FAIRMODE Emission documentation Metadata

L. Tarrasón, M. Guevara and S. López-Aparicio

FAIRMODE Technical Meeting

18th October 2022

FAIRMODE recommendations AAQD revision

- High-resolution emission metadata requirements
- FAIRMODE proposes to specify requirements for documenting the high-resolution emission data that is used as input for local/urban air quality assessments and air quality planning under the AAQDs
- and link those to the information provided under national emission compilation in lower resolution scale prescribed under the National Emissions reduction Commitments (NEC) Directive .

European Commission

Current requirements to report emission data under AAQD (I)

- Assessment

- **Article 13 of the AAQD** on limit values and alert thresholds for the protection of human health, as part of the description of assessment methods.

- **Article 9 of the IPR Decision** establishes that Member States shall make available the emission information set out in Part D of Annex II on the quality and traceability of the assessment methods applied. Part D of Annex II in the IPR Decision includes item (23) where main sources (including traffic, domestic heating, industrial sources, or source area, etc.) are to be reported where available. Item (23) is related to information on fixed measurements - reporting of emission data in relation of modelling assessments is not established in the IPR Decision.

- Planning

- **Article 23 of the AAQD and Annex XV** of the AAQD specifies the information to be included in the local, regional, or national air quality plans and specifies to the need to provide information on the origin of pollution. In particular, Annex XV - A. 5.- "Origin of pollution", explicitly indicates the requirement to provide (a) list of the main emission sources responsible for pollution (map); (b) total quantity of emissions from these sources (tons/year); (c) information on pollution imported from other regions.

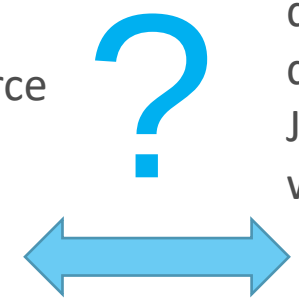
- **Article 13 of the IPR Decision** requires emission data in **Part J** of Annex II "information on the scenario for the attainment years" either for the baseline situation (item 9) or for the projection (item 14).

e-reporting in dataflows D, E1b and I

Current requirements to report emission data under AAQD (II)

- Assessment

  - For **assessment purposes**, reporting of emission data is not always mandatory, only so “where available.”
  - **Only annual totals, sector values**
  - **Only name, year and component requested as documentation**
  - Documentation is too reduced for further use in comparability and assessment applications.
  - Not linked to the reports in dataflow I on source apportionment.



- Planning

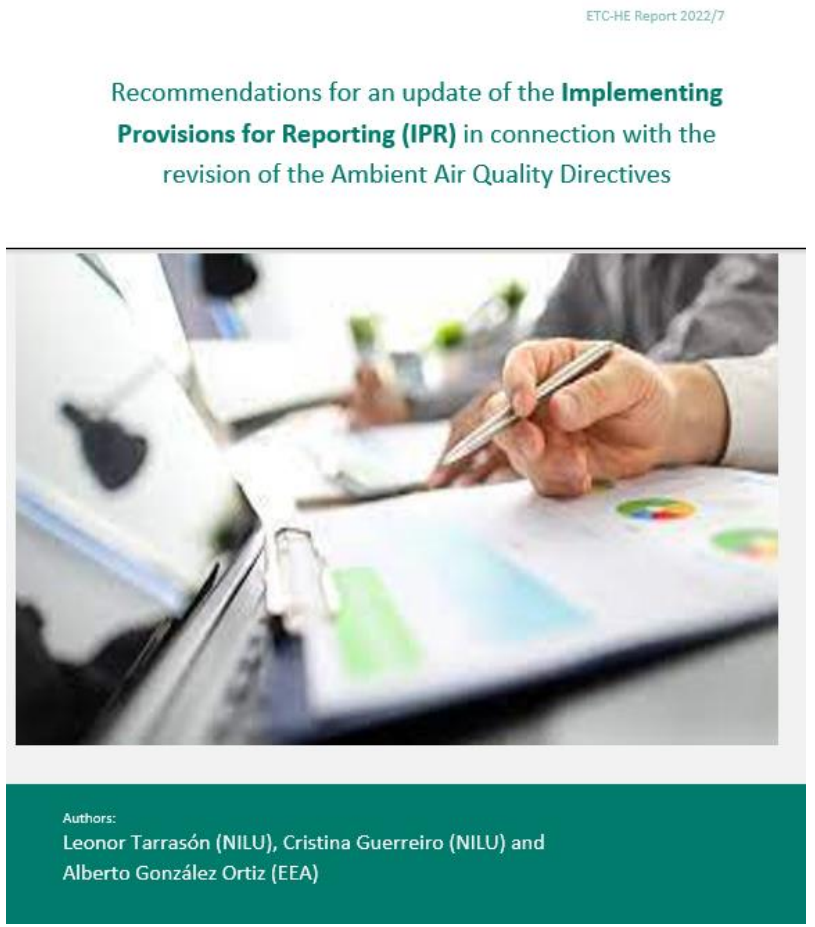
  - For **air quality planning purposes**, the reporting of total emission data under dataflow J both for the baseline scenario (item 9) and for the projection scenario (item 14) is mandatory.
  - **Only annual totals, selected sector values**
  - **No additional information requested.**
  - Lack of consistency of emissions information in the H-K dataflows. No source sector emission data is required to be reported, thus making it difficult to link the information between dataflow J and dataflow I (on source-apportionment) and with K on measures.

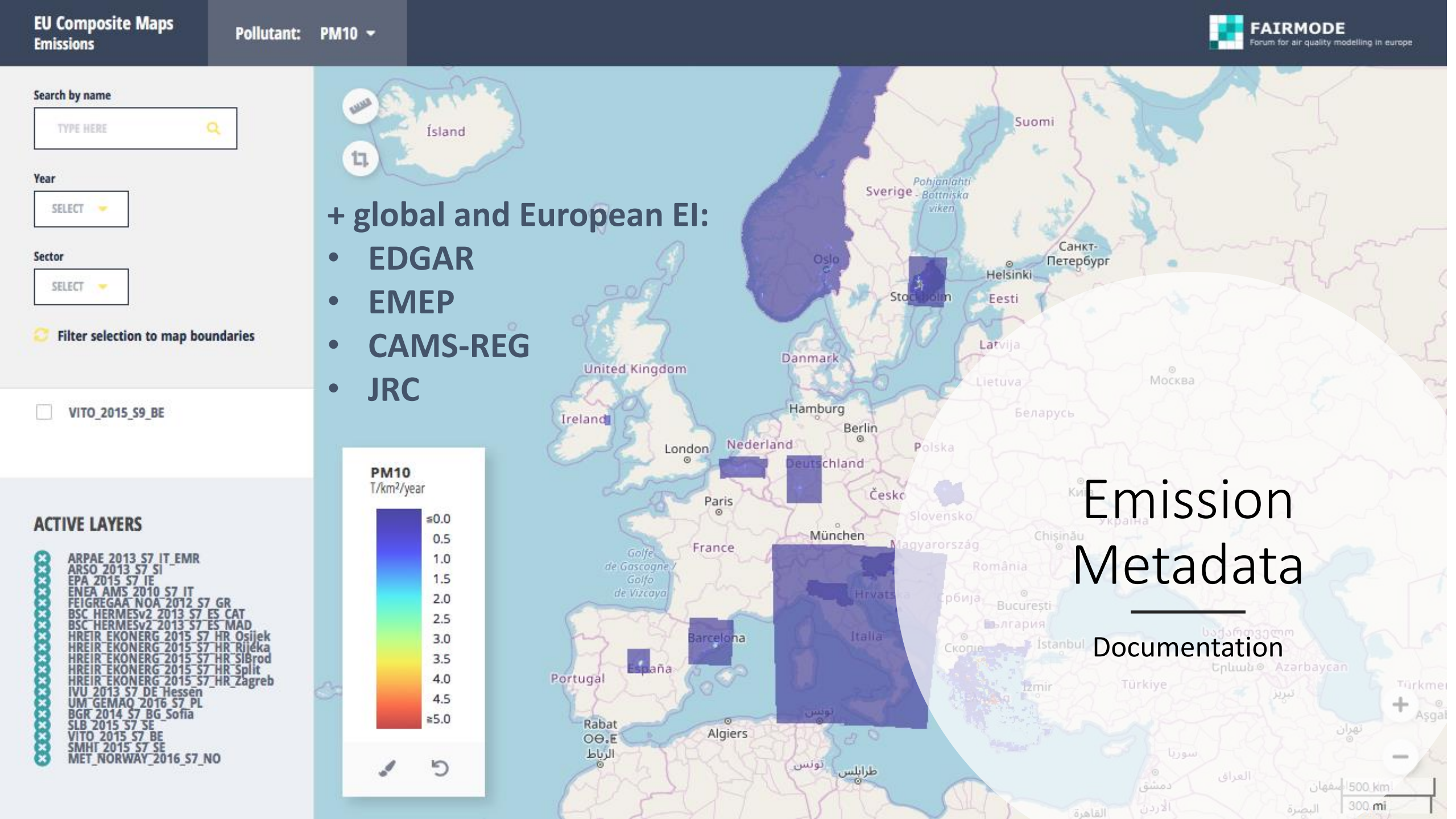
Recommendations to revise emission data reporting under AAQD

- **For assessment purposes**, drop the requirements to report emission data associated to fixed measurements in dataflow D and introduce instead emission data reporting requirements per sector under modelling information in dataflow D1b.
- **For air quality planning purposes**, introduce a requirement to report emission totals per source area and sector in dataflow H with the emissions that are the basis for the results reported in dataflow I, J and K.
- Adopt the description of the emissions under the AAQDs to be consistent with the nomenclature used in GNFR under the NEC Directive to ensure consistency across related legal instruments (FAIRMODE recommendation).
- Ensure consistency in the source sector specification for assessment purposes, including exceedances (dataflow G) exposure calculations (dataflow D), air quality planning (dataflow H), source-apportionment applications (dataflow I), baseline and scenario information (dataflow J) and information on measures (dataflow K).

Recommendations to e-reporting

- We have identified eight (8) basic principles to guide any possible update of the Implementing Provisions for Reporting (IPR).
    - Data and information need to be **transparent**
    - Data and information need to be **comparable**
    - Data and information need to be provided in such a form that it is easy to be assessed in terms of **completeness**
    - Data/parameters need to be **quantifiable**
    - Documentation of the reported data **(metadata) needs to be reported** preferably following a **checklist approach**
    - Metadata information need to be provided in established **common repositories**
    - Data and information needs to be **usable and useful** to trace the progress with the implementation of the Air Quality directives
    - The **mandatory or conditional or voluntary** status of the required data and information needs to be clearly specified, avoiding statements such as (when available) that give rise to confusion and misunderstandings.





+ global and European EI:

- EDGAR
- EMEP
- CAMS-REG
- JRC

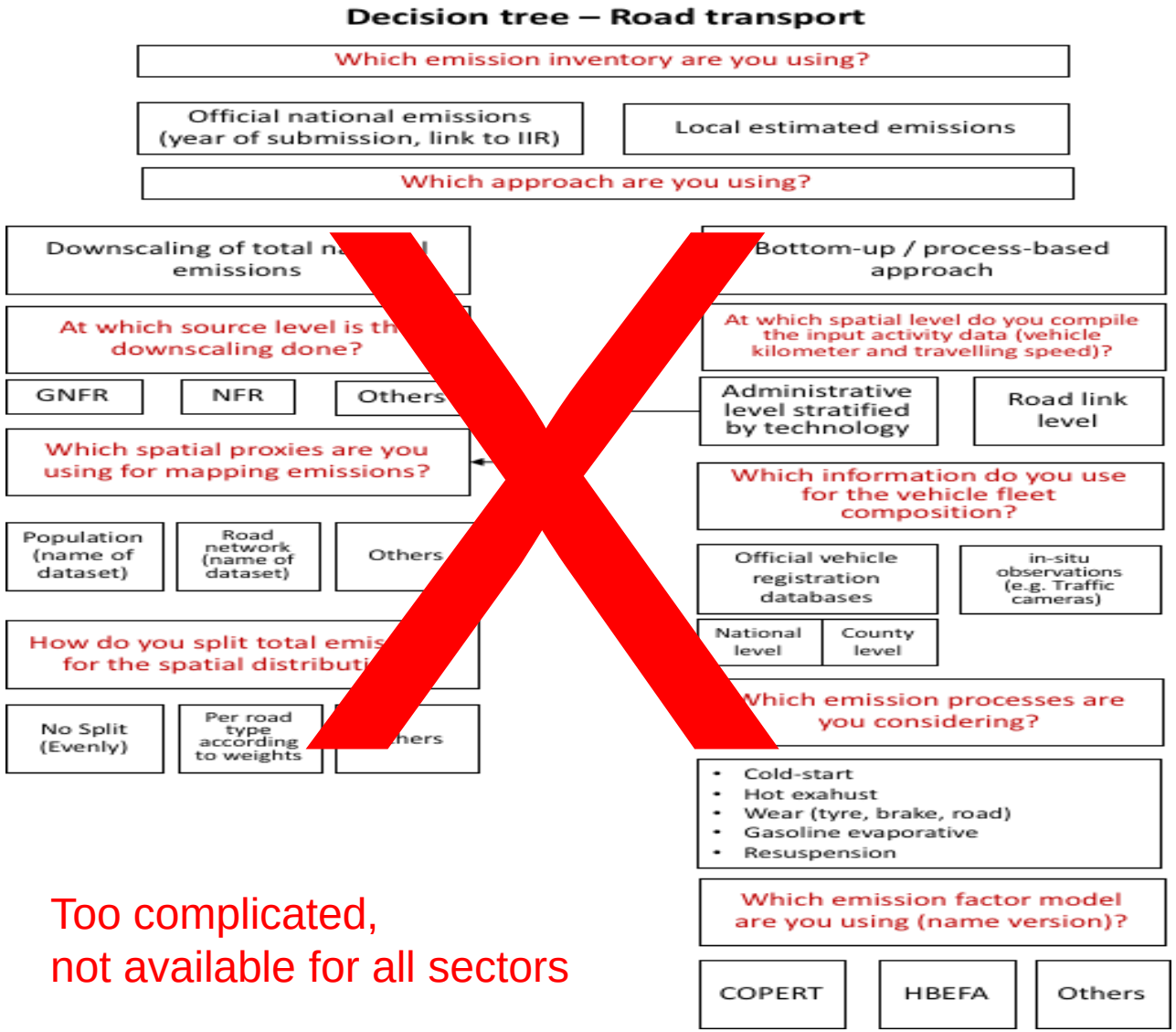
Emission Metadata

Documentation

2021 proposal for metadata request in ECM

Field	Contents- Proposed revised metadata
Code	A descriptive label for the data chosen by the user
Participant	Account owner, user that is logged in to upload the maps
Affiliation	Details on the Account owner (e.g. Institute)
Emission Model_Name	Name of the emission model - common to e-Reporting request
Emission Model_Version	Version of the emission model - common to e-Reporting request
Year	Year of the emission data – common to e-Reporting request
Output frequency	Yearly, monthly, daily, hourly
Sector	Sector code based on the SNAP nomenclature (S1 – S10) or GNFR nomenclature (Gnfr_A – Gnfr_N)
Emission Estimation approach	Methodology used to estimate/model the emissions: “Bottom-Up”, “Top-Down”, Inverse Modelling
Spatial distribution approach	Methodology used to spatially distribute emissions: “Bottom-Up”, Downscaling
Documentation on-line	Multiple choice at CM decision tree
Documentation	Link to publications/references
Pollutant	CO, NH_3, NMVOC, NOx, PM_{10}, $PM_{2.5}$, SO_2
Country	Name of the country selected from a drop down list
Area	In case the map refers to a part of a country: city, region, …
EPSG code	EPSG code for the map projection system

Road transport - On-line Decision Tree



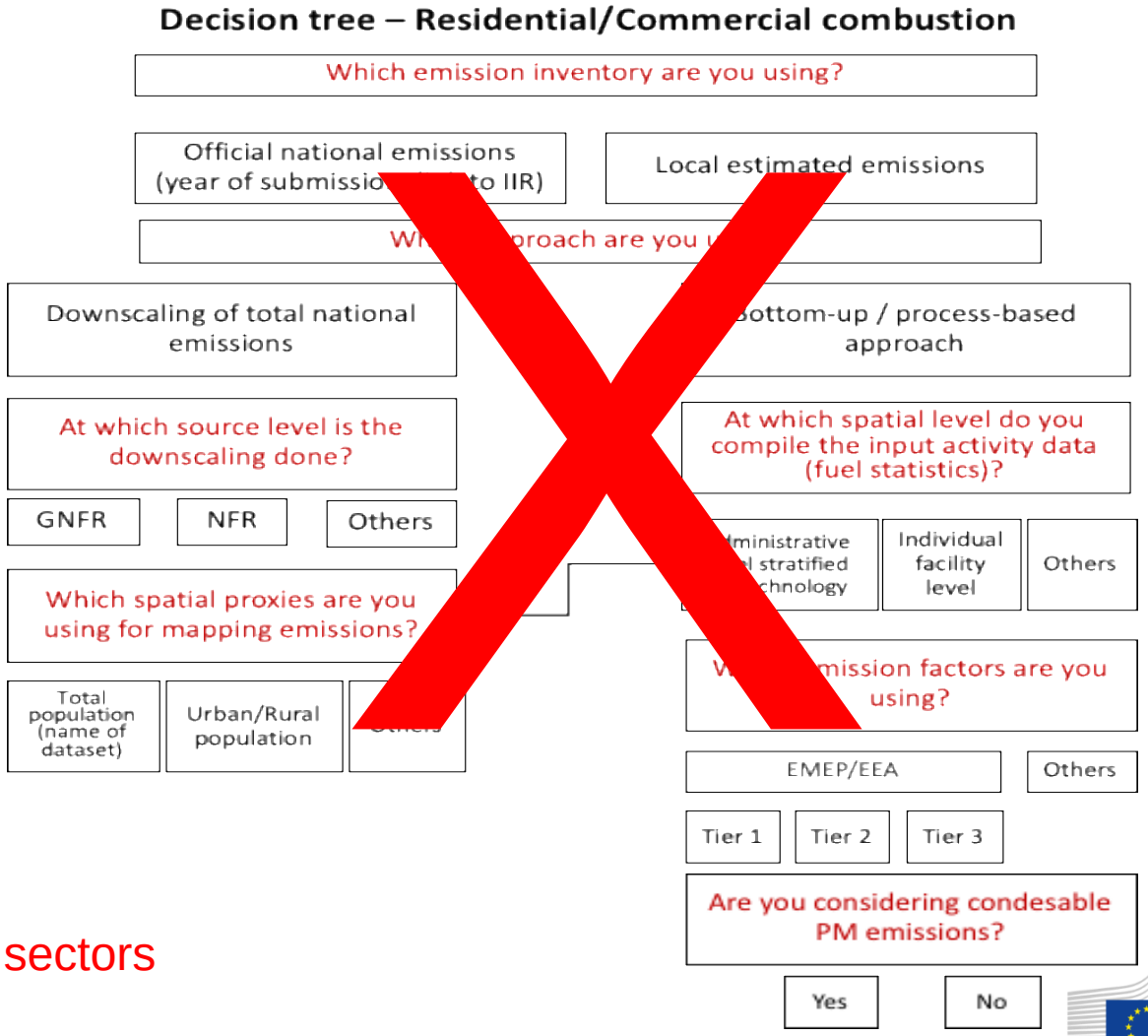
Too complicated,
not available for all sectors

- Should balance complexity vs expert information
- Involves intrinsic guidance
- Provides information for expert review
- Demands actual knowledge of the emissions to upload them
- Ideally implemented as part of the ECM webside

European Commission

Residential Heating - On-line Decision Tree

- Road traffic best practice document available
- Best practices document for residential heating beyond EMEP/CORINAIR not available
- Decision tree as implicit guidance



Too complicated,
not available for all sectors

European Commission

Simplified proposal for metadata request in ECM

Field	Contents- Proposed revised metadata
Code	A descriptive label for the data chosen by the user
Participant	Account owner, user that is logged in to upload the maps
Affiliation	Details on the Account owner (e.g. Institute)
Emission Model Name	Name of the emission model - common to e-Reporting request
Emission Model Version	Version of the emission model - common to e-Reporting request
Year	Year of the emission data – common to e-Reporting request
Sector	Sector code based on the SNAP nomenclature (S1 – S10) or GNFR nomenclature (Gnfr_A – Gnfr_N)
Emission Estimation approach	Methodology used to estimate/model the emissions:per sector “Bottom-Up”, “Top-Down”, Inverse Modelling
Spatial distribution approach	Methodology used to spatially distribute emissions: “Bottom-Up”, Downscaling
Documentation	Link to publications/references
Pollutant	CO, NH_3, NMVOC, NOx, PM_{10}, $PM_{2.5}$, SO_2
Country	Name of the country selected from a drop down list
Area	In case the map refers to a part of a country: city, region, …
EPSG code	EPSG code for the map projection system

Questions for discussion – 18.10.2022

- How do we identify relevant data to document emissions under AAQDs and how to lik to e-reporting?
- Documentation of emission data should be required
  - For assessment purposes?
  - For planning purposes ? (H-K, including – I source allocation)
  - For both ?
- How complete should be the data and information requested
  - For all sectors ?
  - For a set of sectors ?

Questions for discussion – 18.10.2022

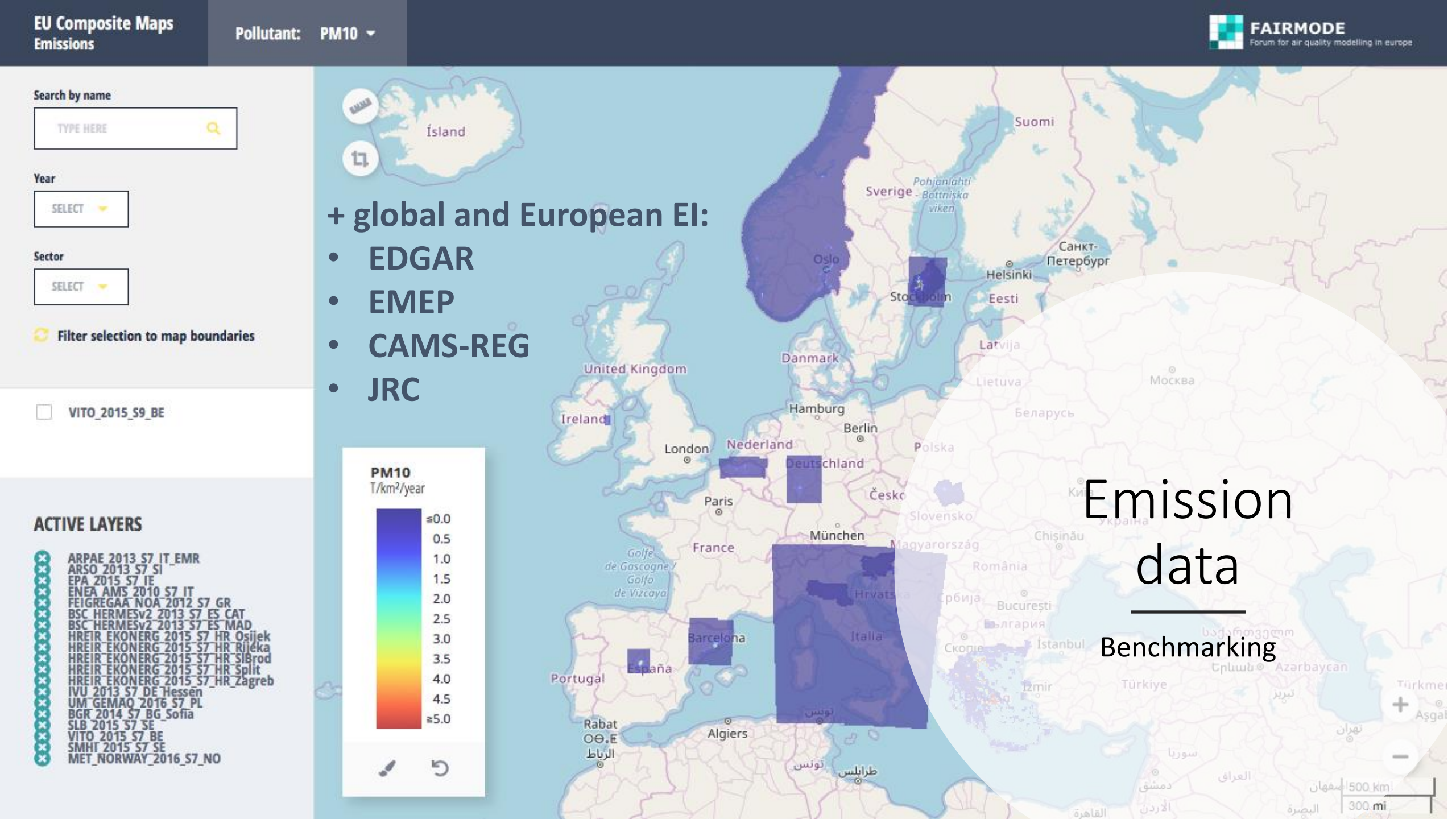
- Are the proposed fields of metadata information appropriate?
  - Any information missing?
  - Any information not necessary?
  - VALUES
  - Annual totals – for the Emission Dashboard
  - Annual gridded data – for the Emission Composite Mapping


European
Commission

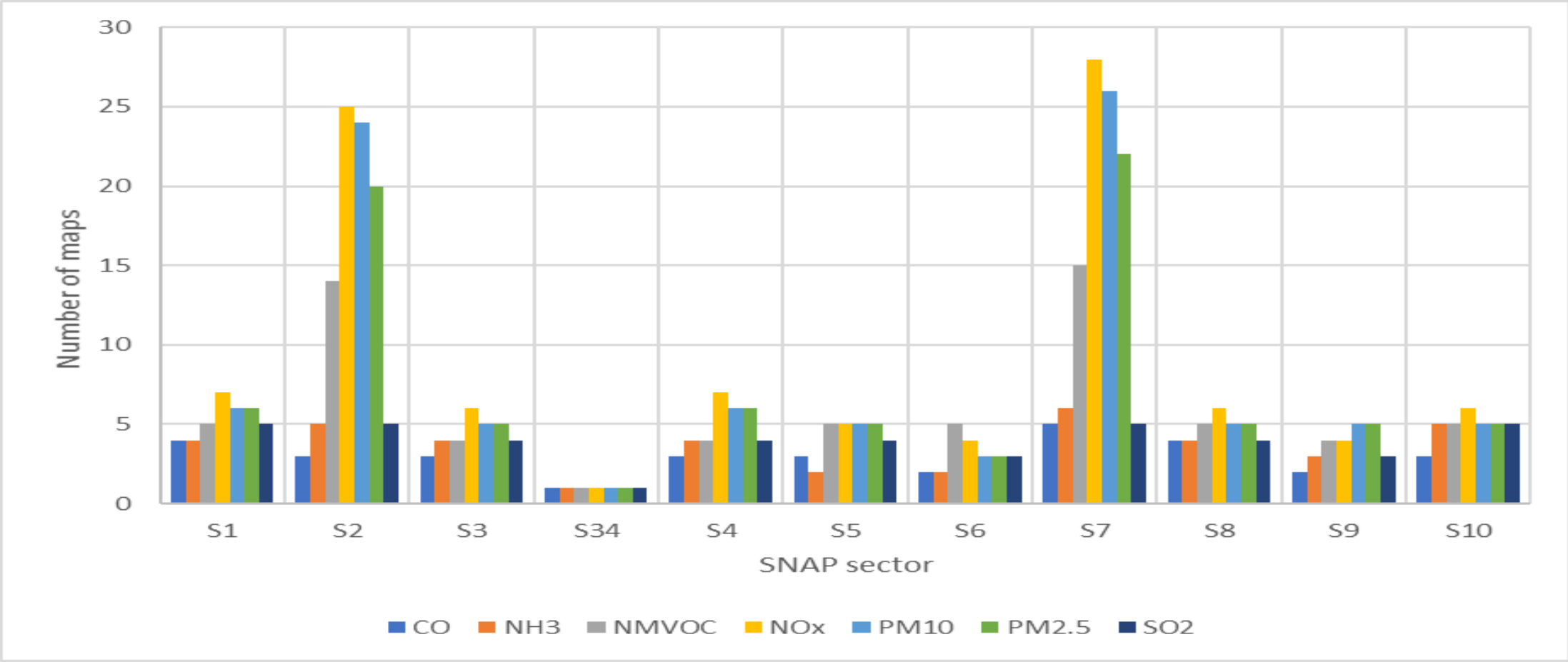
Current metadata request in ECM

DATA BASE: META DATA

	CONCENTRATION	EMISSIONS
COMMON ATTRIBUTES	Pollutant	
	Country /area (= region/city/...)	
	Model name	
	Year	
	Documentation	
	Version	
	Output frequency	
	Map projection system (EPSG code)	
SPECIFIC	Model type (Eulerian, ...)	Emission sector (SNAP or GNFR)
	Data assimilation	Estimation approach (bottom up, ...)


EU Composite Maps
Emissions
Pollutant: PM10
FAIRMODE
Forum for air quality modelling in europe
Search by name
TYPE HERE
Year
SELECT
Sector
SELECT
Filter selection to map boundaries
VITO_2015_S9_BE
ACTIVE LAYERS
ARPAE_2013_S7_IT_EMR
ARSO_2013_S7_SI
EPA_2015_S7_IE
ENEA_AMS_2010_S7_IT
FEIGREGAA_NOA_2012_S7_GR
BSC_HERMESv2_2013_S7_ES_CAT
BSC_HERMESv2_2013_S7_ES_MAD
HREIR_EKONERG_2015_S7_HR_Osijek
HREIR_EKONERG_2015_S7_HR_Rijeka
HREIR_EKONERG_2015_S7_HR_SIBrod
HREIR_EKONERG_2015_S7_HR_Split
HREIR_EKONERG_2015_S7_HR_Zagreb
IVU_2013_S7_DE_Hessen
UM_GEMAQ_2016_S7_PL
BGR_2014_S7_BG_Sofia
SLB_2015_S7_SE
VITO_2015_S7_BE
SMHI_2015_S7_SE
MET_NORWAY_2016_S7_NO
PM10
T/km²/year
≤0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
≥5.0
Ísland
Suomi
Sverige
Oslo
Helsinki
Санкт-Петербург
Eesti
Latvija
Lietuva
Беларусь
Москва
Danmark
United Kingdom
Ireland
Hamburg
Berlin
Polska
London
Nederland
Deutschland
Česko
Slovensko
Paris
München
France
Magyarország
România
Chișinău
Україна
Golfe de Gascogne / Golfo de Vizcaya
Hrvatska
Србија
București
България
Barcelona
Italia
España
Portugal
İstanbul
Скопје
Azərbaycan
Türkiye
İzmir
Rabat
Algiers
تونس
طرابلس
سوريا
العراق
دمشق
الأردن
القاهرة
البصرة
تهران
500 km
300 mi
+ global and European EI:
• EDGAR
• EMEP
• CAMS-REG
• JRC
Emission data
Benchmarking

Emission data per sector currently in ECM



- Focus on SNAP Sectors 2 and 7 and NOx and PM pollutant components

European Commission

Emission estimation approach currently in ECM

Estimation approach	Number of maps (all)	Number of maps (minus Europe/global)
“Bottom-Up”	224	216
Downscaling	2	2
Inverse Modelling	12	12
“Top-Down”	216	135

- These results indicates that the documentation of emission methodologies in ECM is probably misleading