AIRUSE LIFE+ project

AIRUSE

LIFE 11 ENV/ES/000584

Technical staff from ITC involved in AIRUSE:

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AIRUSE

B.5 Industrial sources contributions

Results from the receptor model

Area	Values in % contributions to 2013 annual mean									
	TOTAL INDUSTRY*		DIRECT INDUSTRY		REG ($OC+SO_4^{2-}$)		nTR-NO_3^-		Shipping	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
POR-TR	< 12	< 14	4	5	10	13	2	1	<1	<1
BCN-UB	< 36	< 39	11	12	26	37	8	3	4	5
FI-UB	< 23	< 26	5	6	21	29	6	4	<1	<1
MLN-UB	n.a.	< 22	n.a.	5	n.a.	19	n.a.	6	n.a.	<1

n.a.: not available

*Contributions for sources directly/indirectly and totally/partially related with industrial source

AIRUSE industrial activity inventory

Methodology. Required information

Channelled primary PM	Fugitive or diffuse primary PM
Main industrial activity (IPPC or E-PRTR code)	
Annual production (kg, tonnes, m^2, …)	
Type of fuel	
Process stages: number of point sources	Activities that can generate diffuse emissions
Implemented BATs	Quantity of material handled
Emission duration (hours/year)	Distance travelled by trucks inside the company
Emission temperature	Paving in the areas travelled (paved or unpaved)
Emission volume flow rate (dry basis)	Storage park area and amount of stored material
Emitted PM concentration	Implemented mitigation measures
BATs maintenance operations	Maintenance operations of the mitigation measures

Primary PM emissions quantification

Channelled emissions

- **Methodology 1**: Direct emission data for TSP and/or PM10 available from the industrial emissions inventory. **BCN and FI**.

- **Methodology 2**: Calculation of annual TSP emissions from C_{TSP}, flow rate and total hours of annual emission. **MLN**.

- **Methodology 3**: No detailed information was available. PM10 and PM2.5 emissions were calculated from production data, applying emission factors. **POR**.

PM10/TSP and PM2.5/PM10 ratios and emission factors were obtained from the following databases: EMEP/EEA, AP 42 (US-EPA), AUSTRALIA-EPA and IIASA

Primary PM emissions quantification

Diffuse emissions

Methodology: PM10 and PM2.5 emissions were calculated from **amount of bulk material handled or production data**, applying generic emission factors.

Only emissions associated with the handling of bulk solids have been quantified

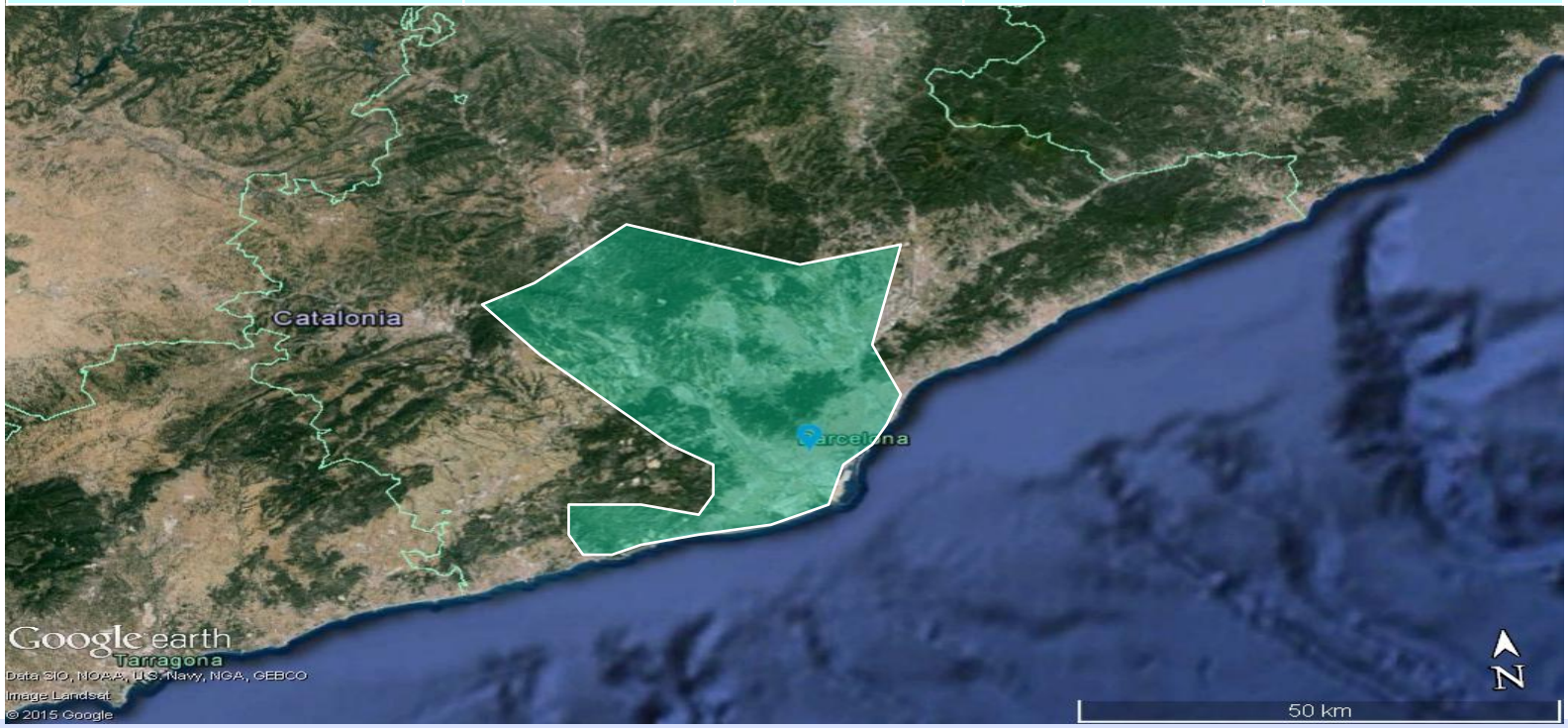
Two handling operations have been considered

Primary PM diffuse emissions have been underestimated

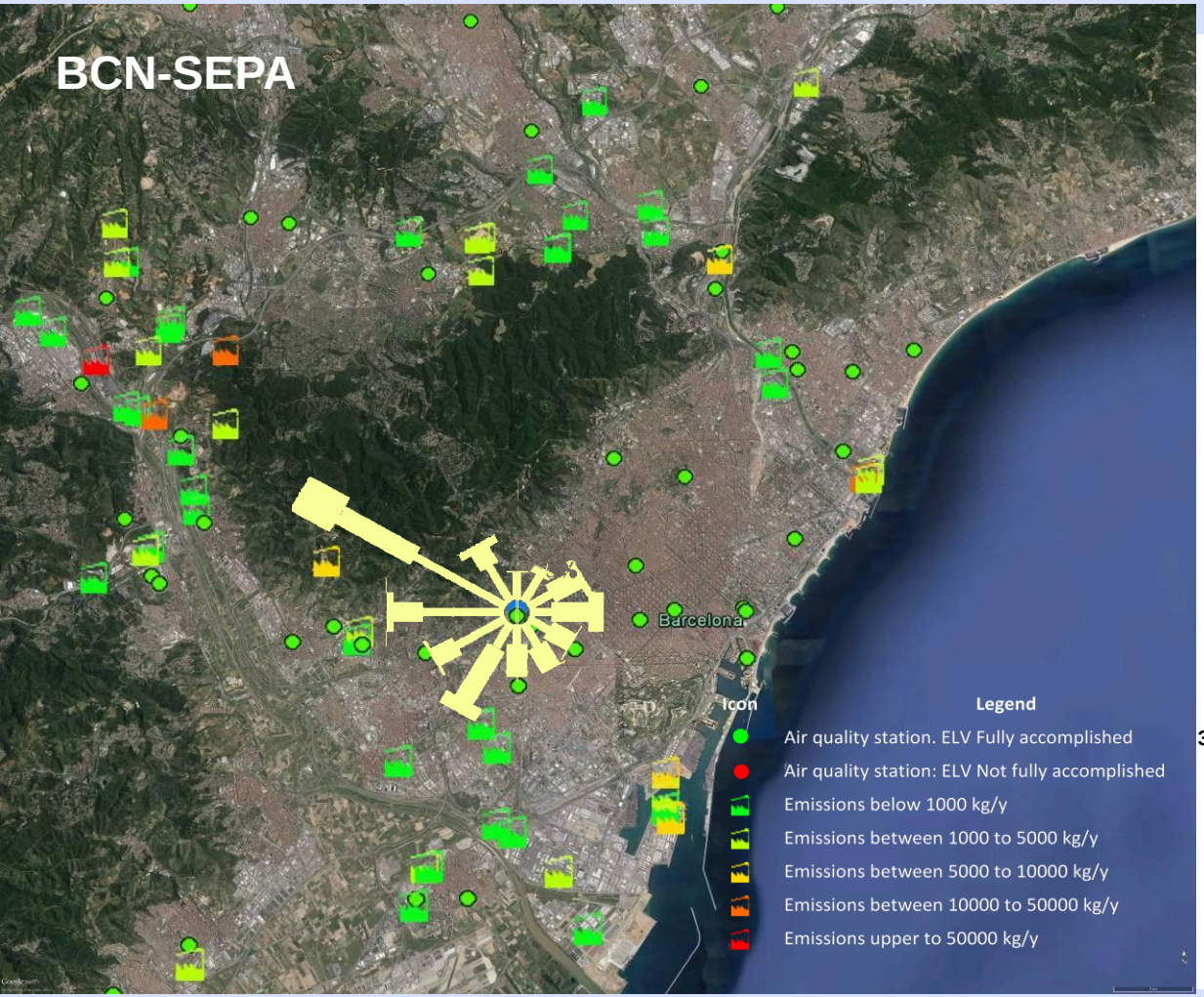
PM10/TSP and PM2.5/PM10 ratios and emission factors were obtained from the following databases: EMEP/EEA, AP 42 (US-EPA), AUSTRALIA-EPA and IIASA

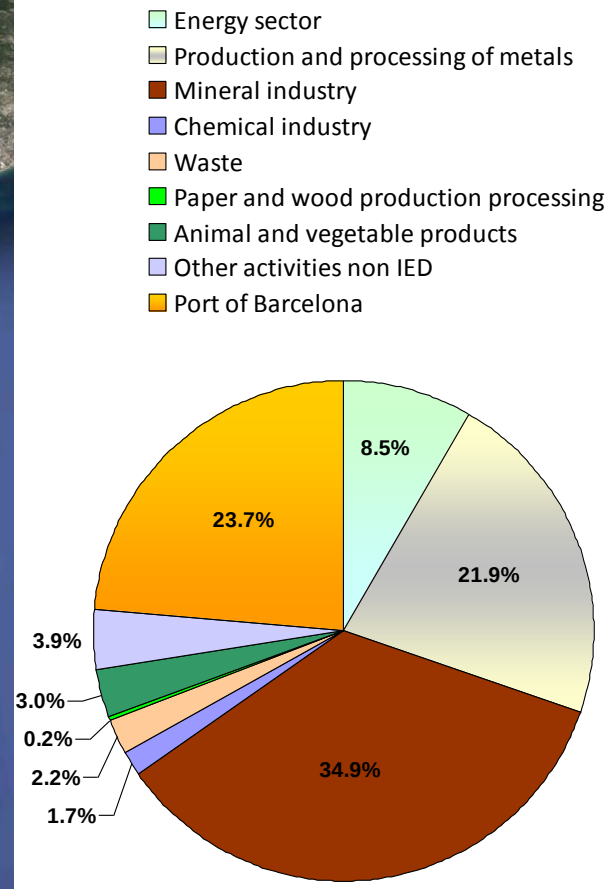
BCN-SEPA

Study area			Industrial emission inventory		
Population (Minhab.)	Area (km^2)	Density ($inh./km^2$)	Facilities	Methodology	ELV-BAT
4.6	725	6345	>60	1	Medium-High

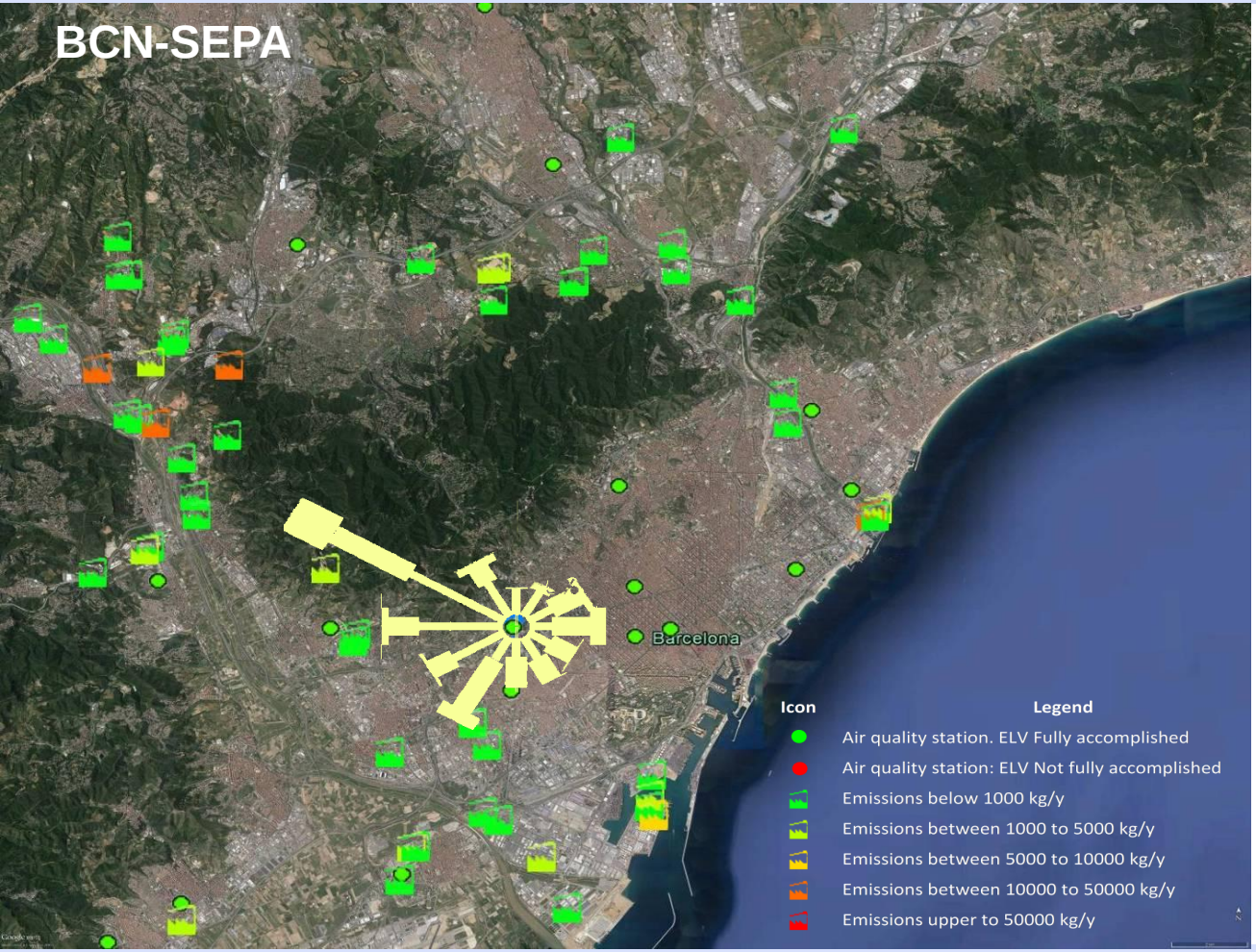


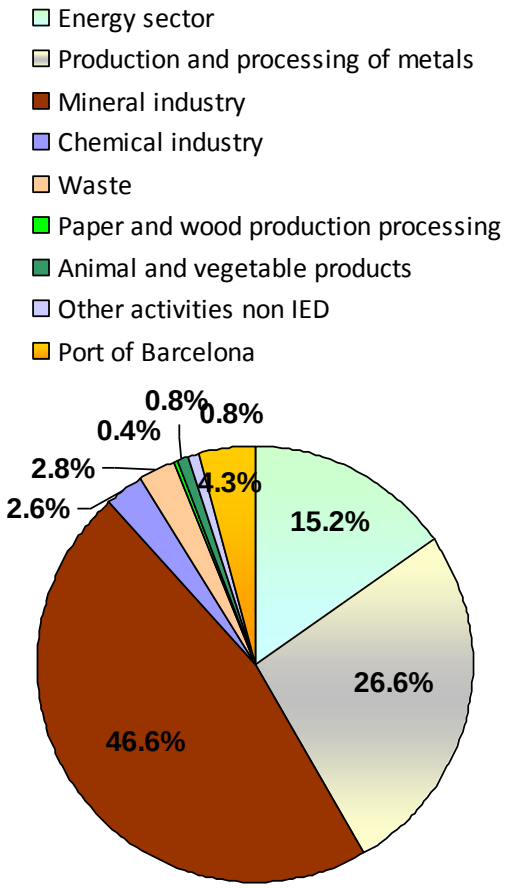
Primary Industrial PM10 emissions



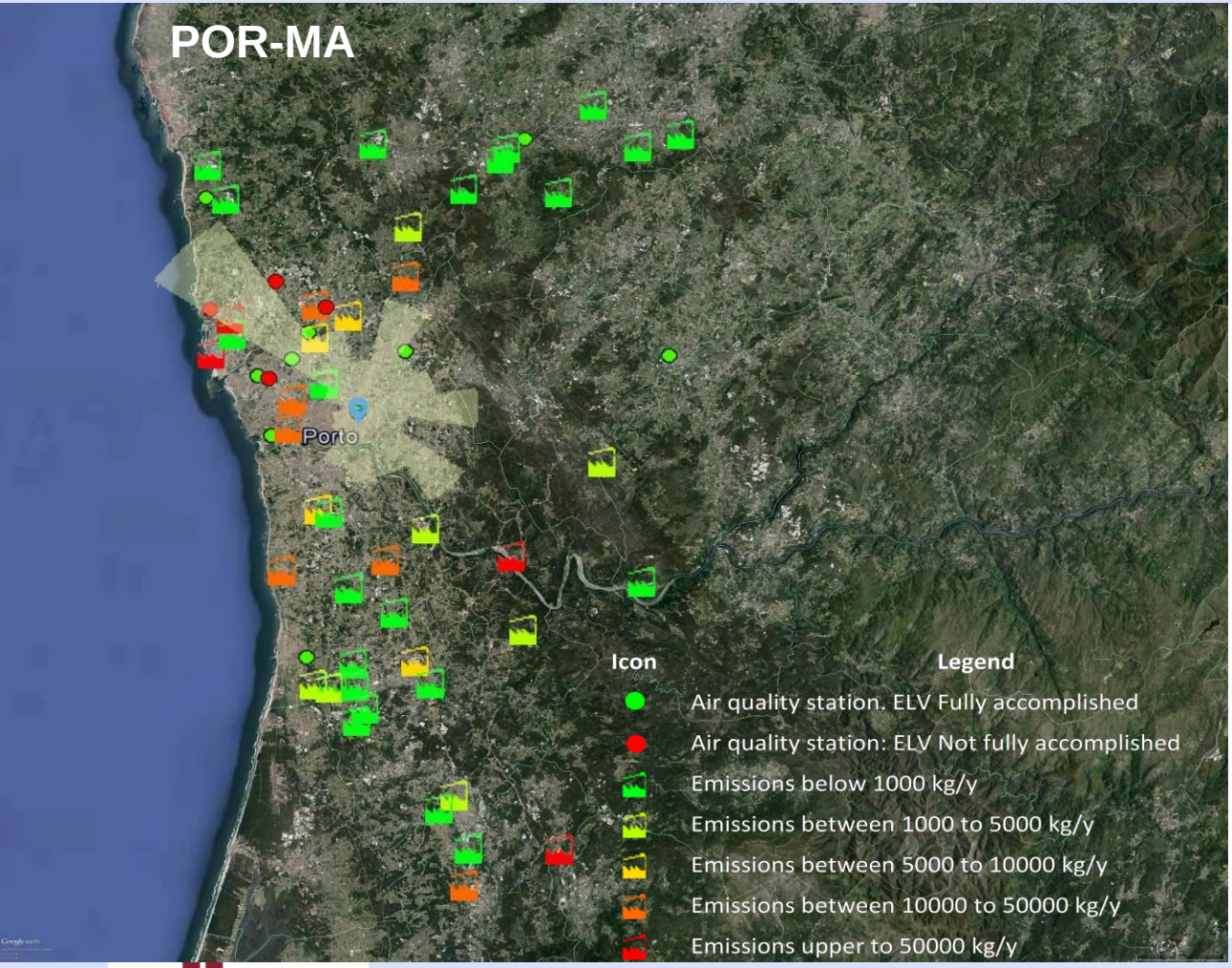


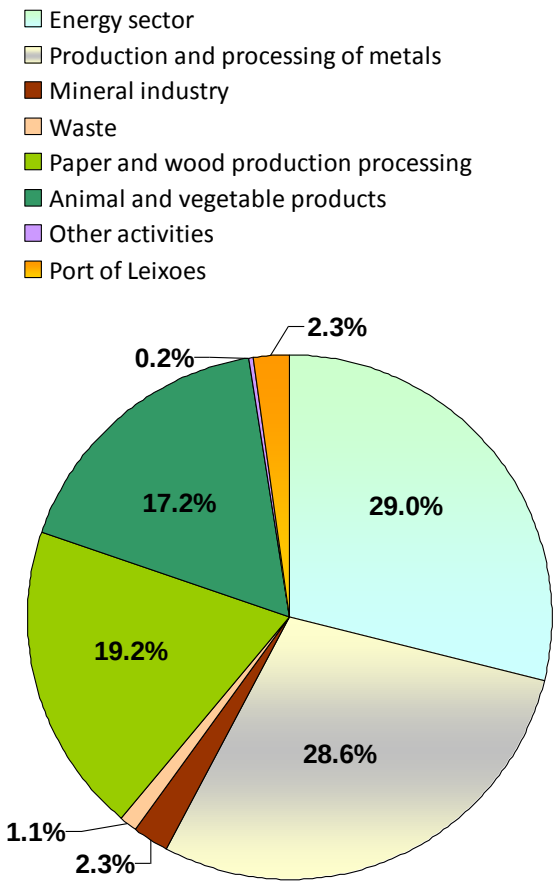
Primary Industrial PM2.5 emissions



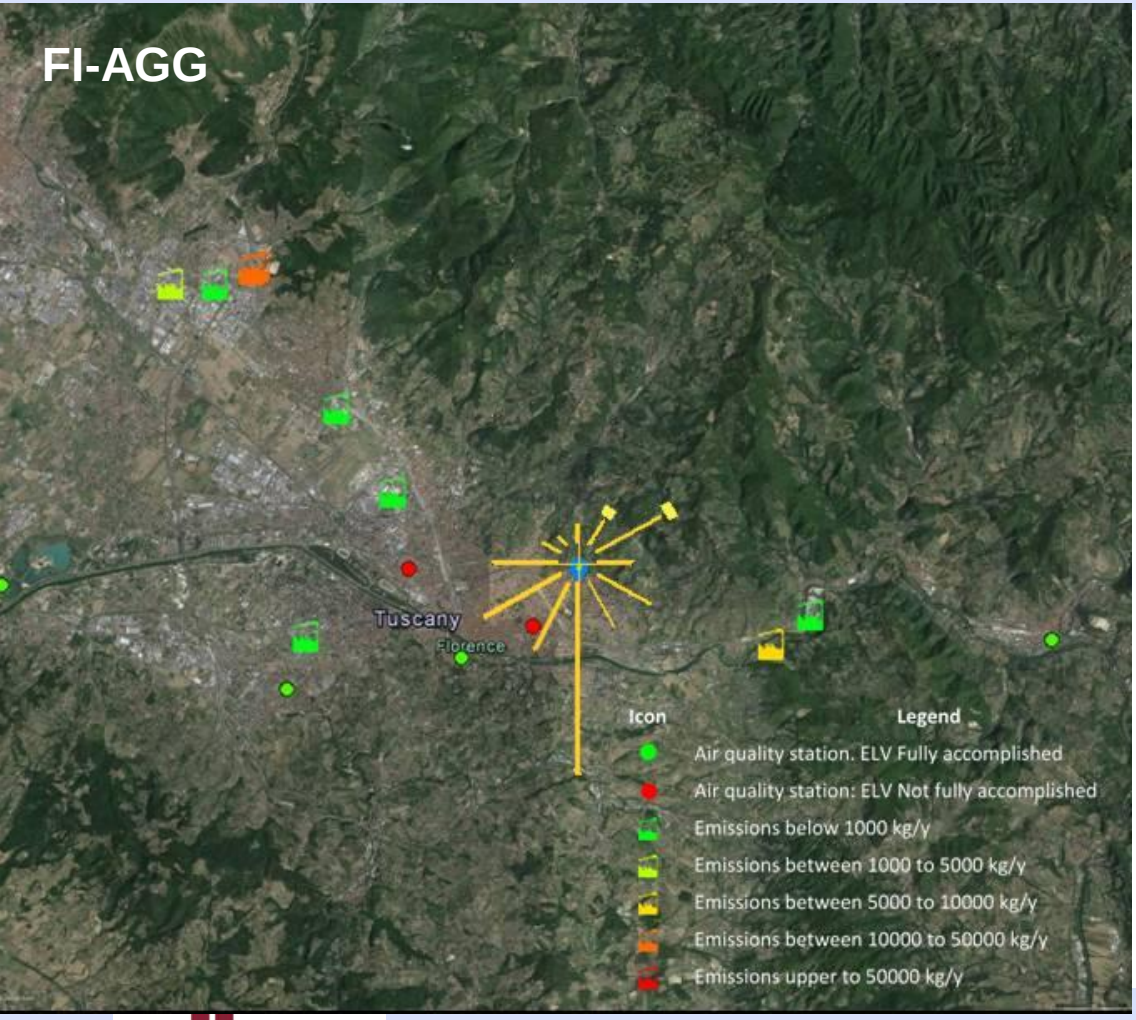


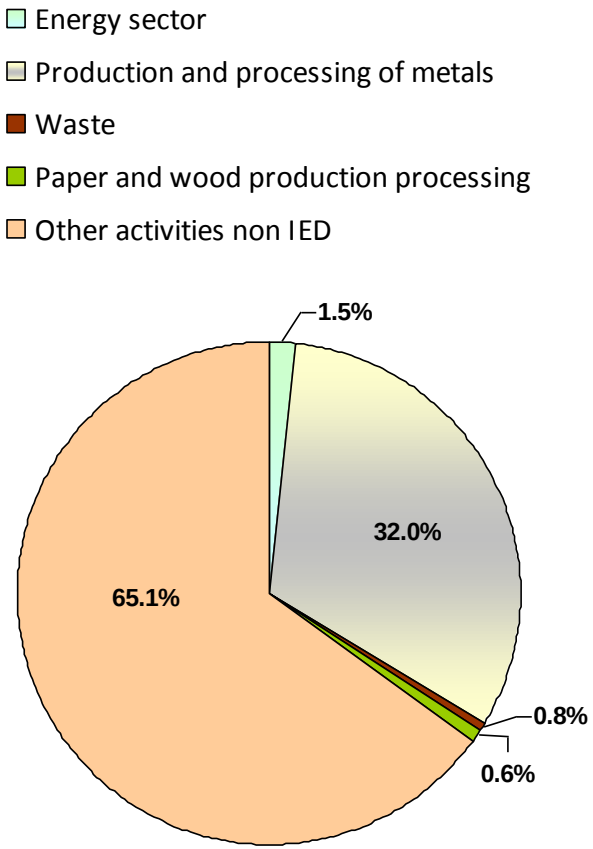
Primary Industrial PM10 emissions





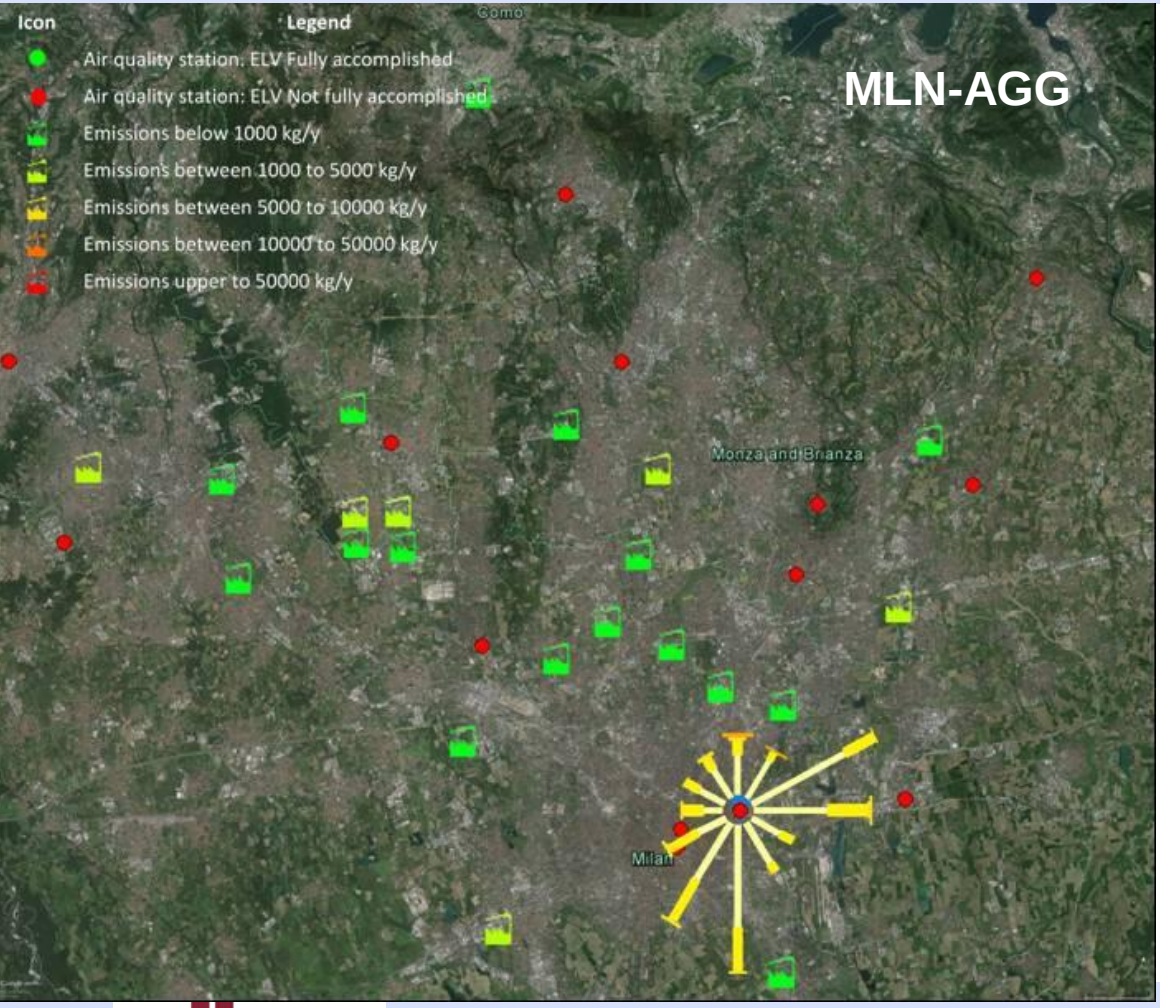
Primary Industrial PM10 emissions

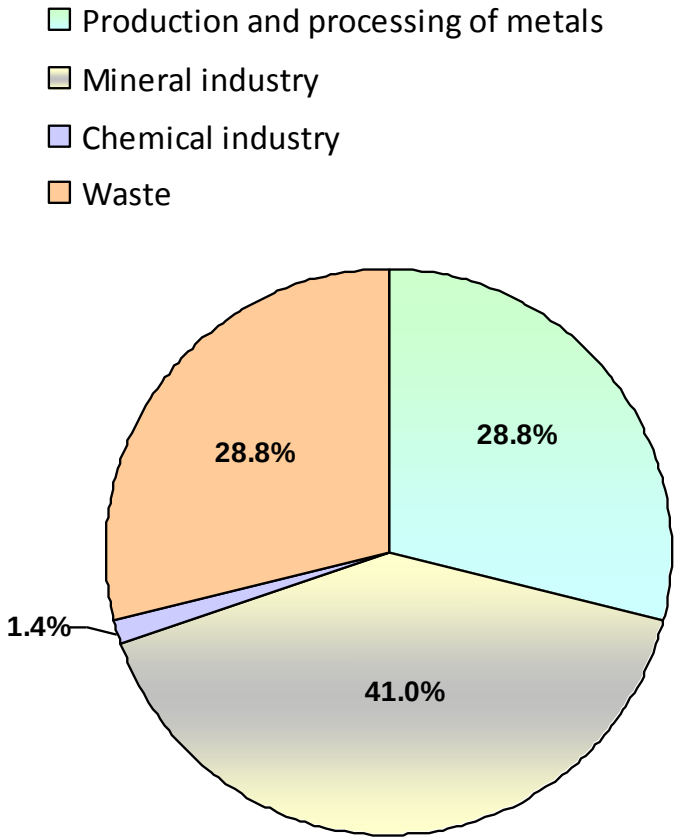




Other activities: Concrete manufacturing, silver processing and biomass co-generation plant (<50Mw)

Primary Industrial PM10 emissions





Precursors of secondary PM

Study area	Total emissions (tonnes/year)					
	PM emissions		Gaseous emissions*			
	PM10	PM2.5	NO_x	SO_2	NH_3	NMVOCs
POR-MA	669.8	571.3	6068	399	355	1207
BCN-SEPA	246.5	137.0	5733	221	10.7	4070
FI-AGG	31.9	17.0	N/C	N/C	N/C	N/C
MLN-AGG	16.3	14.3	993	410	N/C	N/C

N/C: Unquantified

*Data from E-PRTR 2012

Recommendations

Addressed to EU regulatory and technical bodies (EMEP, IPTS, R&D managers)

- **Emission inventories:**

  - Encouraging efforts to standardise and coordinate baseline information

  - Extending information in public inventories (e.g. E-PRTR) to improve transparency

  - Harmonising key parameters: air quality (PM_{10}, $PM_{2.5}$), ELVs (PST), E-PRTR(PM_{10})

- **Diffuse sources:**

  - Developing and compiling specific PM diffuse emission factors and efficiencies

- **Channelled emissions:**

  - Developing and compiling specific PM10/TSP and PM2.5/PM10 ratios

  - Regulating maximum temperatures in exhaust gases and/or abatement systems

  - Fostering control of secondary PM precursors and heavy metal emissions

Recommendations

Addressed to National and/or Regional environmental bodies

- **Primary PM emissions:**

- Updating the ELVs adopted in the BREF documents

- Increasing emission control frequency to ensure proper BATs operation

- Including real control and quantification of diffuse emissions

- **Gaseous emissions (secondary PM precursors) and heavy metals:**

- Quantifying these emissions in greater detail

- Selecting the cleanest available fuels and/or using controlled combustion systems

- Fostering implementation of cleaning systems in hot emissions

Recommendations

Addressed to Regional environmental bodies:

- **Regional inventories of PM industrial emissions**

  - Periodically updating the list of industrial activities

  - Using a bottom-up approach, including non-IED activities and diffuse emissions

  - Controlling and quantifying shipping, harbour, and public works emissions

Addressed to stakeholders

- **Awareness-raising activities**

  - Organising specific campaigns (workshops, info-days…) for industrial associations, harbour managers, local authorities, health groups, etc

  - Involvement of stakeholders can greatly increase emission inventories accuracy

B7. Developing & testing cost-effective PM measures & strategies

Road dust - AIRUSE tests

At typical urban road:

- Street cleaning
- CMA
- $MgCl_2$

At industrial paved road:

- Street cleaning
- CMA

At industrial unpaved road:

- Water flushing
- CMA

Soil dust

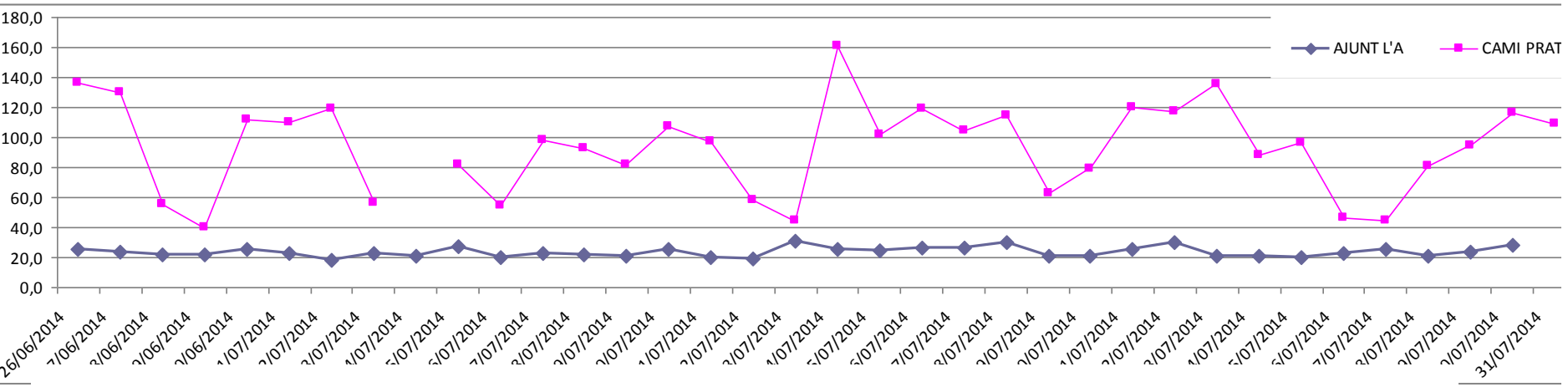
At urban park we tested nano-polymer

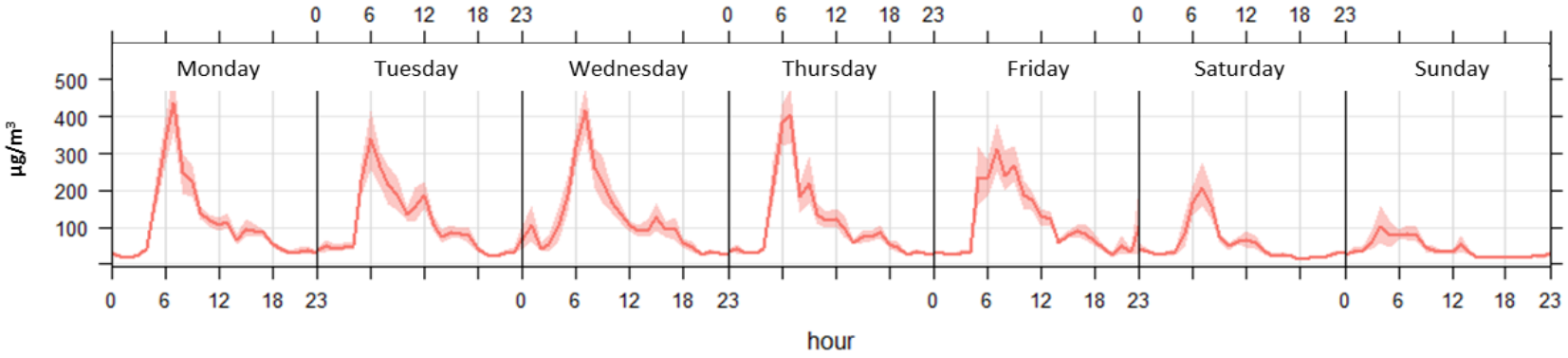
Industrial (ceramic) paved road (l'Alcora)

- 250 companies (tiles, spray-dried granules, pigments..)
- 17% of the worldwide supply
- consumes 12 Mt/year of clay

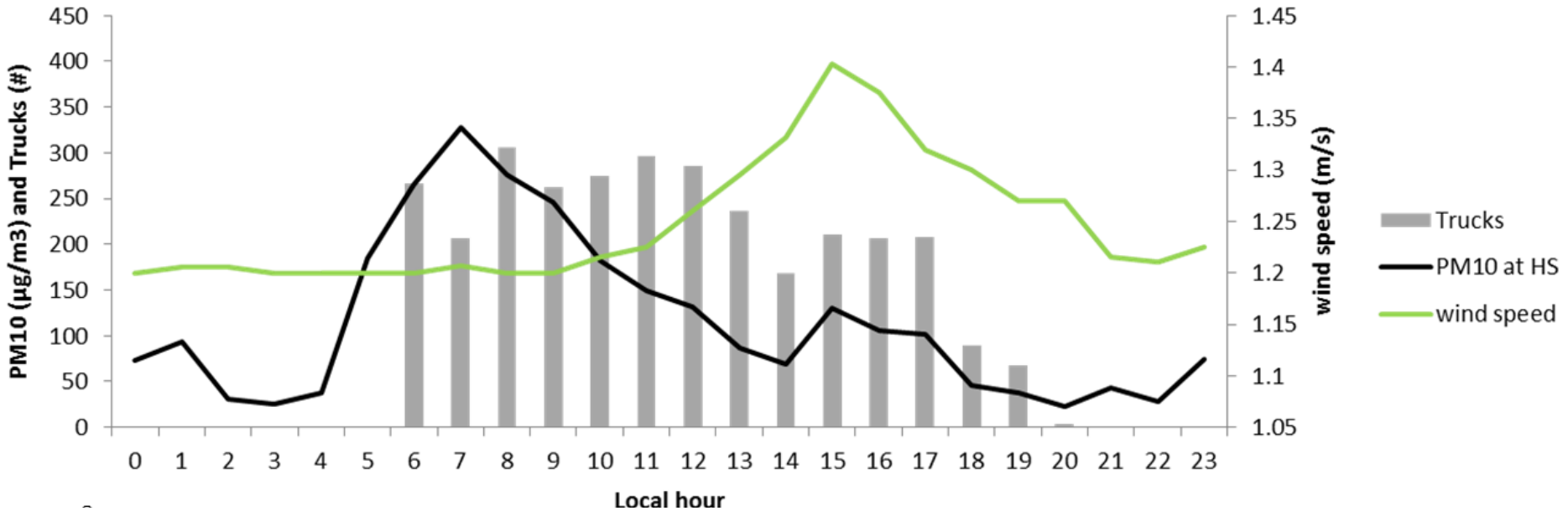
Industrial (ceramic) paved road (l'Alcora)

Industrial paved road (l'Alcora)

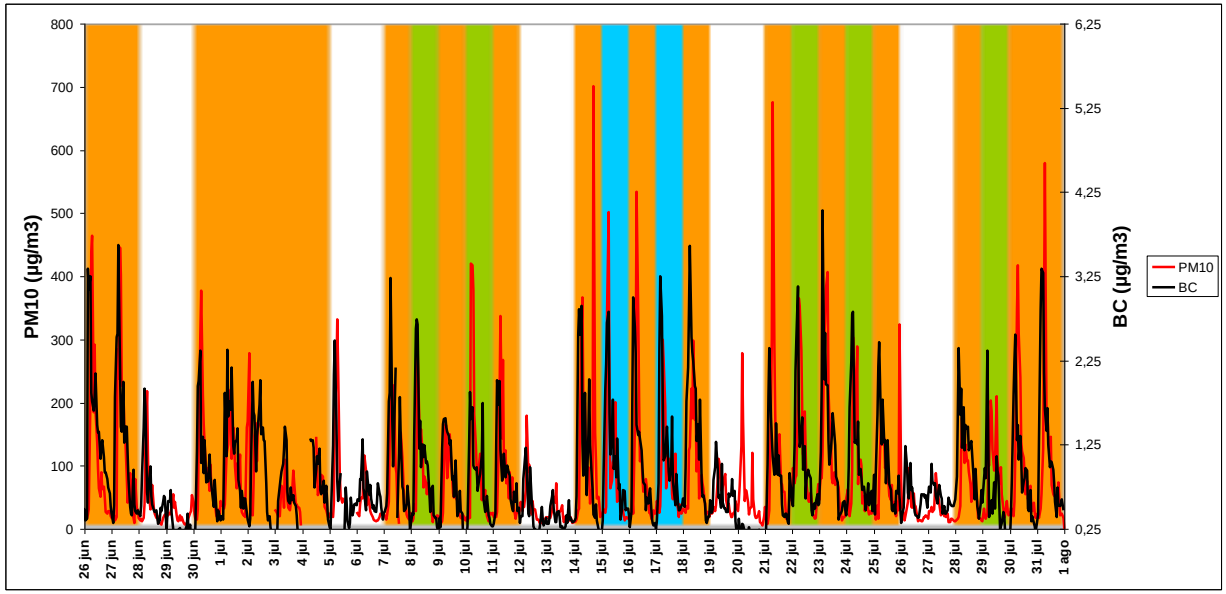


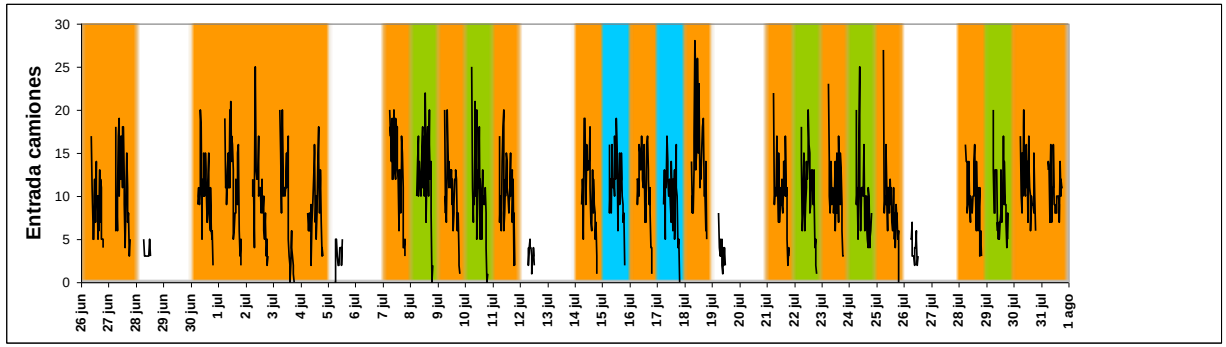


Industrial paved road (I'Alcora)



Industrial paved road (l'Alcora)



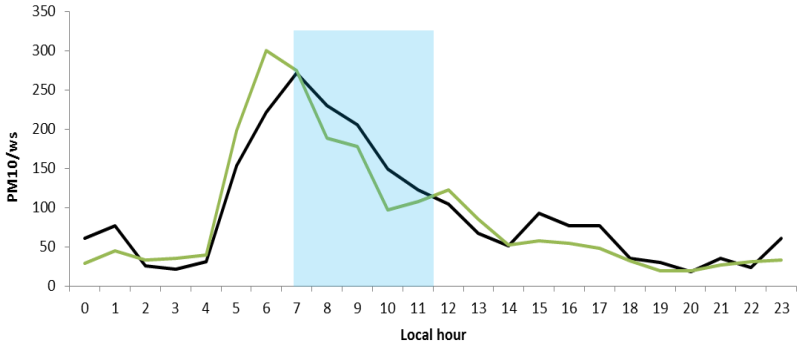


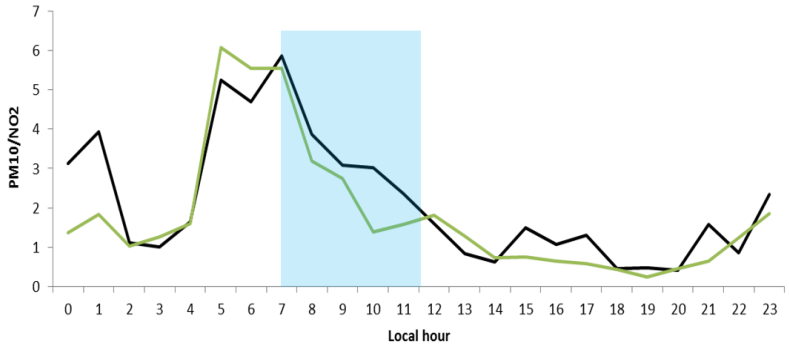
Industrial (ceramic) paved road (l'Alcora)

CMA application

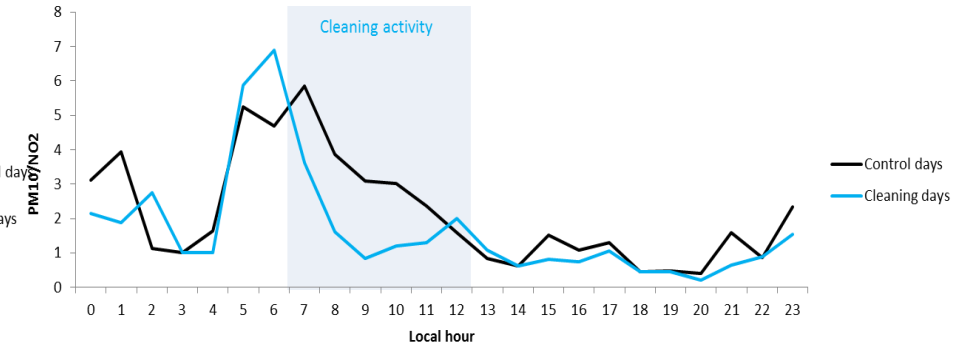
Industrial paved road

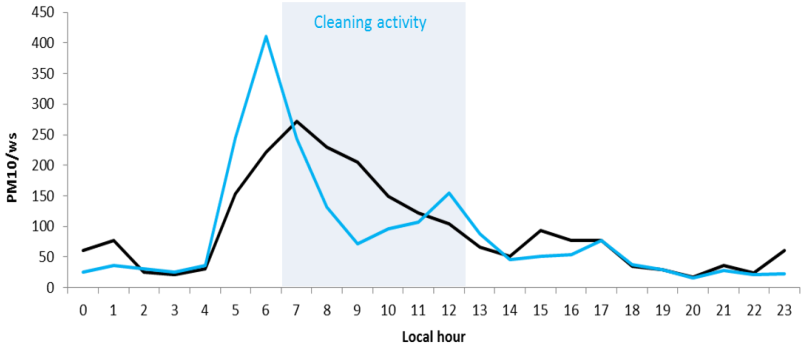
CMA
8% reduction

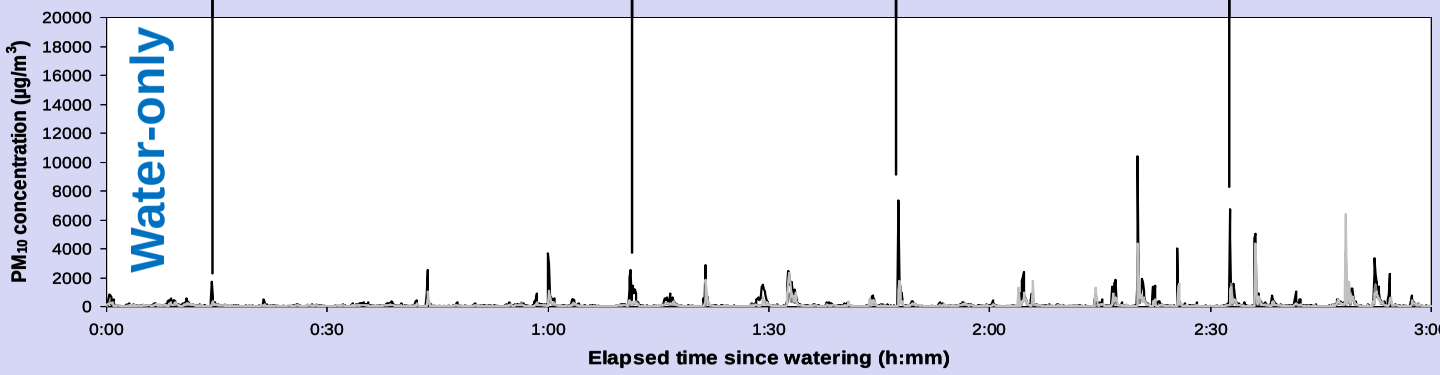




Water-only
18% reduction

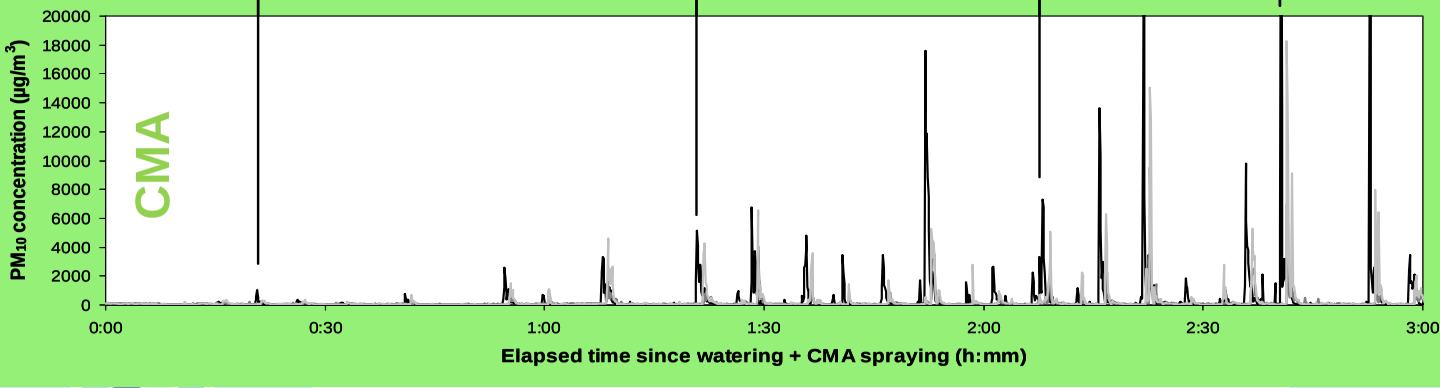






Unpaved r

http://airuse.eu/media/watering.mp4



Conclusions

Source	Location	Dust loading	Measure	Dosage	PM10 reduction	Notes on measurement
Road dust	Urban paved road	3-6 mg/m^2	Street washing	1 L/m^2	**7-10% on a daily mean**	kerbside
			CMA	15-20 g/m^2	Negligible	kerbside
			$MgCl_2$	15-20 g/m^2	Negligible	kerbside
	Industrial paved road	20-40 mg/m^2	Street washing	27 L/m^2	**18% on a daily mean**	kerbside
			CMA	30-60 g/m^2	**8% on a daily mean**	kerbside
	Industrial unpaved road	infinite	Street washing	3.5 L/m^2	**>90% up to 1 h**	downwind
			CMA	100 g/m^2	Not observed	downwind
Soil dust	Public park	infinite	Nano-polymer	3 L/m^2	**-2.9 µg/m^3**	Inside the park

Conclusions

- ✓ **Street washing revealed the highest efficiency in reducing mobility of particles.**
- ✓ **The effect is short lived (<8hours), and should be performed before rush hours**
- ✓ **Sweeping using CMA does not offer evidence of improved efficiency in Mediterranean climate**

ACKNOWLEDGEMENTS

EC- LIFE+ PROGRAM

Spain	**MAGRAMA, GenCat, Barcelona, l'Alcora and Madrid City Councils, URBASER, Cantera La Torreta**
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Portugal	**Porto City Council, North Regional Coord. & DeveloP. Comm. (CCDR-N)**
Greece	**Ministry of Environment, Energy and Climate Change**

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FLORENTINA STUDIORUM UNIVERSITAS

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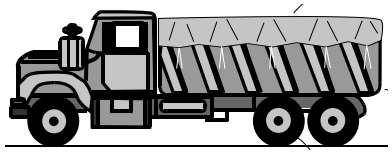
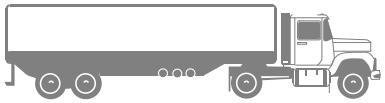
BATs road transport of dusty materials

Types of trucks

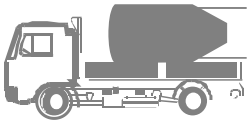
Dump truck



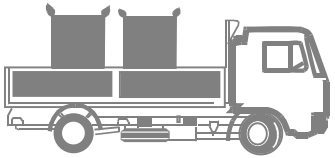
Bulk solids tanker truck



Portable silos



Big bags



Minimise fugitive emissions