CT7 – High-resolution emissions
Wrap up and next steps

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FAIRMODE
Forum for air quality modelling in Europe

European Commission

Topics discussed

Best practices

- Other sectors: Non-road mobile construction machinery

- Temporal variability of emissions

Updates from CAMS

- The CAMS COVID-19 emission dataset

Emission benchmarking activities
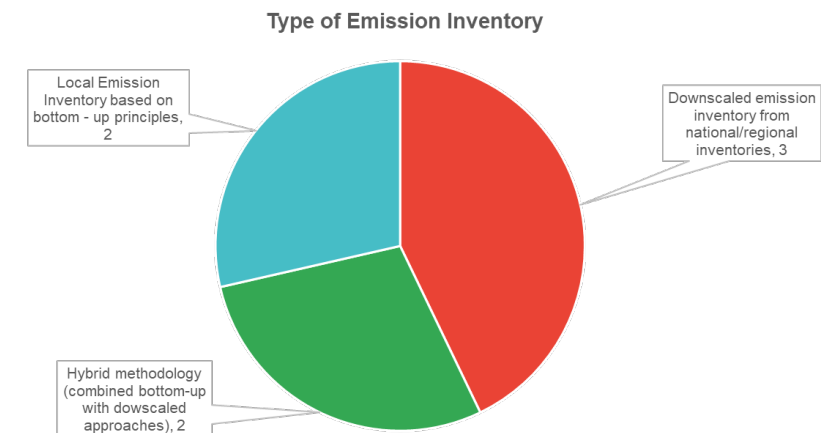
- New approach for Emission QA/QC

Other Sectors: Non-road mobile construction machinery

- We focused **on NRMM in construction**; We presented the results from the **Questionnaire to map practice** and the state of new developments at NILU.

Questionnaire – Lessons learn

- NRMM in construction has received less attention than other sectors at urban scale;

- The contribution from this sector to total emissions shows a wide range of results;

- Spatial distribution; use of traditional proxies (population, land use data) in combination with more sector specific (employment data, building construction).

- Temporal distribution; not addressed or simple approaches

- Important gaps concerning non-exhaust emissions

- Type of Emission Inventory

Type of Emission Inventory

Local Emission Inventory based on bottom - up principles, 2

Downscaled emission inventory from national/regional inventories, 3

Hybrid methodology (combined bottom-up with downscaled approaches), 2

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Other Sectors: Non-road mobile construction machinery

- We focused **on NRMM in construction**; We presented the results from the Questionnaire to map practice and **the state of new developments at NILU.**

New developments by NILU – Lessons learn

- CT7 is a forum to share methods and discuss best practice.

- This sector presents highly variability in space and time. The data collection is a challenge in many locations

- We need specific studies that establish the contribution from NRMM in construction (e.g., exceedances of PM10; exhaust vs non-exhaust contribution,…). This is key to evaluate the level of resources dedicated to this sector.
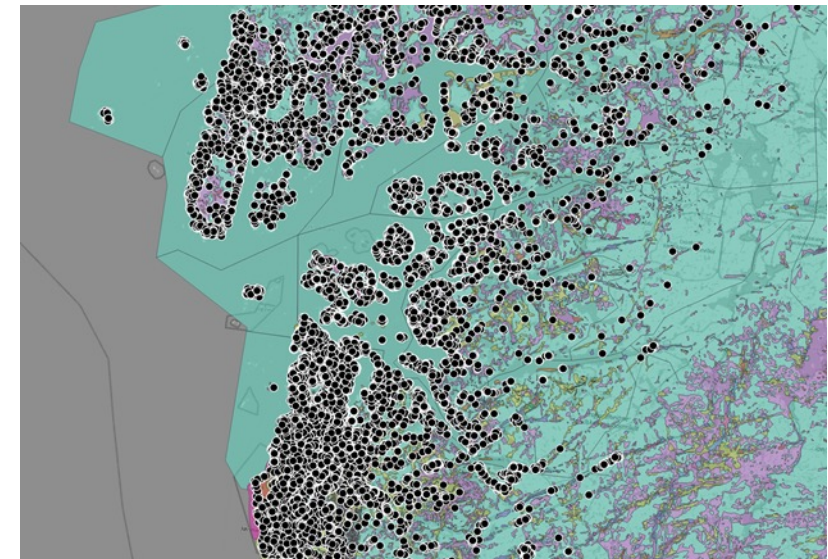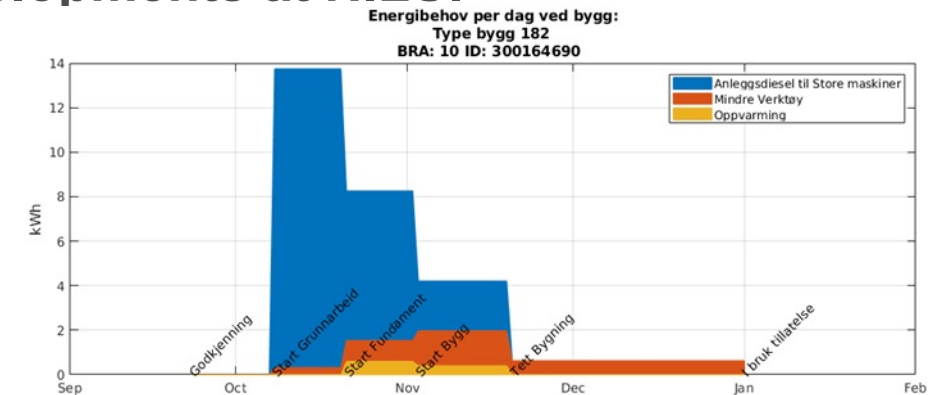
Temporal variability of emissions

- Temporal disaggregation is the process of breaking down aggregated annual emissions into fine temporal resolutions (usually up to hourly scale)

- Requirement for AQ modelling

- Hierarchy of temporal allocation steps: annual → month → day → hour

- For each resolution, use of specific temporal weight factors

Annual emissions   Monthly share   Daily share   Hourly share

$$E_{i,s,h} = \sum_{c} \left(E_{i,c,s,j} \frac{x_{c,s,j,m}}{\sum_{m=1}^{12} x_{c,s,j,m}} \frac{7}{n_{m,j}} \frac{y_{c,s,d}}{\sum_{d=1}^{7} y_{c,s,d}} \frac{z_{c,s,d,h,t}}{\sum_{h=1}^{24} z_{c,s,d,h,t}} \right)$$
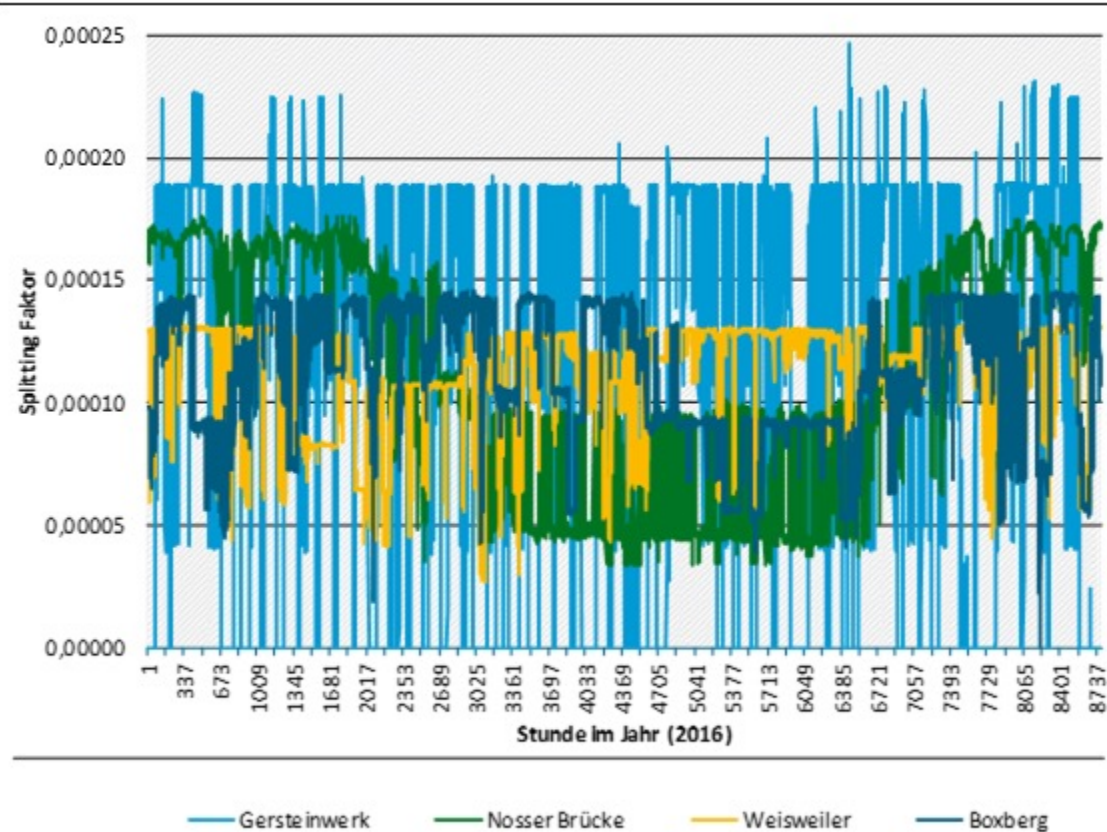
Crippa et al. (2020)

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Temporal variability of emissions

Energy sector: Use of electricity generation data at the facility- or fuel-level. Differences in daily distribution:

- Power plants versus heating plants
- Fuels mostly used in peaking power plants (natural gas) versus base load power plants (coal)

Splitting factors for four power plants

Stefan Feigenspan (UBA)   Datenquelle: https://www.entsoe.eu/

Jeroen Kuenen (TNO)
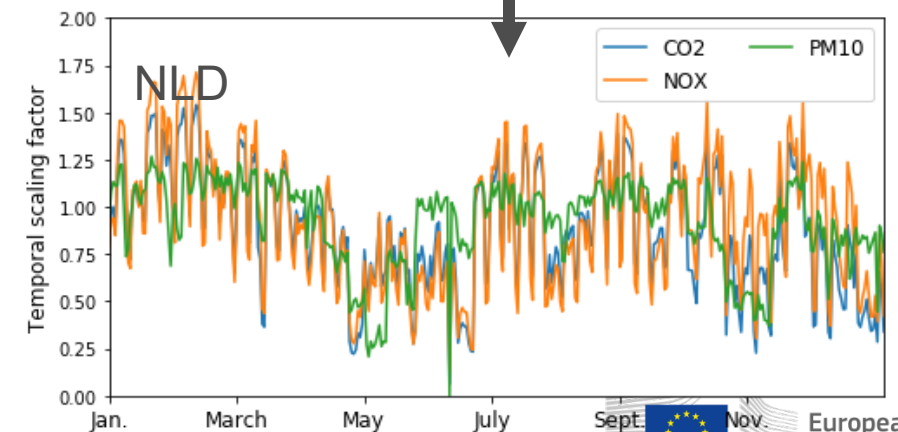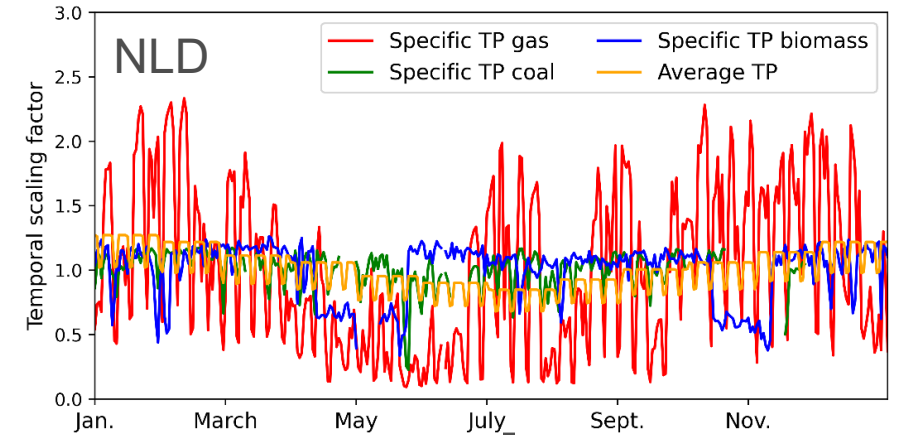
Temporal variability of emissions

Residential sector: Use of electricity generation data at the facility- or fuel-level. Differences in daily distribution:

- Importance of the spatial variability on the residential heating season (linked to climate zones)

- Residential wood combustion versus cabin wood combustion: need to be treated separately as they occur differently on space and time;
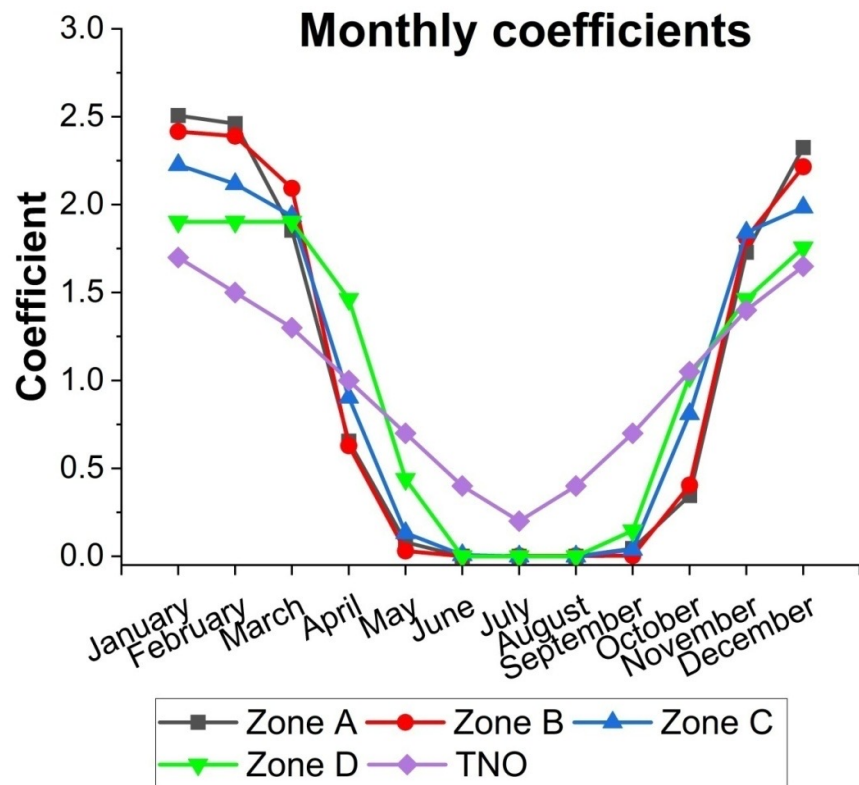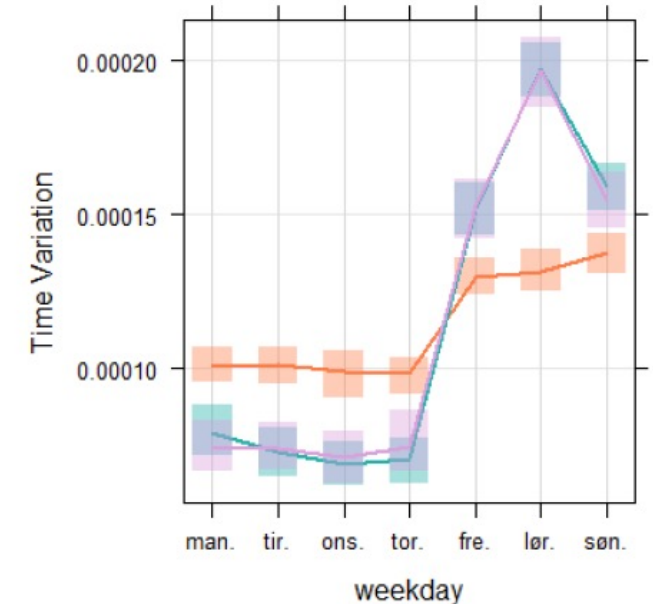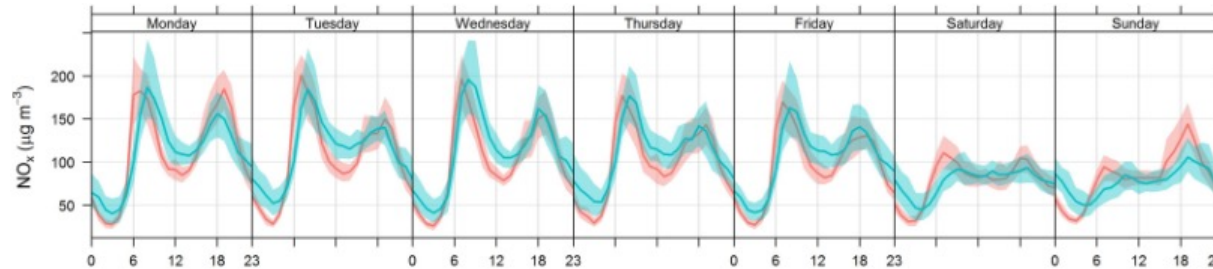

Sandy Fameli (NOA)
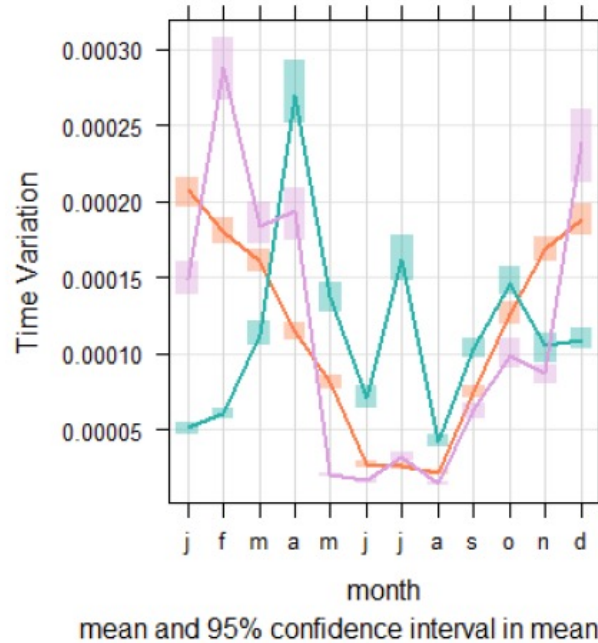
Susana López-Aparicio (NILU)
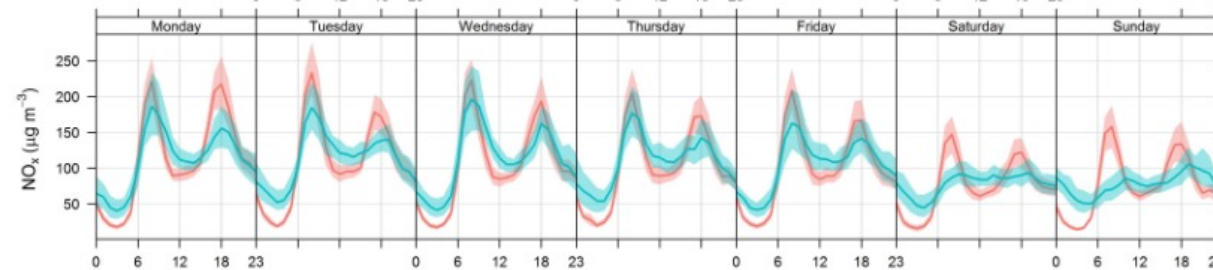
Temporal variability of emissions

Road transport:

- Power plants versus heating plants
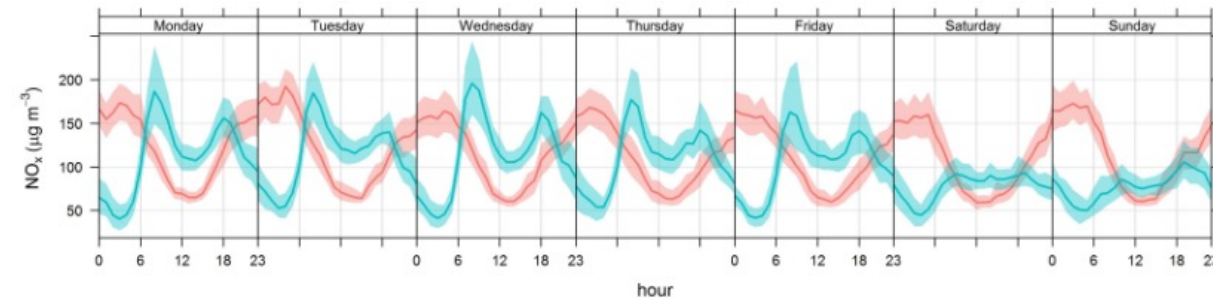- Fuels mostly used in peaking power plants (natural gas) versus base load power plants (coal)

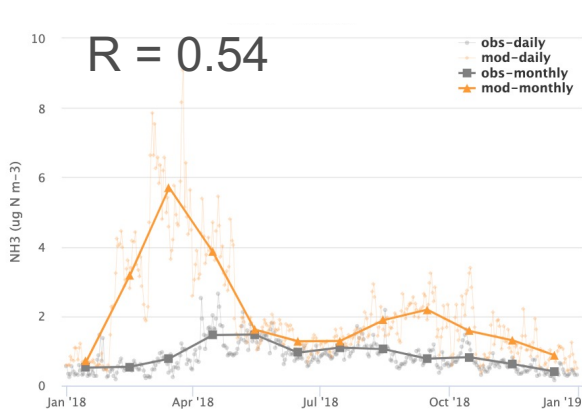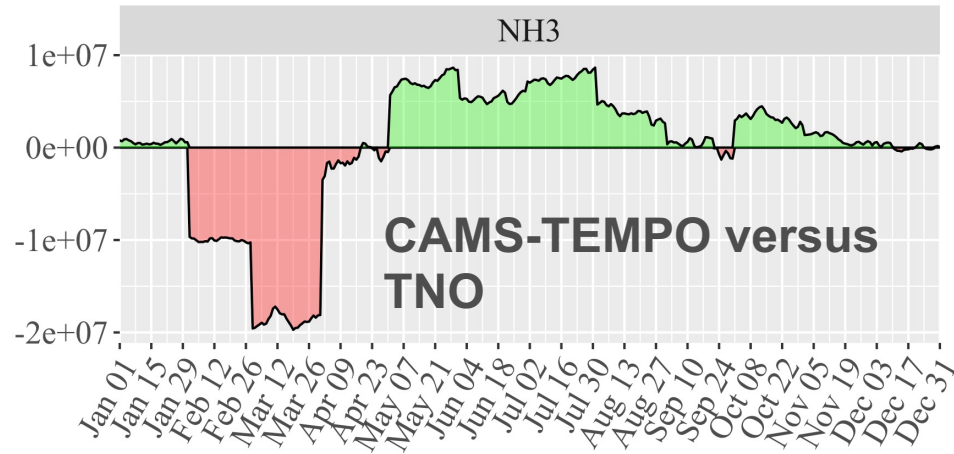1. / 2. Both scenarios give the same image
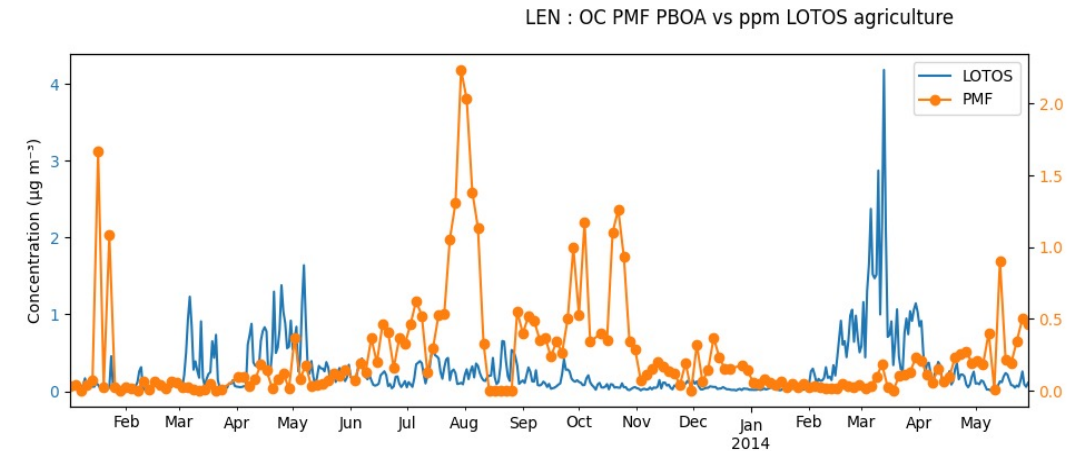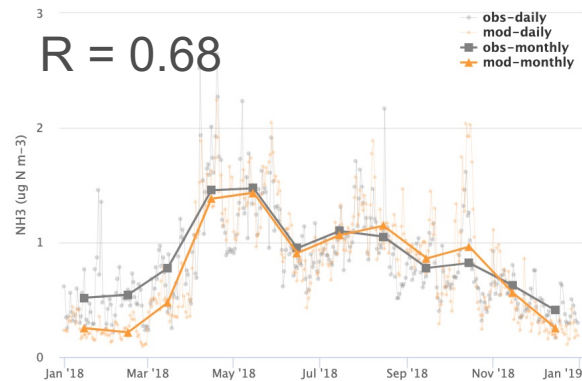
3. TNO factors

4. No factors

Temporal variability of emissions

Agricultural sector:

- Impact of using dynamic versus static temporal profiles on NH3 emissions/concentrations

- Need to consider pollutant-dependent profiles (e.g. NH3 from use of fertilizers versus PM10 from agricultural waste burning activities)
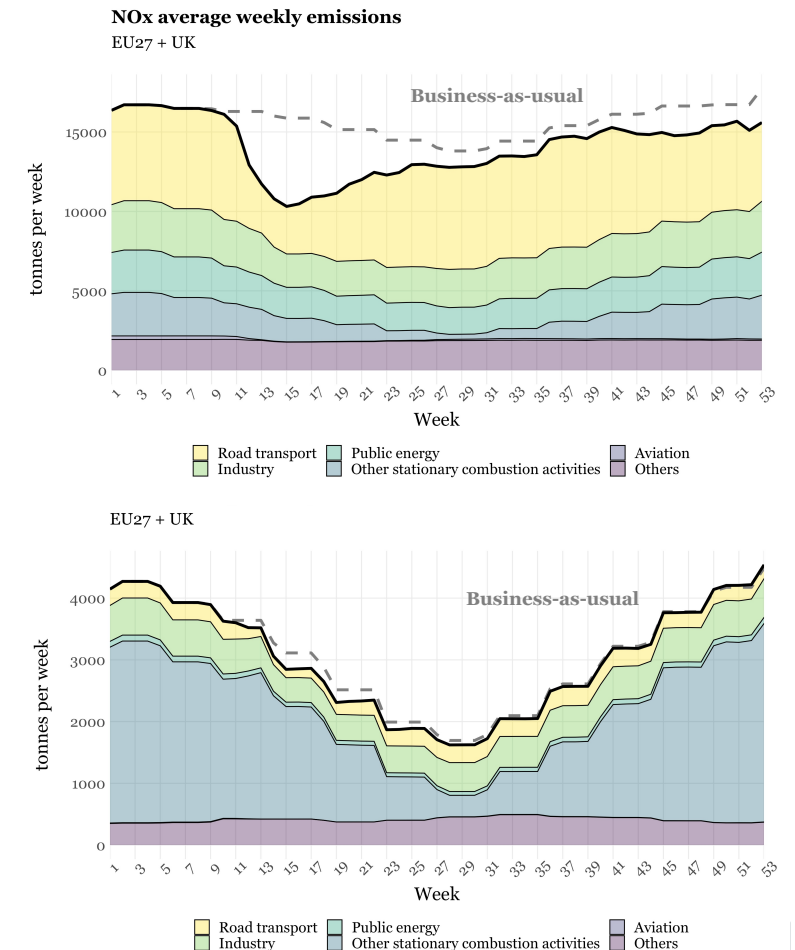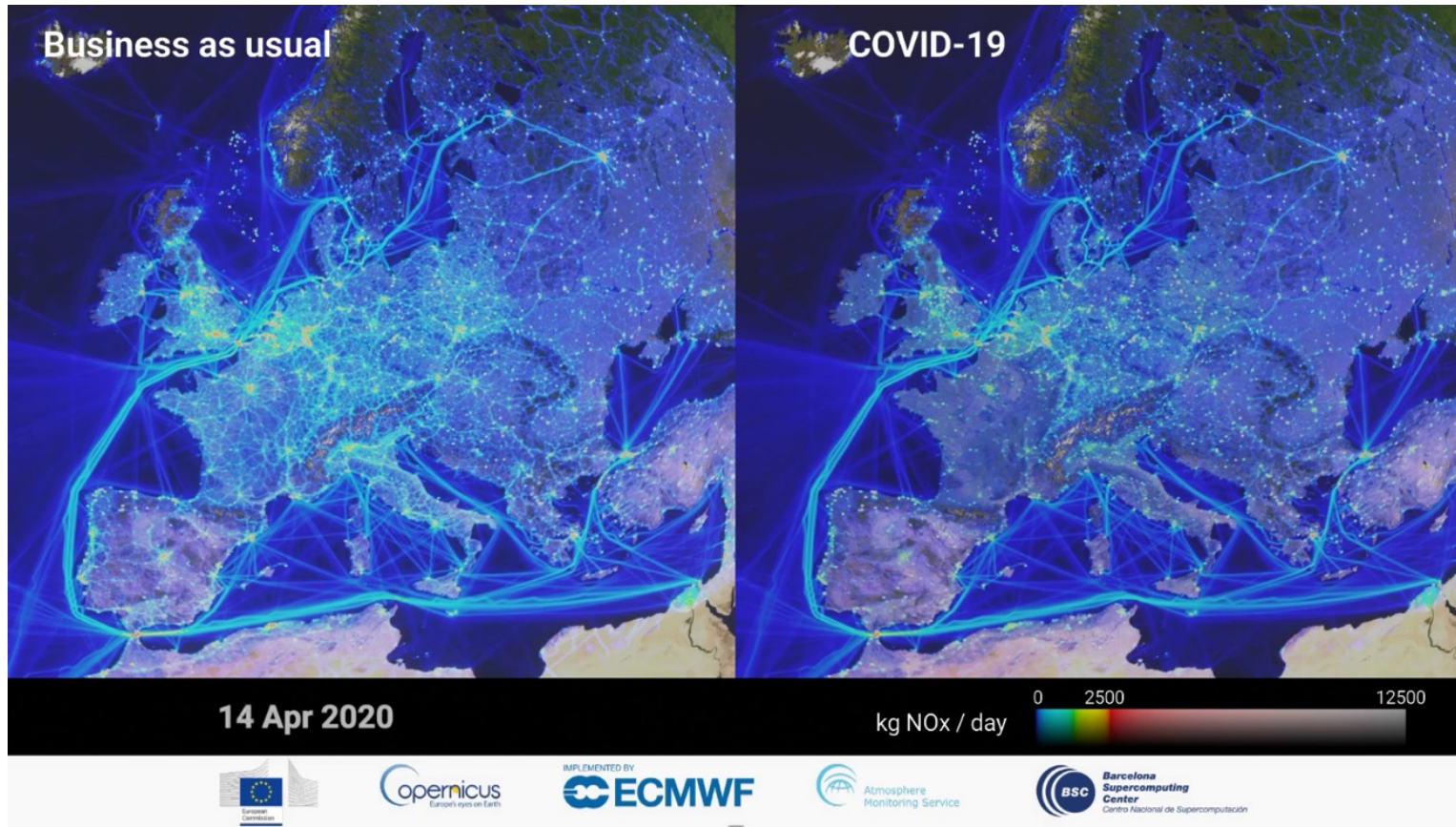

Marc Guevara (BSC)

Jeroen Kuenen (TNO)

Update from CAMS

New CAMS emission product to help quantifying the impact of COVID-19 restrictions:
- Dataset of daily country-, sector-, pollutant-dependent emission adjustment factors
- Resulting dataset to be combined with the CAMS-REG European emissions for air quality modelling
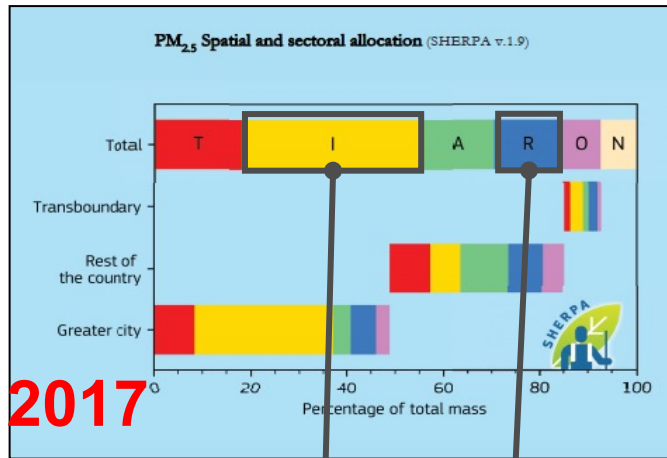
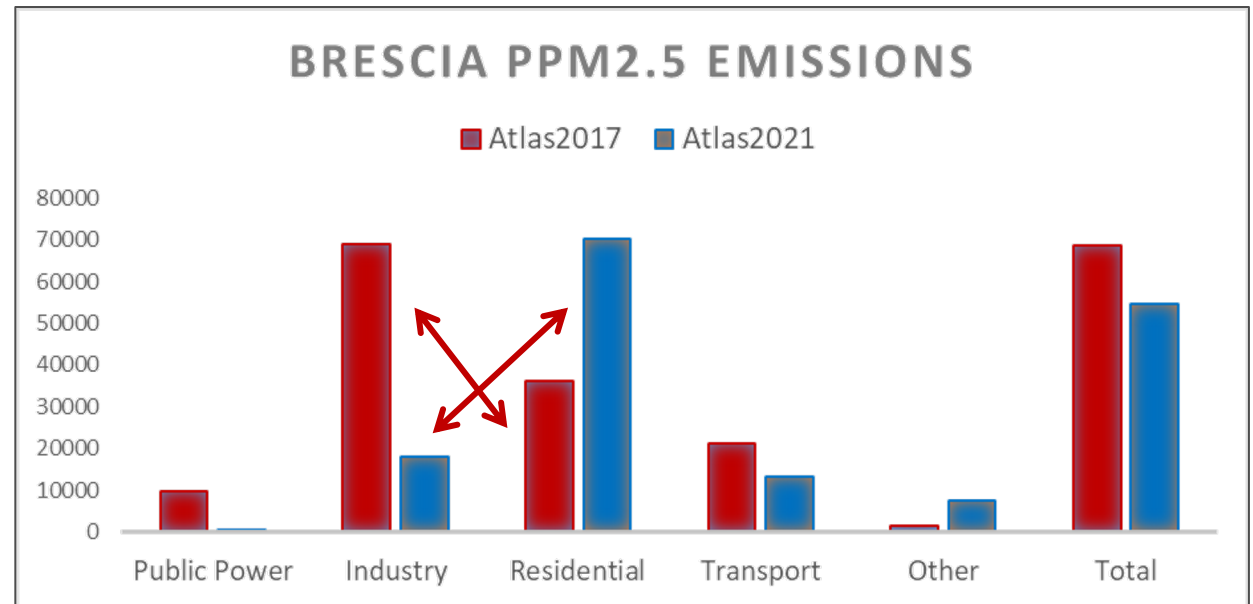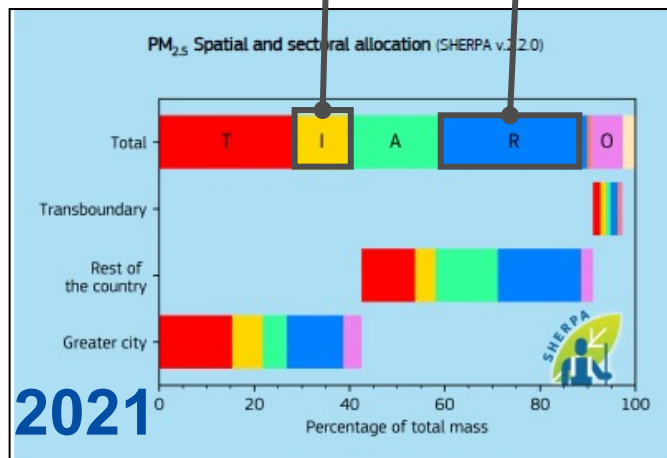# Emission benchmarking activities

- The use of different emission inventories (or versions of emission inventories) can lead to significant different AQ modelling results
- Benchmarking allows flagging inconsistencies / improving understanding behind emission differences

Brescia

# Emission benchmarking activities

- New screening approach developed by JRC to flag large differences (inconsistencies) between emissions

- Flexible method: choice of sectors/species, areas of study, inconsistency threshold

- Possible uses: inventory vs. inventory   /   Inventory version vs. inventory version   / Inventory version & year vs. inventory version & year

Application (CAMS42 vs CAMS22 (2015)
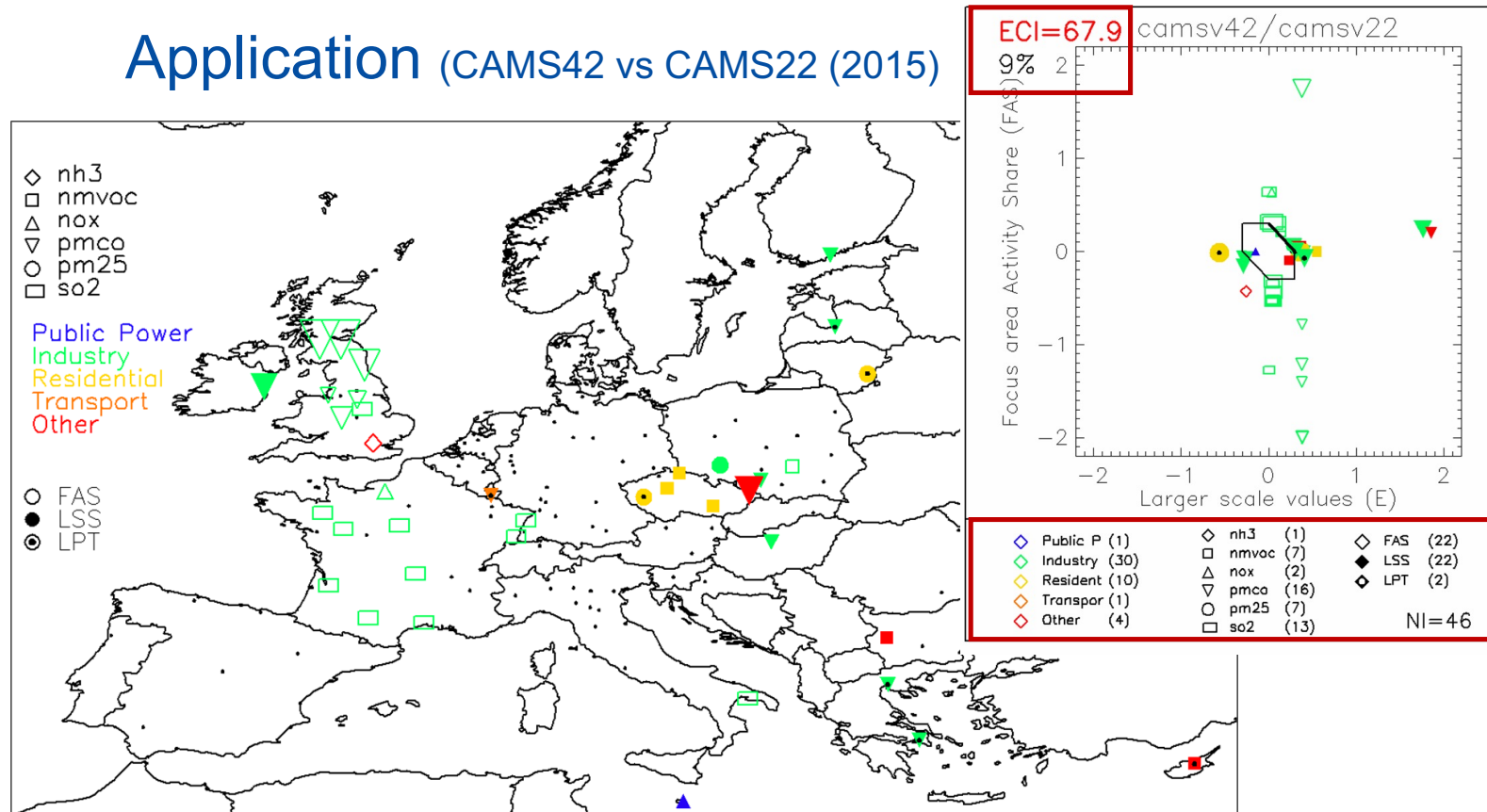
Next steps

Best practices:

- **Other sectors: Non-road mobile construction machinery**
  - We will keep the development and benchmarking with downscaled emissions inventories to assess consistencies/inconsistencies and relevance of the sector on total emissions.
  - Depending on the final results, we will evaluate the relevance of continuing investigating

- **Temporal variability of emissions:**
  - Unlike national emissions, countries do not report official information on temporal profiles
  - First time the topic is proposed in CT7 → Lot of contributions received!
  - Continue exchanging practices and discussing best methods
  - Results can be valuable for the improvement of current profiles used for AQ

Benchmarking activities:
- The focus of CT7 is on urban scale + comparison between urban and regional/national emissions
- Inconsistencies found between versions of official reported emissions, which indicate the need to have a better connection between providers and users of national emission inventories (sometime the updates made are not clearly reflected in IRR reports)
- Results from the new screening approach can be a good way to establish this connection + have a consistent method for comparison between downscaling and urban scale inventories

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