AGATE

AGricultural ATmospheric Emissions

Duration: 2 year

Start: 1 October 2024

End: 30 September 2026

Presented by Ronald van der A

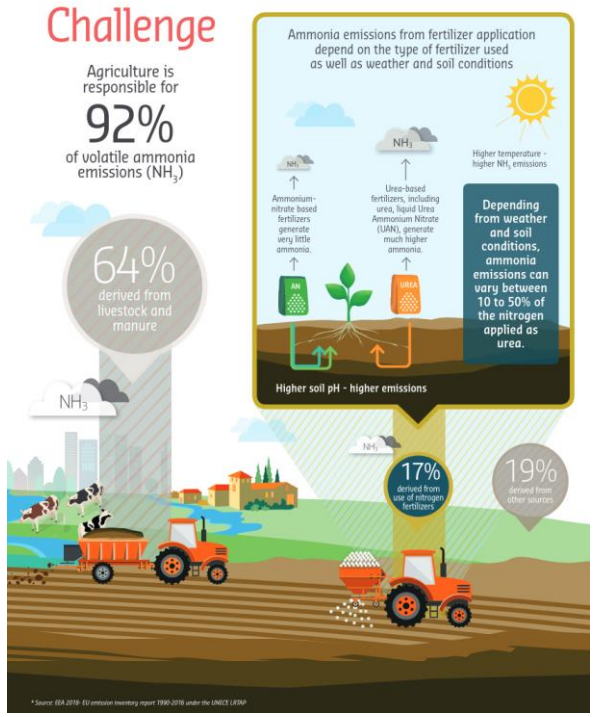
esa

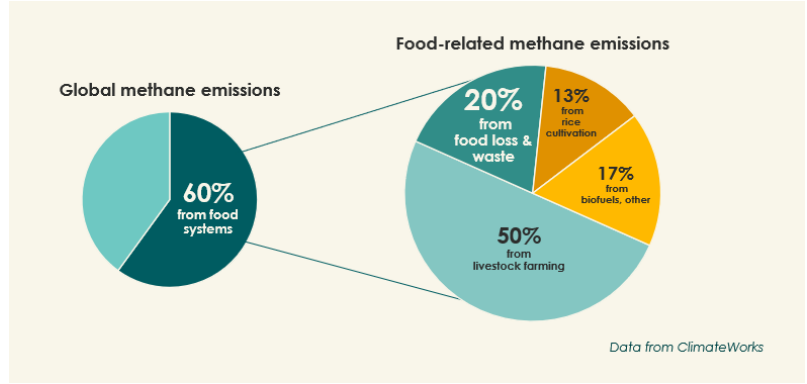
Koninklijk Nederlands Meteorologisch Instituut
Ministerie van Infrastructuur en Waterstaat

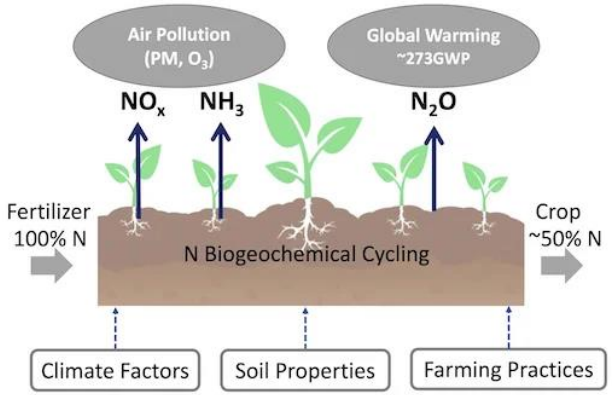
vito

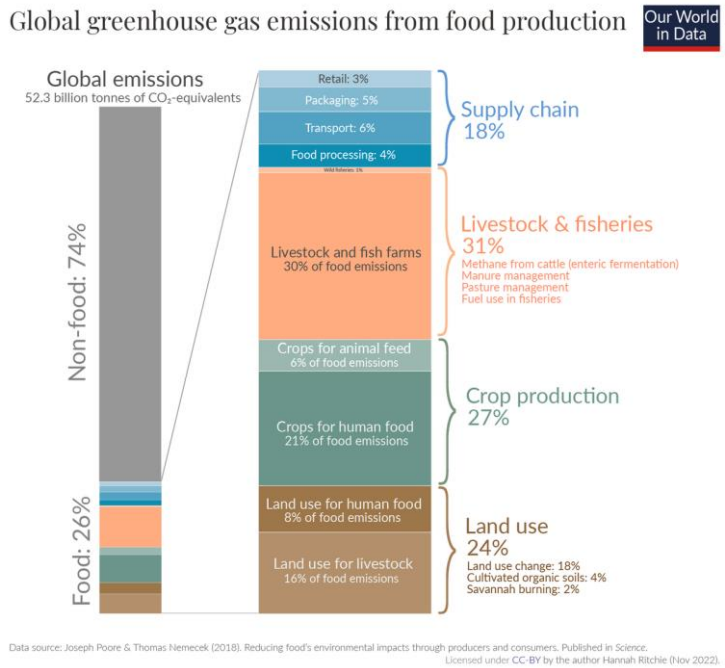
Agricultural emissions

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









Stakeholders

Belgium/Netherlands (NOx/NH3):

- 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/NH3/CH4):

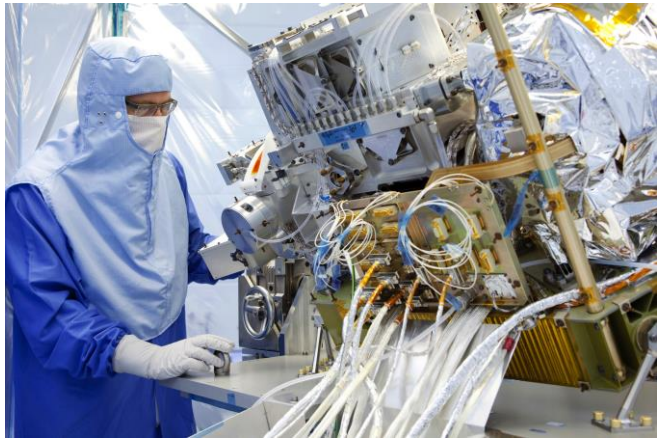
- Agenzia Regionale per la Protezione Ambientale (ARPA-Lombardia): Environmental Agency

South-East Asia (NOx/NH3/CH4):

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

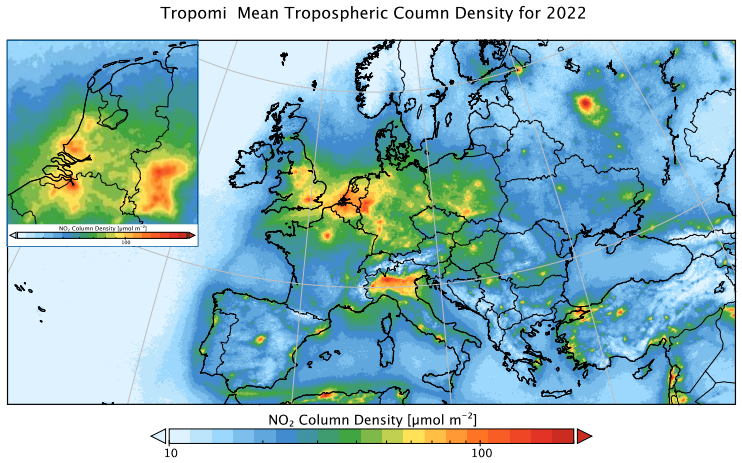
Satellites:

- TROPOMI/Sentinel-5P (ESA)
- CrIS (NOAA)
- IASI/MetOP (EUMETSAT)

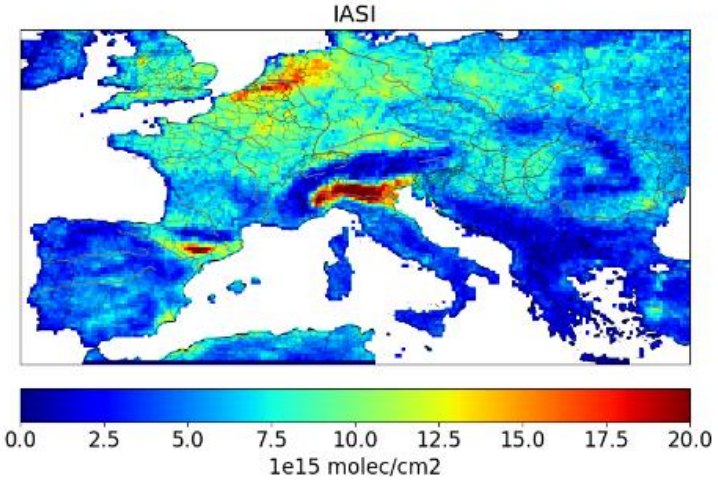


TROPOMI ON SENTINEL 5P	
Launch	13 October 2017
Spatial resolution	3 x 5 km
Data processing	DLR, Germany KNMI, The Netherlands
Data products	▸ Total column O_3, **NO_2**, CO, SO_2,**CH_4**, HCHO ▸ Cloud and aerosol information

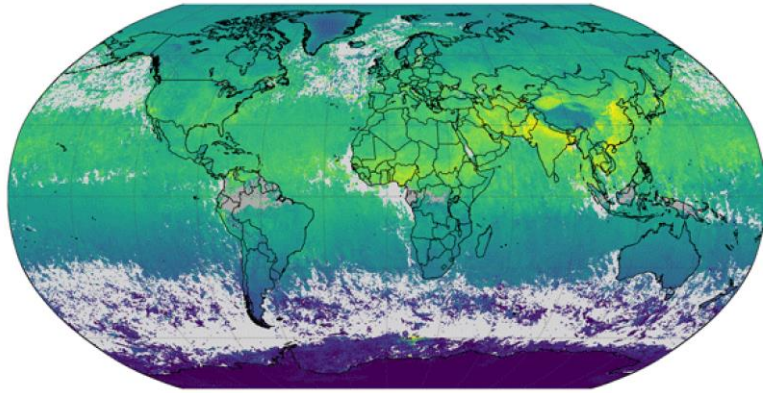
NO2 from TROPOMI



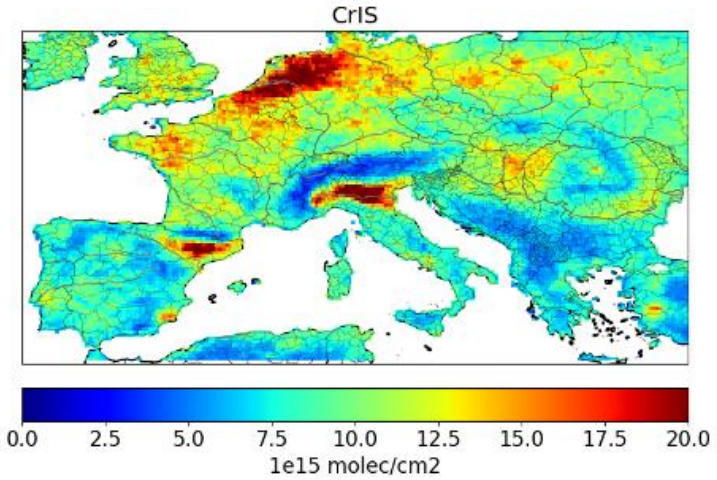
Ammonia from IASI



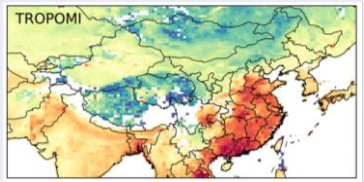
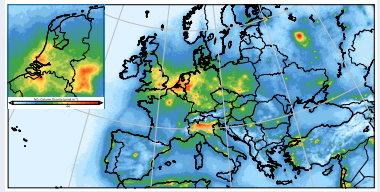
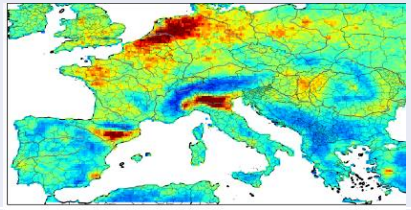
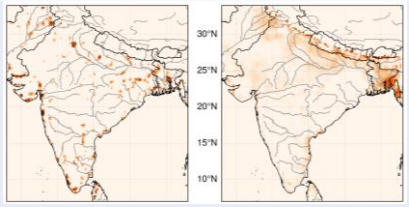
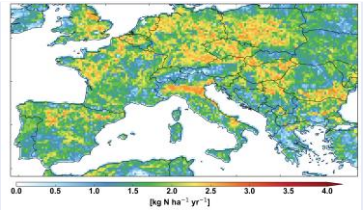
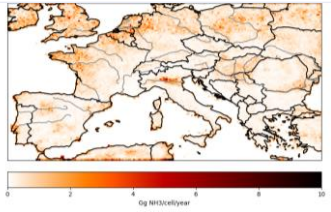
Methane from TROPOMI



Ammonia from CrIS



Processing of AGATE emissions

Product line	CH4	NOx	NH3
Satellite	Sentinel 5P  		CrIS, IASI 
Retrieval			
Inversion	Divergence method	DECSO algorithm	
Emissions			
Downscaling	Rice CH4 Livestock CH4	Soil NOx	Crops NH3 Livestock NH3
Deposition		Nitrogen deposition	

AGATE baseline products

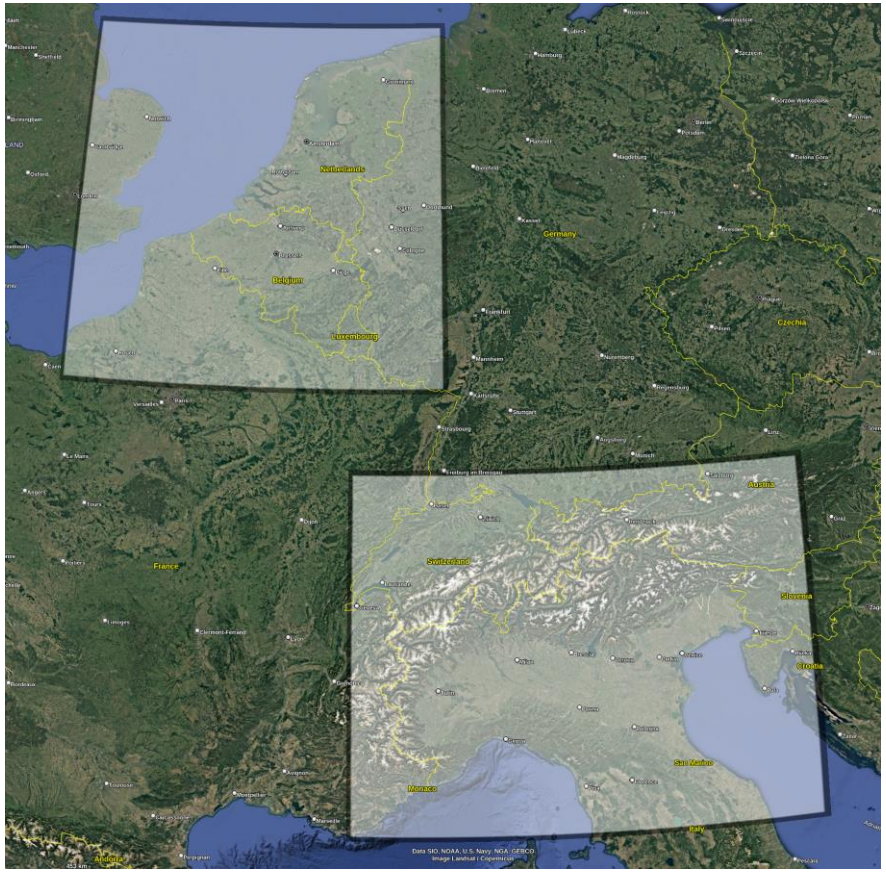
Step 1				
Satellite-derived emissions (10 km scale)		NH3 Low countries & Po Valley	Soil-NOx Low countries & Po Valley	CH4 Po Valley
Step 2				
High resolution emissions (user-defined)	Crops	Crops-NH3	Soil-NOx	Rice-CH4
	Livestock	Livestock-NH3		Livestock-CH4
Step 3				
High resolution deposition (user-defined)	Deposition	Nitrogen-deposition		

- Web-site: https://esa-agate.org

Domains

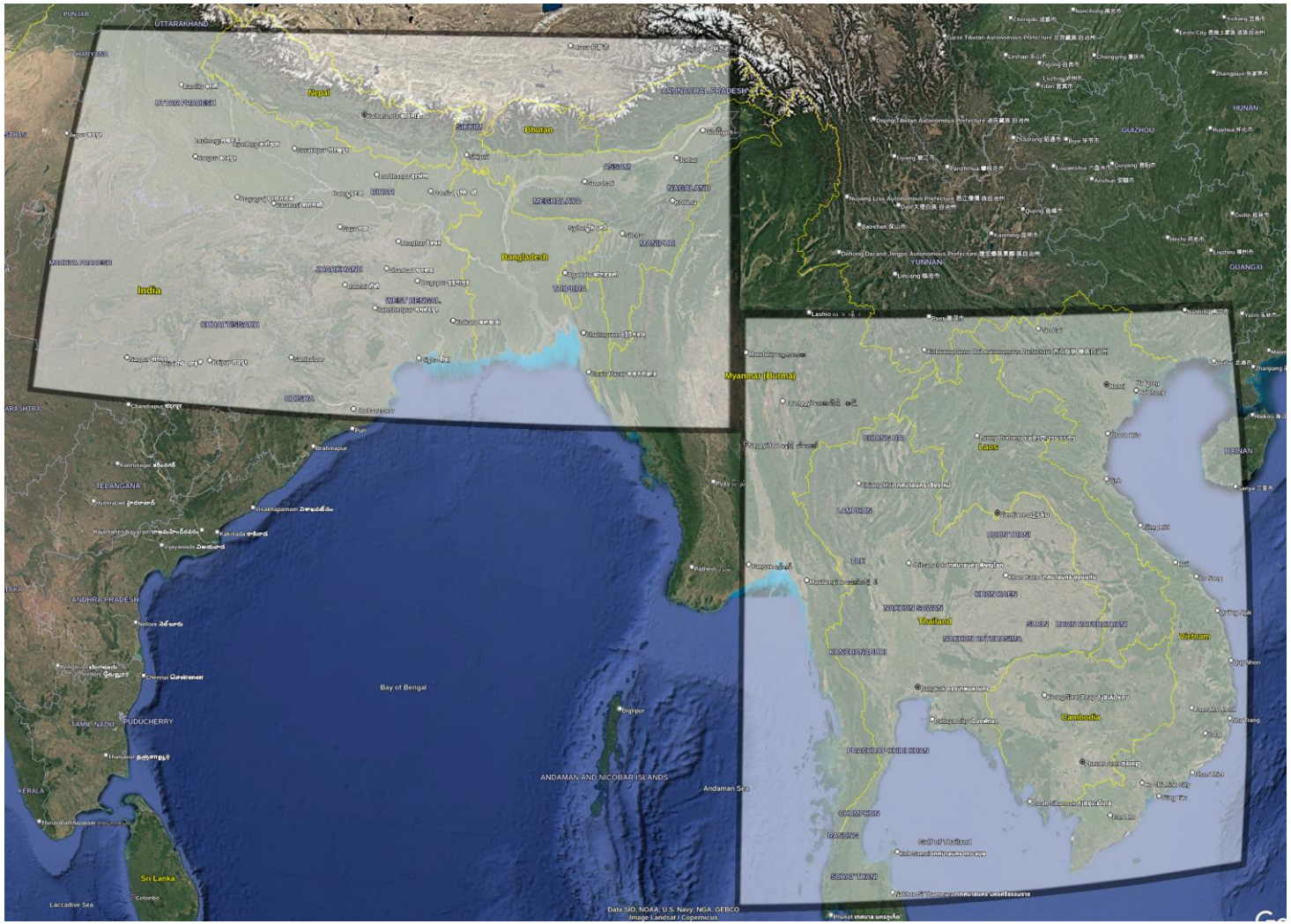
In Europe:

- “Benelux”
- North Italy



In Asia:

- North East India 15-28 N , 80-97 E
- South East Asia 8-23 N , 96-110 E



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

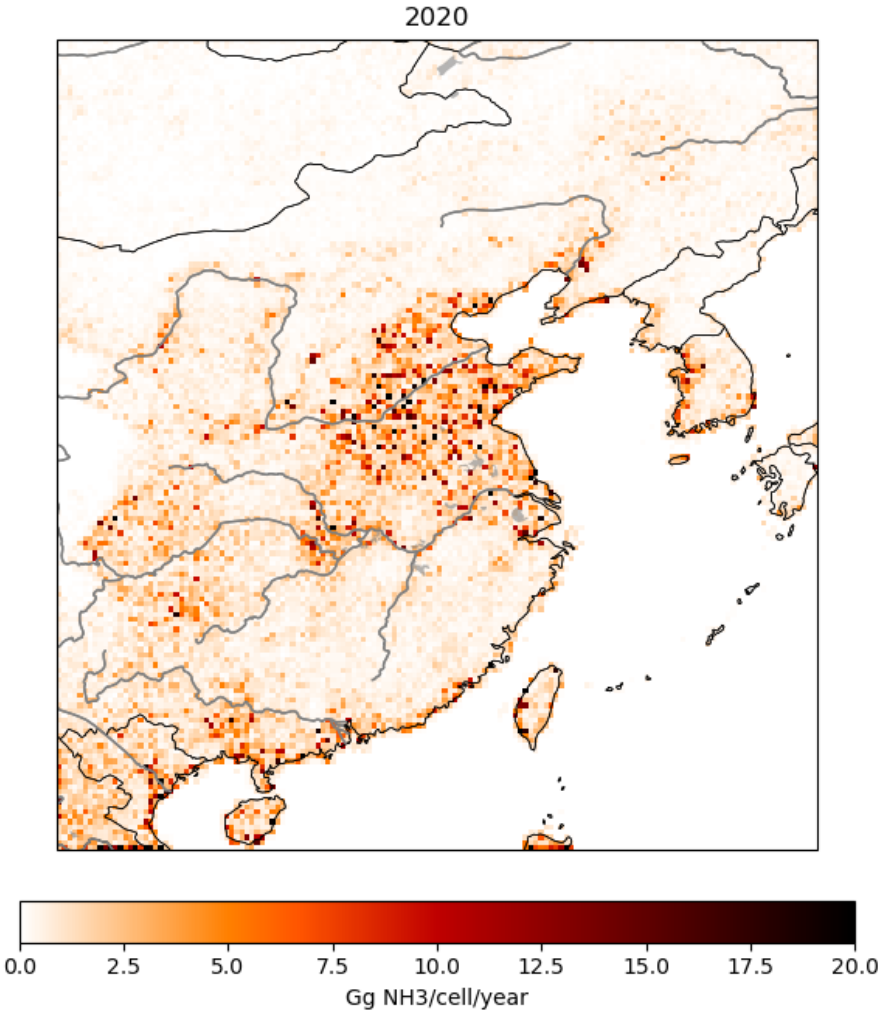
Proxy data

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

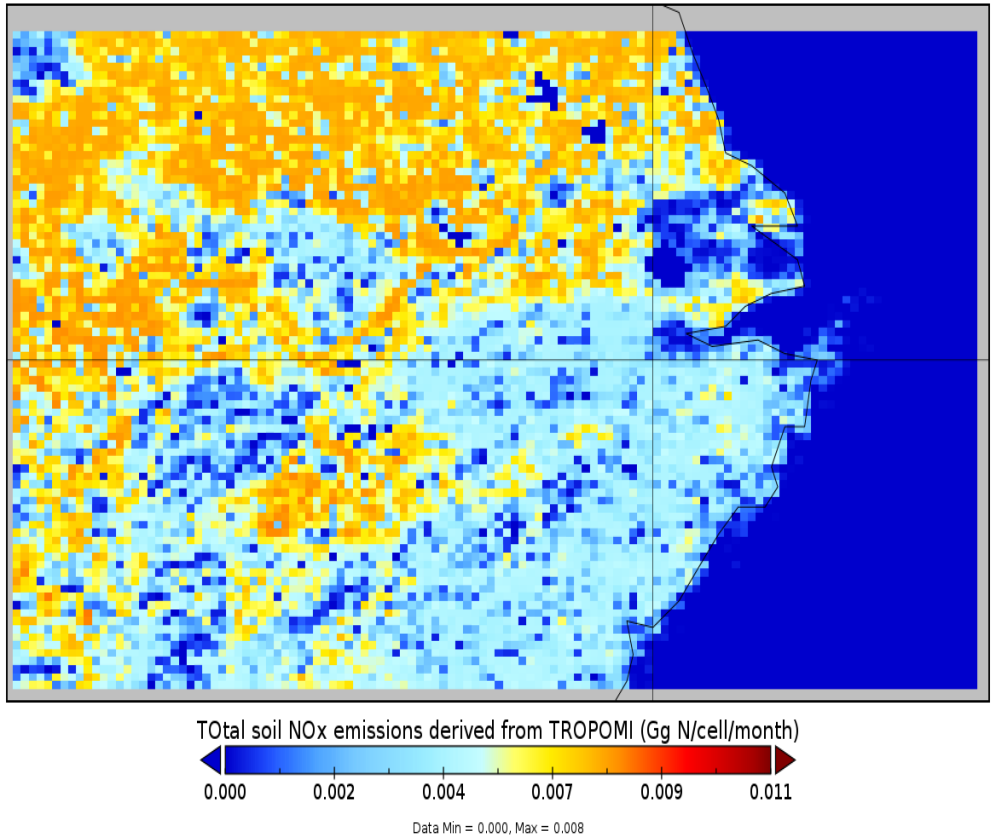
Some examples

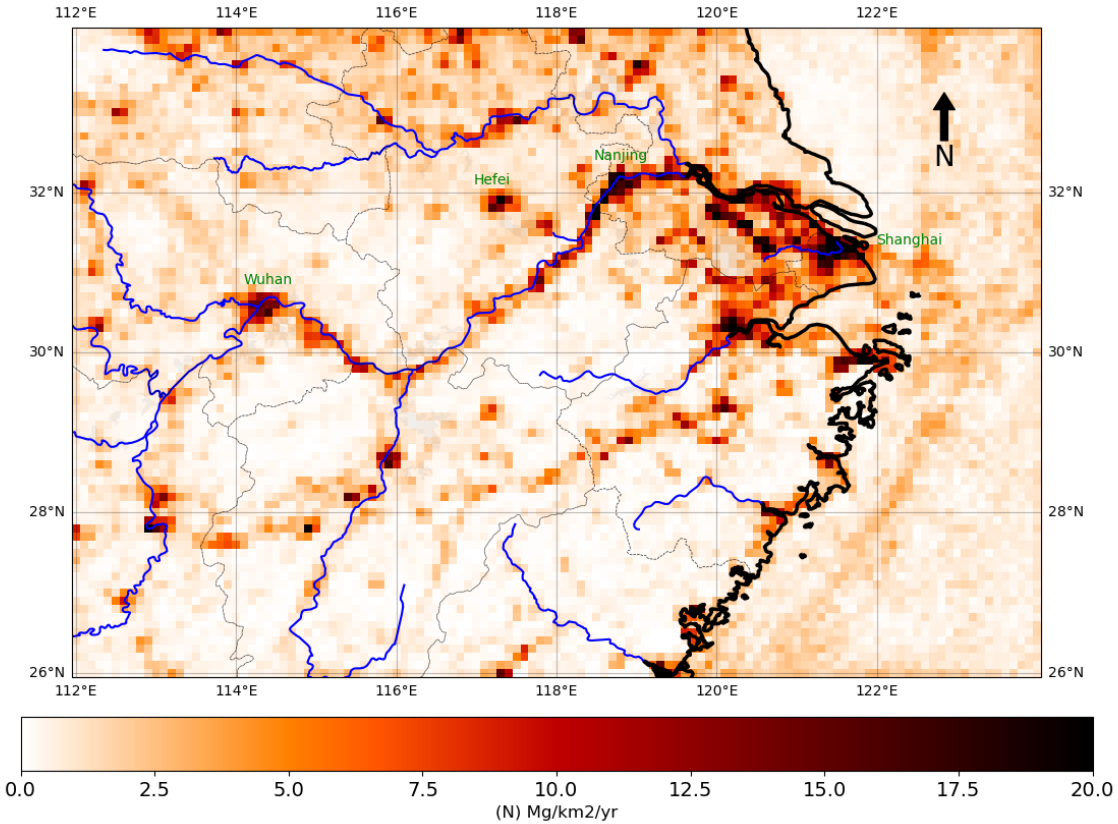
NH3 emissions over China in 2020



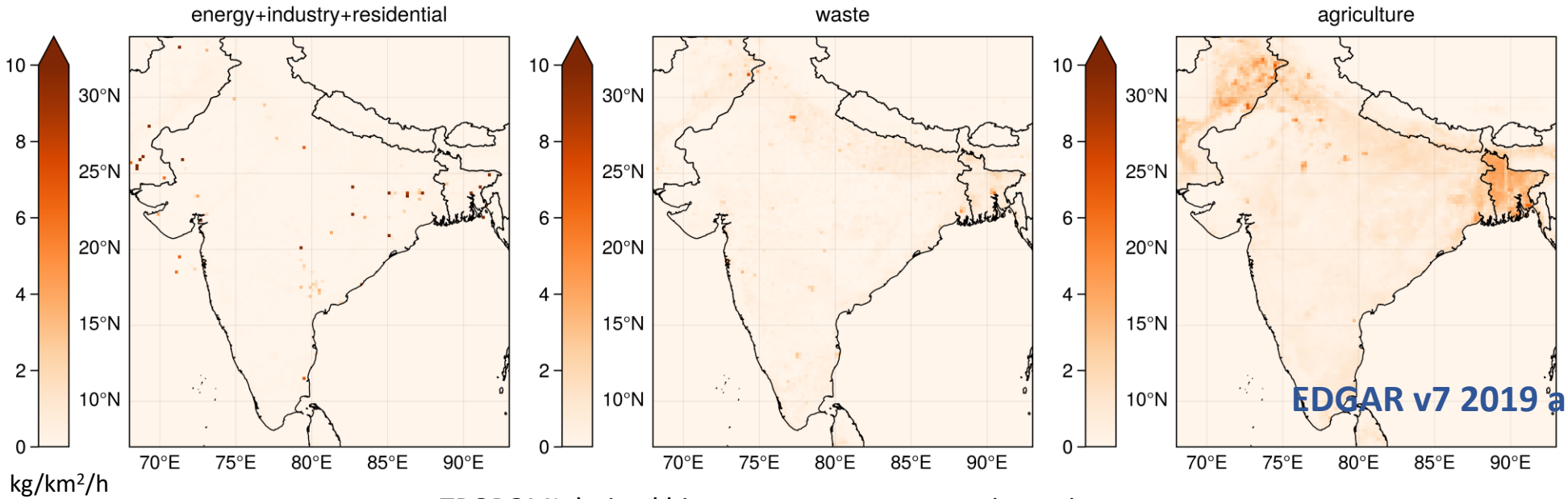
NOx emissions in the Yangtze River Delta

- Spatial resolution: 10 km
- Monthly emissions
- Processed for the Shanghai Meteorological Service

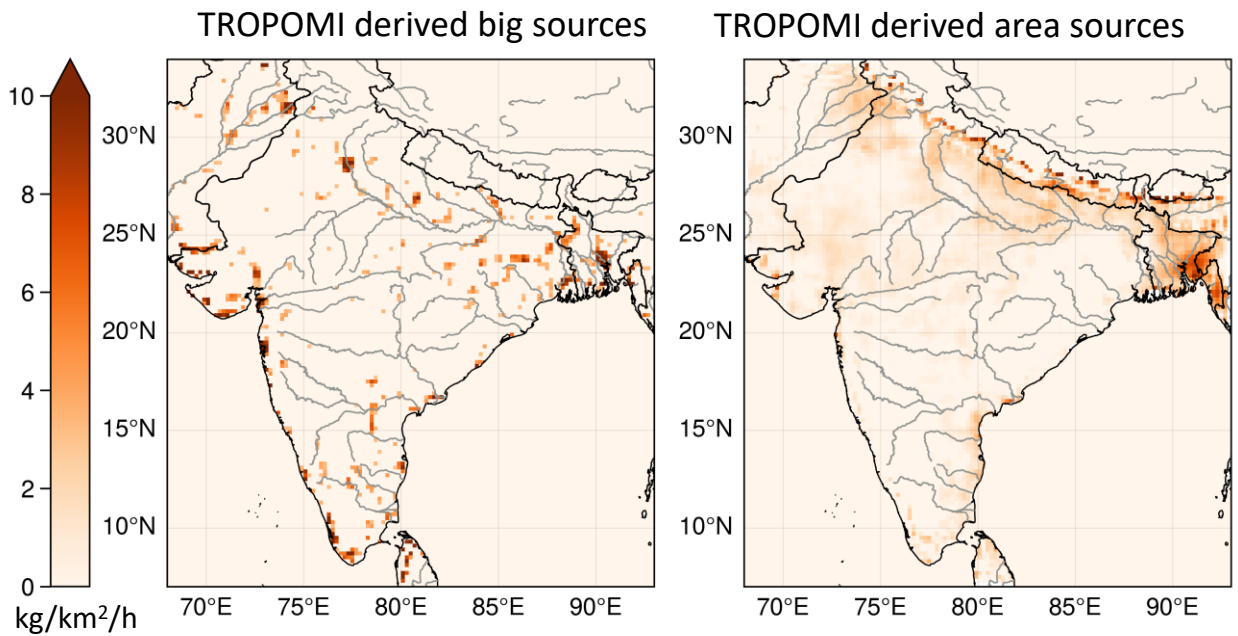




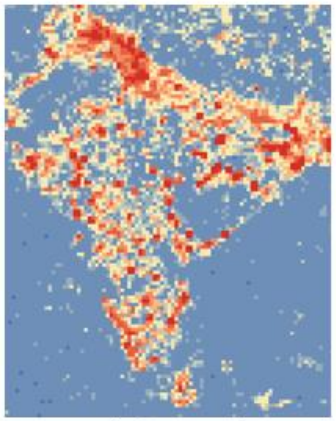
Different categories of methane emissions



EDGAR v7 2019 annual emission

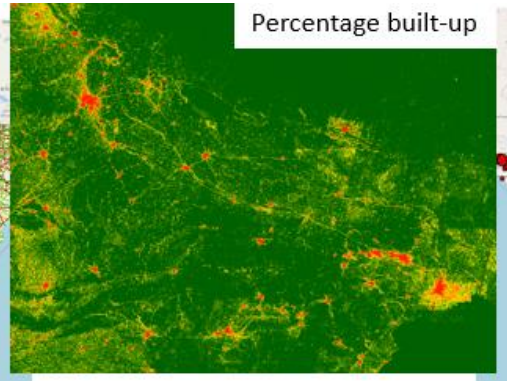


Downscaling of satellite derived emissions to high resolution for Bangalore and Chennai



NOx emissions 01/2018

Road map



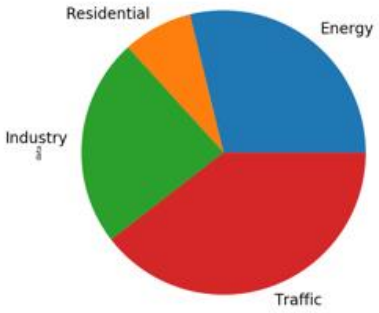
Percentage built-up

Powerplants

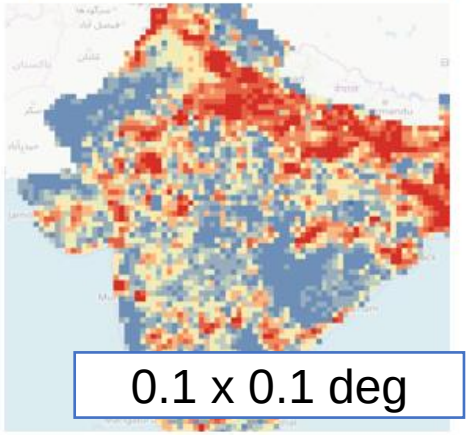
Open source GIS data

Satellite based emission estimates

Local sector split from HTAP v2 inventory



AirQast Standard resolution inventory

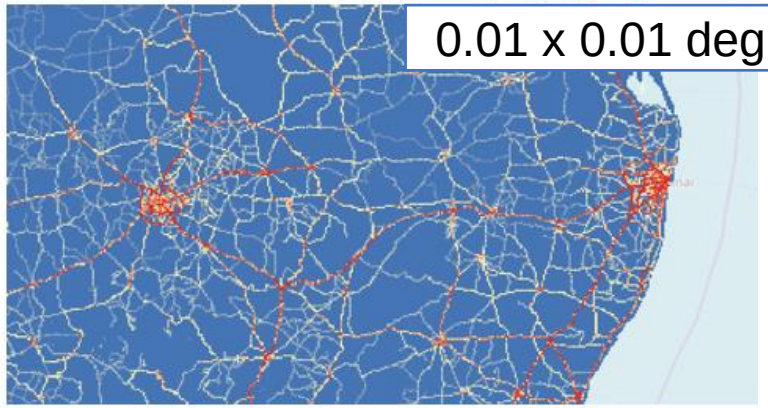


0.1 x 0.1 deg

Residential NOx emissions 01/2019

Downscaling

AirQast High resolution inventory



0.01 x 0.01 deg

Traffic NOx emissions in Bangalore / Chennai in 01/2019

vito.be