



Composite Emission Mapping Exercise

FAIRMODE Technical Meeting
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Central priority of WG2 activities in 2017-2019:

To provide local emission information knowledge to urban, regional, national and European assessments

- **Comparison** of local inventories with national and European inventories
- **Improvement** of TOD national emission inventories and BUP local inventories – **reducing the gap** between them
- Better understanding of **sources contributing** to urban pollution
- **Support to WG1** assessment work; and **WG3** and **WG4** source allocation and measure identification work
- Move from benchmarking/guidance to **permanent improvements**

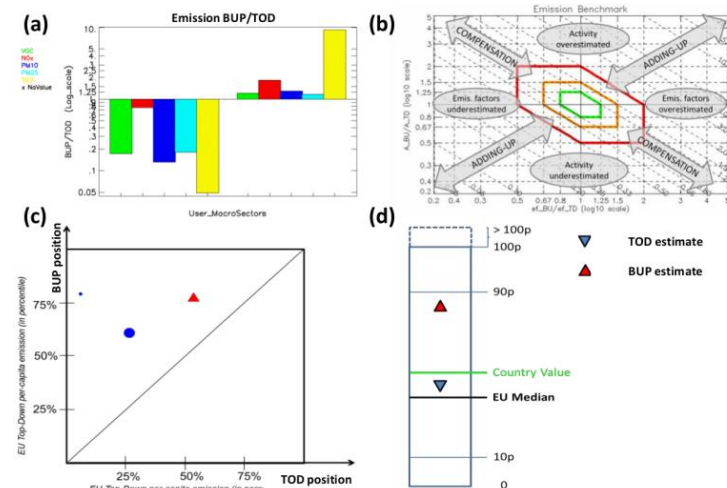
METHOD: Evaluation of Local inventories vs European wide inventories in the Δ -emission benchmarking tool

A set of diagrams that support:

Δ DELTA Benchmarking

Fairmode Tools and Software

- **Comparison** of bottom-up (BU) and top-down (TD) emission inventories: bar plot, diamond plot, emission ratios and per capita plot
- **Flag out anomalous behaviors** in the emission inventories
- **Get insight** in possible **explanation** for the inconsistencies
- Reasons for discrepancies between emission totals **over a given geographical area (city, region, country)**



Benchmarking activities between 2015-2017: Involving local emission experts (Stockholm, Madrid, UK, Barcelona, 7 Norwegian cities, Emilia Romagna region, Porto, Lisbon, ...)

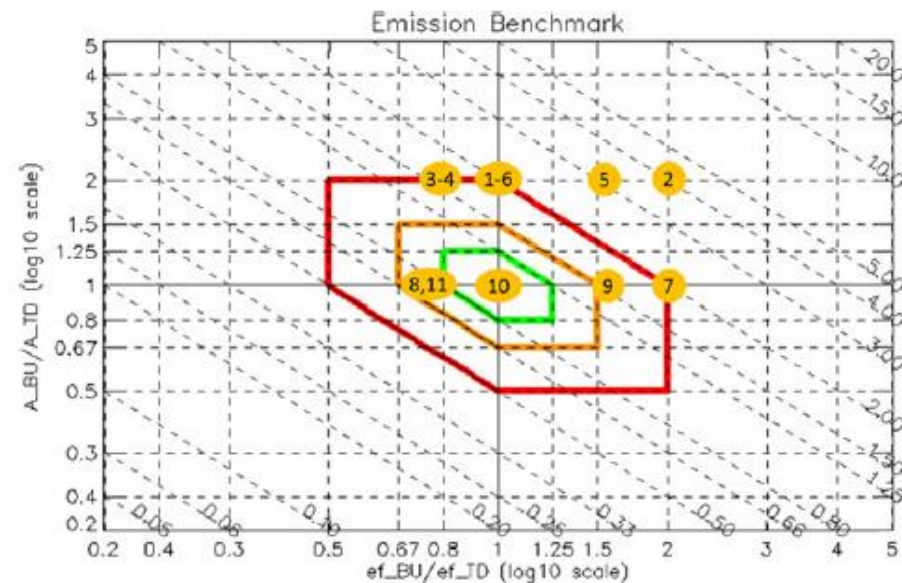
Air Qual Atmos Health (2016) 9:325–333
DOI 10.1007/s11869-016-0402-7



A novel approach to screen and compare emission inventories

P. Thunis¹ · B. Degraeuwe¹ · K. Cuvelier² · M. Guevara³ · L. Tarrason⁴ · A. Clappier⁵

- Description of the diamond plot
- Identifying whether differences between inventories can be mostly related to differences: (1) in the use of emission factors or (2) in the choice of activity data.

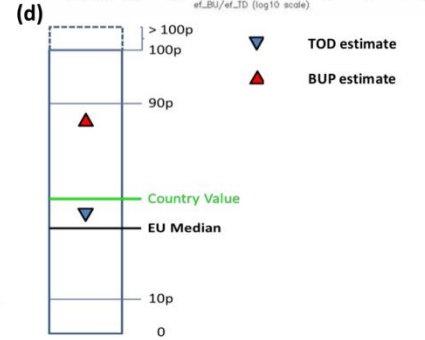
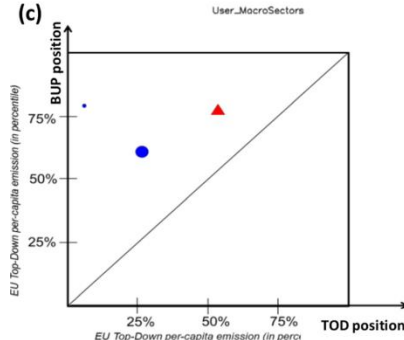
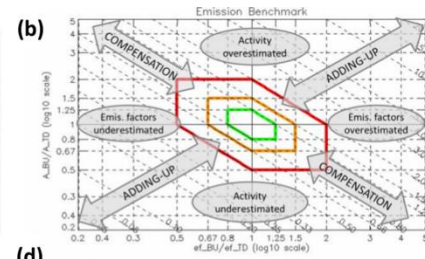
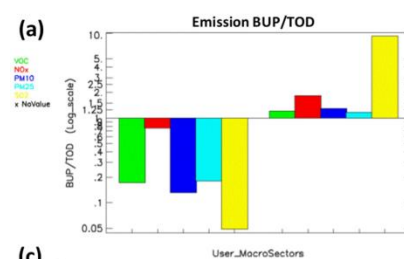


A benchmarking tool to screen and compare bottom-up and top-down atmospheric emission inventories

M. Guevara¹ • S. Lopez-Aparicio² • C. Cuvelier³ • L. Tarrason² • A. Clappier⁴ • P. Thunis⁵



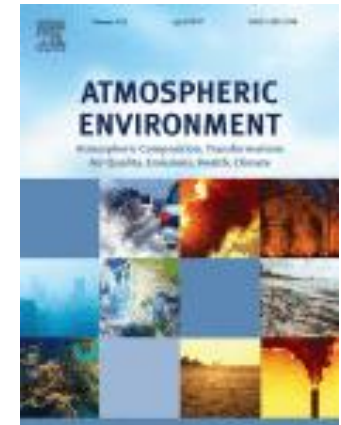
- Description of the benchmarking Methodology - Δ -Emis tool
- Sequence of steps to perform a correct analysis of the results (Barcelona case study; bottom-up and TNO_MACC-II)





Atmospheric Environment

Volume 154, April 2017, Pages 285–296



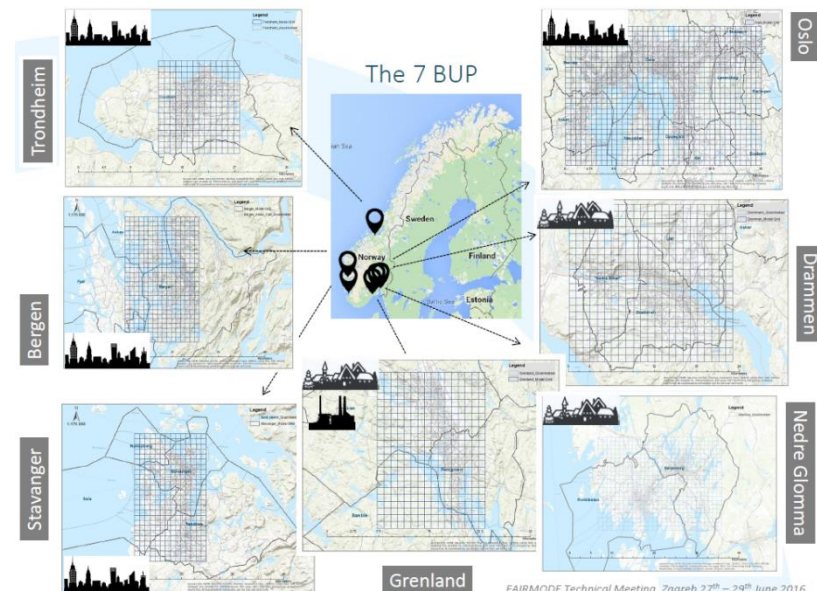
Assessment of discrepancies between bottom-up and regional emission inventories in Norwegian urban areas

Susana López-Aparicio^a,  , Marc Guevara^b, Philippe Thunis^c, Kees Cuvelier^d, Leonor Tarrasón^a

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<https://doi.org/10.1016/j.atmosenv.2017.02.004>

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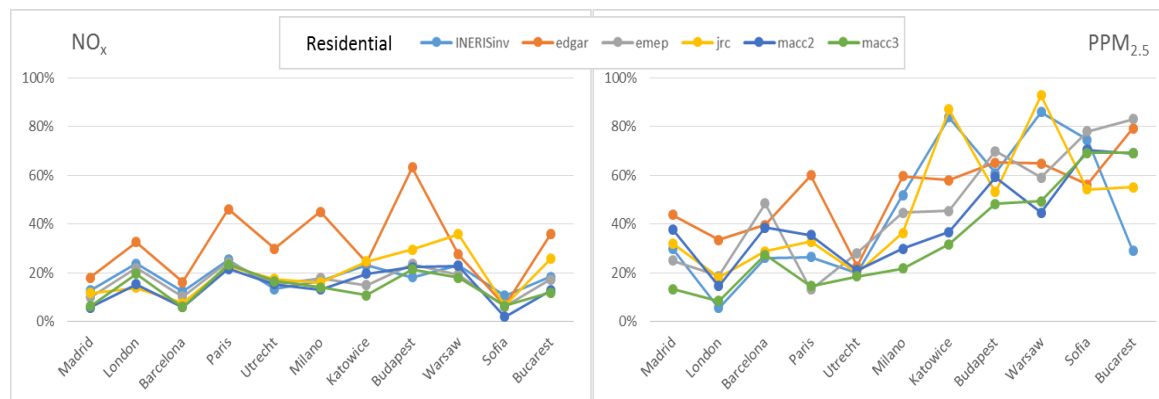
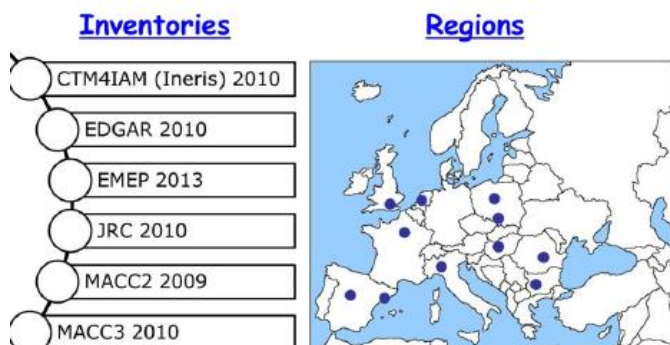
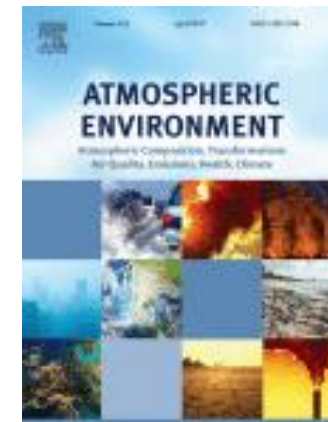
- **Benchmarking of multiple emission inventories for different Norwegian cities (bottom-up, EC4MACS, TNO_MACC-II and TNO_MACC-III)**
- **Important discrepancies in PM_{2.5} residential wood burning and NO_x from road transport**

Spatial inter-comparison of Top Down emission inventories in European urban areas (*Under revision*)

Trombetti, M., Thunis, P., Bessagnet, B., Clappier, A., Couvidat, F., Guevara, M., Kuenen, J., Lopez-Aparicio, S.

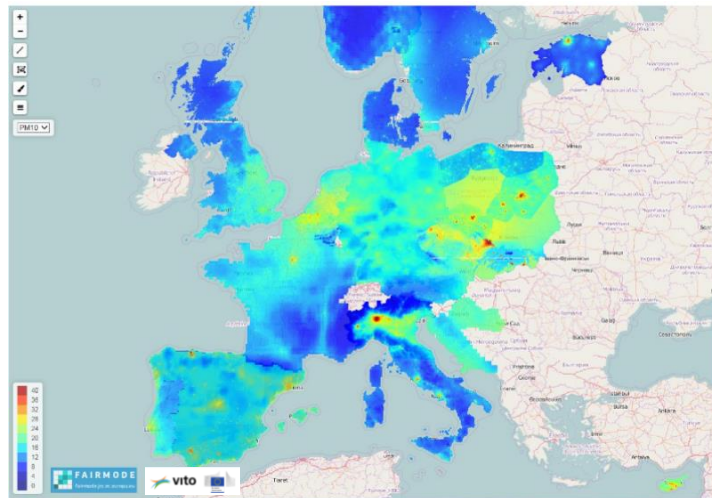
- How a set of six EU wide emission inventories behave in selected European urban areas in terms of sectorial shares and regional allocation

Submitted to:

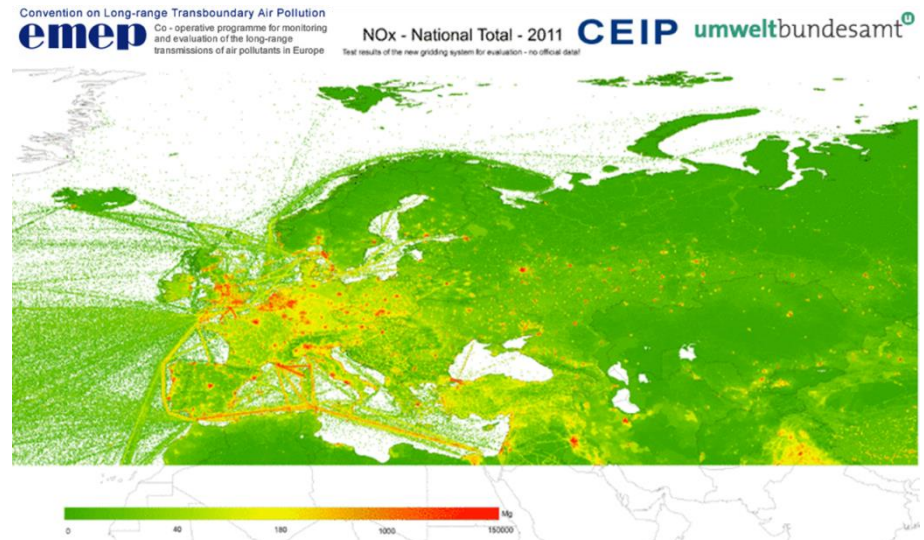


- How do we move from benchmarking to permanent improvements?
- Which use for the new EMEP 0.1x0.1 reported country gridded emissions?
- How do we secure further involvement of local emission expertise in the work of FAIRMODE?

Composite mapping for emissions launched at the technical meeting in Zagreb

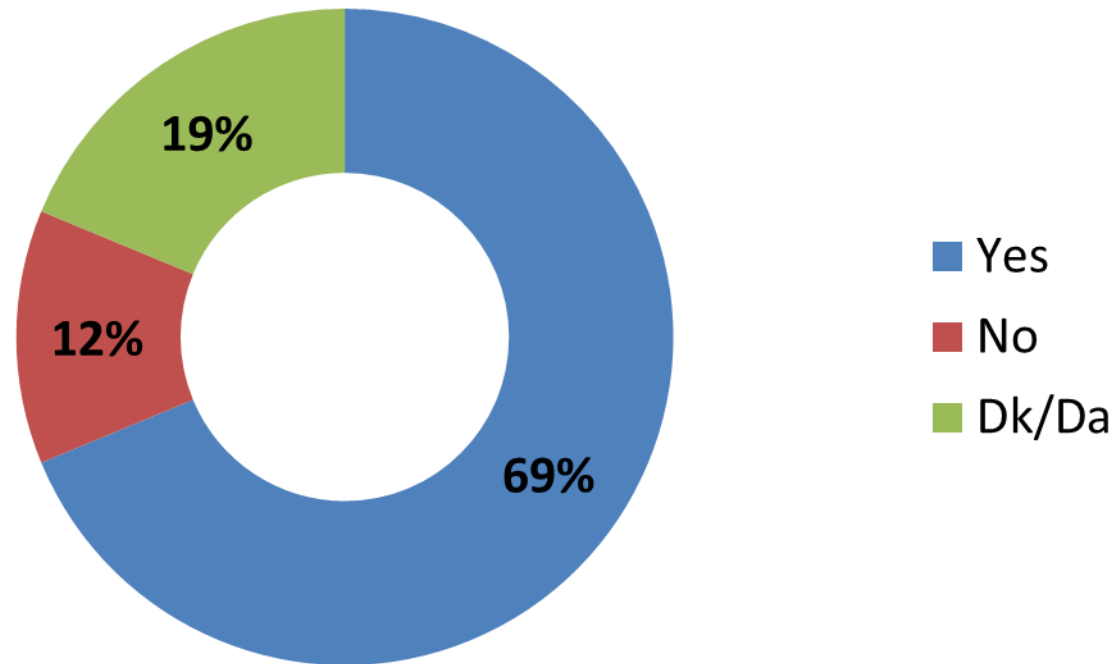


WG1 Experience → AQ
composite mapping exercise

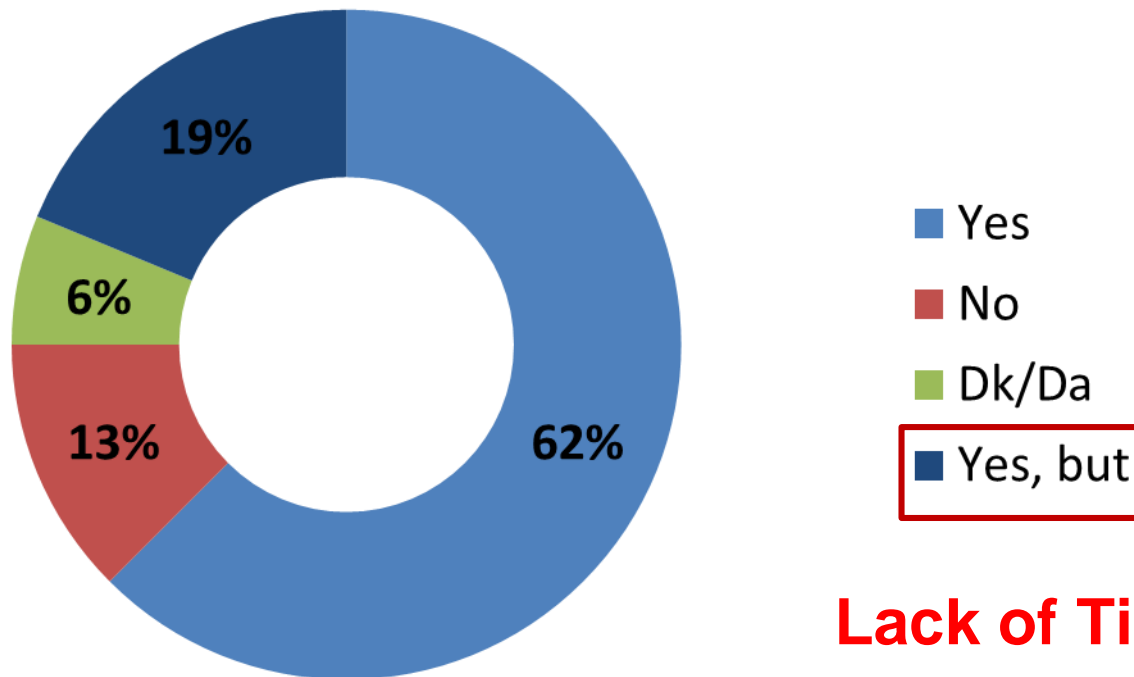


FAIRMODE national and local estimates vs
data from EMEP CEIP

Do you think that a geospatial visualization of emissions may help to improve the estimation of emissions at local scale?

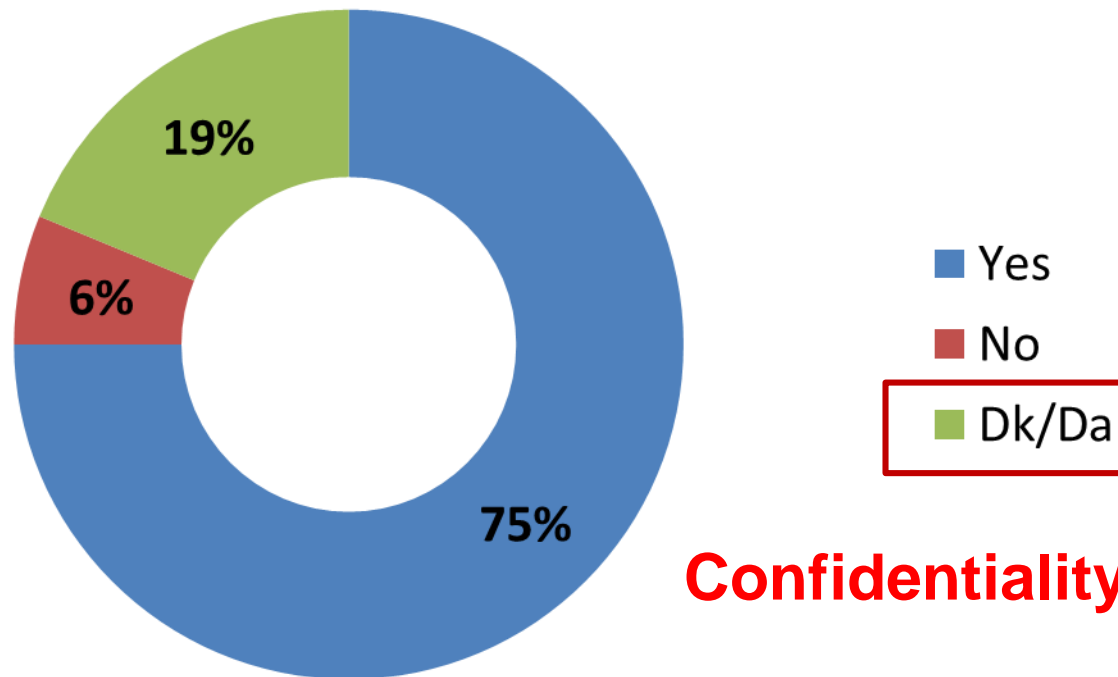


Would you be interested in participating in an activity aiming at collecting and assembling modelled emission maps?

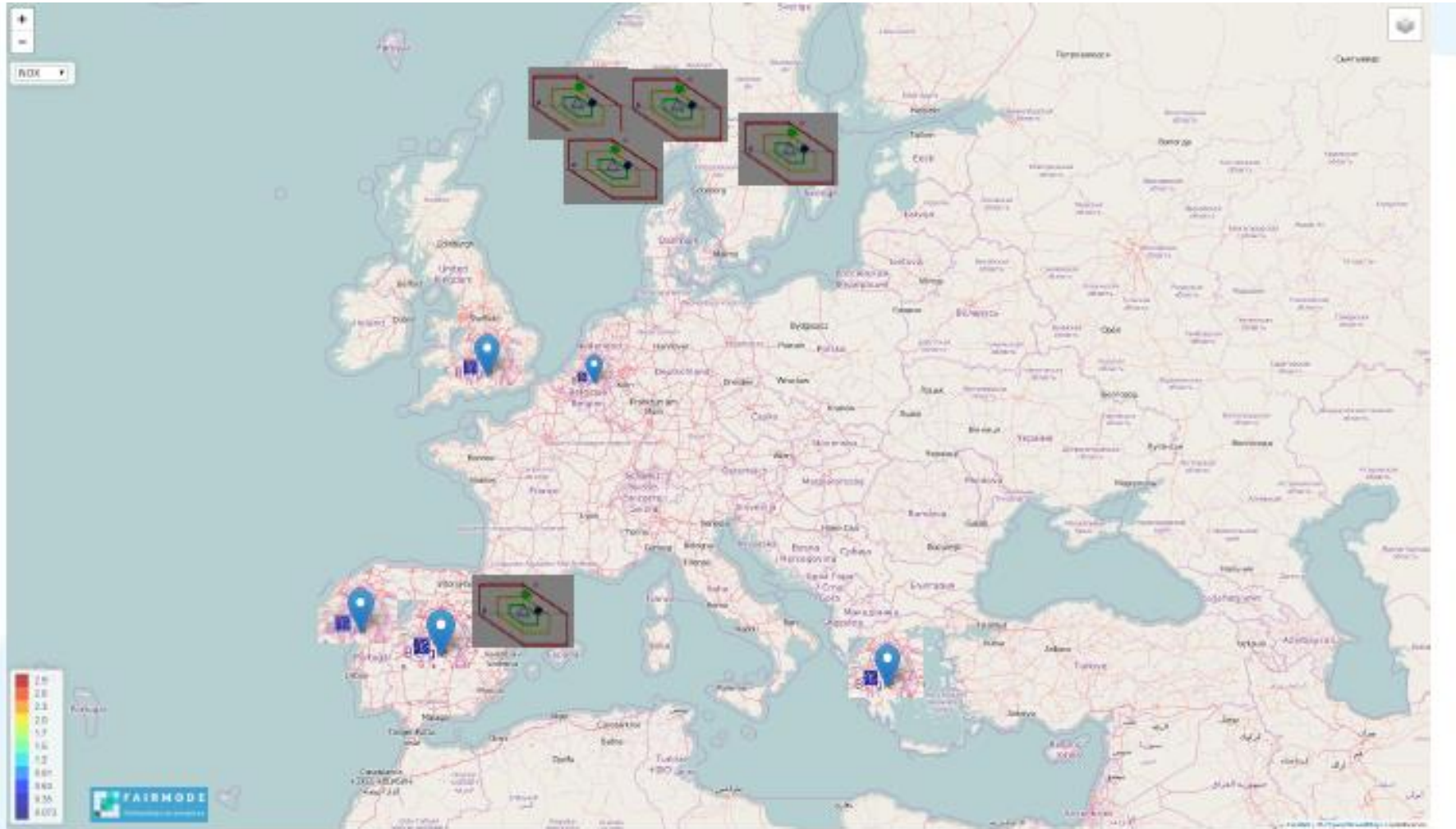


Lack of Time

Would you be able to contribute to this exercise providing your emission data?



Confidentiality Issues



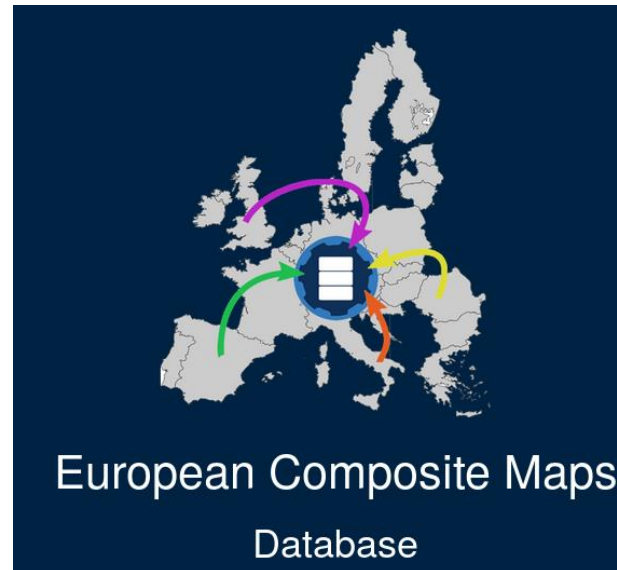
FAIRMODE WG2 ADDED VALUE

Diamond diagrams as quality control and feedback to national EU wide TD inventories

- National emissions
- Air quality modellers



- Local emissions
- Emission modellers



<http://fairmode.jrc.ec.europa.eu/ecmaps/>

Urban emission data compilation



Barcelona
Supercomputing
Center
Centro Nacional de Supercomputación



	A	B	C	D	E	F	G	H
1	Shape	1	City	shp				
2	shape_SWE-City-Stockholm_LL							
3	2012	#	Reference year					
4	#Species	BU sector:	BU sectors nomenclature	Correspondence with SNAP	tton/year			
5	VOC	ENp	energy_plants	S1	0.01256			
6	VOC	ENr	boilers_heating	S2	0.02958			
7	VOC	INDe	industrial_boilers	S3	0.20326			
8	VOC	IND	industries	S4	0.06235			
9	VOC	PET	petrol_stations_depots	S5	0.17383			
10	VOC	SOLV	solvent_use	S6	4.362512			
11	VOC	TRA	road_transport	S7	0.1587			
12	VOC	TRAp	gasoline_road_transport	S7.1	0.09734			
13	VOC	TRAd	diesel_road_transport	S7.2	0.04751			
14	VOC	TRAg	LPG_road_transport	S7.3	0.00329			
15	VOC	TRAv	road_transport_non-exhaustvolatilization	S7.4	0.00894			
16	NOx	ENp	energy_plants	S1	0.40427			
17	NOx	ENr	boilers_heating	S2	0.06846			
18	NOx	INDe	industrial_boilers	S3	0.05393			
19	NOx	IND	industries	S4	0			
20	NOx	PET	petrol_stations_depots	S5	0			
21	NOx	SOLV	solvent_use	S6	0			
22	NOx	TRA	road_transport	S7	2.33981			
23	NOx	TRAp	gasoline_road_transport	S7.1	0.32164			
24	NOx	TRAd	diesel_road_transport	S7.2	1.91526			
25	NOx	TRAg	LPG_road_transport	S7.3	0.04236			
26	PM10	ENp	energy_plants	S1	0.02377			
27	PM10	ENr	boilers_heating	S2	0.02608			
28	PM10	INDe	industrial_boilers	S3	0.01466			
29	PM10	IND	industries	S4	0			
30	PM10	PET	petrol_stations_depots	S5	0			
31	PM10	SOLV	solvent_use	S6	0			
32	PM10	TRA	road_transport	S7	0.7091			
33	PM10	TRAp	gasoline_road_transport	S7.1	0.00304			
34	PM10	TRAd	diesel_road_transport	S7.2	0.04369			
35	PM10	TRAg	LPG_road_transport	S7.3	0.00033			
36	PM10	TRAv	wear_road_transport	S7.5	0.66119			
37	END							
38								

Emissions file format for the Δ Emission tool

- Total emissions per sector (.CSV template): species; BU sector; BU sector nomenclature; Correspondence with SNAP; Kton/year
- Shape file

Emissions file format for the Composite map

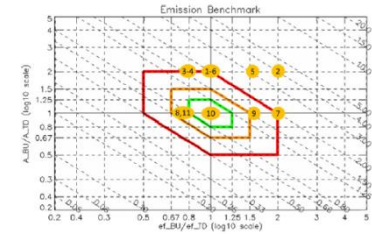
- ASCII or GeoTiff
- Gridded emission as annual total by pollutant and SNAP sector [ton / km² · year].

Species	BU sector	BU sectors nomenclature	Correspondence with SNAP	tton/year
CO2e	ENp	energy_plants	S1	0.01256
CO2e	ENr	boilers_heating	S2	0.02958
CO2e	INDe	industrial_boilers	S3	0.20326
CO2e	IND	industries	S4	0.06235
CO2e	PET	petrol_stations_depots	S5	0.17383
CO2e	SOLV	solvent_use	S6	4.362512
CO2e	TRA	road_transport	S7	0.1587
CO2e	TRAp	gasoline_road_transport	S7.1	0.09734
CO2e	TRAd	diesel_road_transport	S7.2	0.04751
CO2e	TRAg	LPG_road_transport	S7.3	0.00329
CO2e	TRAv	road_transport_non-exhaustvolatilization	S7.4	0.00894
NOx	ENp	energy_plants	S1	0.40427
NOx	ENr	boilers_heating	S2	0.06846
NOx	INDe	industrial_boilers	S3	0.05393
NOx	IND	industries	S4	0
NOx	PET	petrol_stations_depots	S5	0
NOx	SOLV	solvent_use	S6	0
NOx	TRA	road_transport	S7	2.33981
NOx	TRAp	gasoline_road_transport	S7.1	0.32164
NOx	TRAd	diesel_road_transport	S7.2	1.91526
NOx	TRAg	LPG_road_transport	S7.3	0.04236
PM10	ENp	energy_plants	S1	0.02377
PM10	ENr	boilers_heating	S2	0.02608
PM10	INDe	industrial_boilers	S3	0.01466
PM10	IND	industries	S4	0
PM10	PET	petrol_stations_depots	S5	0
PM10	SOLV	solvent_use	S6	0
PM10	TRA	road_transport	S7	0.7091
PM10	TRAp	gasoline_road_transport	S7.1	0.00304
PM10	TRAd	diesel_road_transport	S7.2	0.04369
PM10	TRAg	LPG_road_transport	S7.3	0.00033
PM10	TRAv	wear_road_transport	S7.5	0.66119

Workflow for uploading your gridded emission data

CSV
Shapefiles

Δ DELTA Benchmarking
Fairmode Tools and Software



✓
CMapping
quality check
tool

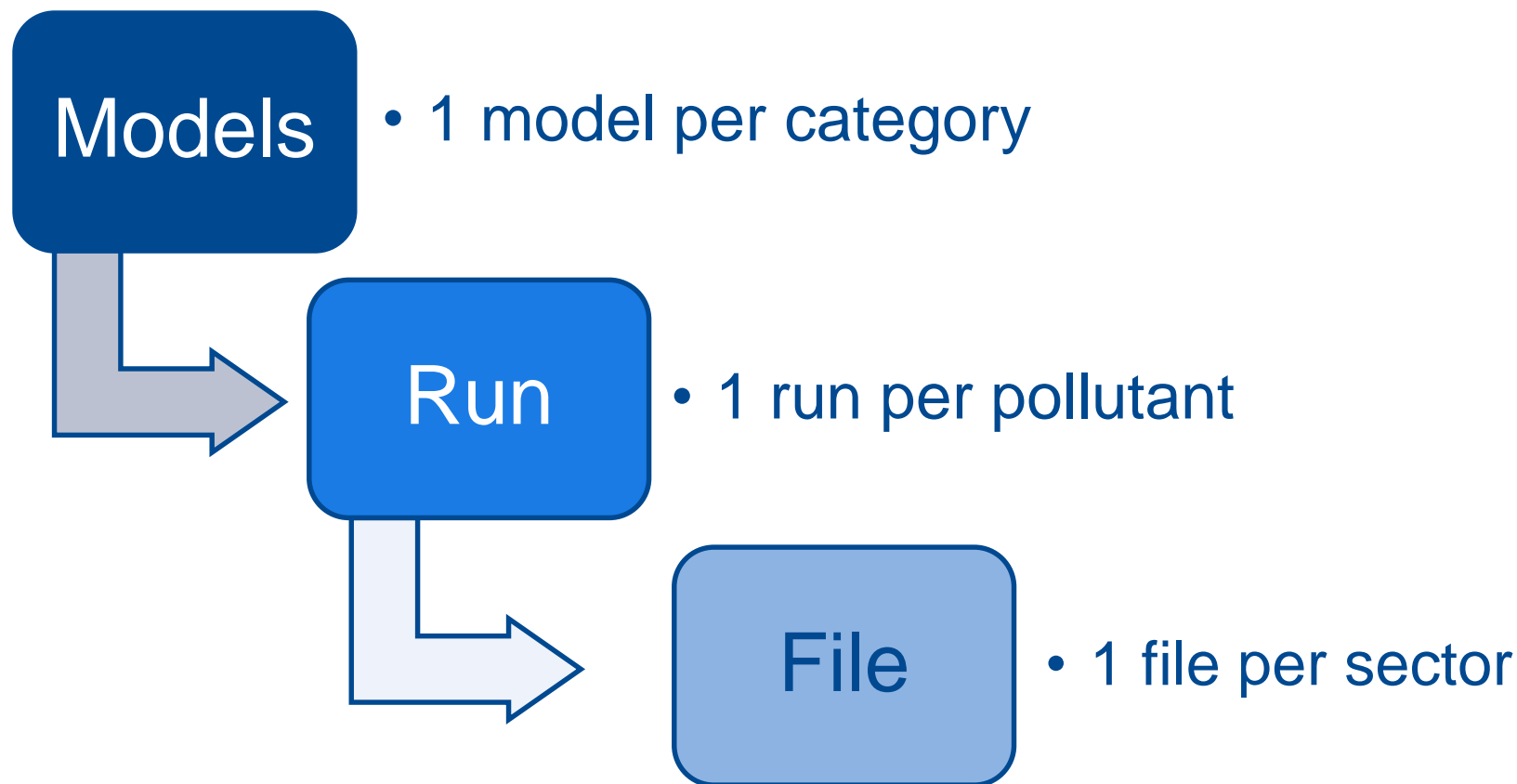
European
Composite
Maps
database

European
Composite
Map viewer

ASCII
GeoTiff

Hands-on session on
how to upload the
data → Join us!

- Consistency with the AQ composite mapping structure





+ New Model

Category Code Model name Model type Status Updated



- **Category:** Emissions
- **Code (model_institute. Used to identify the data on the EC Maps viewer):**
HERMES_BSC
- **Model name:** HERMES
- **Description (optional):** e.g. link to a publication/report/presentation of the model

Category

Emission

Code

Reference code to your model (model_institute). This code will be used to identify your data on the EC Maps viewer.

HERMES_BSC

Model name

HERMES

Description (optional)

<http://www.sciencedirect.com/science/article/pii/S1352231013006730>

Current status

Created

Update

14-06-2017 14.15

Save

Cancel and return to list



 + New run

 Back to models

- **Pollutant** : NO_x, SO₂, CO, NH₃, NMVOC PM₁₀, PM_{2.5}
- **Output frequency**: yearly
- **Country**: Spain
- **Area (optional)**: City/region
- **EPSG Code**: <http://spatialreference.org/ref/epsg/>
- **Year**:
- **Version**:
- **Documentation**:
- **Description (optional)**:



Pollutant
CO

Output Frequency
Yearly

Country
Albania

Area (optional)

EPSG Code
Map coordinate reference id from the EPSG Dataset
EPSG - 0

Year
2017

Version

Documentation

Description (optional)



Files

[← Back to models](#) [← Back to run](#) [+ Add new file](#)

File Name	File Size	Content Type	Sector	System File Name	Updated
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New File

The CMAPPING tool should be used to check the concentration maps before these are uploaded.

Avoid to upload unvalidated data to the database.

- **Sector:** S1, S2, S3, S4, S5, S6, S7, S8, S9, S10
- **Estimation approach:** bottom-up, top-down, downscaling, inverse modelling

Select a file

The [CMAPPING tool](#) should be used to check the concentration maps before these are uploaded to the Composite mapping database. Please, avoid to upload unvalidated data to the database to help us keeping the database consistent

Sector
You can tag files with sectors. The default value for single uploads is S1

Estimation Approach

S3 and S4 emissions usually reported together → S34 category to be created

Mapping between SNAP and GNFR14



GNFR14	SNAP
A_PublicPower	SNAP1 (Public electricity and heat production)
B_Industry	SNAP1 (Petroleum refining) SNAP3 SNAP4 SNAP5 (Quarrying and mining of minerals other than coal → PM)
C_OtherStationaryComb	SNAP2
D_Fugitive	SNAP4 (Fugitive emissions oil: Refining / storage, Fugitive emission from solid fuels: Solid fuel transformation → NMVOC) SNAP5 SNAP9 (Venting and flaring (oil, gas, combined oil and gas))
E_Solvents	SNAP6
F_RoadTransport	SNAP7
G_Shipping H_Aviation I_Offroad O_AviCruise P_IntShipping	SNAP8
J_Waste	SNAP9 (except D_Fugitive category)
K_AgriLivestock L_AgriOther	SNAP10

Mapping between SNAP and GNFR14



GNFR14	SNAP
A_PublicPower + B_Industry	SNAP1 SNAP3 SNAP4
C_OtherStationaryComb	SNAP2
D_Fugitive + J_Waste	SNAP5 SNAP9
E_Solvents	SNAP6
F_RoadTransport	SNAP7
G_Shipping H_Aviation I_Offroad O_AviCruise P_IntShipping	SNAP8
K_AgriLivestock L_AgriOther	SNAP10

Or move to the GNFR14 nomenclature...



Models

+ New Model

	Category	Code	Model name	Model type	Status	Updated		
Runs 2	Emission	HERMES_BSC	HERMES		Created	12/06/2017	Edit	Delete



Model Runs

[Back to models](#) + New run

	Model Category	Pollutant	Run Year	Country	Area	Updated			
Files 2	Emission	PM2.5	2013	Spain	Madrid	15/06/2017	Details	Edit	Delete
Files 2	Emission	PM10	2013	Spain	Madrid	15/06/2017	Details	Edit	Delete



Files

[Back to models](#) [Back to run](#) + Add new file

	File Name	Sector	Estimation Approach	File Size	Content Type	Updated		
Download	CEMAP_HERMESv2_ESP_PM25_S7_EPSG32662_annual_2013_mad1km.asc	S7	Bottom-Up	91 KB	text/plain	15/06/2017	Edit	Delete
Download	CEMAP_HERMESv2_ESP_PM25_S2_EPSG32662_annual_2013_mad1km.asc	S2	Top-Down	70 KB	text/plain	15/06/2017	Edit	Delete

Populating the EC Maps viewer



Institution	Country (Region)	Resolution	Year	Sector	Pollutants
BSC	Spain (Catalonia, Madrid)	1x1km	2013	S2, S7	NOx, PM10, PM2.5, NMVOC
SLB-analys	Stockholm (Sweden)	1x1km	2015	S7	NOx, PM10
VITO	Flanders region (Belgium)	1x1km	2015	S1, S2, S3, S4, S5, S7, S8, S10	NOx, CO, SO2, NH3, PM10, PM2.5, NMVOC
JRC	Europe	1x1km	2010	S1, S2, S34, S7, S8, S9, S10	NOx, CO, SO2, NH3, PM10, PM2.5, NMVOC
EMEP	Europe Spain, Belgium, Portugal (official)	0.1x0.1	2014 2015	S2, S7, S34	NOx, PM10, PM2.5, NMVOC
NILU	Oslo (Norway)	1x1km	2013	S34, S2, S7, S8	NOx, PM10, PM2.5
UA	Lisboa (Portugal)			S2, S7, S3, S4	
CITTA	Coimbra (Portugal)		2015	S7, S7.1, S7.2	NOx, NMVOC, PM2.5

Populating the EC Maps viewer



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Convention on Long-range Transboundary Air Pollution
emep Co-operative programme for monitoring and evaluation of the long-range transmissions of air pollutants in Europe
CEIP umweltbundesamt



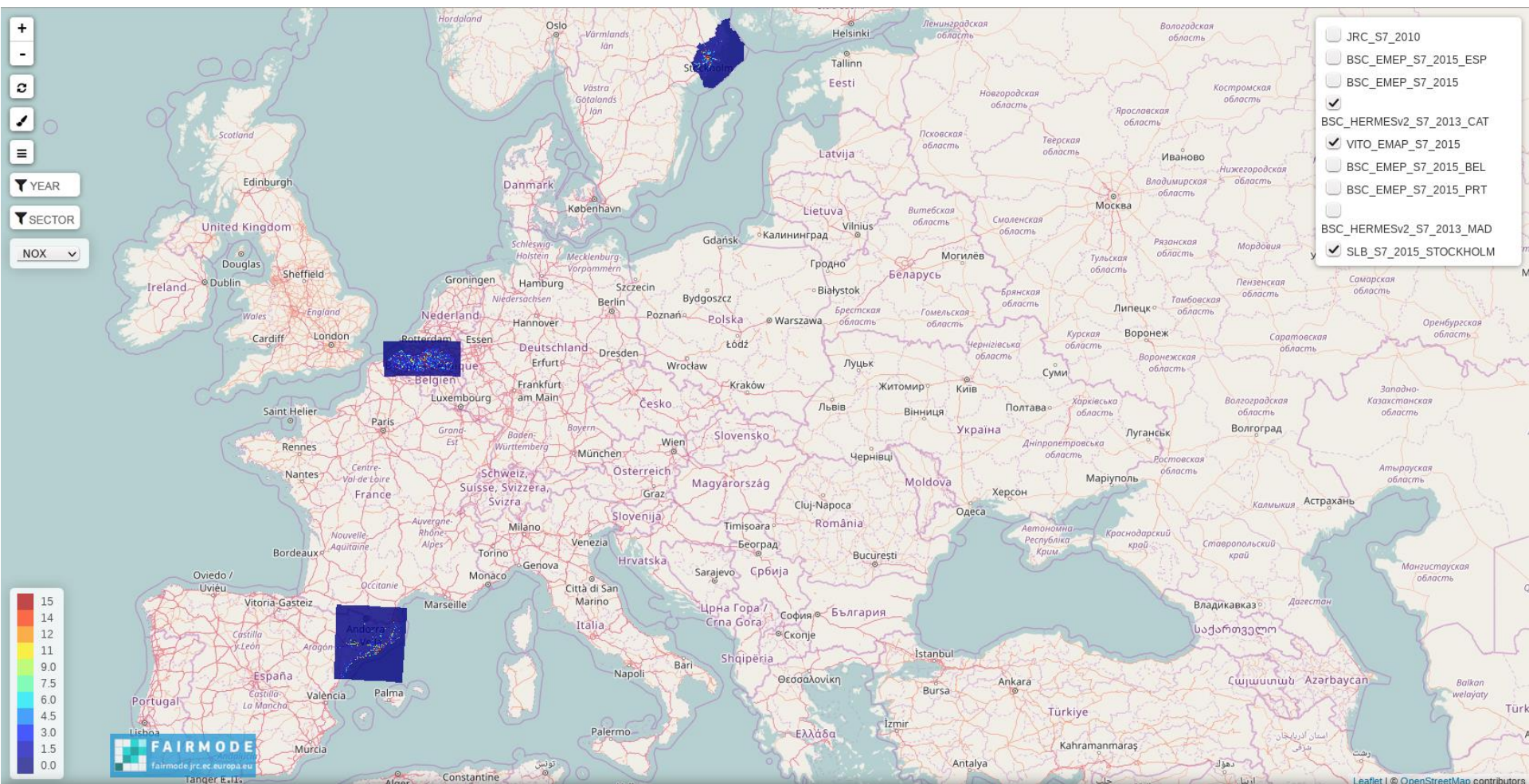
Joint Research Centre



More contributions?



First results



<https://eucompositemaps.marvin.vito.be/emissions/>