AGATE

AGricultural ATmospheric Emissions

Duration: 2 year

Start: 1 October 2024

End: 30 September 2026

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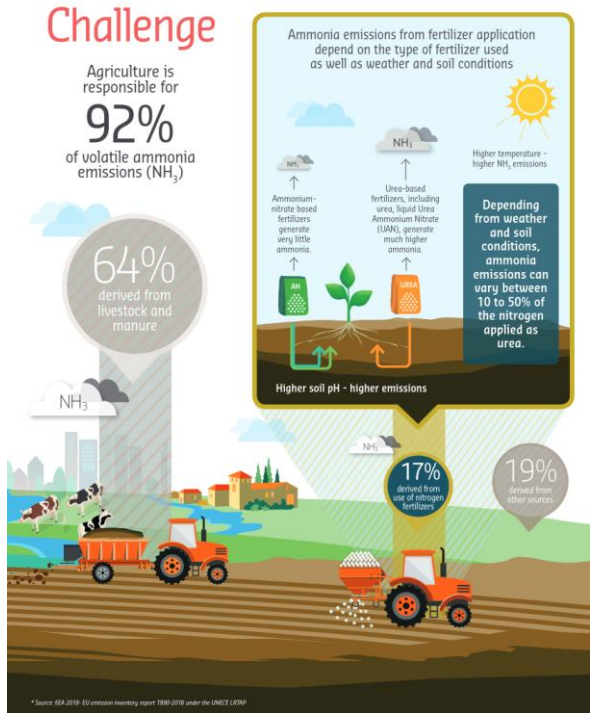
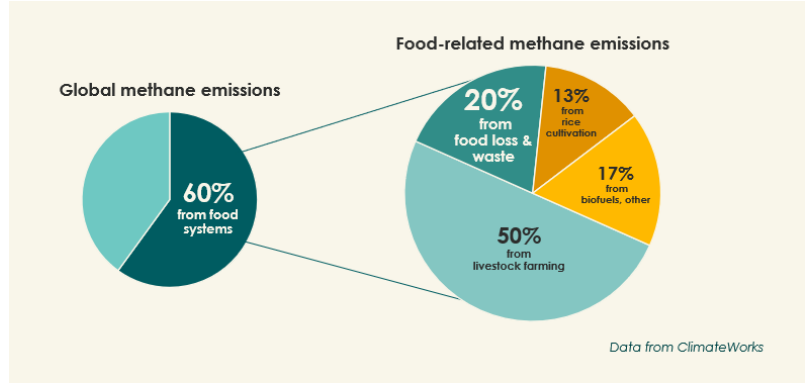
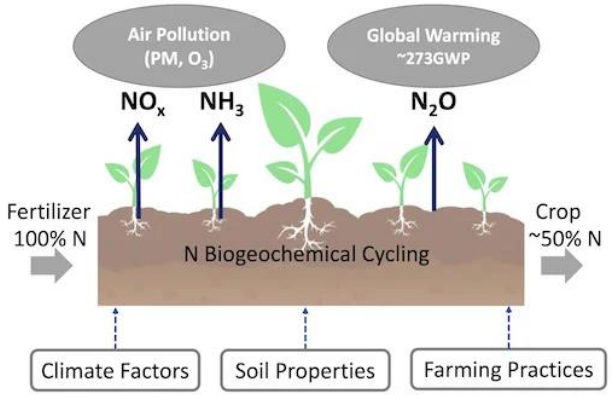
Ministerie van Infrastructuur en Waterstaat

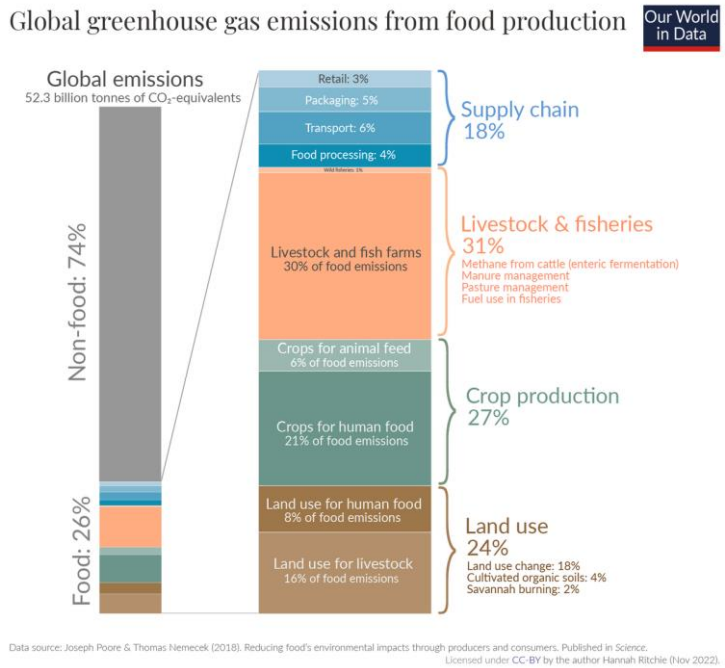
Agricultural emissions

Agricultural emissions have a significant effect on
(1) climate change and
(2) air quality









Stakeholders

Belgium/Netherlands (NOx/NH_3):

- Flanders Environment Agency (VMM): Flemish emission registration
- Vlaamse Landmaatschappij (VLM): developing resilient open nature spaces in Flanders
- National Institute for Health and Environment (RIVM): Dutch pollutant Release and transfer register

Po-Valley ($NOx/NH_3/CH_4$):

- Agenzia Regionale per la Protezione Ambientale (ARPA-Lombardia): Environmental Agency

South-East Asia ($NOx/NH_3/CH_4$):

- The Energy and Resources Institute (TERI, India): Environmental-friendly food production
- Asian Institute of Technology (AIT, Thailand): Food security and education

Methodology

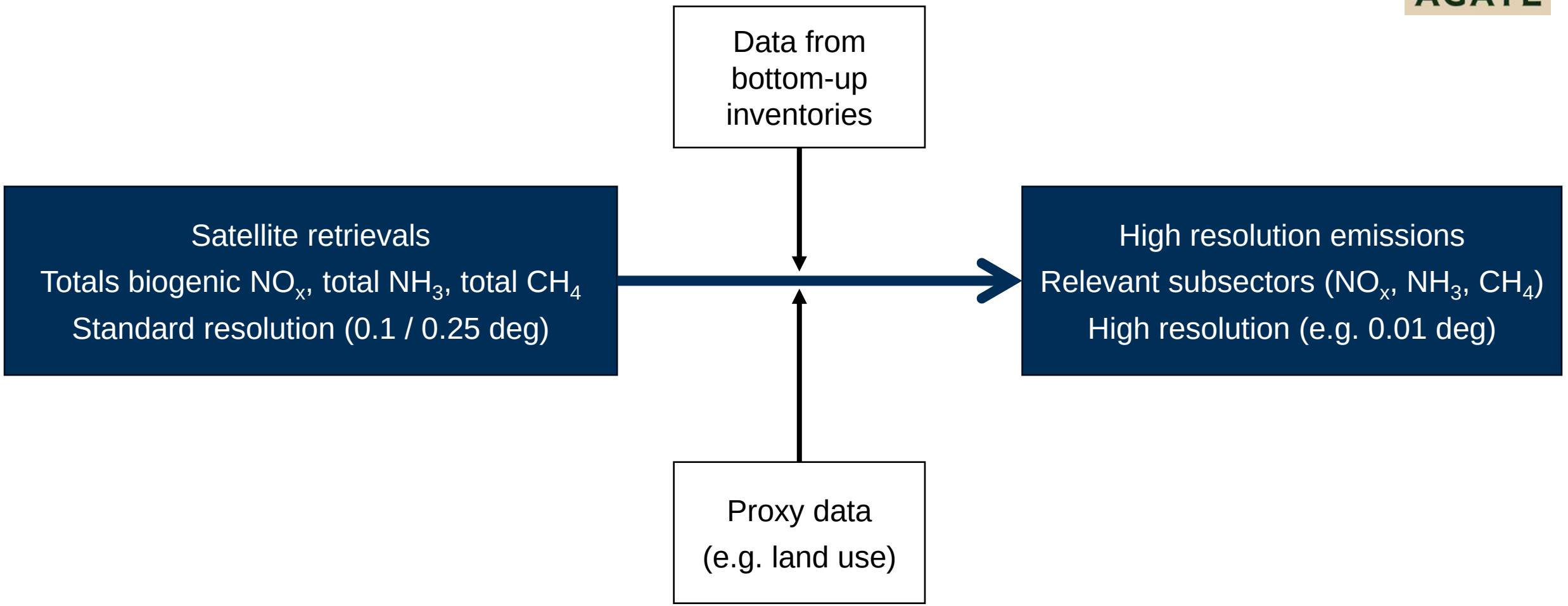
Step 2a: High resolution emissions via downscaling

Step 2b: Validation of high resolution emissions via concentrations

Table 2.2.1 **Data products** *(F=Flanders/Netherlands, P=Po Valley (Italy), A=Southeast Asia (India, Thailand))*

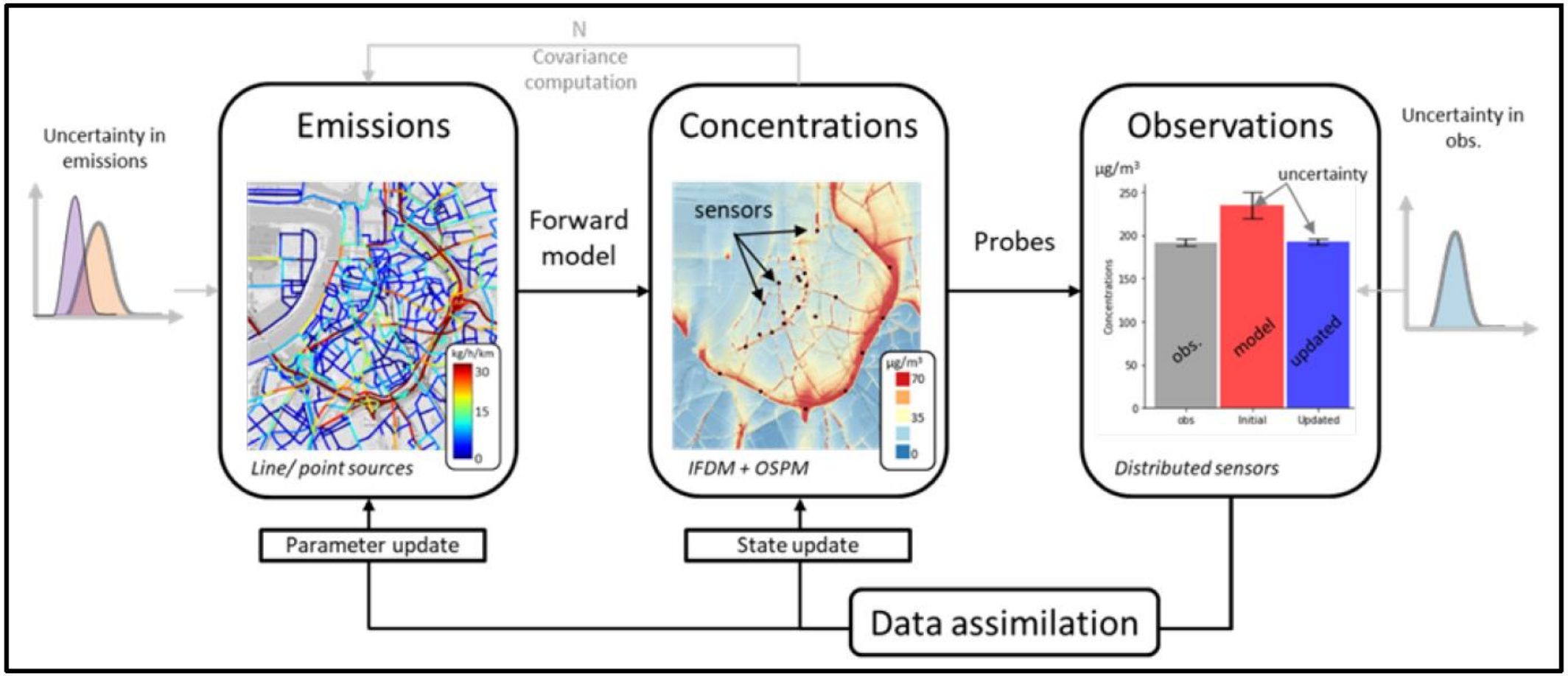
Step 1				
Satellite-derived emissions (10 km scale)	Total	**NH_3** (F/P/A)	**Soil-NO_x** (F/P/A)	**CH_4** (P/A)
Step 2				
High resolution emissions (user-defined)	Crops	**NH_3 -crops** (F/P/A)	**Soil-NO_x** (F/P/A)	**Rice-CH_4** (P/A)
	Livestock	**NH_3 -livestock** (F/P/A)		**Livestock-CH_4** (P/A)
High resolution concentrations (for validation)	Total	**NH_3** (F/P)		
Step 3				
High resolution deposition (user-defined)	Total	**Nitrogen-deposition** (F/P)		

General roadmap of Step 2a



Step 2b: Validation using data assimilation

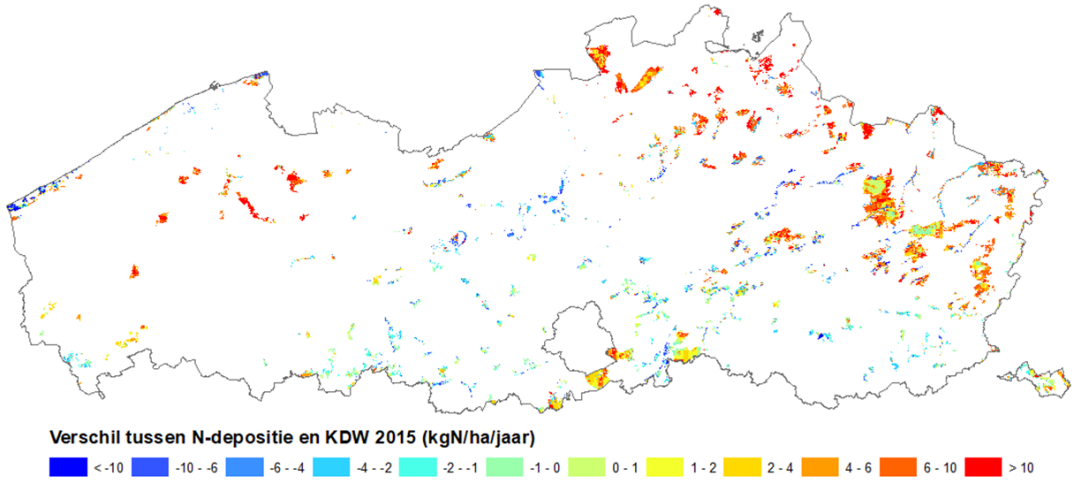
- Improve emissions based on data assimilation technique
- Use measurements of concentrations and reruns of model to update the emissions

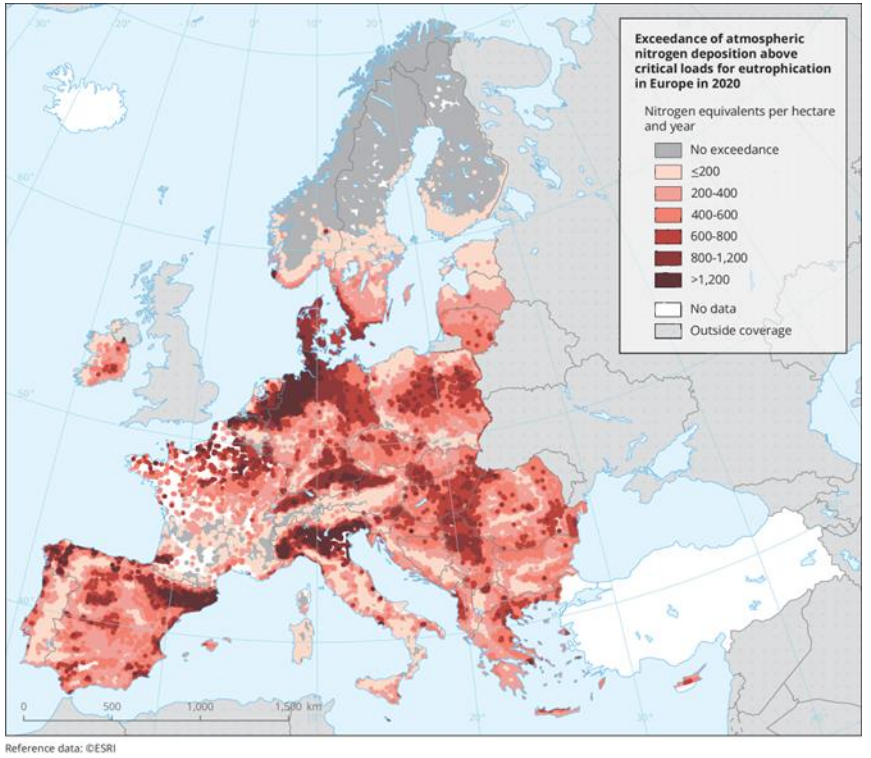


Why nitrogen deposition is important?

EU legislation: ‘Habitats Directive’ 92/43/EEC, Article 6, §3

- One of the main threats to protected nature in Flanders, the Netherlands and Northern Italy is a surplus of reactive nitrogen deposition (eutrophication)
- N-deposition of reduced N > N-deposition of oxidized N
- However, critical deposition values (CDV) for nitrogen are exceeded in large parts of Europe
- Link to granting of environmental permits: How to do if CDV’s are exceeded?

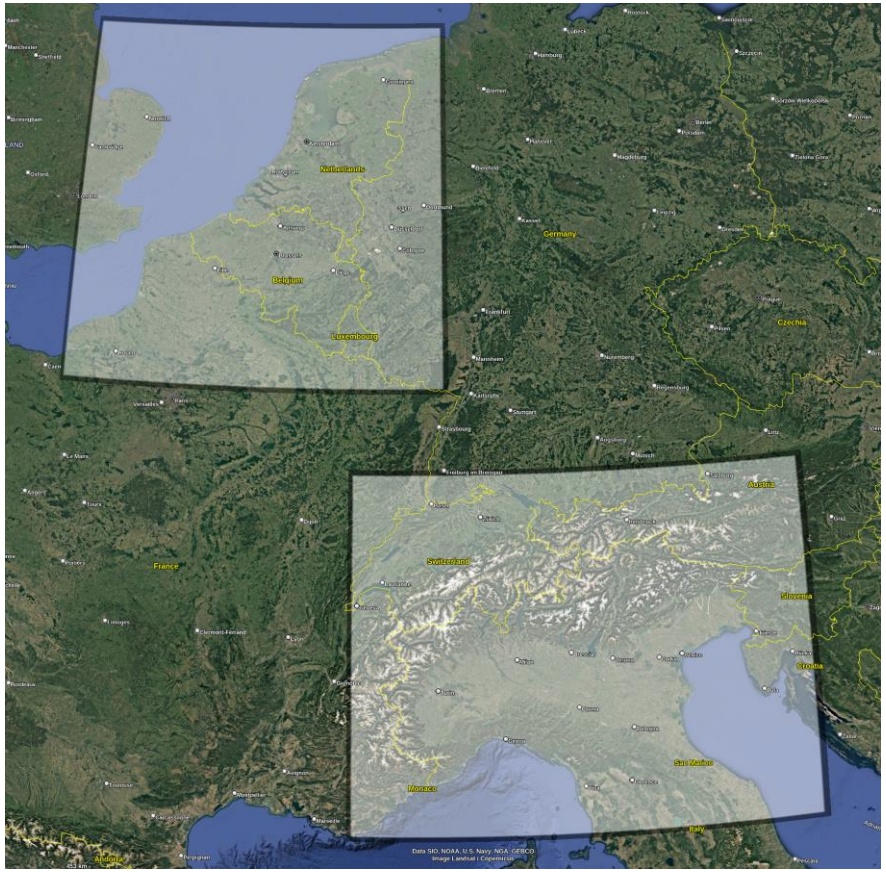




Domains

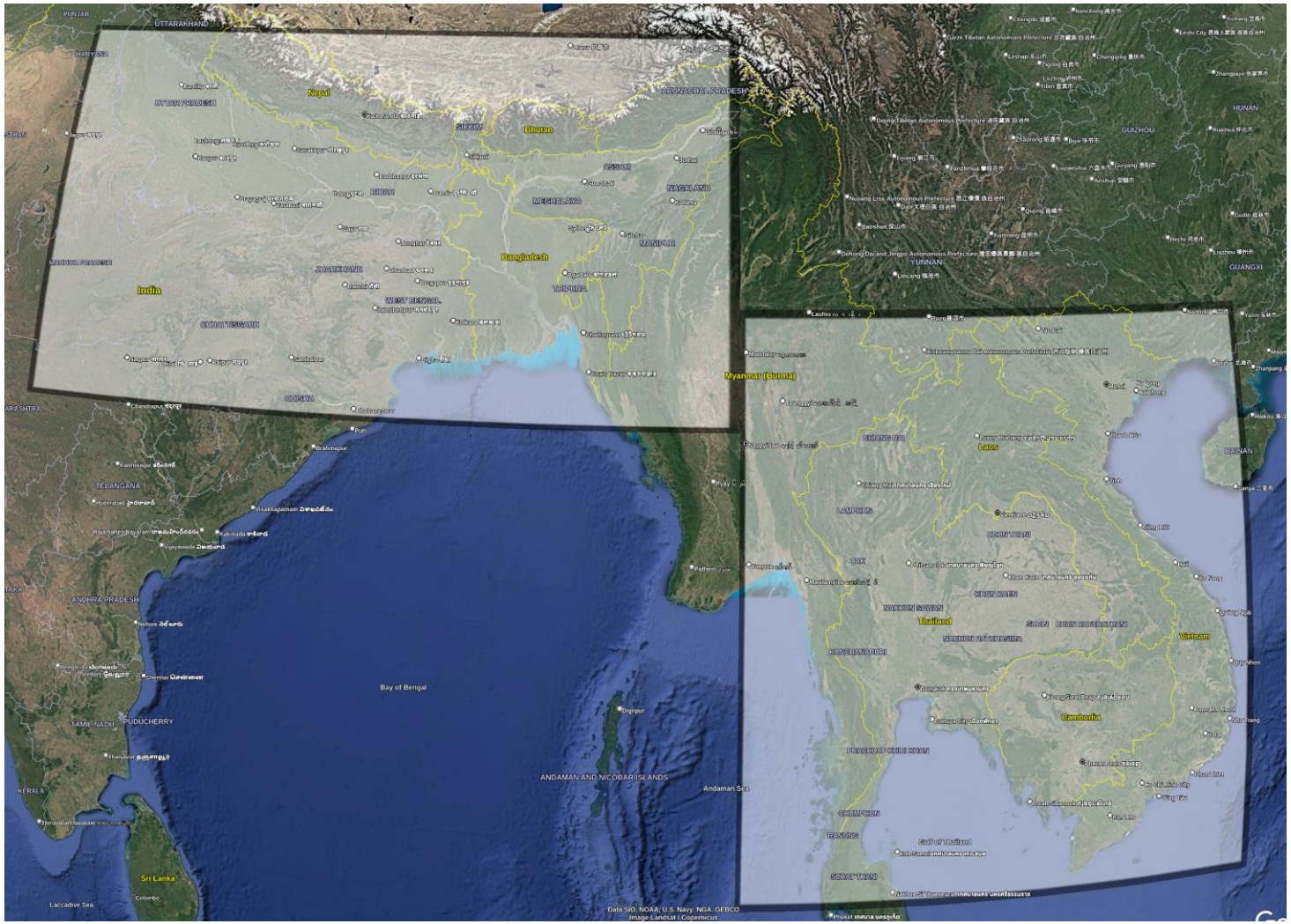
In Europe:

- “Benelux”
- North Italy



In Asia:

- North East India
- South East Asia



Project phases

Time period	Project activity
Oct. 2024 – March 2025	Definition of all requirements
Dec. 2024 – April 2025	Data collection and quality check
March 2025 - June 2025	Product development and validation
June 2025 - September 2025	Prototype service development
Oct. 2025 – September 2026	Service implementation and validation

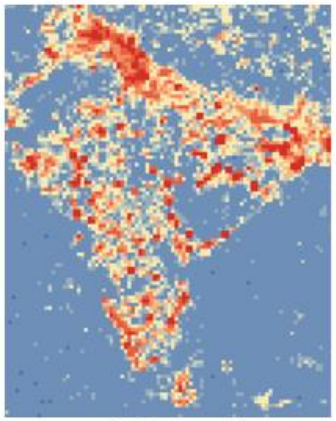
Proxy data

Proxy data is requested for:

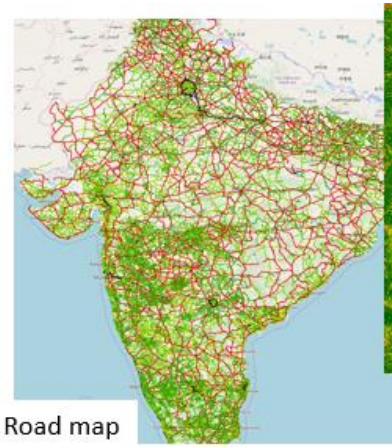
- Improving the downscaling process (Step 2a)
  - (local) land use data sets (e.g. location of (rice) fields)
  - (Local) sector split for emissions
  - Point source emissions
- Validation of our products with local observations/inventories (Step 2b, 3)
  - Complementary (local) bottom-up (emission) data sets
  - Concentration observations of NH_3 and NOx from (local) measurement campaigns for validation and data assimilation

Some examples

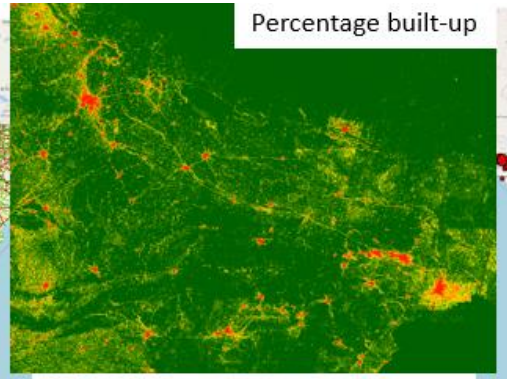
Downscaling of satellite derived emissions to high resolution for Bangalore and Chennai



NOx emissions 01/2018



Road map



Percentage built-up

Powerplants

Open source GIS data

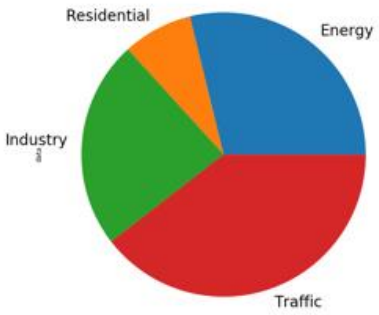
Satellite based emission estimates

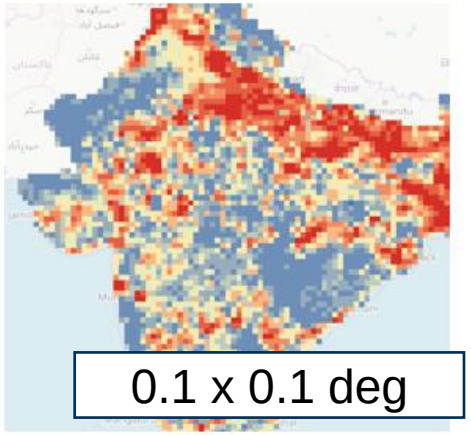
AirQast Standard resolution inventory

Downscaling

AirQast High resolution inventory

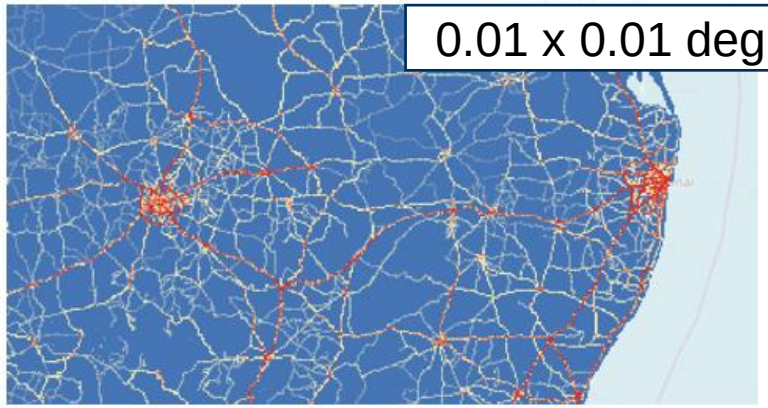
Local sector split from HTAP v2 inventory





0.1 x 0.1 deg

Residential NOx emissions 01/2019



0.01 x 0.01 deg

Traffic NOx emissions in Bangalore / Chennai in 01/2019

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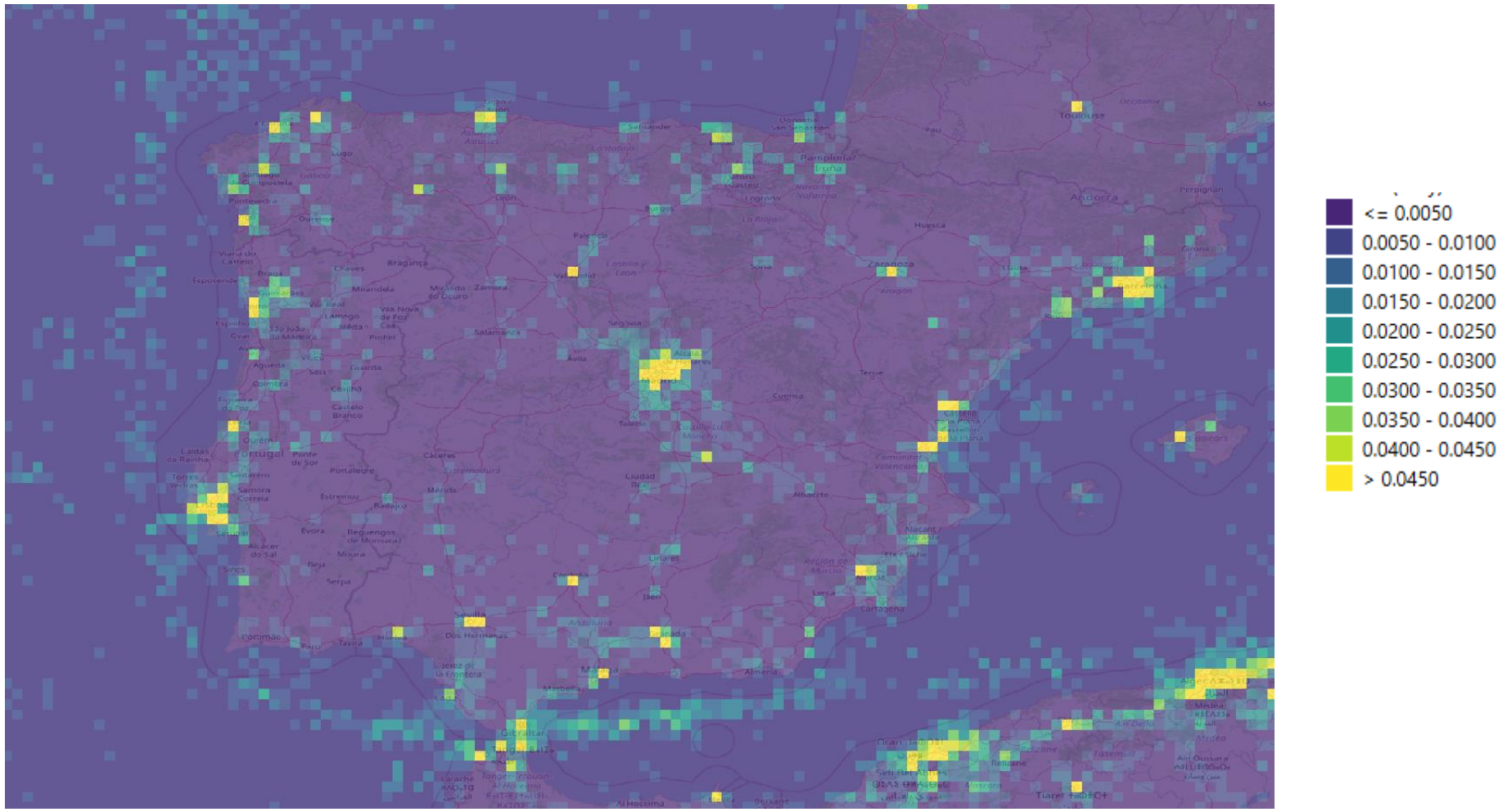
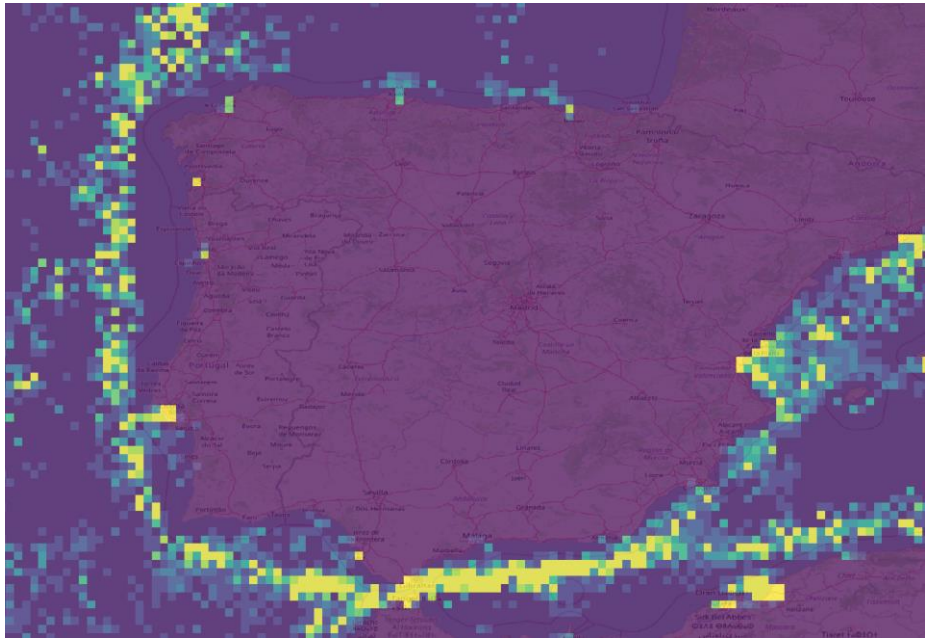
Refining satellite derived emissions into emissions by sector for the Iberian peninsula

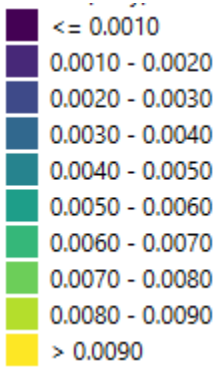


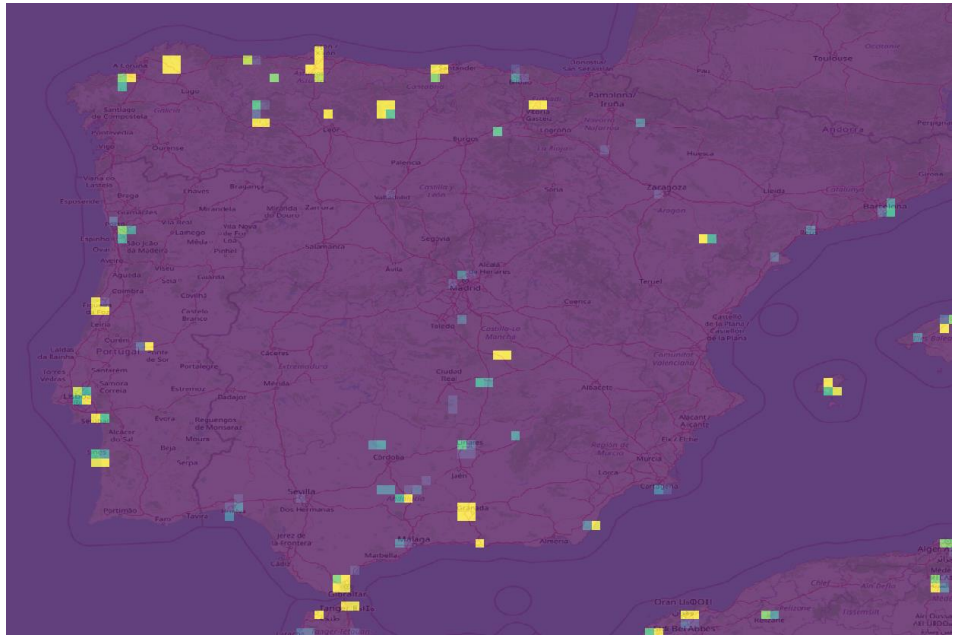
Standard resolution, Total NOx, January 2019 (Gg N per cell)

Refining satellite derived emissions into emissions by sector for the Iberian peninsula

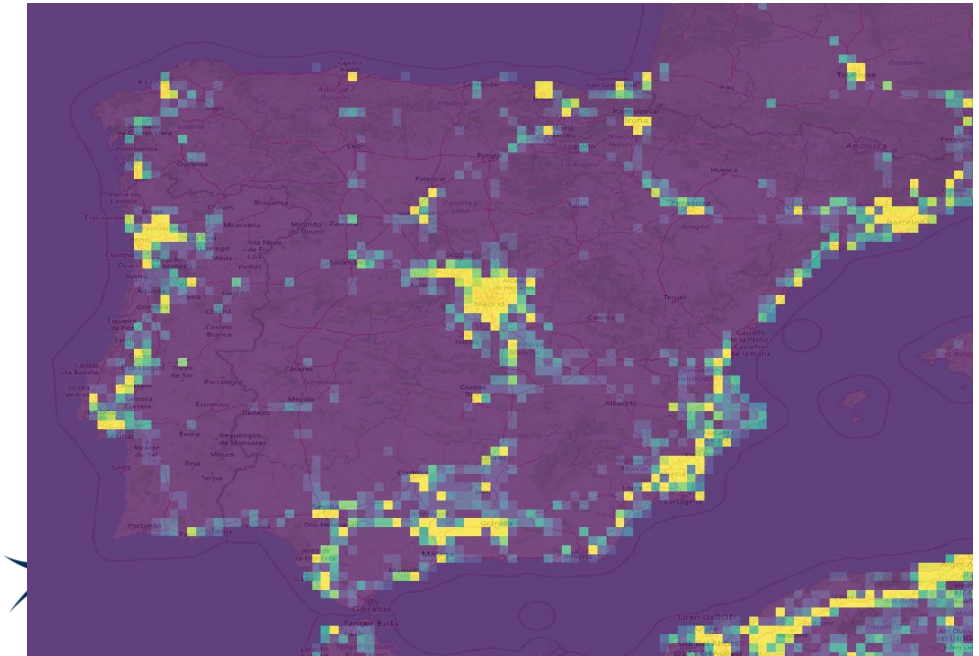


Shipping





Energy



Traffic

Standard resolution. NOx, January 2019

(Gg N per cell) for selected sectors

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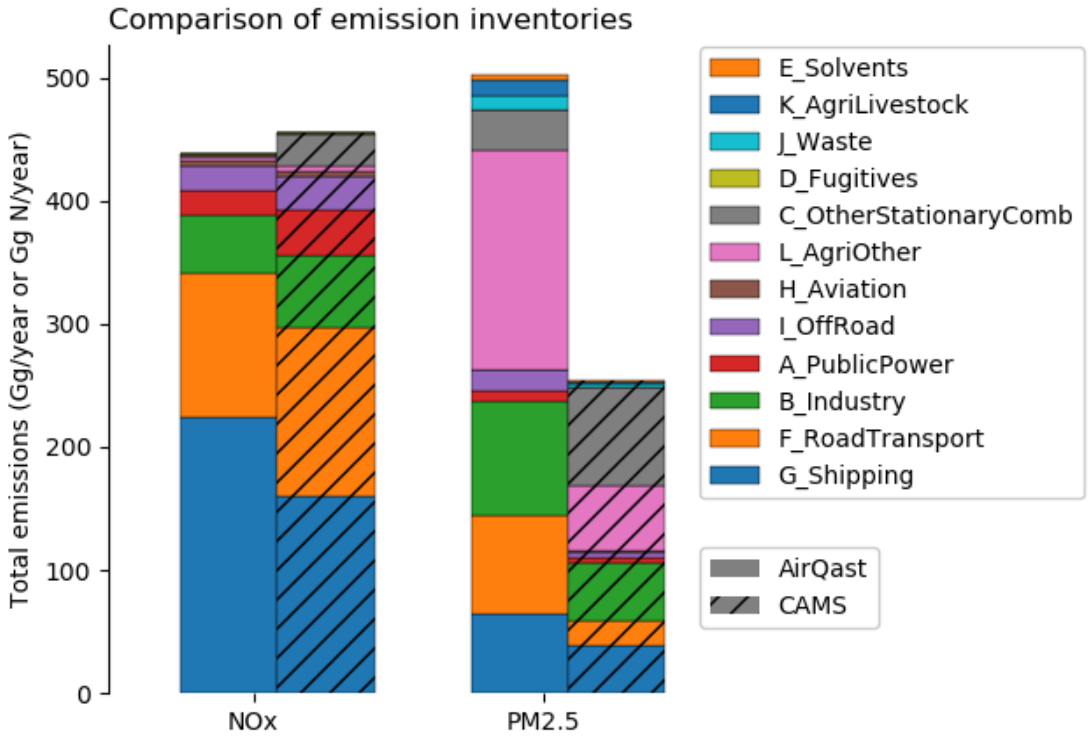
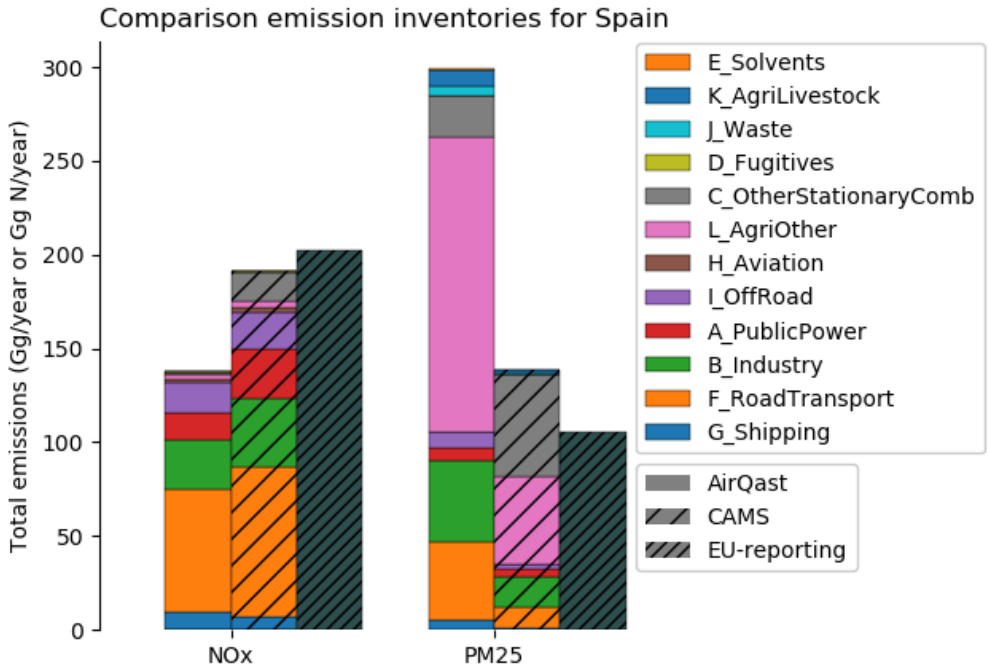
Refining satellite derived emissions into emissions by sector for the Iberian peninsula

Comparison with existing inventories (2019)

Total in the domain



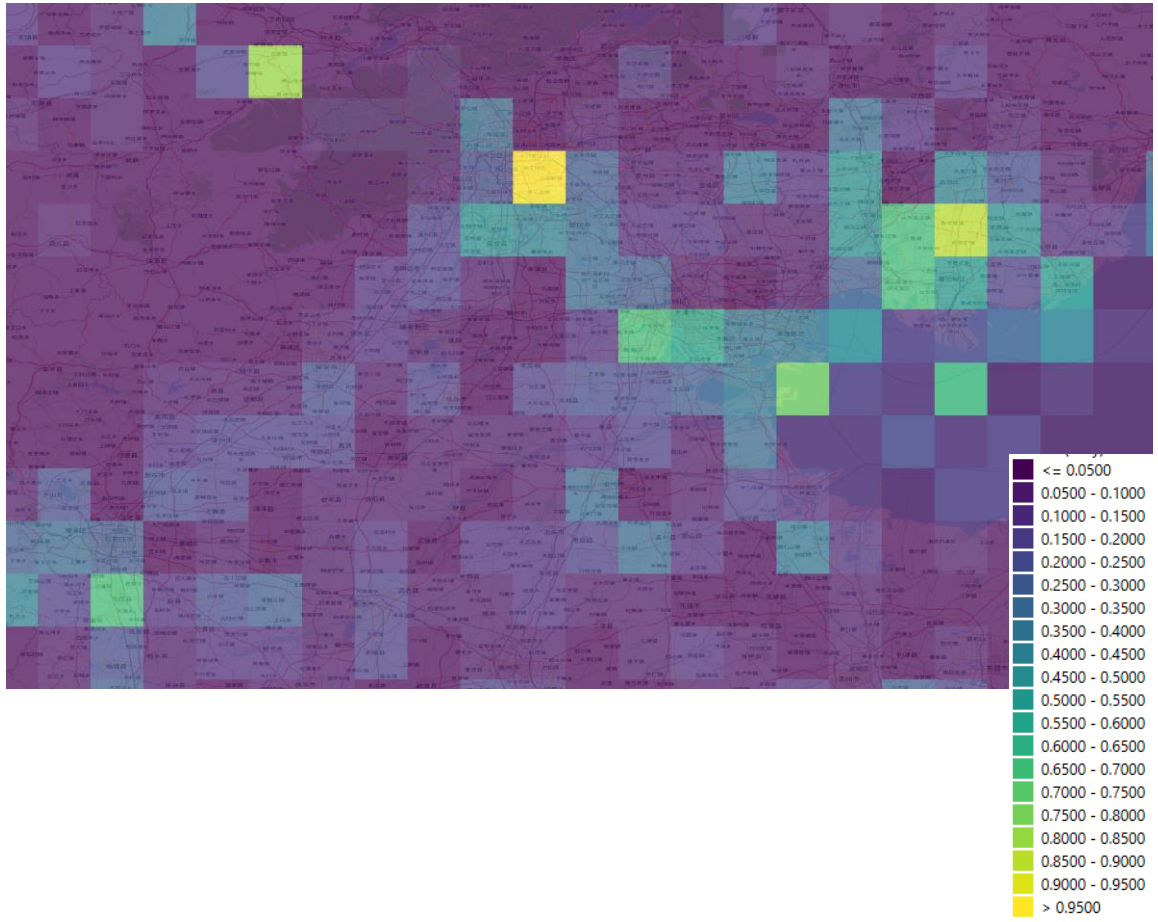
Spain



Downscaling of satellite derived emissions to high resolution for Beijing and Tianjin

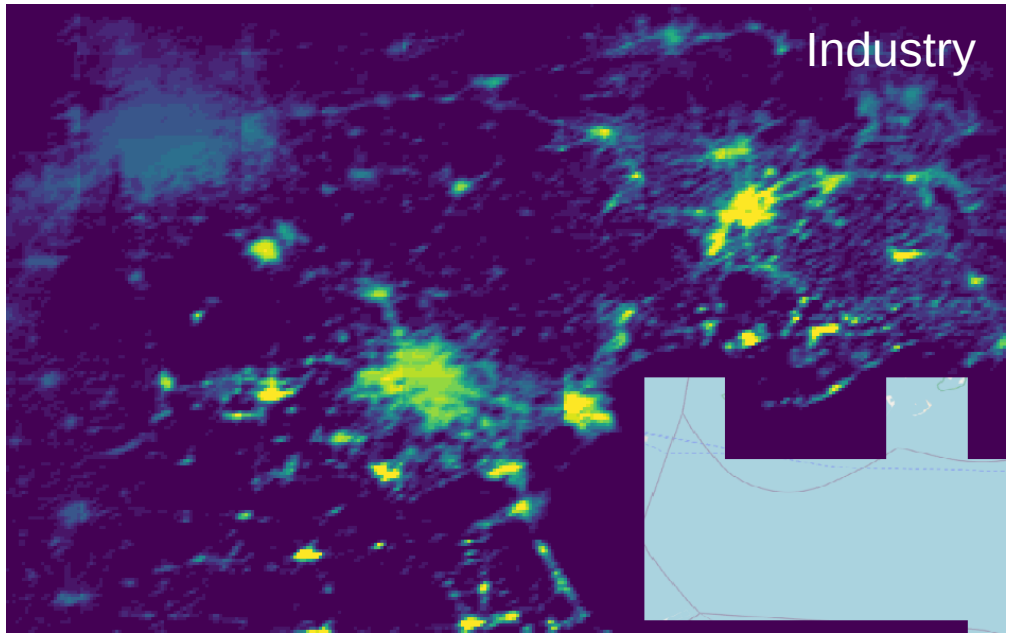
Downscaling in China (NOx, December 2019, Gg N per cell)

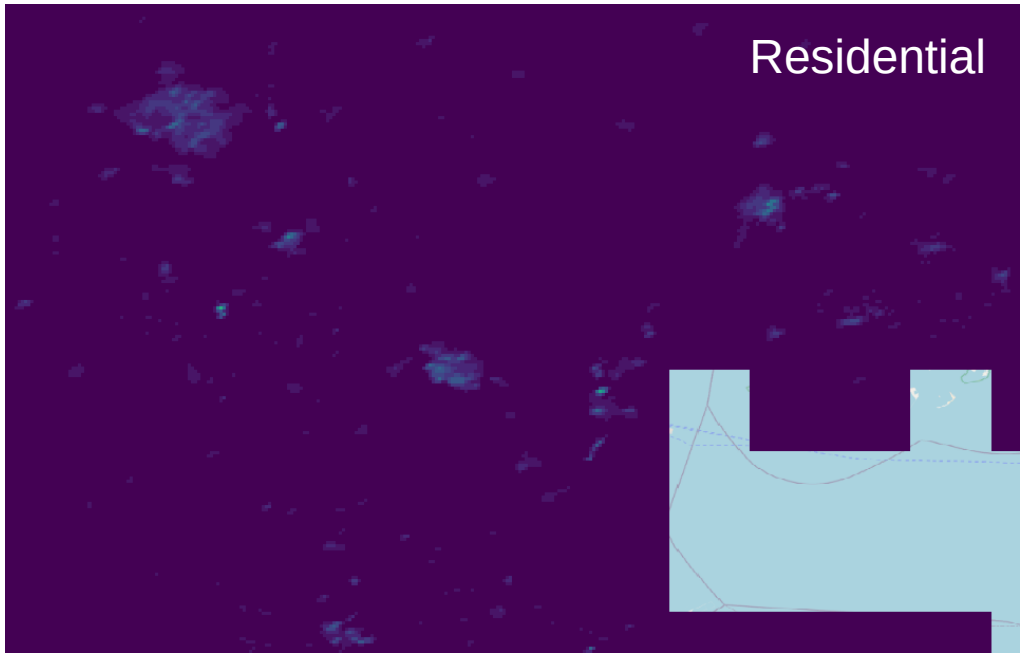
Standard resolution

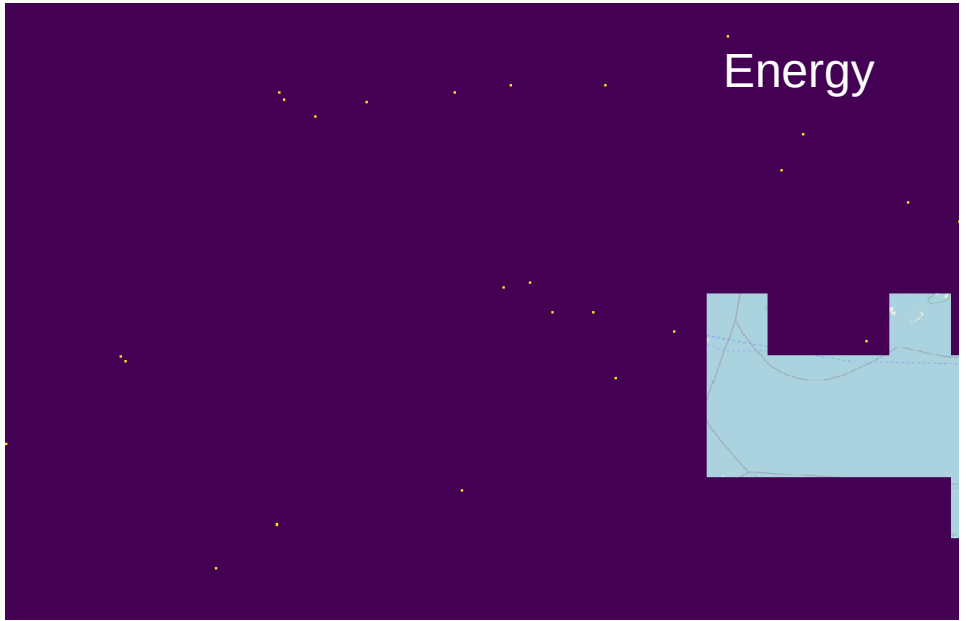


High resolution

Downscaling of satellite derived emissions to high resolution for Beijing and Tianjin







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