FAIRMODE CT7

WG7 – High-resolution emissions
Current Status

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European Commission

WG7 – The Road Map

- ## Metadata

Elaborating recommendations to define the relevant meta-data that support urban emission inventories. The metadata recommendations will provide a common framework to better understand the differences between inventories. The composite mapping platform will be used to support this task and test its feasibility

- ## Interaction with CAMS/TFEIP

Providing relevant feedback to improve European inventories used for regulatory purposes (EMEP) and Copernicus monitoring services (CAMS-REG).

- ## Best practice
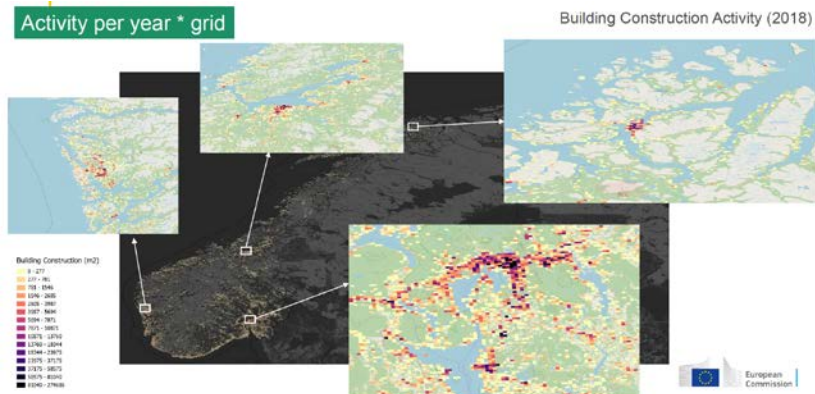
Identifying best practices and drafting final recommendations for the compilation of traffic and residential heating high resolution emission inventories.

- ## New sectors

Initiate benchmarking activities for the compilation of high-resolution emissions from new sectors (construction, off-road, agriculture). This will be achieved through applying the benchmarking methodology (quality assurance) to a large number of datasets to capture local specificities across Europe. The composite mapping platform will also support this benchmarking activity.
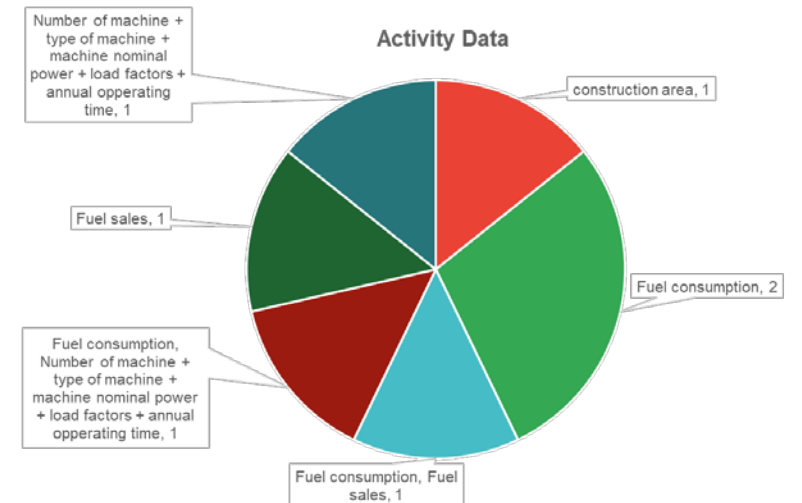
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NEW SECTORS - NRMM

- The need to provide guidance for other sectors than traffic and residential heating has been brought by local and national agencies, and modelers. NRMM has not been a priority sector, however it is becoming more important in urban areas

- Questionnaire (specific for construction) was launched during 2021 to map current practices, the existing knowledge and identifying gaps

- Specific sessions were organized to share practices.

FAIRMODE
High-resolution emission inventories (CT7)

Section 1 of 7

Emissions from NRMM in construction

This questionnaire is part of the activities in CT7 - High-Resolution Emissions in FAIRMODE (https://fairmode.jrc.ec.europa.eu/). The purpose of the questionnaire is to map practices, methods and data sources used for the compilation of high-resolution emissions from non-road mobile machinery (NRMM) used in construction.

Activity per year * grid

Building Construction Activity (2018)

Building Construction (m2)

KEY CHALLENGES

- **Data compilation**; Multiple sources of activity data need to be collected and processed.

- **Emission factors**; knowledge on fleet composition and EF for new machinery

- **Spatial distribution**; additional challenge with future scenarios

- **Temporal distribution**; additional challenge when addressing meteorology driven emissions (non-exhaust)


Activity Data

Number of machine + type of machine + machine nominal power + load factors + annual operating time, 1

construction area, 1

Fuel sales, 1

Fuel consumption, 2

Fuel consumption, Number of machine + type of machine + machine nominal power + load factors + annual operating time, 1

Fuel consumption, Fuel sales, 1

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BEST PRACTICES – Time variation of emissions

Residential sector: Importance of the spatial variability on the residential heating season (linked to different climate zones and changes in outdoor temperature)
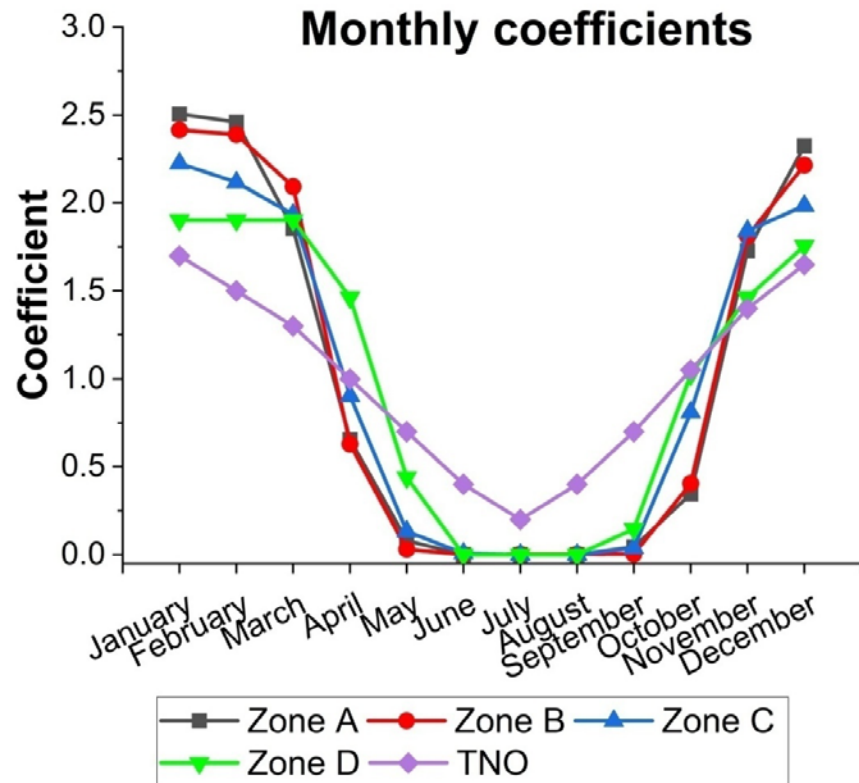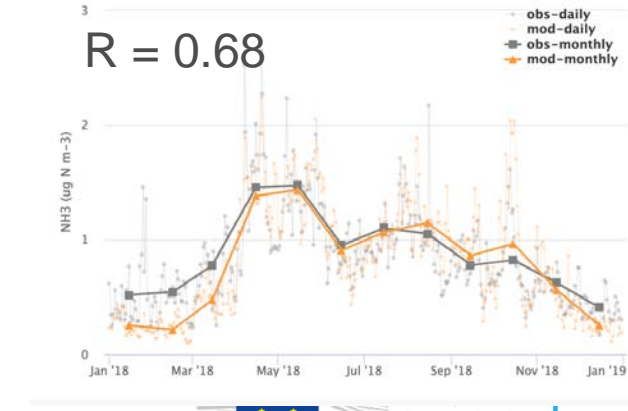
Agricultural sector: Impact of using dynamic versus static temporal profiles on NH3 emissions & concentrations

Sandy Fameli (NOA)

CAMS-TEMPO versus TNO temporal profiles

R = 0.54

R = 0.68
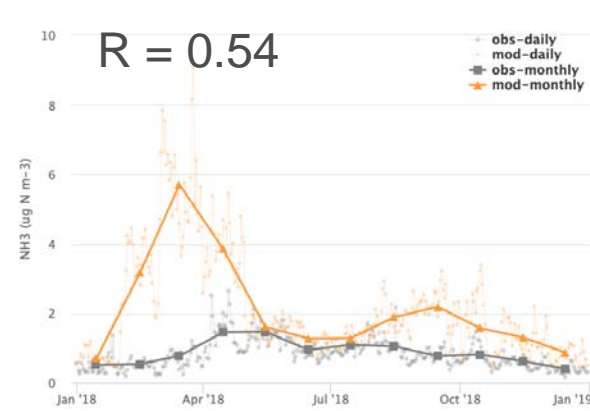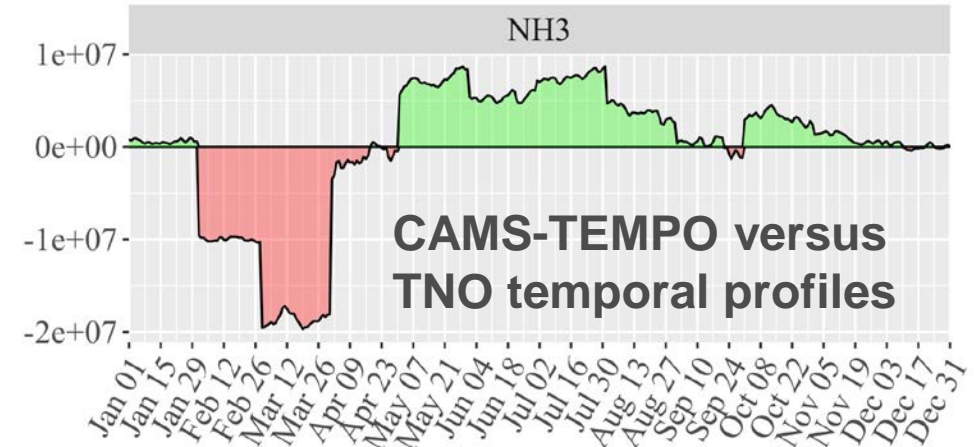
Marc Guevara (BSC)

# BENCHMARKING – feedback to improve European inventories

- 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
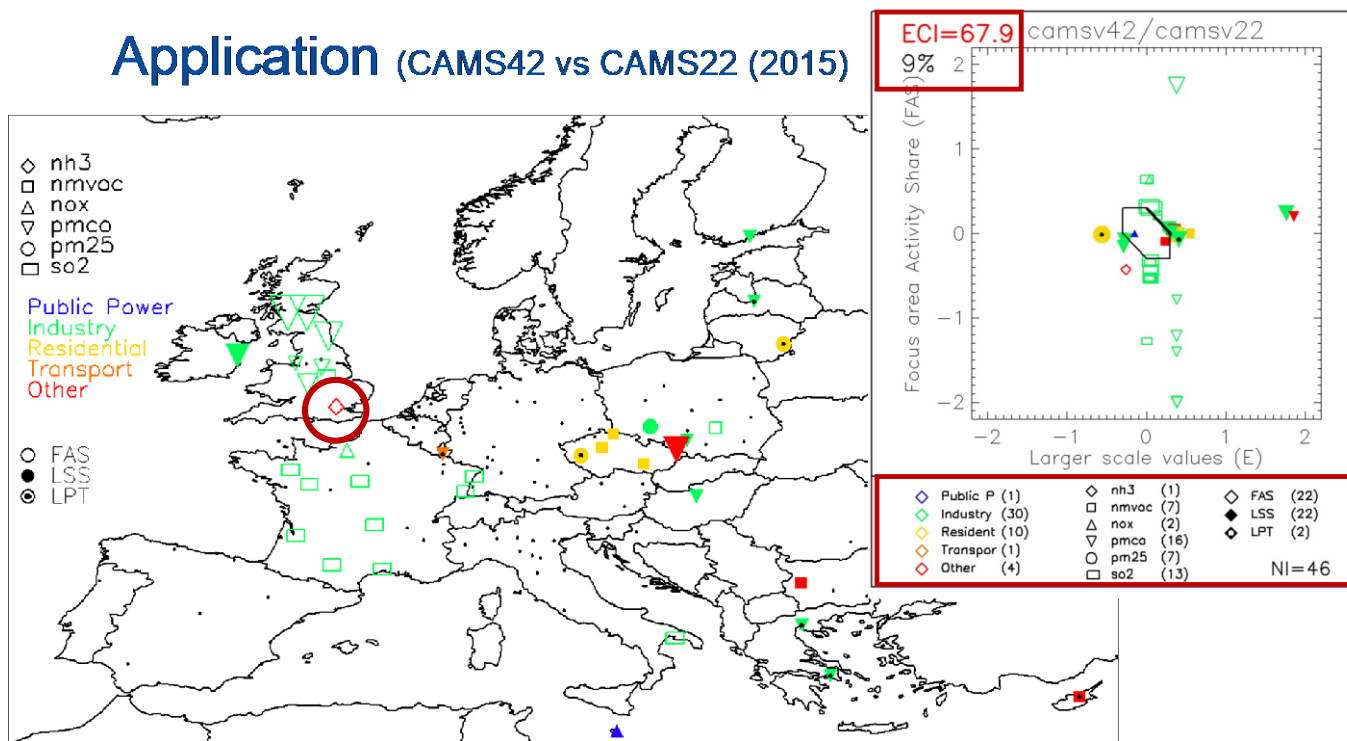
London: inconsistent "other" urban share for NH3.

UK NH$_3$ emissions from "other waste" category ended up in the same point source in London

Thunis et al. (GMD, 2022)
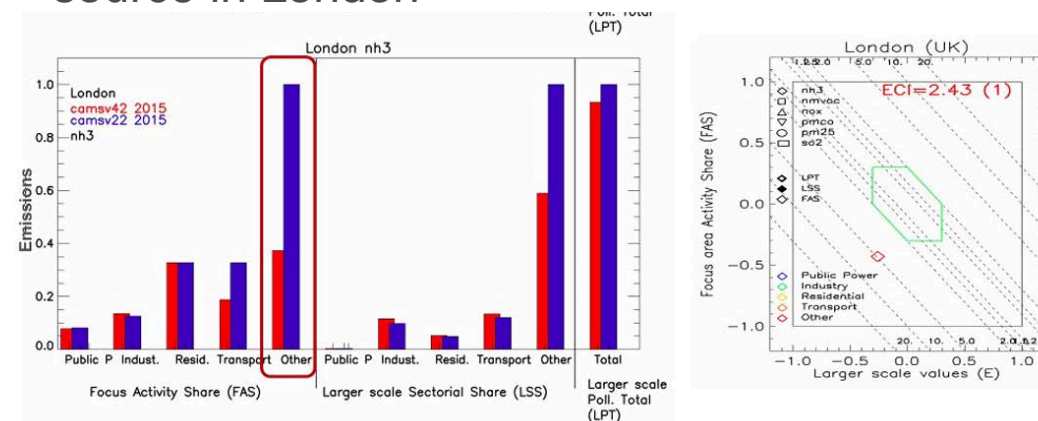
INTERACTIONS with TFEIP

- TFEIP new working group on improving the usability of emission inventories for AQ modelling (lead by J. Kuenen, TNO)

- Contributions provided to the updated chapter for spatial emissions mapping as part of the EMEP/EEA 2023 Guidebook update (+ living Annex)

METADATA – decision tree

- Emission Composite Map platform has been populated with local and regional emission inventories
- Metadata information has been requested together with the emission data

CT7 – What did we achieve?

- Metadata

> Elaborating recommendations for a common system to define emission meta-data.
> - Flagging and identifying the relevant information and key elements to be provided with emission data.

- Interaction with CAMS/TFEIP

> - Organized interaction FAIRMODE / CAMS
> - Carried out benchmarking activities (new JRC screening approach)
> - Initiated support to TFEIP

- Best practice

> - Knowledge transfer activities: organized session for share/exchange practices;
> - We organized specific sessions on time variation of emissions (residential, traffic, construction, agriculture)

- New sectors

> Initiate benchmarking activities for the compilation of high-resolution emissions from new sectors (construction, off-road, agriculture).
>
> - Knowledge transfer activities: organized NRMM session for share/exchange practices;
> - Questionnaire for construction to map current practices.

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Thanks!

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FAIRMODE CT7

FAIRMODE Plenary Meeting

2-3 March 2023

I) WG7 – Road map 2023-2025

- ## Best – practise through QA/QC

Identifying best practices through QA/QC approaches and drafting recommendations for the compilation of sectorial high resolution emission inventories that are relevant at the urban scale.

- ## Metadata recommendation

Elaborating recommendations for a common system to document the use of ancillary data and define the relevant meta-data that support each emission inventory at the urban scale.

- ## Benchmarking and Emission dashboard

Benchmarking and creating an emission dashboard (EU, bottom-up national and local inventories) to monitor progress and identify inconsistencies among inventories. Regular inter-comparisons will be carried out to support this objective.

- ## Use of Composite mapping platform

i) as spatial information support to evaluate specific sectors/ topics identified as inconsistency by the dashboard;
ii) to carry out emission evaluation in relation with activities of the composite mapping for assessment purposes

- ## Provide relevant feedback

To European inventories used for regulatory purposes (EMEP, CAMS-REG) and research project (e.g., REMI, RI-URBANS, NordicWelfAir, "Others").

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II) WG7 – Short term plans (2023)

- Best – practise through QA/QC

  Identifying best practices through QA/QC approaches and drafting recommendations for the compilation of sectorial high resolution emission inventories that are relevant at the urban scale.

- Metadata recommendation

  Elaborating recommendations for a common system to document the use of ancillary data and define the relevant meta-data that support each emission inventory at the urban scale.

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Benchmarking intercomparisons

Local Inventory

Europe wide Inventories

Inconsistency indicator

ECI>100
41%

Sectors
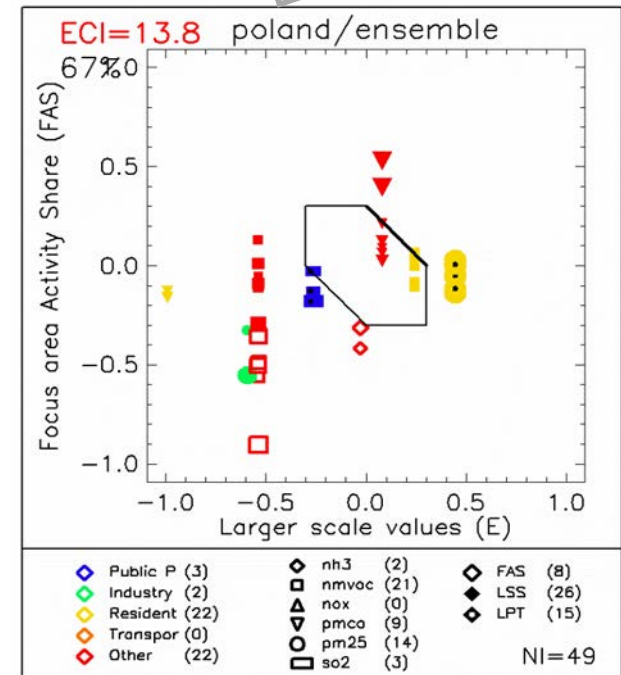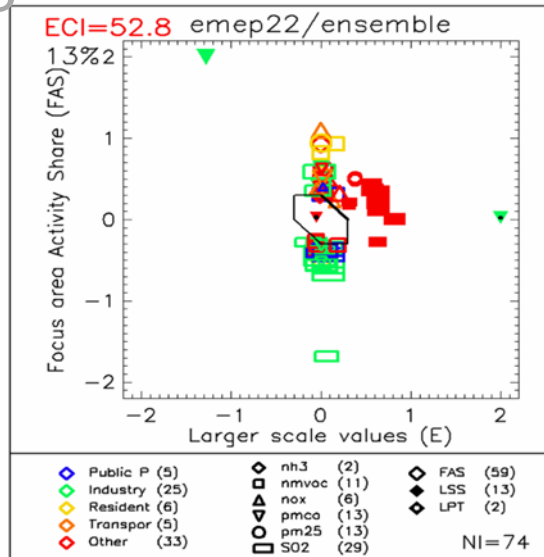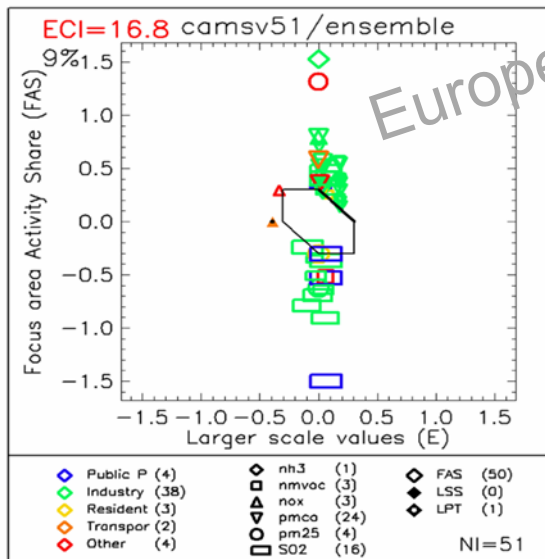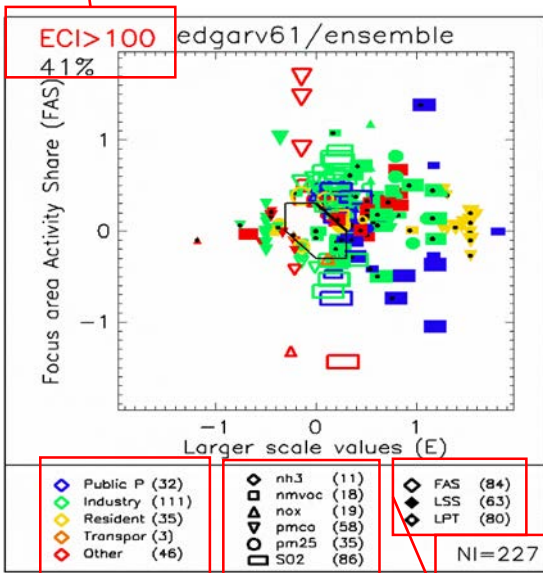
Pollutants

Number of inconsistencies

Urban share (FAS), country sector share (LSS), country pollutant total (LPT)
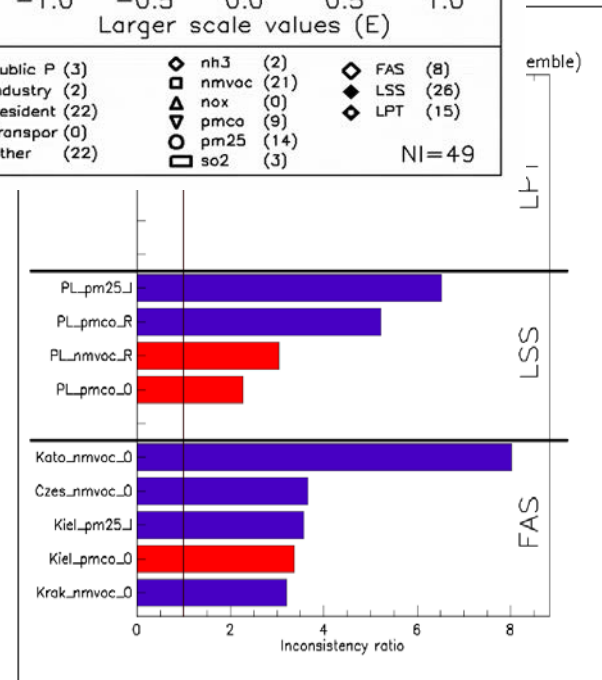
Build on
I.   benchmarking methodology (Thunis et al., 2022);
II.   new ensemble* approach
(*reference inventory; median CAMS, EMEP & EDGAR)

Benchmarking intercomparisons

- Leassons learned

Benchmarking Europe wide inventories

- CAMS and EMEP behave more closely, yet they show inconsistencies in terms of spatial distribution
- Large differences between CAMS/EMEP and EDGAR, industrial and residential sector
- Spatial inconsistencies for the industry and "other" sectors

Benchmarking Local inventory

- Main difference is in the spatial distribution, but inconsistencies are also in the sectorial share (residential and others).

- Future benchmarking intercomparisions

Basis: the intercomparison exercises support the assessment of methods behind emissions

- EI from RI – URBAN (ca April 2023)
- Norway – GNFR – 1 km (ca April 2023)
- Others…(contact WG7-chair)

- Points to discuss

Emission data are aggregated (Annual, GNFR sector, NUTS3) but

- Data sharing – still a concern?

Emission dashboard

- An emission dashboard will be developed aiming at assessing and monitoring the level of consistency among EU top-down inventories.

- The dashboard will contain the 3 main inventories (EDGAR, EMEP and CAMS) and will be compared to the ensemble (median).

- The frequency is determined by the release frequency of the 3 inventories.

- Outcomes: ECI, differences in terms of pollutants, sectors and type (national totals, sector totals or urban), at different spatial scales (country → NUTS3).

- These inventories will serve as basis for the comparison with the emissions underlying the MQI map (Composite mapping).

Builds on
- Leassons learned from the benchmarking - ensemble approach
- The ensemble will be a dynamic reference inventory (reference year)

Composite mapping of emissions (Synergy with WG2)

Benchmarking composite map ("MQI map") based on available annual concentration maps at NUTS3/NUTS2 level containing in addition the underlying emissions

➡ More detail in WG2 session QA/QC for assessment applications

INPUT

Precursor considered	NO_x, NMVOC, NH_3, SO_2, PPM
Temporal	Annual totals
Year considered	Same as for used for assessment
Sector considered	Traffic (GNFR F), commercial and residential (GNFR C), agriculture (GNFR K, L), industry (GNFR A, B), shipping (GNFR G), Solvents (E), Fugitive (D), Off-road (I, H) (Waste (GNFR J)
Spatial aggregation	Emissions aggregated to NUTS3 covered by the modelling domain PLUS over a series of smaller areas defined by shape files A pre-processing programme will be made available by the JRC to aggregate emissions over the different areas.
Data format	2 excel files (output of the JRC pre-processor): 1 for the NUTS3 entirely covered by the modelling domain, the second for all small areas.

OUTPUT

- Having concentration and MQI as reference
- assess and compare the underlying emissions;
- Benchmarking with Europe wide inventories
- Identify inconsistencies at i) pollutant; ii) sector; iii) type (national, sector share, spatial distribution)

Builds on
- Taking advantage of the New Composite mapping:
  Emissions → Modelling results → MQI

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Provide relevant feedback

TFEIP and FAIRMODE

Category | **Title**
General guidance | Spatial mapping of emissions

Version | Guidebook 2019

EMEP/EEA air pollutant emission inventory guidebook 2019
Technical guidance to prepare national emission inventories

FAIRMODE community has contributed to the update of the chapter Spatial mapping of emissions

TABLE WITH SUGGESTED METHODS/PROXIES

› Detailed table (18 pages) by (G)NFR in current Guidebook chapter

› Contribution from FAIRMODE to review this table

› Needs definition of Tier 1-2-3 => improve inventories but don't make reporting overly demanding!!!

NFR sector	NFR sector name	GNFR sector	Cat.	Best quality----------→----------→----------Approximate estimate			
				Tier 3	Tier 2	Tier 1	Notes
1.A.1 Energy industries	1.A.1.a Public Electricity and Heat Production	A_PublicPower	A	Reported point source data or national totals disaggregated using plant-specific capacity or other activity statistics	Employment data e.g. for 1.A.1.c: number of employees by economic activities (EUROSTAT Employment statistics - Manufacture of coke oven products) See also section 3.3.5 for an example	Industrial Land cover	A combination of tiered approaches might be needed depending on the availability of a complete dataset of point sources. Where only partial datasets are available for point sources use proxy data most relevant to sub-sectors to map diffuse remainder.
	1.A.1.b Petroleum Refining	B_Industry	A				
	1.A.1.c Manufacture of Solid Fuels and Other Energy Industries	B_Industry	B				
	1.A.2.a Stationary Combustion in Manufacturing Industries and Construction: Iron and Steel	B_Industry	B		Employment data		A combination of tiered approaches might be needed depending on the

ANNEX

FAIRMODE will contribute to the updates concerning methods/proxies

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III) Summary – Future activities WG7

- Best – practise through QA/QC

- Metadata recommendation

- Provide relevant feedback

- Benchmarking and Emission dashboard

- Use of Composite mapping platform

Links with AAQD

Within the use of modelling for air quality assessment and planning:

- Emission dashboard – composite mapping will contribute to the quality assurance and continuous improvement of input data for modelling applications
- WG-Activities will contribute to guidance on the development of emissions to support the assessment of air quality within the EUs AAQD
- Provide methodologies / guidance to contribute to good modelling practices

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Thanks!

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