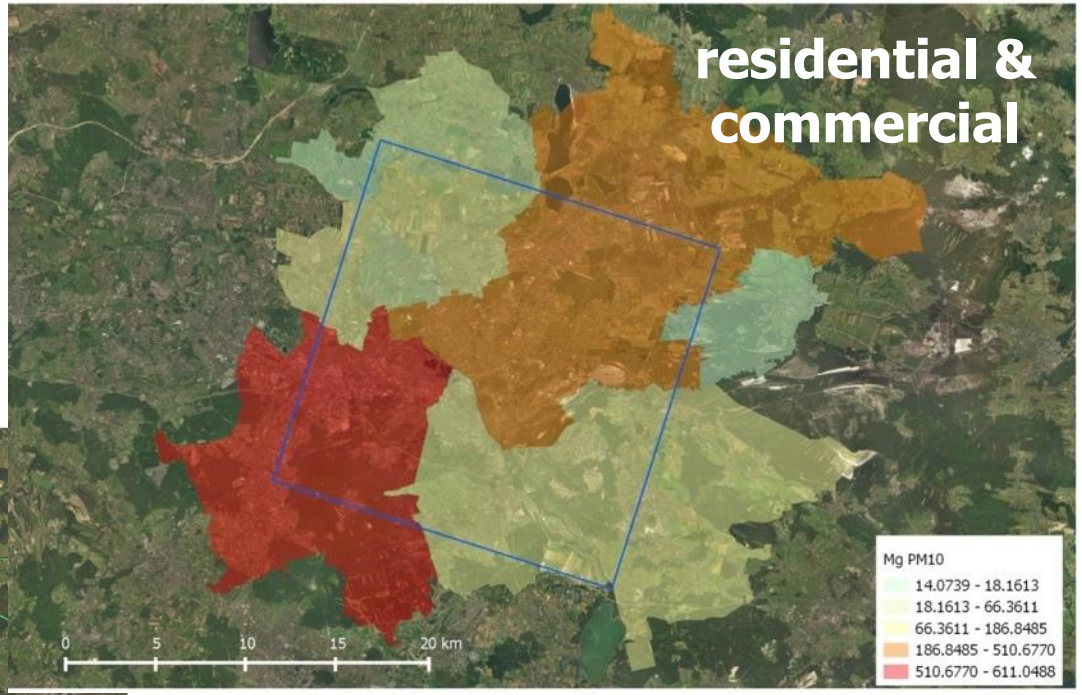
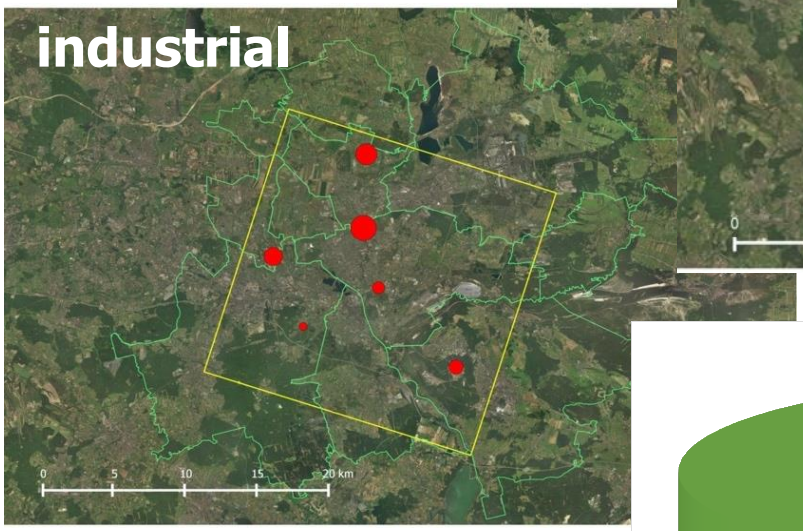
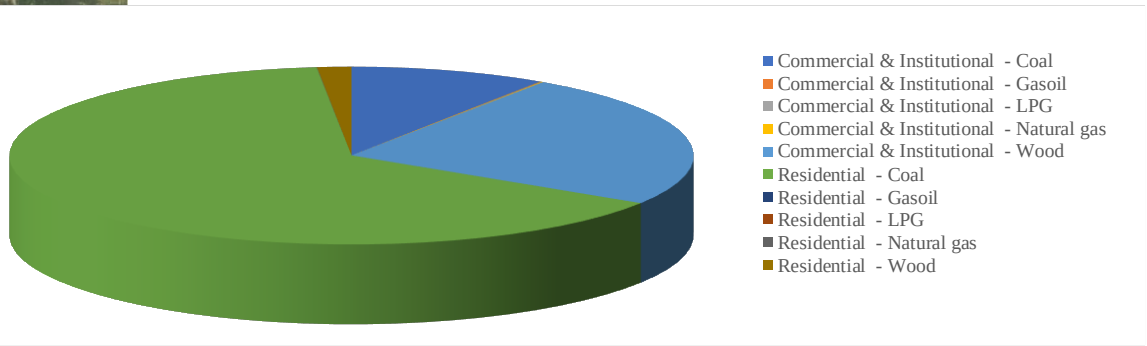
Sosnowiec case study 2016 PM_{10} emissions







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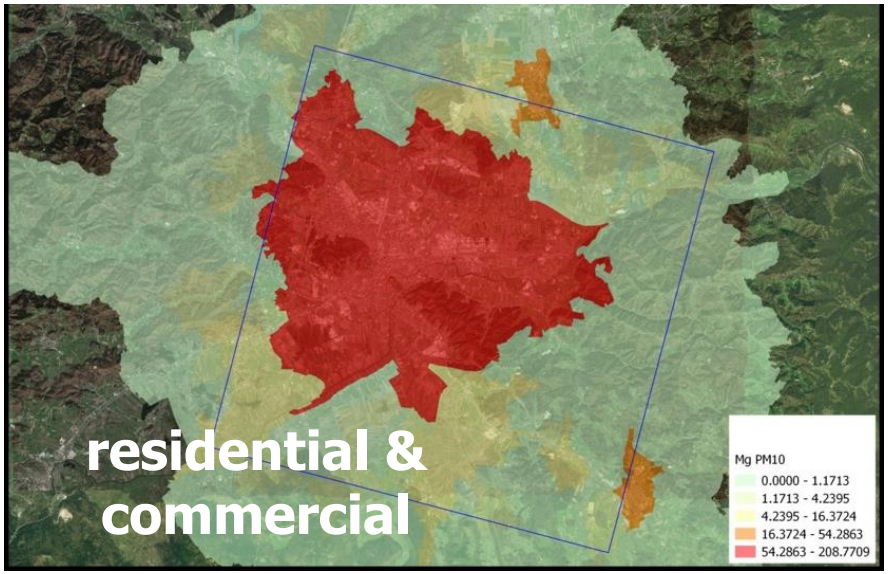

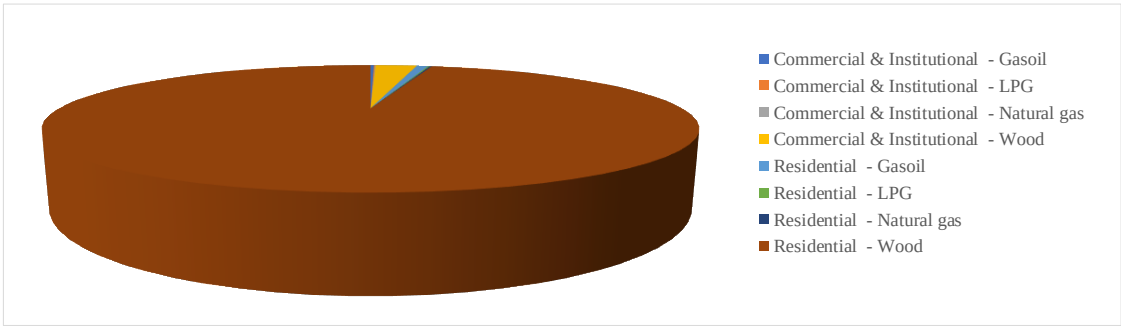

Ljubljana Case study 2010 PM_{10} emissions

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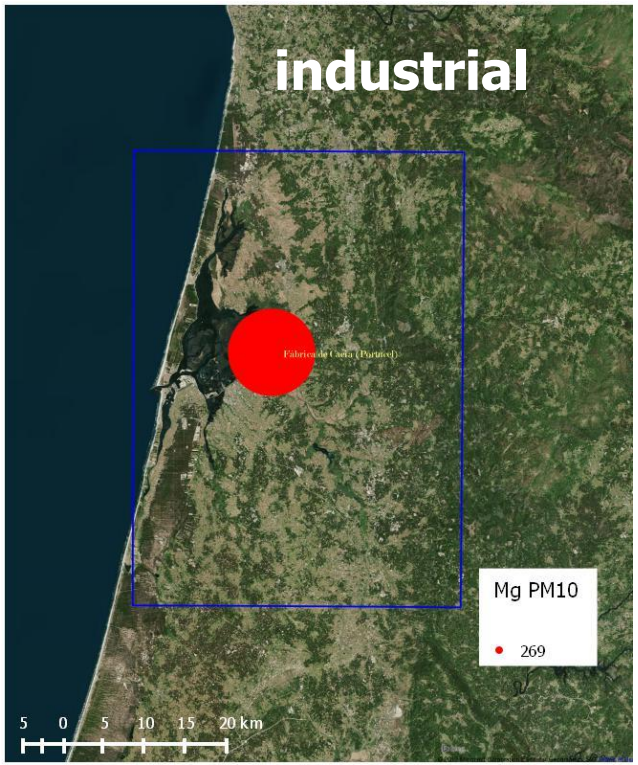
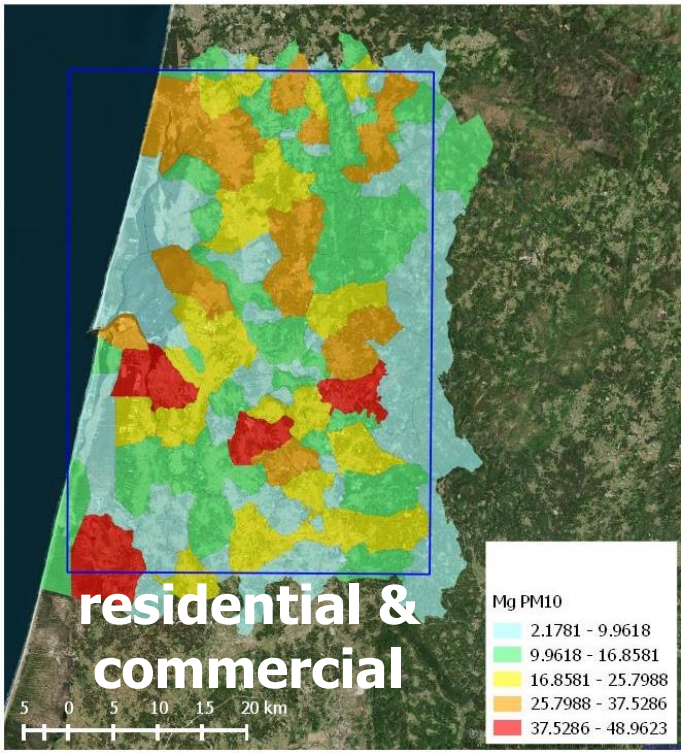
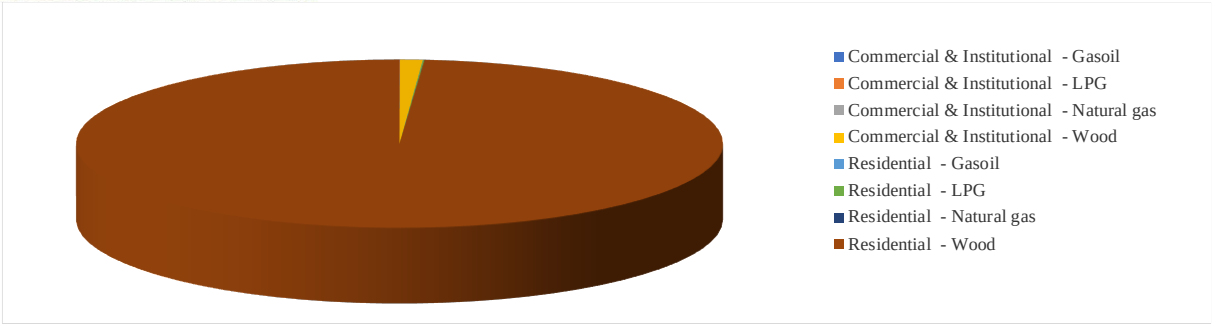


Aveiro Case study 2016 PM_{10} emissions





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emissions projections modeling approach

Emissions for future year (k) for a single territorial unit/source (u) related to a specific activity (i) are estimated starting from the base year (0) emissions and using specific projections factors of activity level (a_{ikn}) due to activity measures n, specific drivers for emission factors (f_{ijkm}) due to emissions control measures m for a selected pollutant (j), specific projections factors (drivers) of activity level related to a selected units (a^d_{ikun}) due to activity measures n and specific drivers for emission factors (f^d_{ijkum}) due to emissions control measures m and, if any, additional emissions foreseen for a selected new activity in a selected territorial units/source u (E^{new}_{ijku}):

$$E^d_{ijuk} = E^d_{iju0} \prod_m \prod_n a_{ikn} f_{ijkm} a^d_{iukn} f^d_{ijukm} + E^{new}_{ijku}$$

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Scenario definition

The following type of scenarios have been considered:

- **The business-as-usual "BAU" scenario which aims to capture the changes on the air quality if no further measures are taken in the expected technological and behavioural changes. It reflects the normal trend without any policy or other interventions beyond the measures already established**
- **The scenarios from the Stakeholders Dialogue Workshop (SDW) translating the vision and expectations of local citizens and stakeholders based on data collected through engagemenet processes plus evidence from the baseline policy assessments.**
- **The final selected Unified Policy Scenario**

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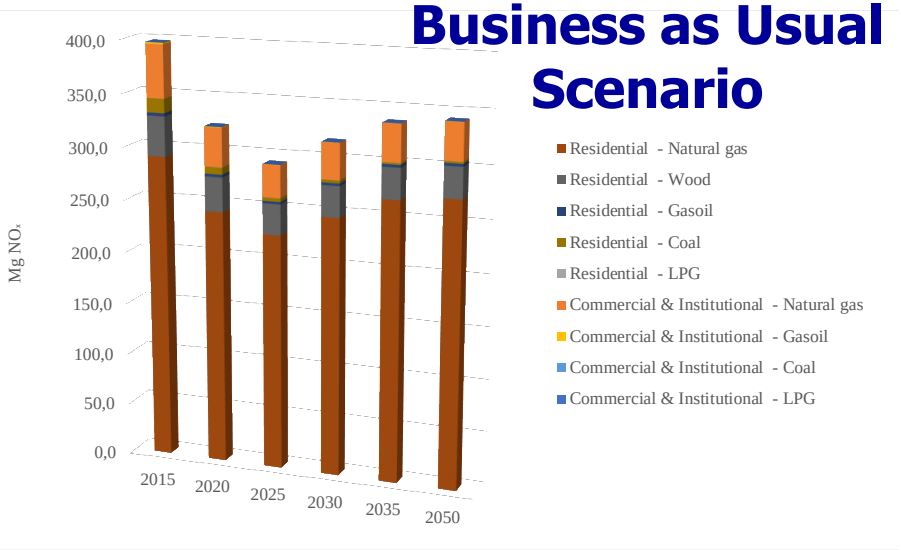
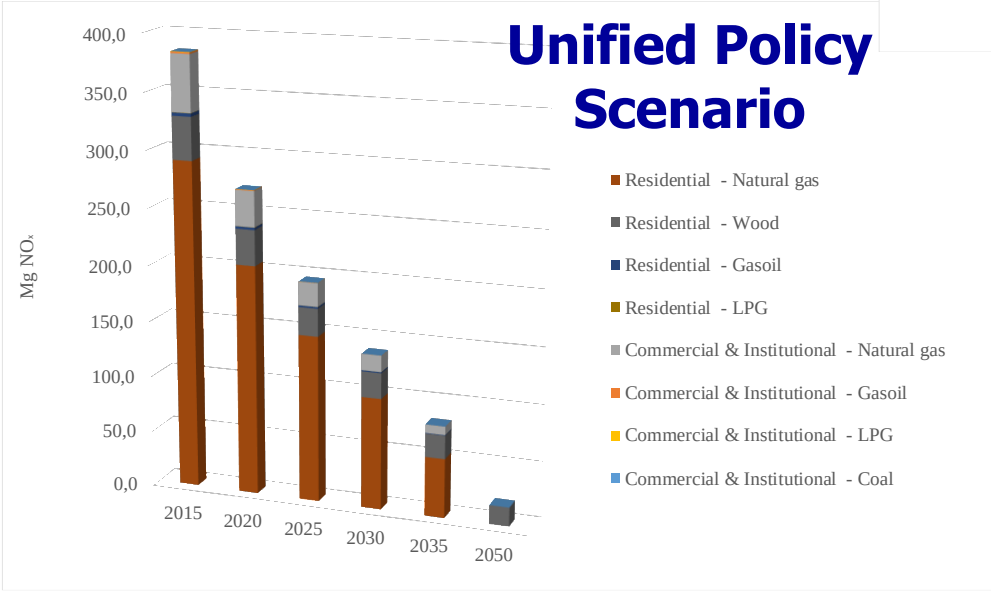
Bristol NO_x residential & commercial emissions projections

Business as Usual Scenario



Unified Policy Scenario



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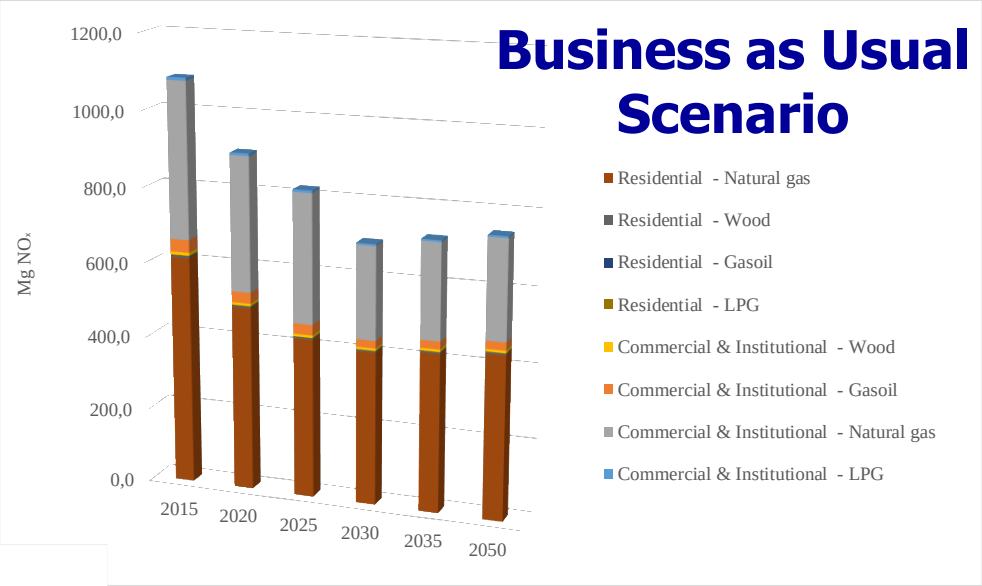
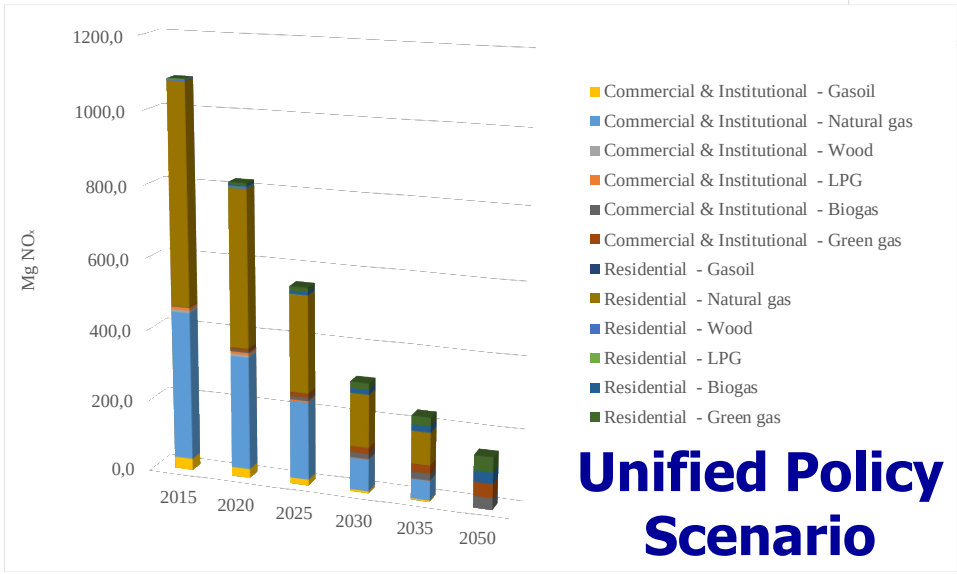
Amsterdam NO_x residential & commercial emissions projections





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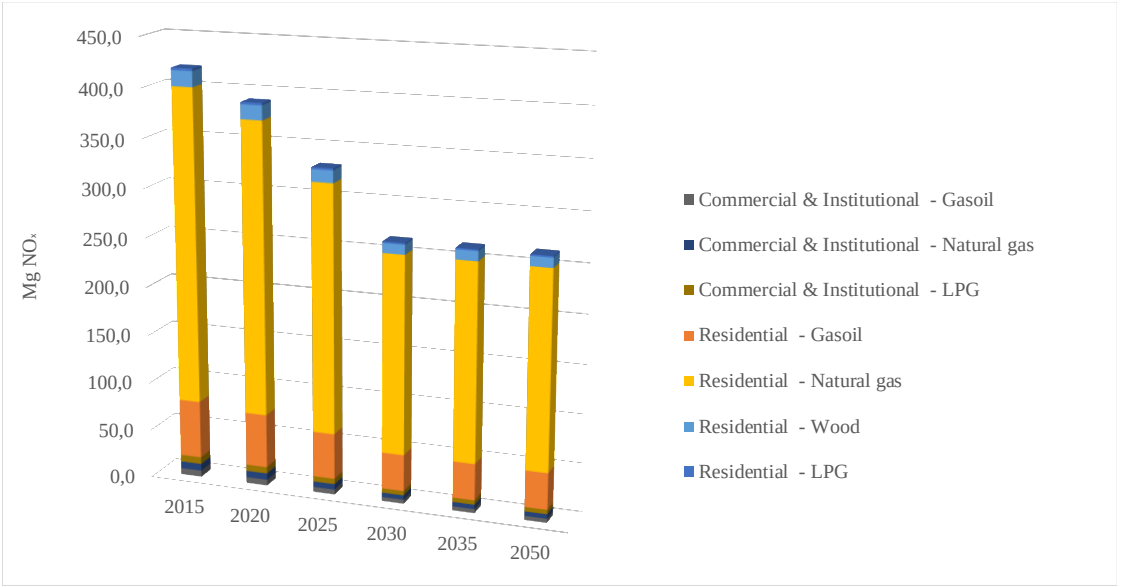
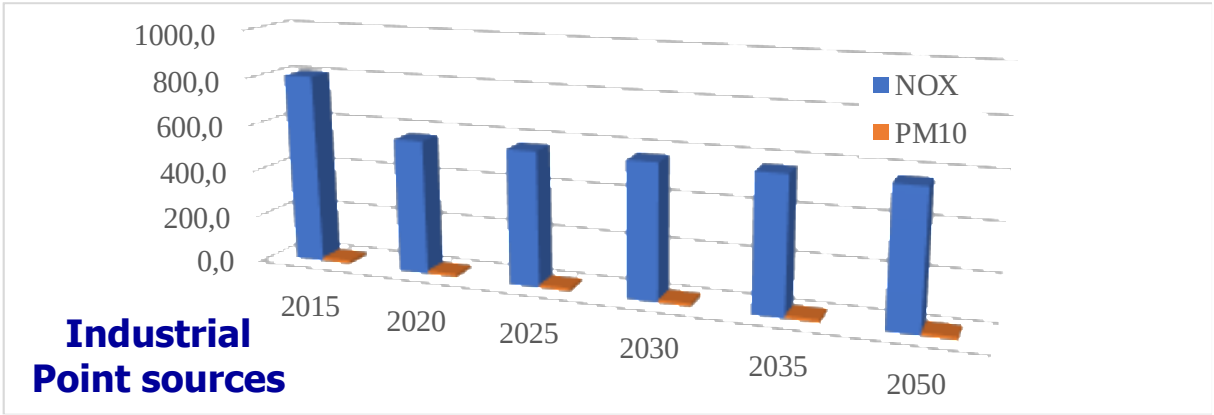
Genova NO_x Industrial, residential & commercial BAU emissions projections





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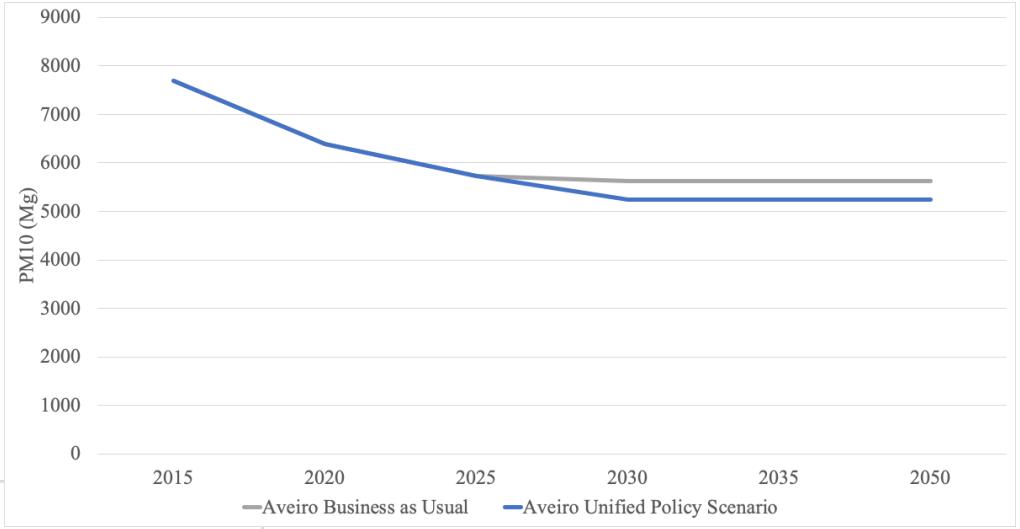
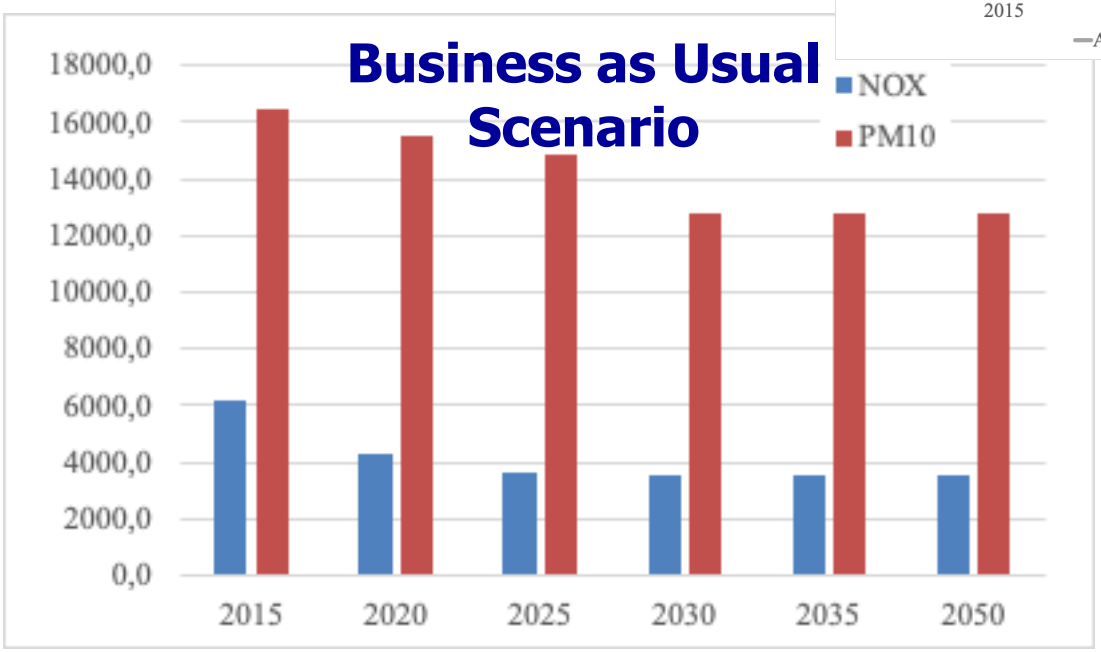
Aveiro Industrial emissions projections (Mg)





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Conclusion

- ClairCity project developed and tested methodologies and techniques to realize emission inventories at city level
- Clair city project developed projections and scenario methodologies and verify instruments to involve citizens in the decision processes
- Claircity project emissions inventory activities generate the input to air quality modeling activities at a very detailed (200 m x 200 m) resolution
- Claircity project emissions inventory and projections activities produce input to city level policy planning
- Claircity project emissions inventory and projections activities are the input for actual and future carbon footprint evaluation at city level

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THANK YOU FOR THE ATTENTION

QUESTIONS?