

# AIR QUALITY MANAGEMENT IN THE PO VALLEY: THE LESSON LEARNED BY THE PREPAIR PROJECT

*Marco Deserti,  
Emilia-Romagna Region*

# background

Po Valley is a main non attainment area in EU

The exceedances are observed in most of the background stations

The emissions and concentration trends are decreasing since 2000

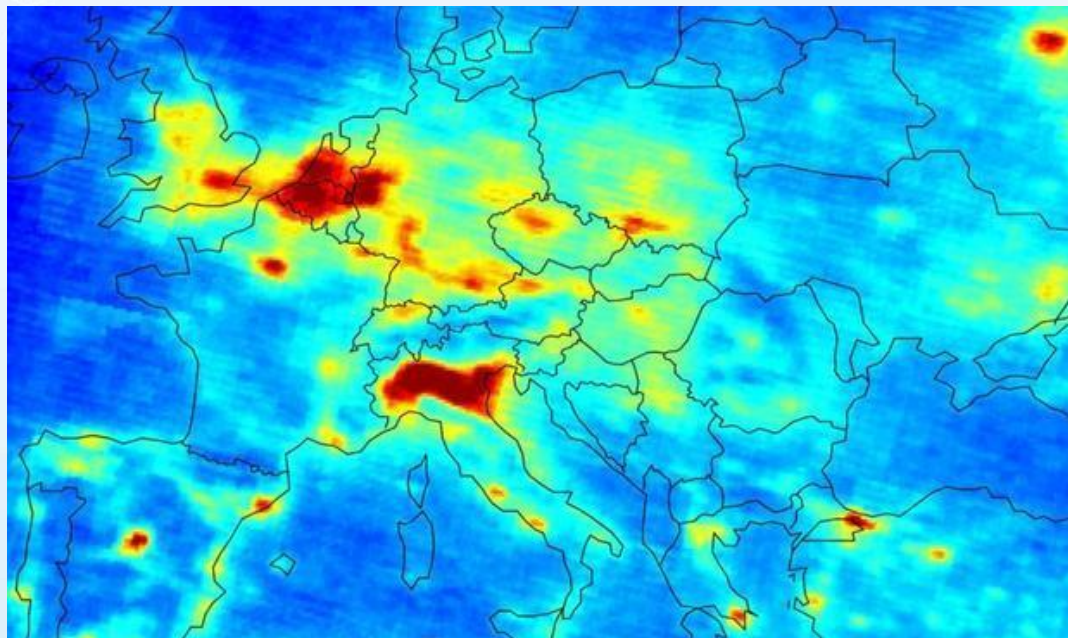
The regions partners of Prepair have enforced AQ plans, the target year is 2025

The goal of the AQ plans is to protect the citizen's health and comply the EU LV as soon as possible

Th EU start infringement procedures for PM and NO<sub>2</sub>

The Clean Air Dialogue between EU commission and Italy was held in Turin last June 11-12.

About 70% of PM in the Po Valley is secondary due to the transformation of NO<sub>x</sub>, NH<sub>3</sub>, VOC



Sentinel 5p Nitrogen atmospheric column January to April 2019  
(Source: ESA)

# Some outcomes of the Clean Air Dialogue

- The Commission ask to Italy to comply with the AQ standards as soon as possible (i.e. 2013) by implementing short term measures, ex:
  - Low emissions zone, Speed limit, Retrofitting for buses, tax measures, fiscal incentives, renewable energy (wind and solar), etc...
- Is it possible to reach this goal? When?

# Emissions reduction targets

- To achieve the PM10 limit on the Po Valley, it is necessary to reduce direct emissions of PM10 and of the two main precursors emitted in the area (NO<sub>x</sub> and NH<sub>3</sub>), by 38% PM10, 39% NO<sub>x</sub> and 22% NH<sub>3</sub> respectively.
- This % reduction corresponds to a reduction of 29,876 tons per year of PM10 emitted directly and 147,428 ton/year of NO<sub>x</sub>, by 54,170 ton/year of NH<sub>3</sub>

	Emissions to be reduced in all macro-sectors (CLE-Plans-Agreements-Prepair)		Macro-sector reductions (CLE-Plans-Agreements-Prepair)	Reductions for CLE macro-sector
	% reduction compared to 2013	Tons	Tons per macro sector (MS)	
			MS7	MS7
NO <sub>x</sub>	39%	147528	115484	94487
			MS2	MS2
PM10	38%	29876	20887	2485
			MS10	MS10
NH <sub>3</sub>	22%	54170	52285	-5399

Ref REPORT OF PREPAIR PROJECT - ACTION A3 "Preliminary assessment of the Air Quality Plans" <http://www.lifeprepare.eu/index.php/azioni/air-quality-and-emission-evaluation/#toggle-id-16>

# Emission Scenarios

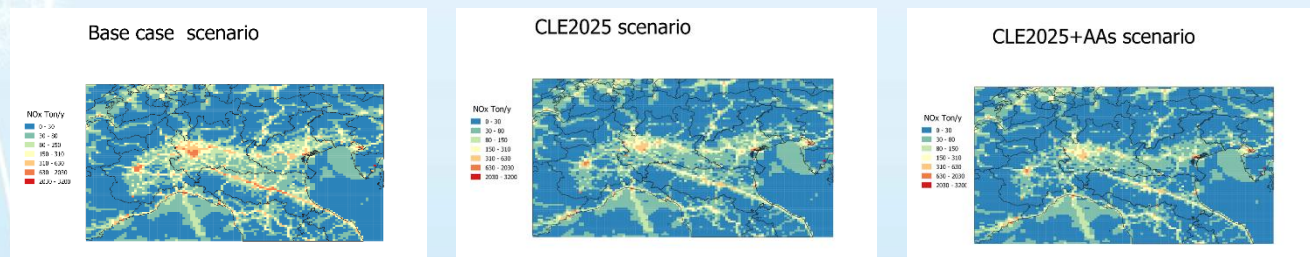
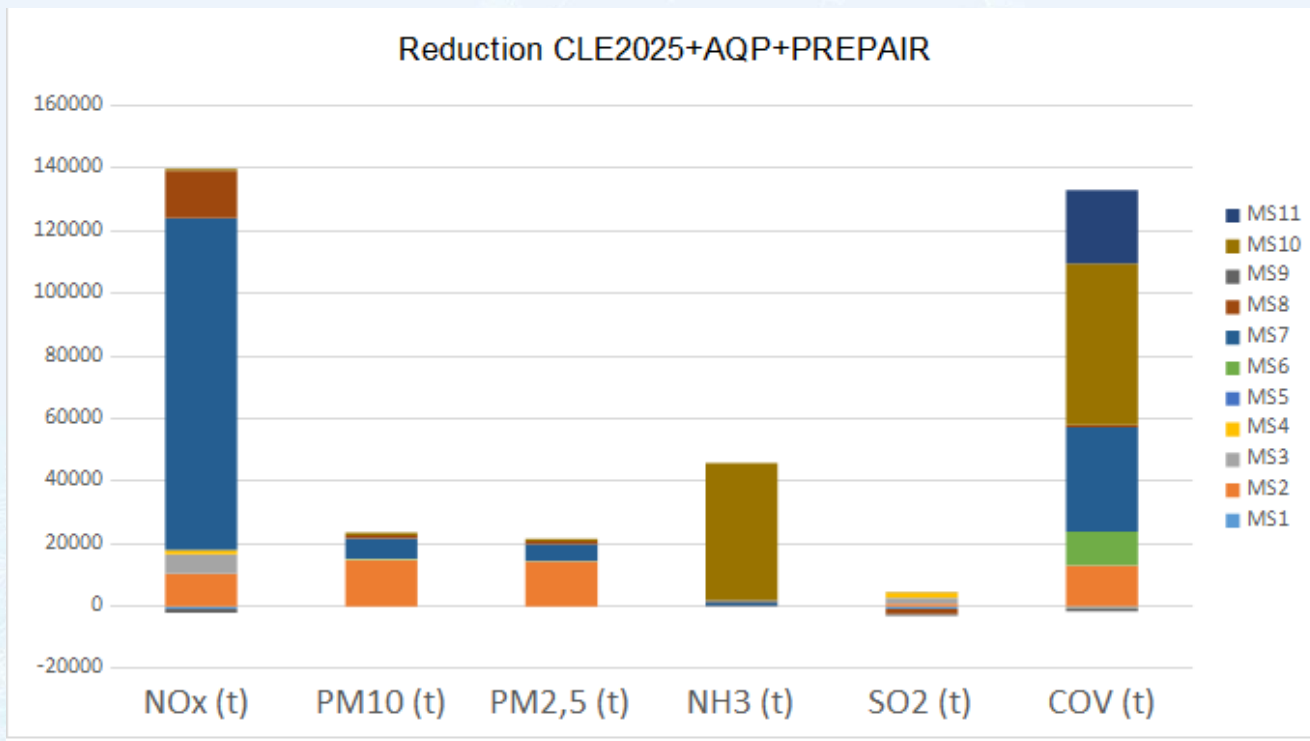


Figure 3 - Figure NOx emissions (Ton/Y) for three simulated scenarios

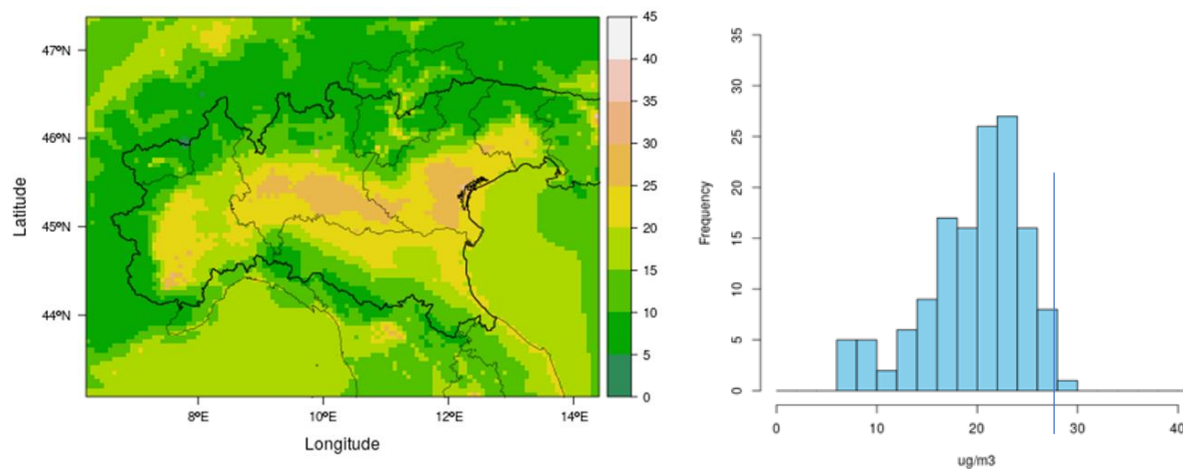


Figure 8 - CLE2025+AAs average  $PM_{10}$  concentration ( $\mu\text{g}/\text{m}^3$ ) and frequency distribution in background stations

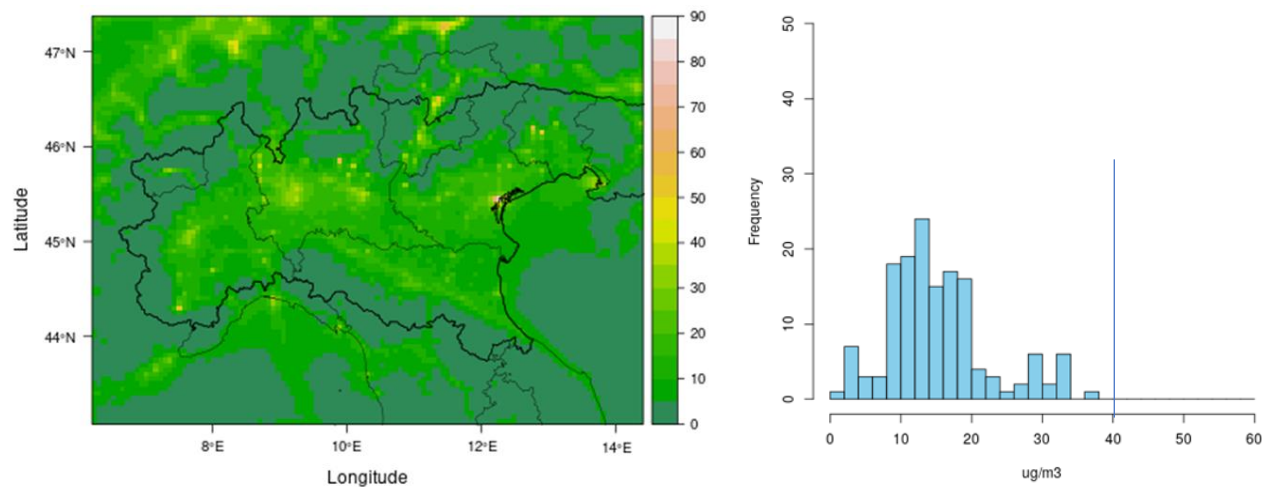


Figure 9 - CLE2025+AAs average  $NO_2$  concentration ( $\mu\text{g}/\text{m}^3$ ) and frequency distribution in background stations

# How can we meet the emission reduction targets?

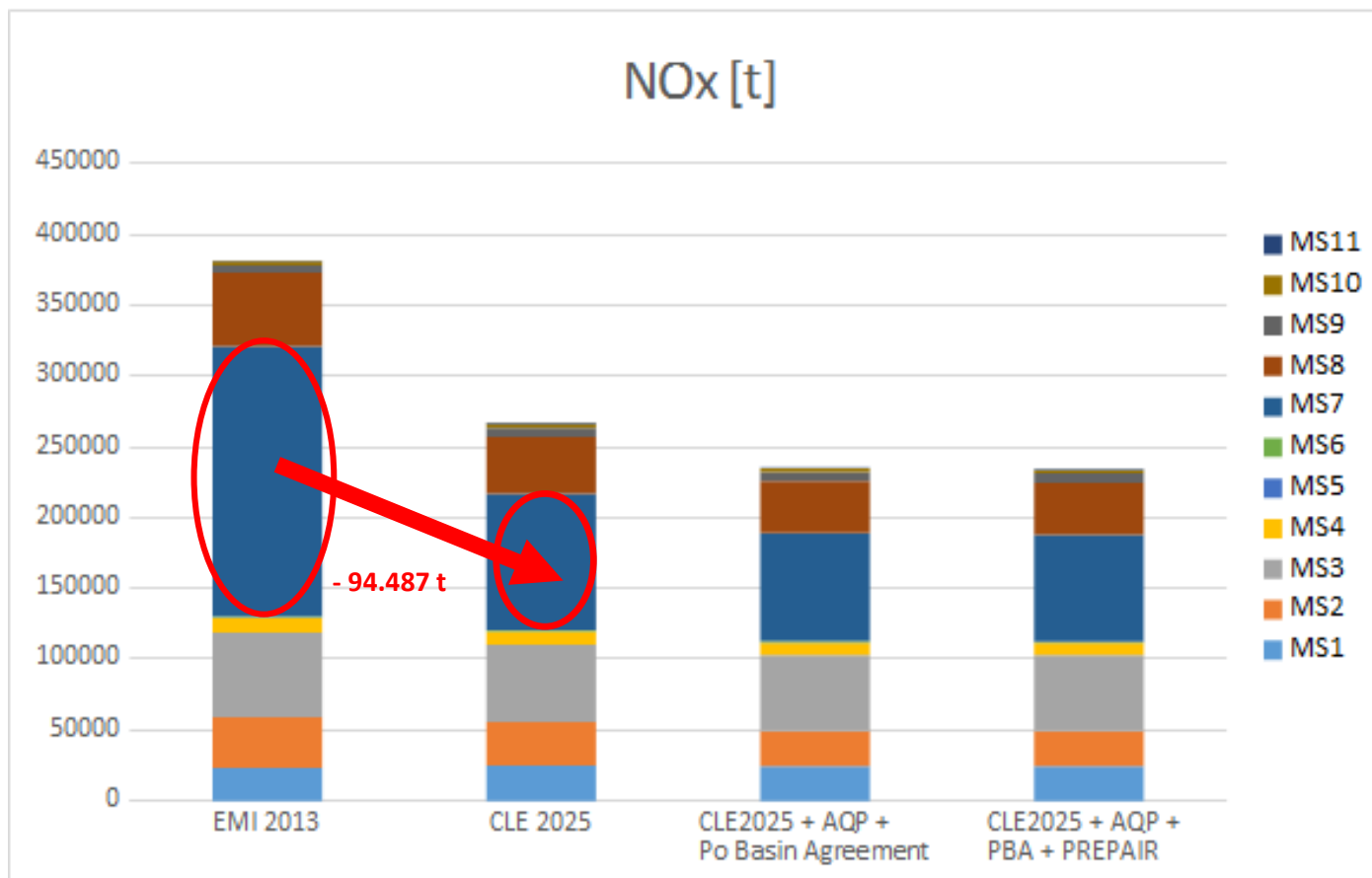
These significant reductions can be achieved by combining the effect of several groups of measures related to different levels of government:

- the current legislation, which will be fully implemented by 2025 (CLE 2025) which is mainly derived from the EU rules;
- the national/interregional measures established by agreements between the regions of the Po Valley and the Italian government.
- the AQ plans by Regions;



## NOx emission reduction:

The main contribution is due to measures relating to macro-sector 7 (MS7) - road transport (115,484 t on 147.528 t), of which the majority share can be reached through the measures of CLE2025 (94,487 t)



Source PREPAIR A3 Report "Preliminary assessment of the Air Quality Plans"

<http://www.lifeprepare.eu/index.php/azioni/air-quality-and-emission-evaluation/#toggle-id-16>

# CLE2025 measures, main contribution:

1. reduction of emissions from diesel vehicles through the introduction of new approval limits, which will not come into full force until after 2020 (EU Regulations (EU) 2016/646; 2017/1151; 2018/1832).
2. progressive replacement of internal combustion technology with electric.

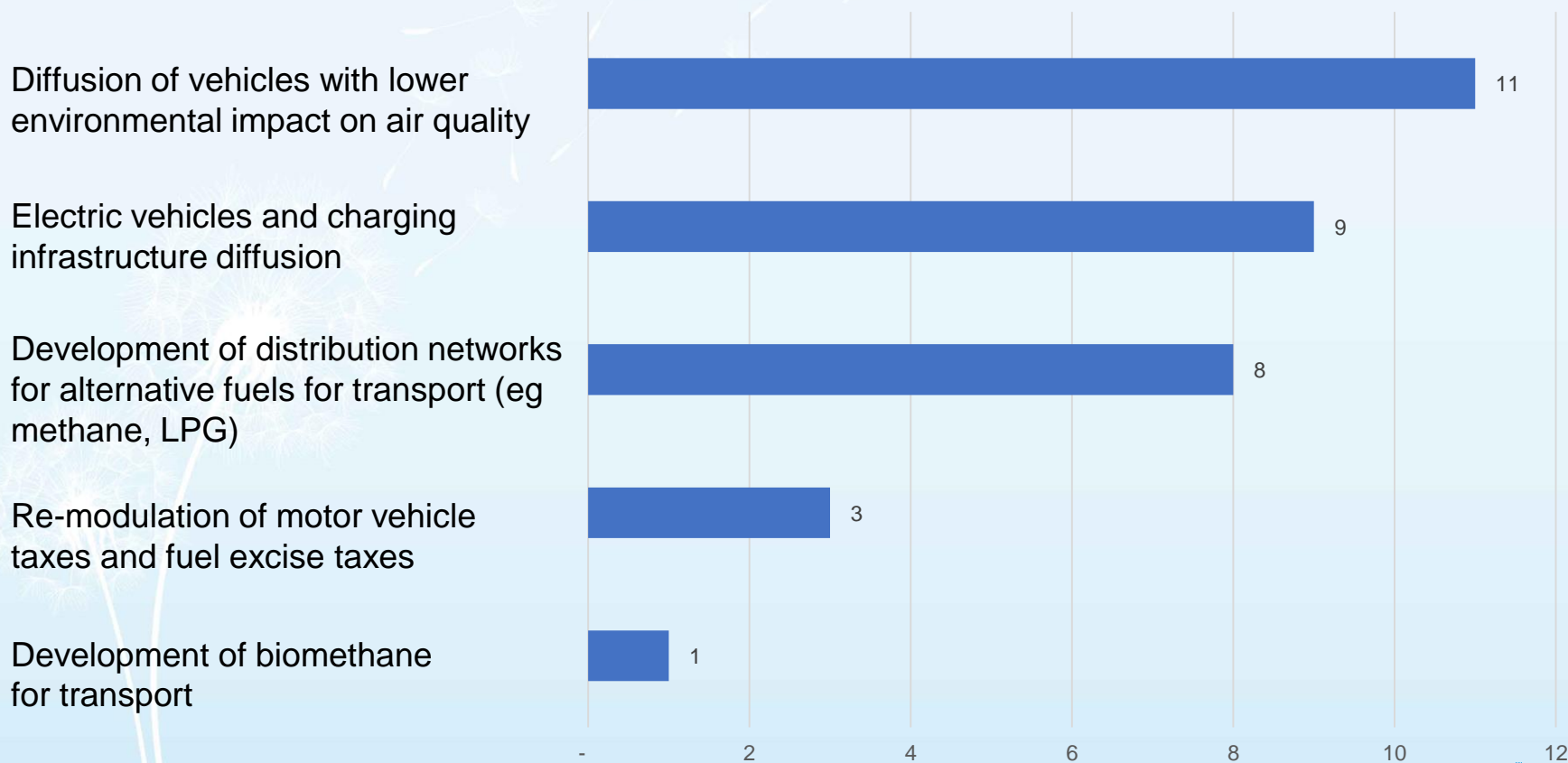
The regional plans, having no regulatory power in this area, plan to facilitate the penetration of low-emission technologies through a wide range of measures that are duly documented in the dataset, developed by the A2 action in the project PREPAIR. The catalogue provides all the measures provided by the AQ plans of the Po Valley, the Po basin agreements and the concrete measures of the project itself.

Source: <http://www.lifeprepare.eu/index.php/azioni/air-quality-and-emission-evaluation/#toggle-id-15>



# PREPAIR action A2: measures dataset (450 records)

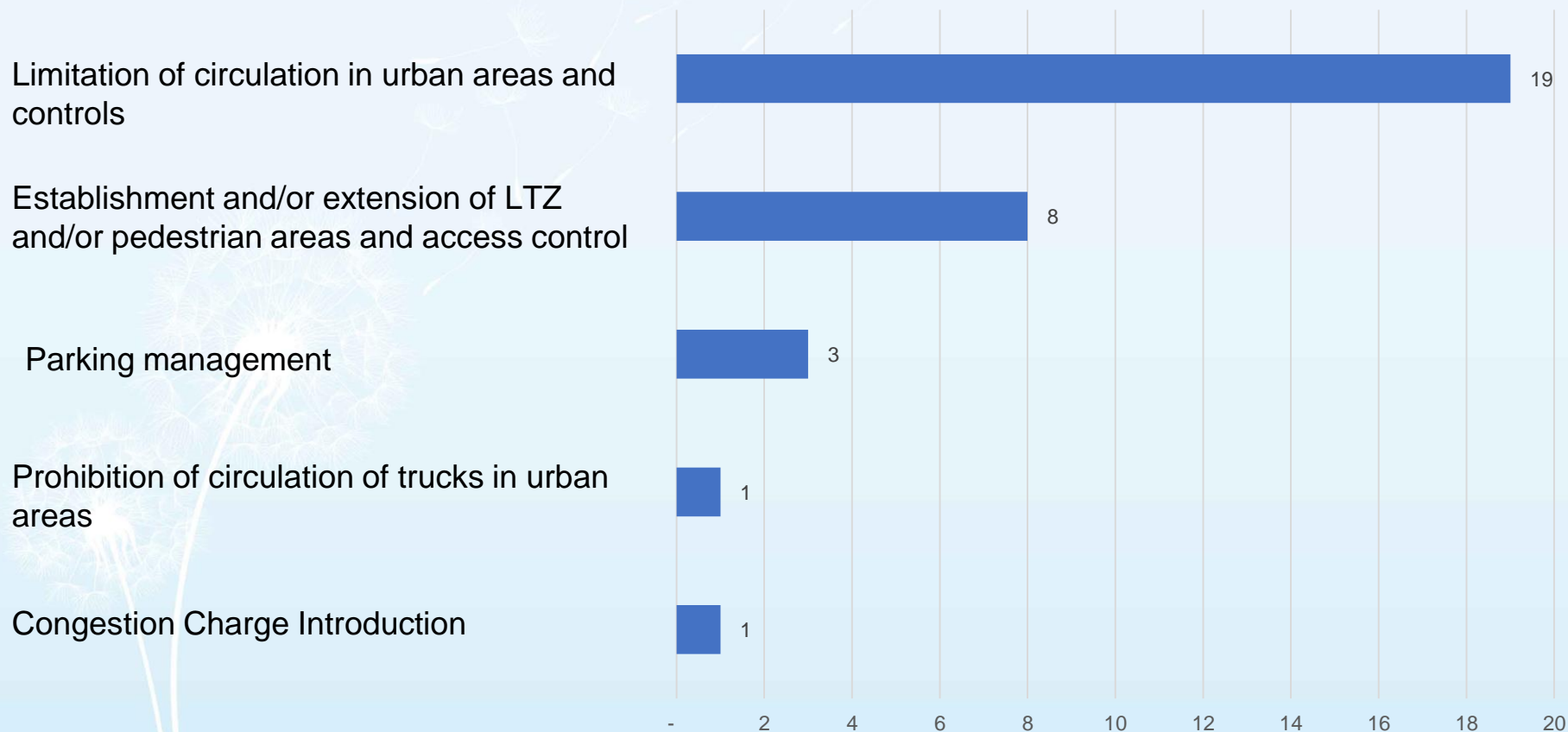
Types of measures planned in the measure group “102 - Vehicle fleet renewal promotion – 32 actions on the Po Basin Area



Source: <http://www.lifeprepare.eu/index.php/azioni/air-quality-and-emission-evaluation/#toggle-id-15>

# PREPAIR action A2: measures dataset

Types of measures planned in the measure group "103 - Reduction of traffic flows in urban areas" - total 32 measurements in the Po Valley



Source: <http://www.lifeprepare.eu/index.php/azioni/air-quality-and-emission-evaluation/#toggle-id-15>

# PREPAIR action A2: measures dataset

Types of measures planned in the measure group "104 Sustainable mobility promotion"  
total 32 measurements in the Po Valley

Support for modal shift towards cycle-pedestrian mobility

Car sharing/pooling development

Territorial planning for transport and sustainable mobility

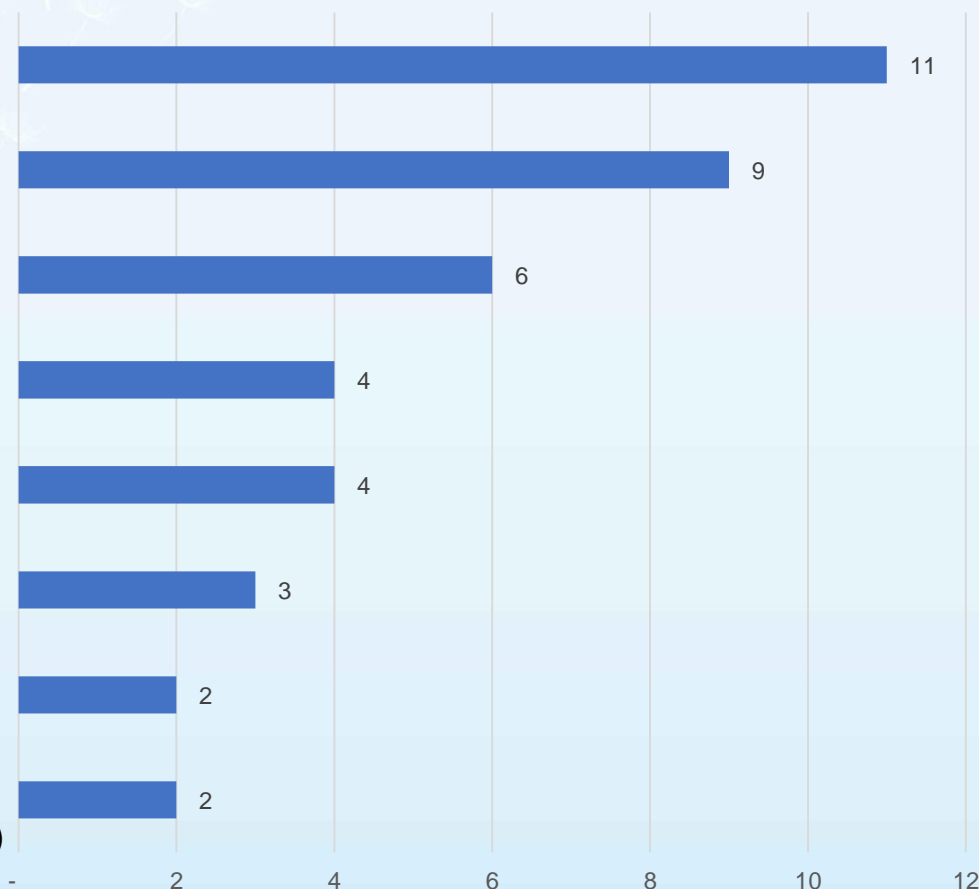
Application of Intelligent Transport Systems (ITS)

Construction and/or extension of new cycle paths

Development of Mobility Management activities

Development of sustainable mobility in companies

Systems to limit and/or optimize systematic movements (eg teleworking, videoconferencing, etc.)



Source: <http://www.lifeprepare.eu/index.php/azioni/air-quality-and-emission-evaluation/#toggle-id-15>

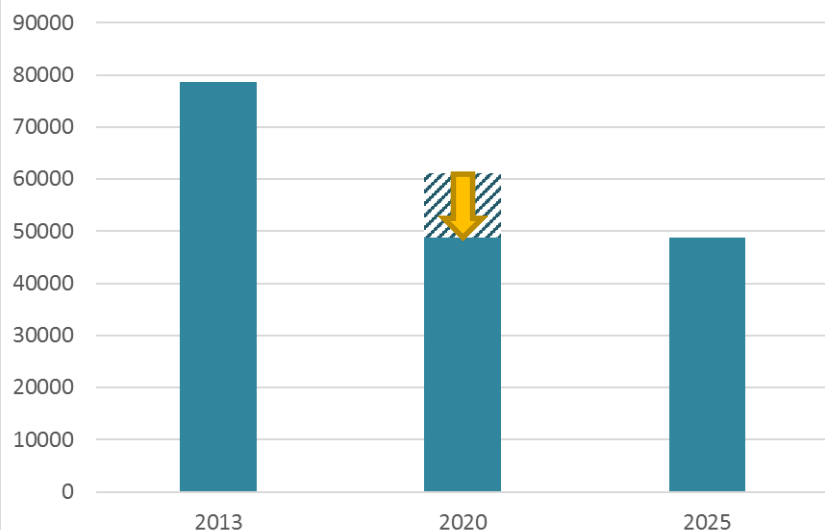


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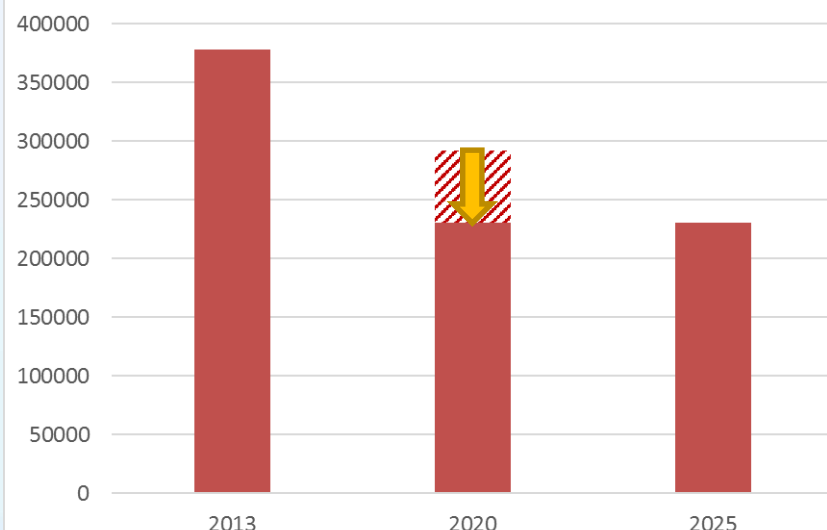
# As soon as possible ?

PM10 Po Basin Emissions (t/y)



/// CLE2025 + Po Basin Plans

NOX Po Basin Emissions (t/y)



/// CLE2025 + Po Basin Plans

- Immediate application of all measures of the air quality plans
- total ban of vehicle circulation for 14 million people to compensate the reduction expected with the application of European and national legislation (Current LEGislation CLE) by 2025

Faster?



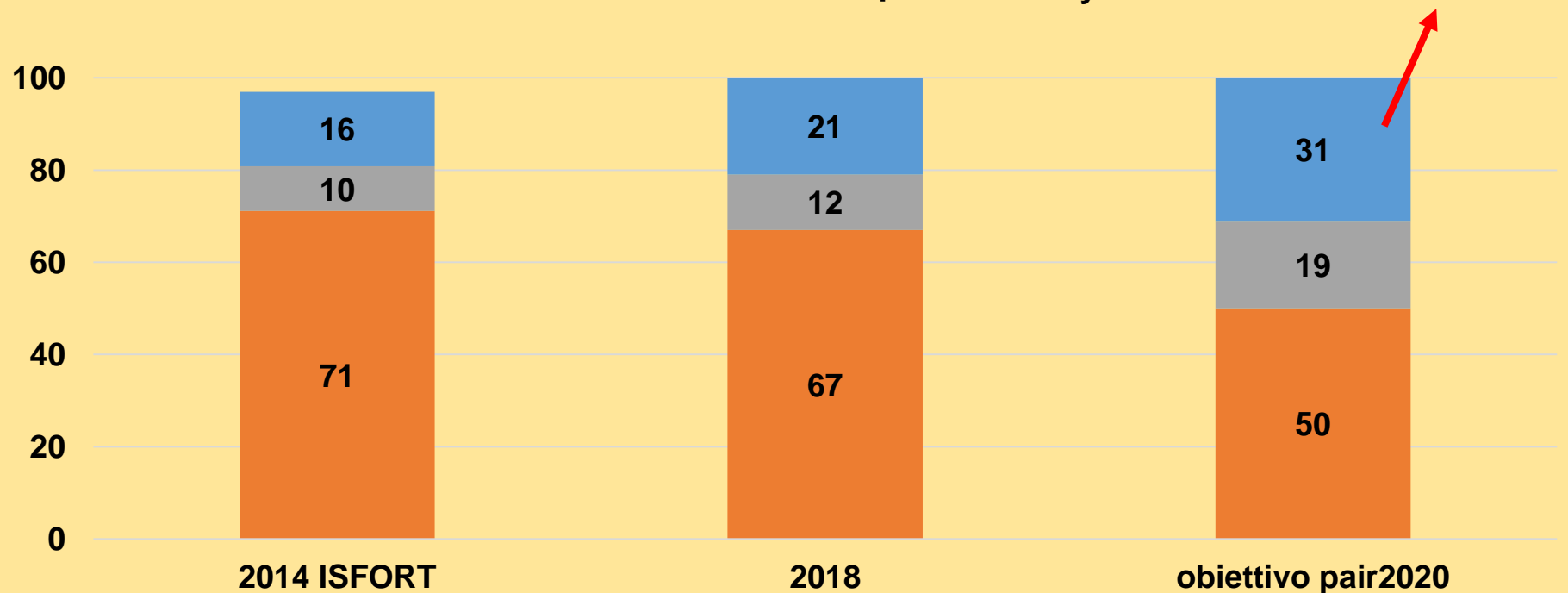
# The real world: an example from E-R PAIR2020

## Other measures

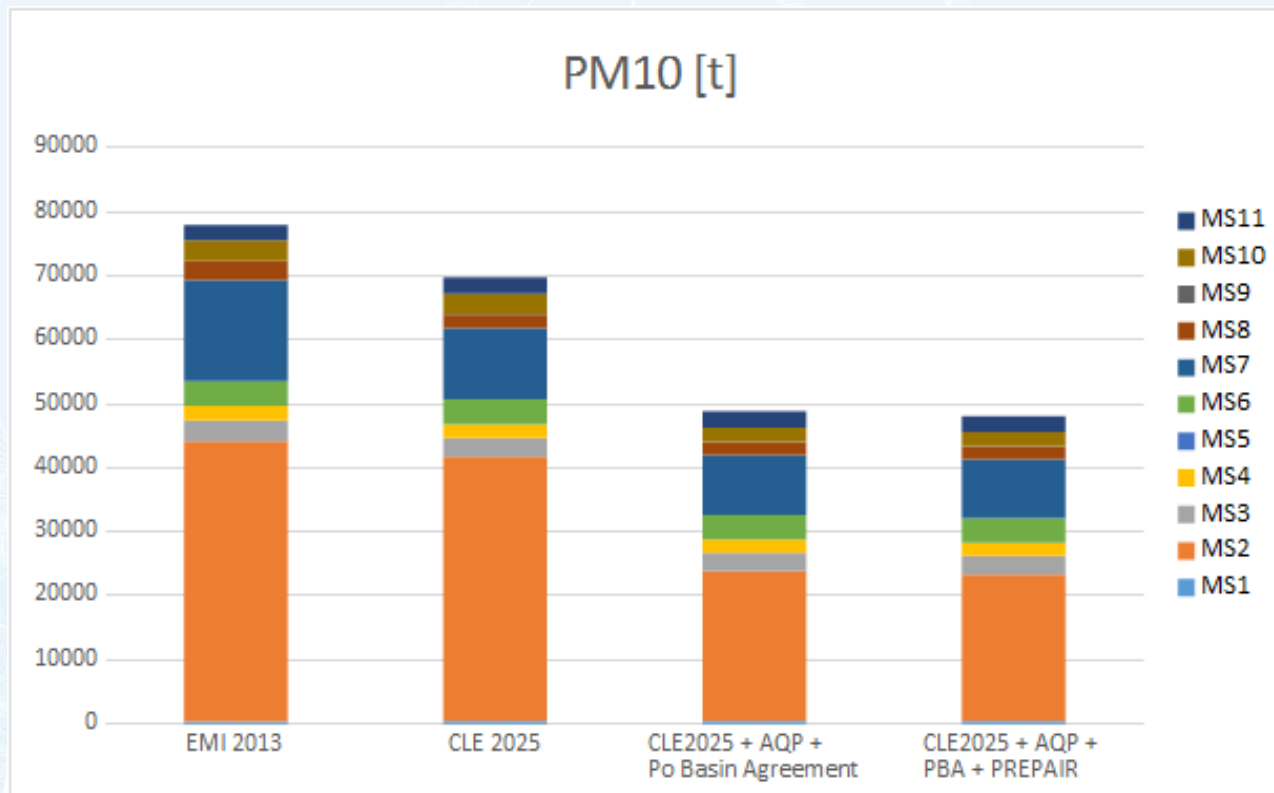
Bikes number for bike- sharing services	Cars number for car-sharing services	number of routes home-school bicibus-pedibus	replacement number of incandescent traffic light lamps with LED lamps
<b>4001</b>	<b>570</b>	<b>83</b>	<b>805</b>

## MODAL SPLIT TRAFFIC FLOWS (%)

120 — Private car and motorcycle — Public transport — Bicycle+Feet



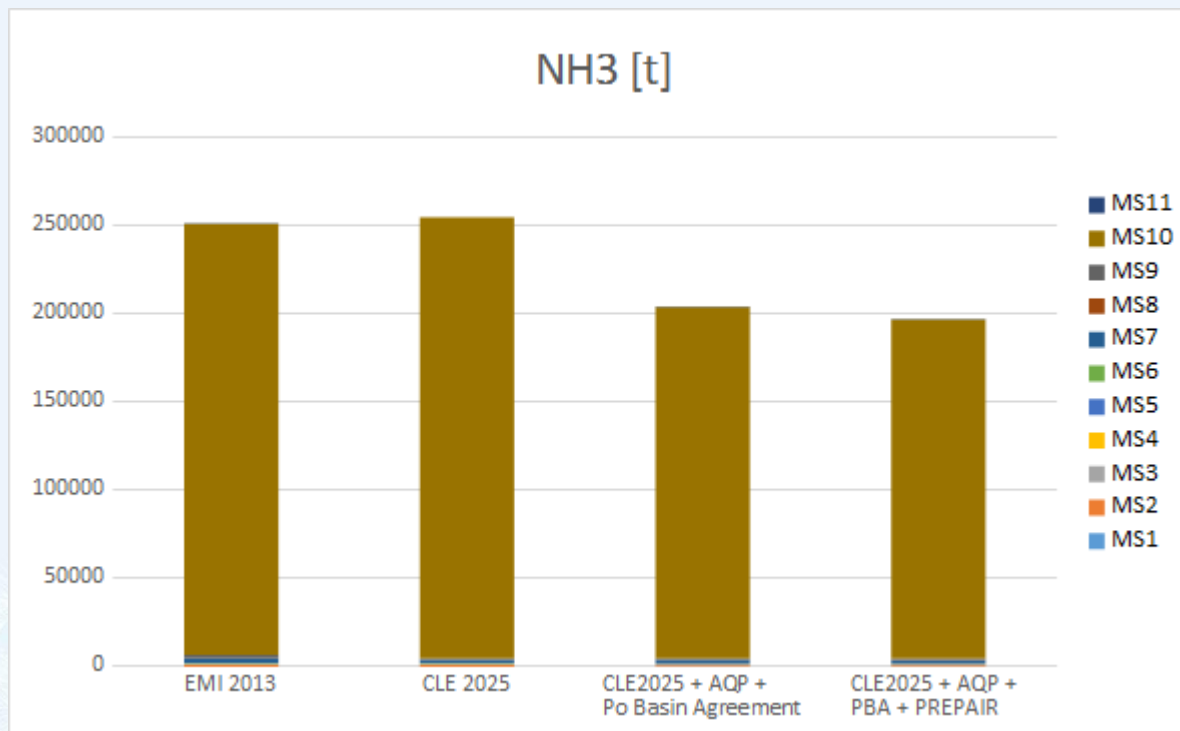
# PM10 emissions



- The reductions planned for PM10 are almost exclusively attributable to the actions of the Regional Plans and the actions of the Padano Basin Agreements,
- CLE act in a non-substantial way on this pollutant.

# PM10 emissions

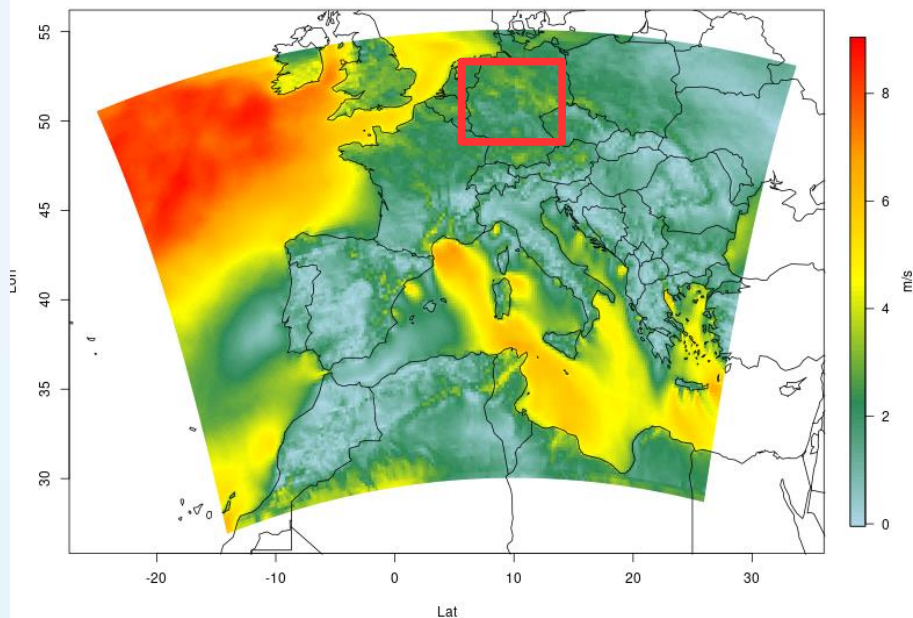
- The main share of direct PM10 emissions is attributable to MS2 (non-industrial combustion), mainly due to domestic biomass combustion.
- The increase in biomass burning is partially due to incentive policies dictated by EU and national regulations to combat climate change.
- Emissive reduction can be achieved not only through behavioral interventions (incentives and prohibitions) but mainly through the introduction of more efficient combustion technologies, the regulation of which depends on EU and National regulations.



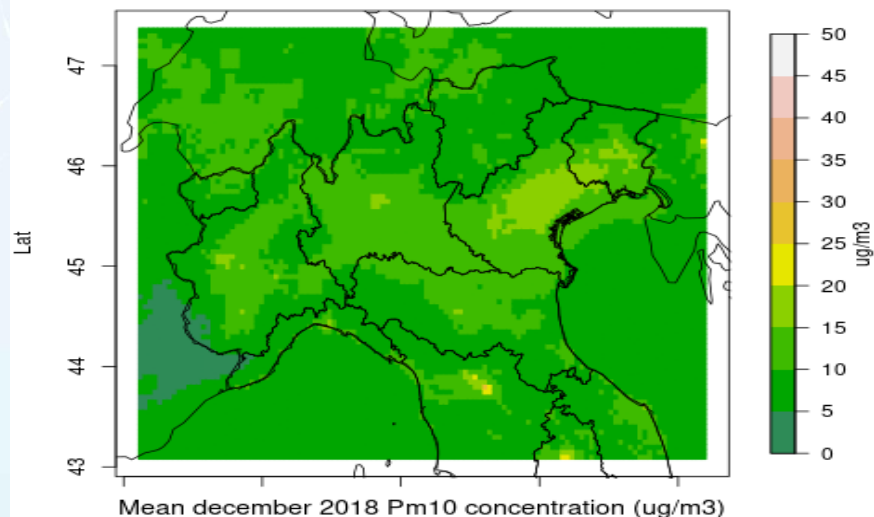
- ammonia, NH<sub>3</sub>, is emitted almost completely by MS10 (agriculture – livestock),
- CLE2025 measures do not contribute to emissive reduction.
- The reductions are due solely to the measures implemented by the regional plans, which act directly and through regionally controlled programming tools such as the Rural Development Programmes (RDP).
- it would be highly desirable for Community policies to be more effective (see the NEC policy).

# As soon as possible?

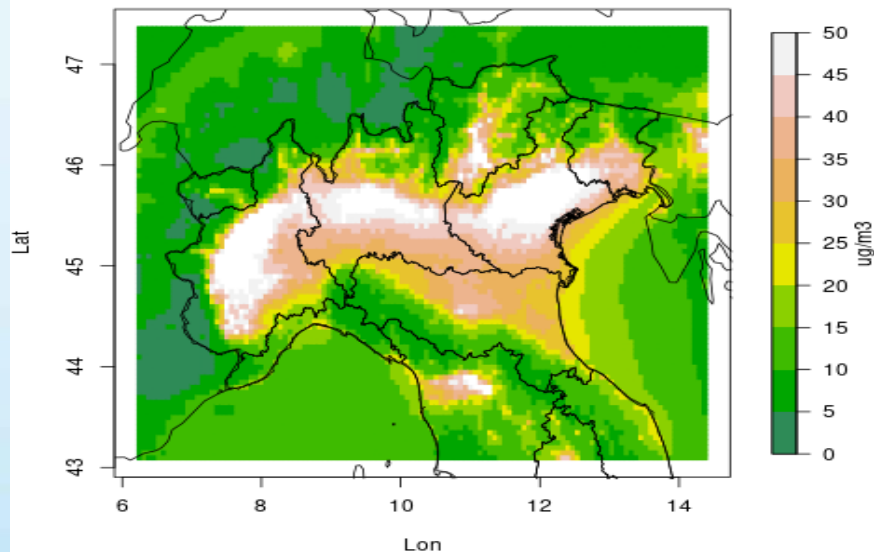
December 2018 mean 10m wind intensity ((m/s)



Mean december 2018 Pm10 concentration (ug/m3) Testcase



Mean december 2018 Pm10 concentration (ug/m3)



Simulation with different meteorology condition: high HMIX and wind:

- %PM10: - 50-70%

# Made the implementation of the AQ plans faster :

the contribution of the PREPAIR concrete actions, some examples:

- Estimating and reducing the ammonia emission in agriculture: the BAT-Tool software
- Opportunities and risks of burning woody biomass for domestic heating
- Low emission transport. Tools and actions to simplify the choice of a sustainable mobility
- Energy efficiency for buildings: the training for technicians and public officers
- Actions to promote cycling mobility
- Creation of educational pathways on air quality



## Action E5 – Creation of formal and non-formal educational pathways on air quality issues related to project objectives

- Design, test and implement educational pathways to raise awareness and strengthen knowledge about air quality issues.
- First test phase in 3 classes per region
- Implementation of the educational path in at least 20 classes per region from October 2019 (6 meetings/class)

**Beneficiario responsabile:** FLA

**Beneficiaries involved:** Piedmont Region, Trento Autonomous Province, Emilia-Romagna Region, Arpa Veneto, Piedmont Harp, Arpa Aosta Valley, Arpae

**Duration:** May 2019 to December 2020.



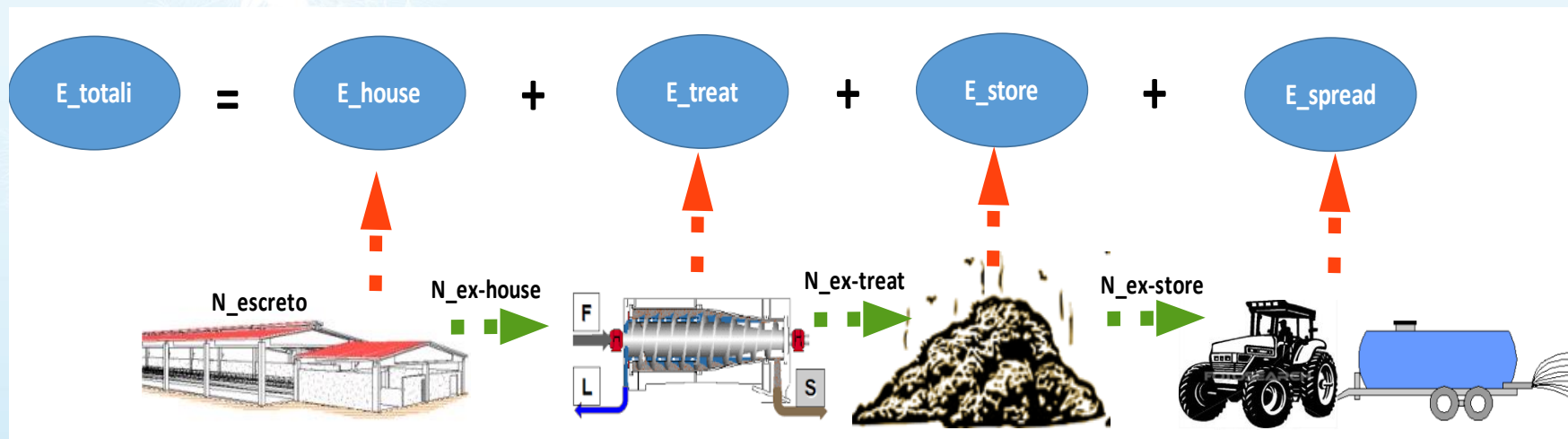
# Action C5 - Implementation of a common model for assessing gaseous emissions and odours from intensive cattle, pig and poultry farming



## BAT-TOOL

Ammonia emissions consider the following emissive stages:  
(which includes techniques applied in nutrition), treatments, effluent storage, effluent distribution

The model is based on the mass flow of nitrogen at different stages of the emissive chain, starting with excreted nitrogen



# Summarizing:

- It is possible comply the AQ LV reducing emissions on the Po valley of about 40% (NO<sub>x</sub>, PM, NH<sub>3</sub>)
- The contribution of the EU legislation to emission reduction is very important, especially for reducing NO<sub>x</sub> emissions by M7 (traffic),
- The emission reduction target request the full implementation of advanced technologies. Time is necessary. Monitoring the AQ plans is crucial (Prepair contribution), made the AQ plans faster is necessary (Prepair contribution)
- Due to the specific geomorphological and climatic conditions, the compliance to the European limits values in the Po Valley bears an element of great disparity if compared to other Member States (should be considered for the Fitness check)

