

***The implementation of regional air quality plans:  
nitrogen oxides and PM assessment  
through RAINS-Italy and local models***

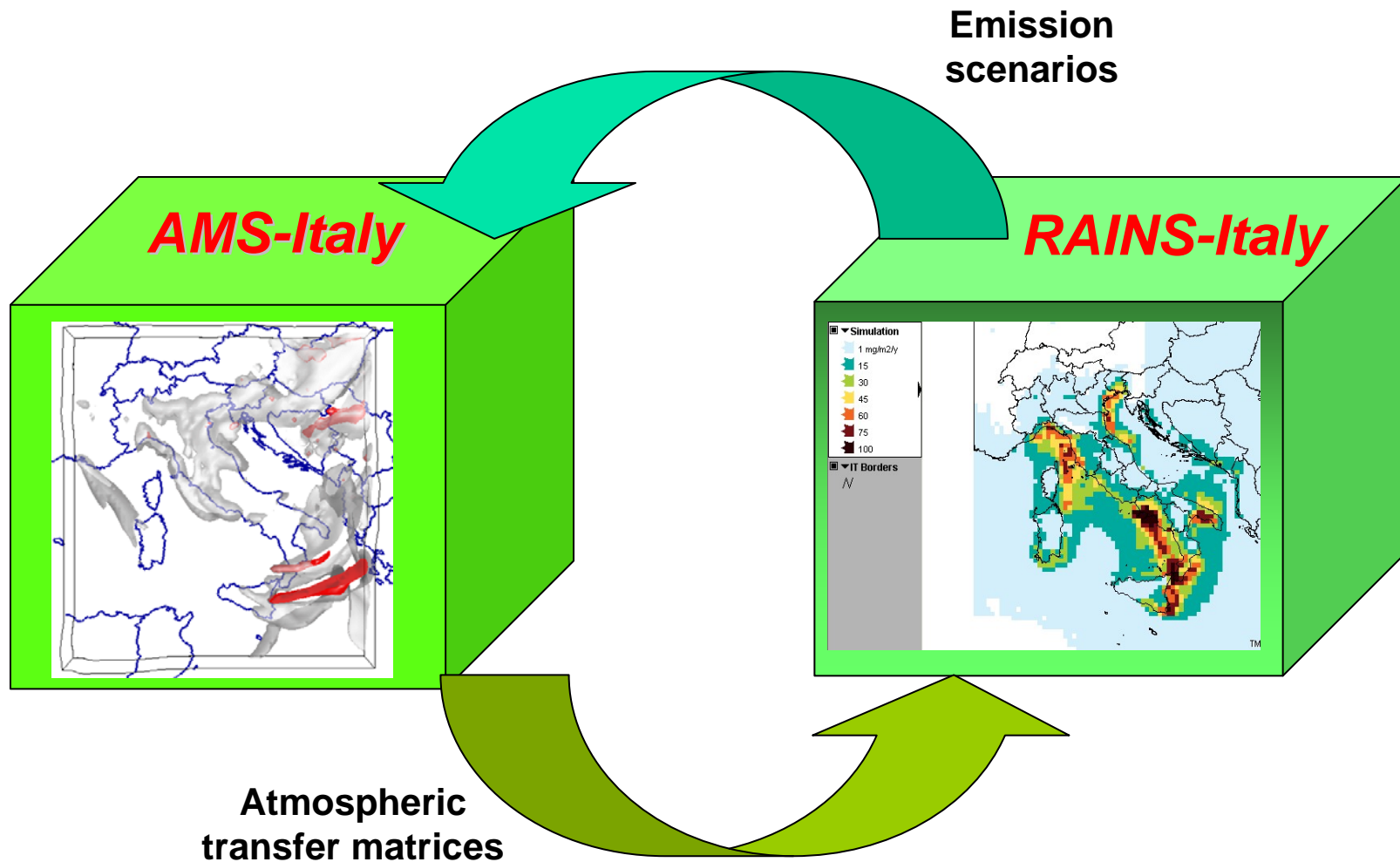
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F. Sordi<sup>x</sup>, P. Radice\*, G. Truffo<sup>x</sup>, G. Arduino<sup>x</sup>, T. Pittini\****

*\*ARIANET, Milano*

*+ENEA, Roma*

*°APAT, Roma*

*<sup>x</sup>Regione Piemonte, Torino*



## EU “Framework” Directive on ambient air quality assessment and management and Daughter Directives

- Air quality standards – LV and MOT
- Current status + policy scenarios

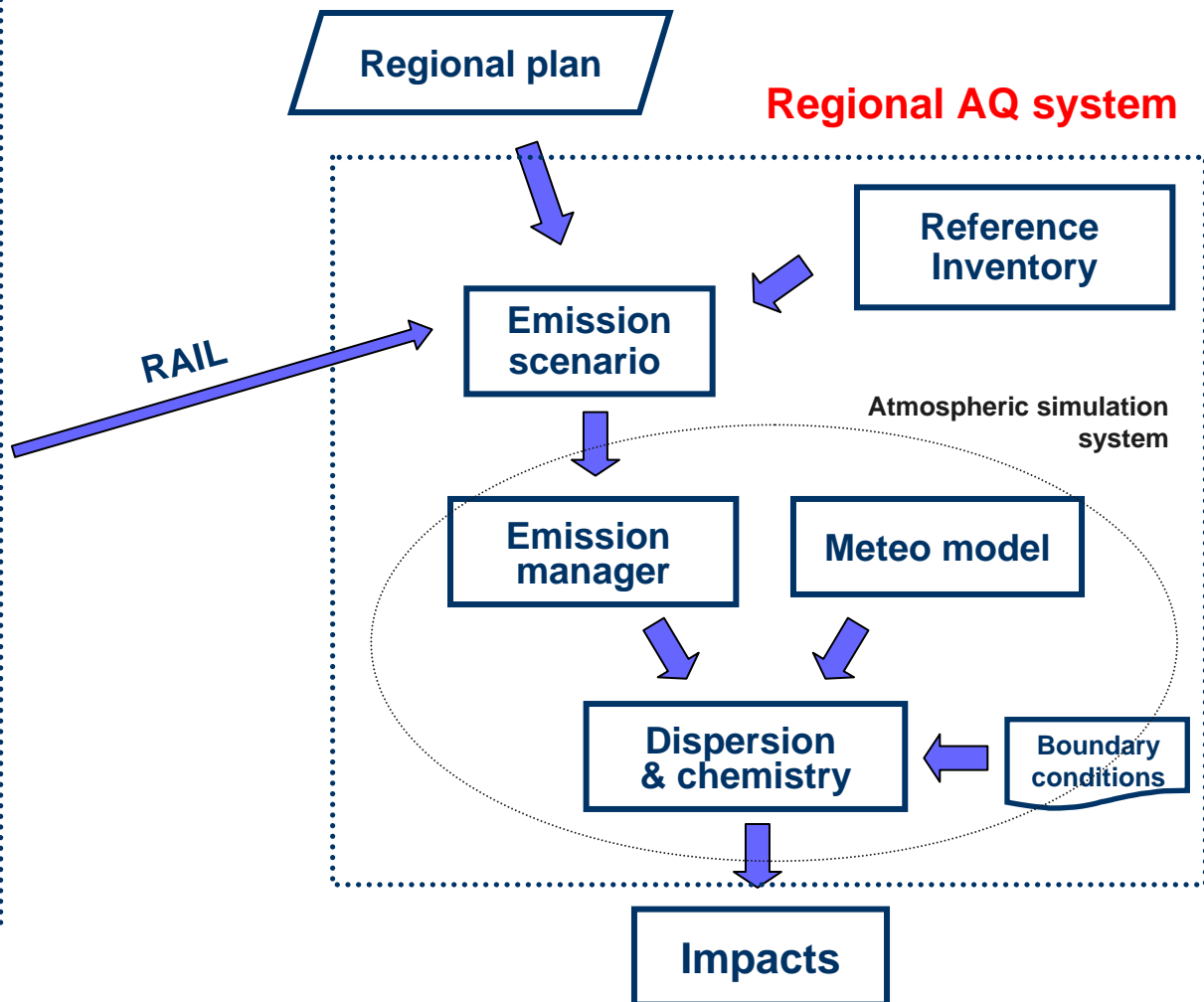
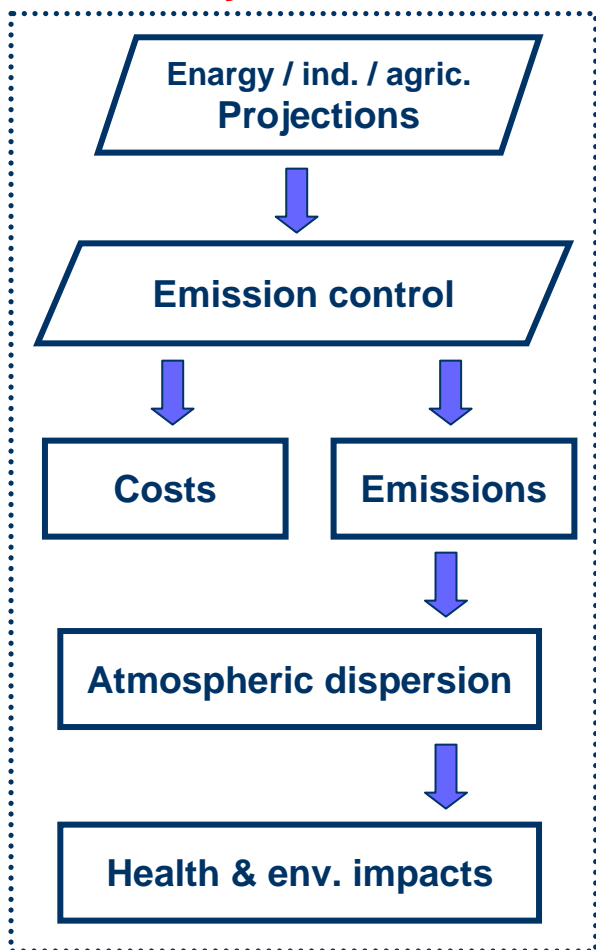
Italy: **regional** plans

Regional decision maker: ... LV will be respected?  
... role of local measures?

Develop coherent evaluations, taking into account:

- **local** features (sources, topography & land-use, meteorology...)
- broader **context**

## RAINS-Italy



1. **Inventories harmonization**: REI (Regional Emission Inventory) vs. RAINS-Italy, for baseline year
2. **Projected emission scenario**: RAINS-Italy CLE, downscaled at municipality level using REI
3. **Regional Plan emission scenarios**: translation (at municipality level) of local measures
4. **Impacts on concentrations**: simulation through regional 3D atmospheric modelling system

*Ongoing process, promoted by the Ministry of the Environment,  
with the progressive involvement of regional governments*

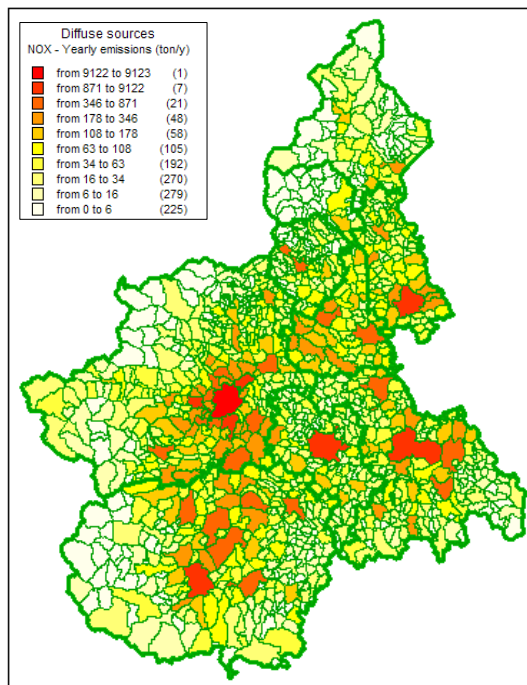
## Piemonte case

## Regional Air Quality System



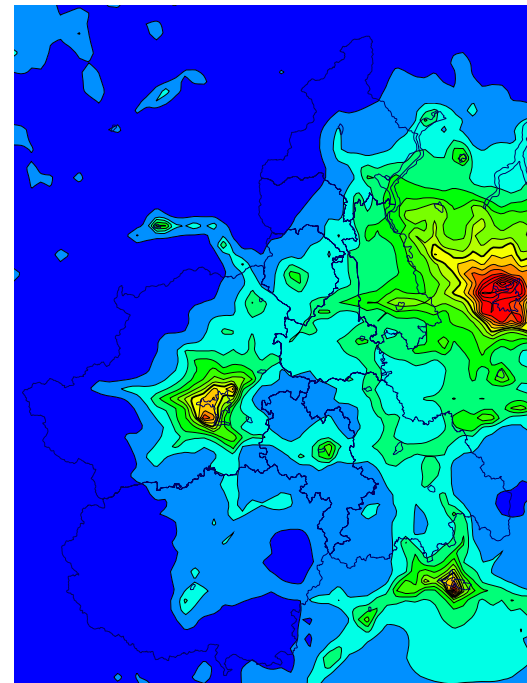
**Major issues:**  
**NO<sub>2</sub>, PM<sub>10</sub>, O<sub>3</sub>**

**Emission inventory**



1200 munic.

**AMS**



4 km res.

**Routinely used:**

- yearly air quality evaluation (since 2004)
- regional & urban air quality forecast (4 & 1 km, since 2005)

## Heating

- energy efficiency (new & renovated)
- boilers: efficiency & emission limits
- ban of dirtier fuels (coal and distillate oil)
- incentives for solar heating for sanitary water
- district heating expansion

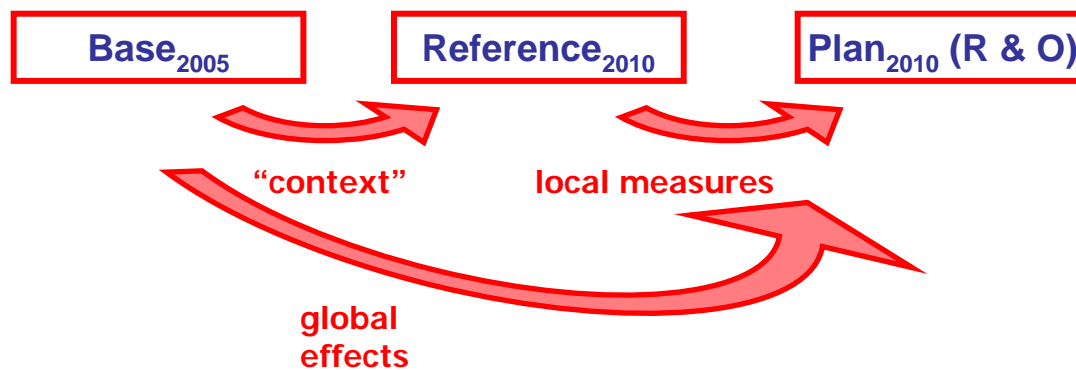
## Transport

- whole region: progressive ban of the most polluting vehicles
- “Plan Zones”: restricted traffic zones in municipalities > 10000 inh.
- adoption of DPF (diesel particles filters)





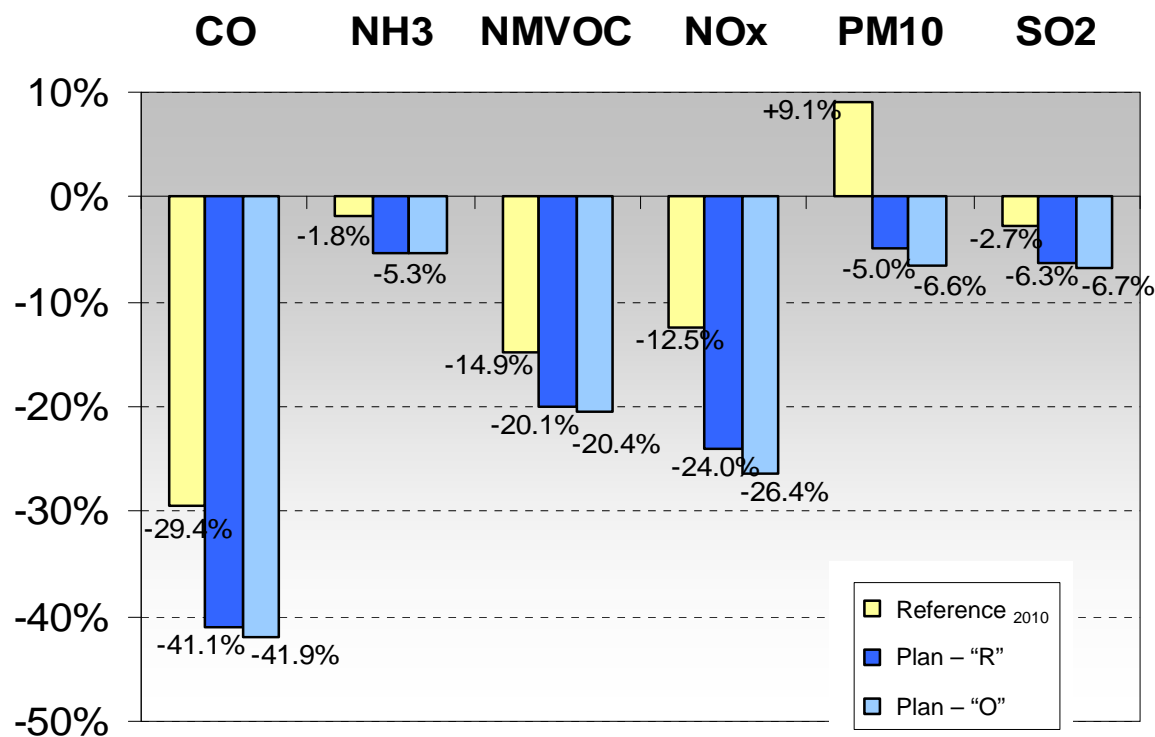
## Piemonte case Effects on emissions



## Regional level

Variations for “**Plan 2010**” scenarios respect to “**Base 2005**”

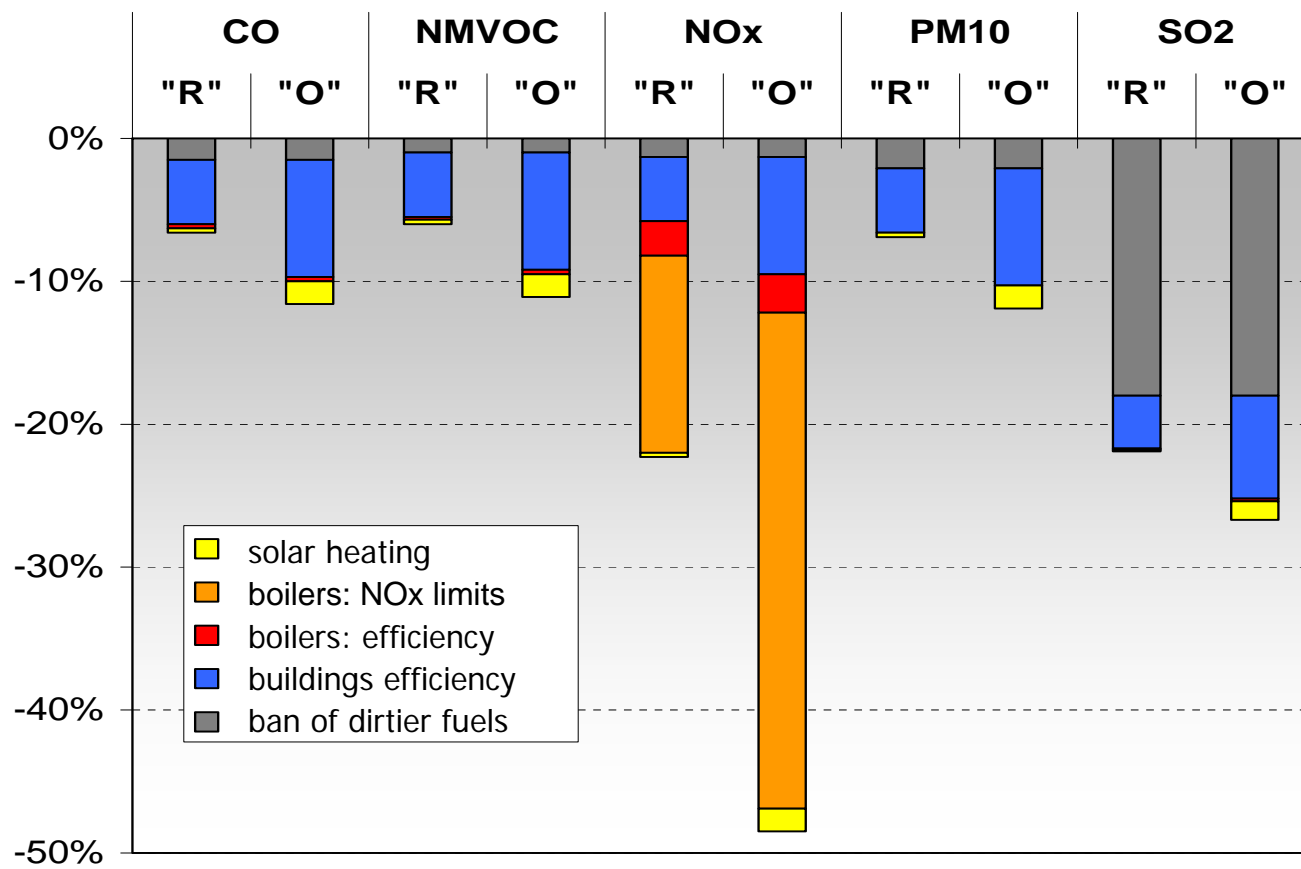
(all categories)



(CLE + local measures)

## Detail on individual measures - Heating

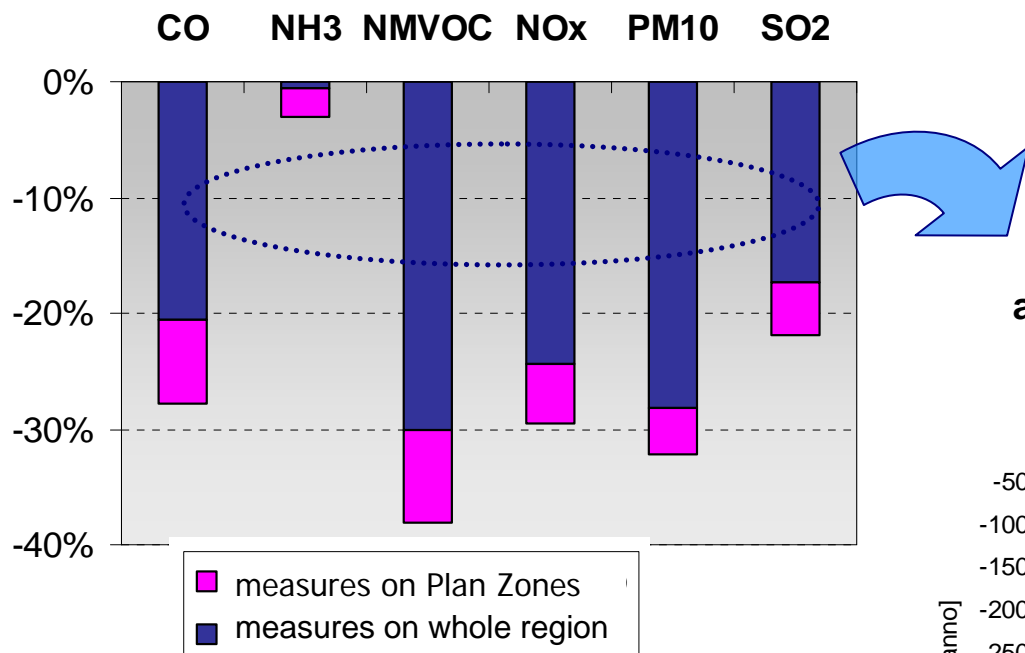
**“Plan 2010” vs. “Reference 2010” variations, by measure**



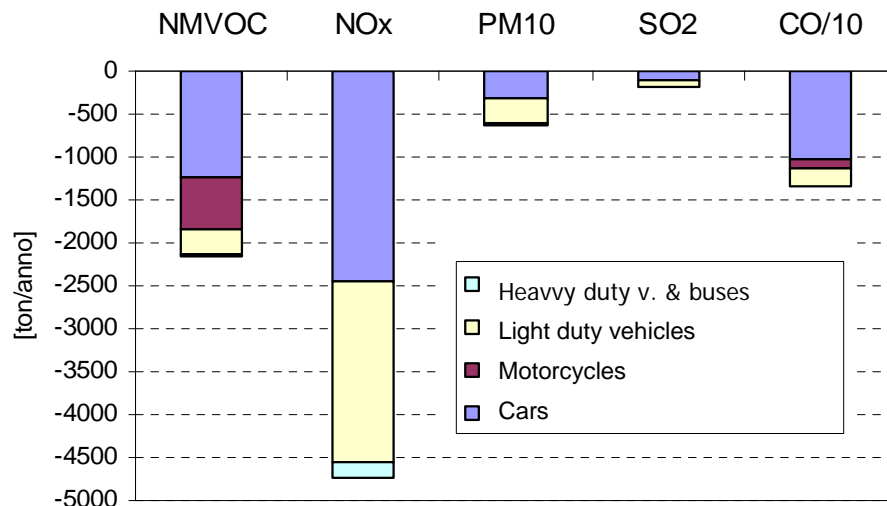
(local measures)

## Detail on individual measures - Mobility (examples)

“**Plan 2010**” vs. “**Reference 2010**” variations, by type



Measures on whole region:  
absolute contributions by vehicles categories

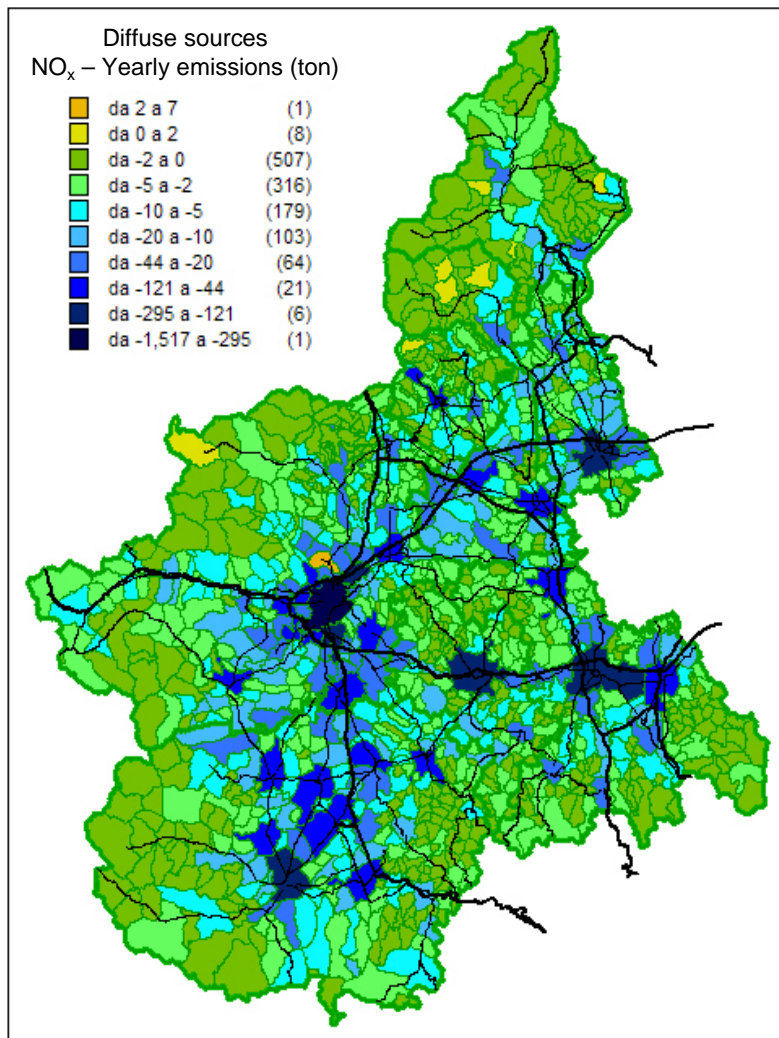


(local measures)

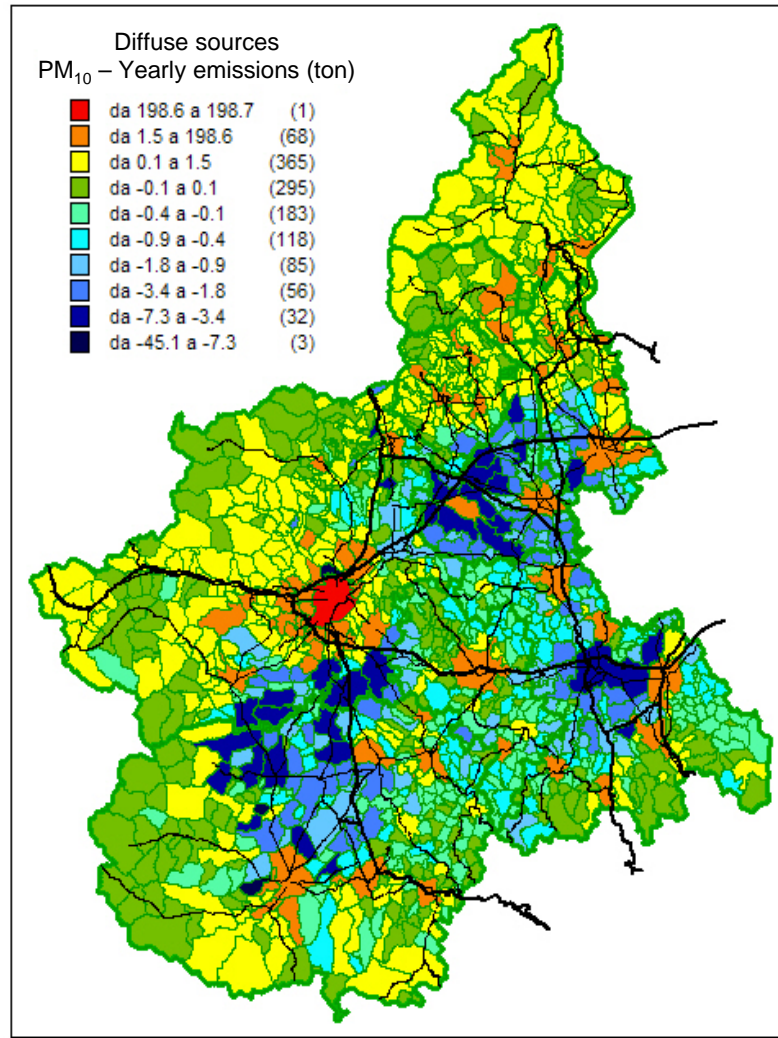
## Details on municipalities (examples)

Variations “**Base 2005**” ⇒ “**Reference 2010**”

### NO<sub>x</sub>

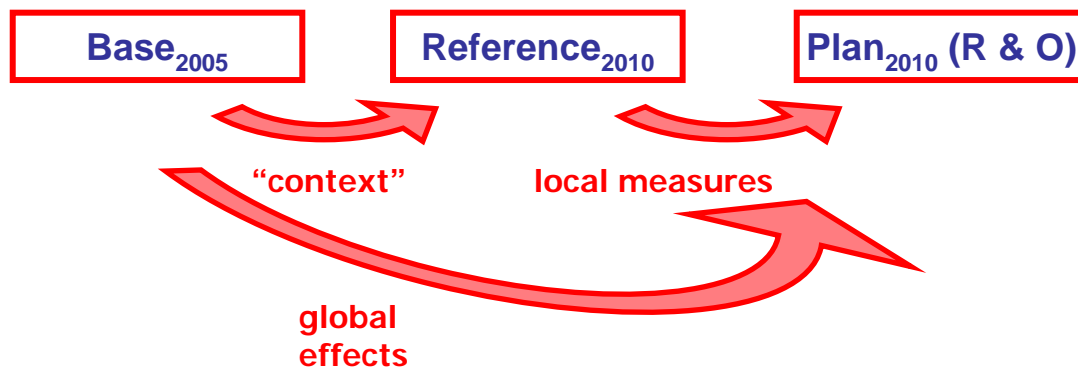


### Primary PM<sub>10</sub>



## Piemonte case

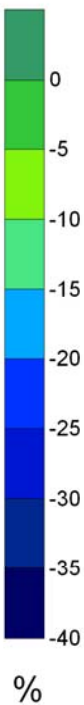
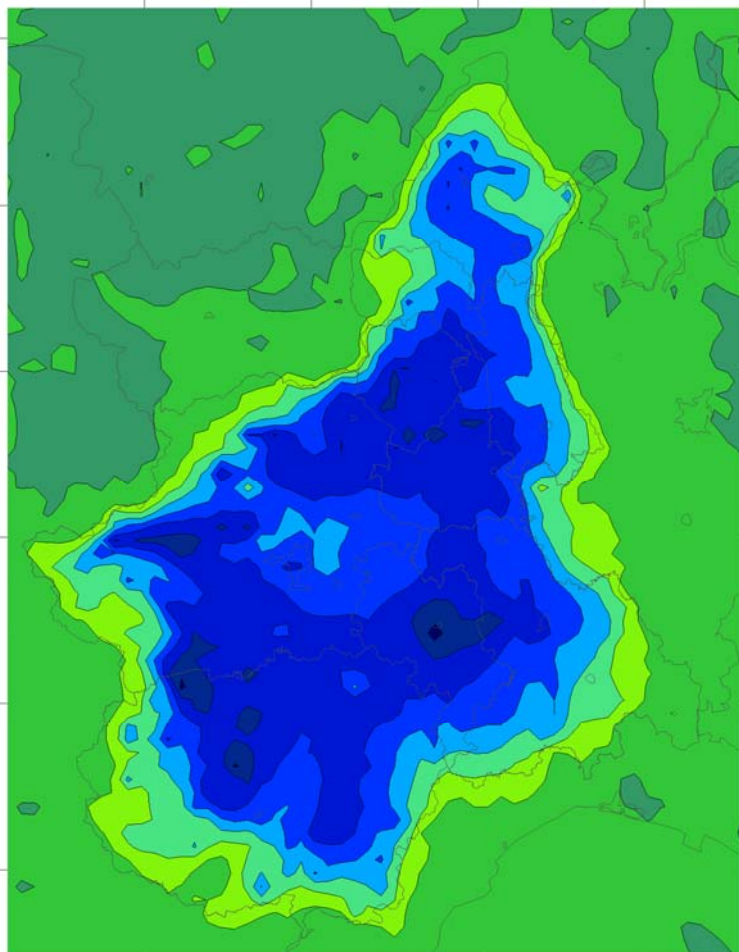
### Effects on concentrations



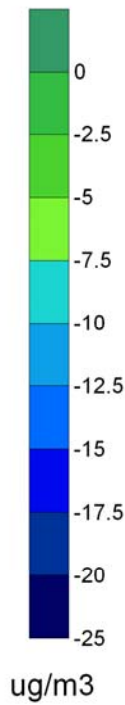
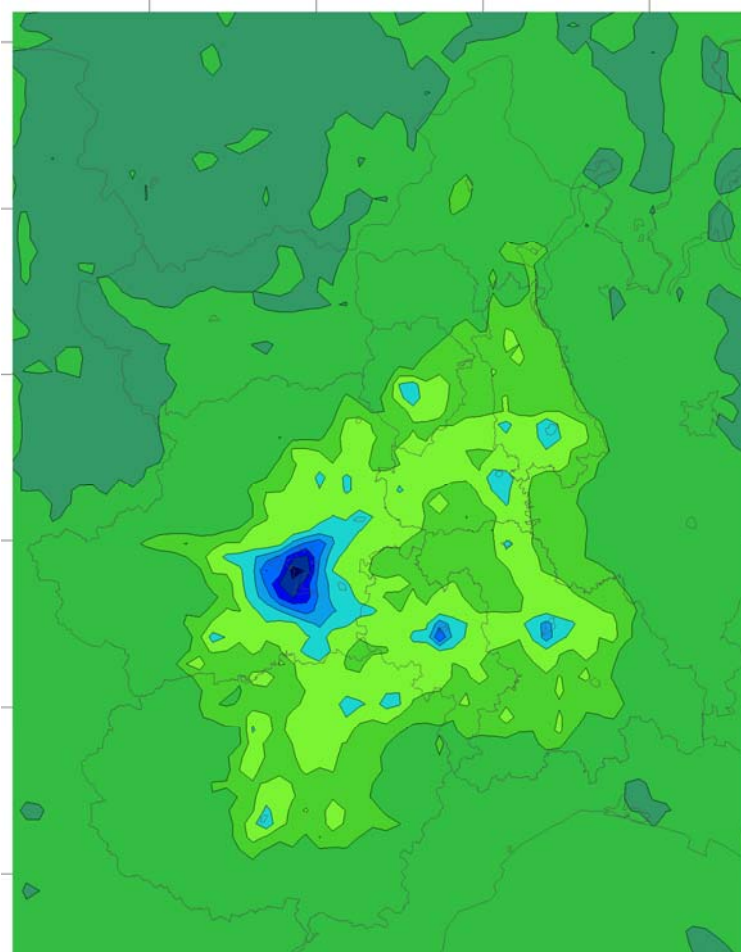
# NO<sub>2</sub> concentrations, yearly averages

**“Plan-R 2010” vs. “Baseline 2005”**  
(CLE + local measures)

*Relative variation*



*Absolute variation*

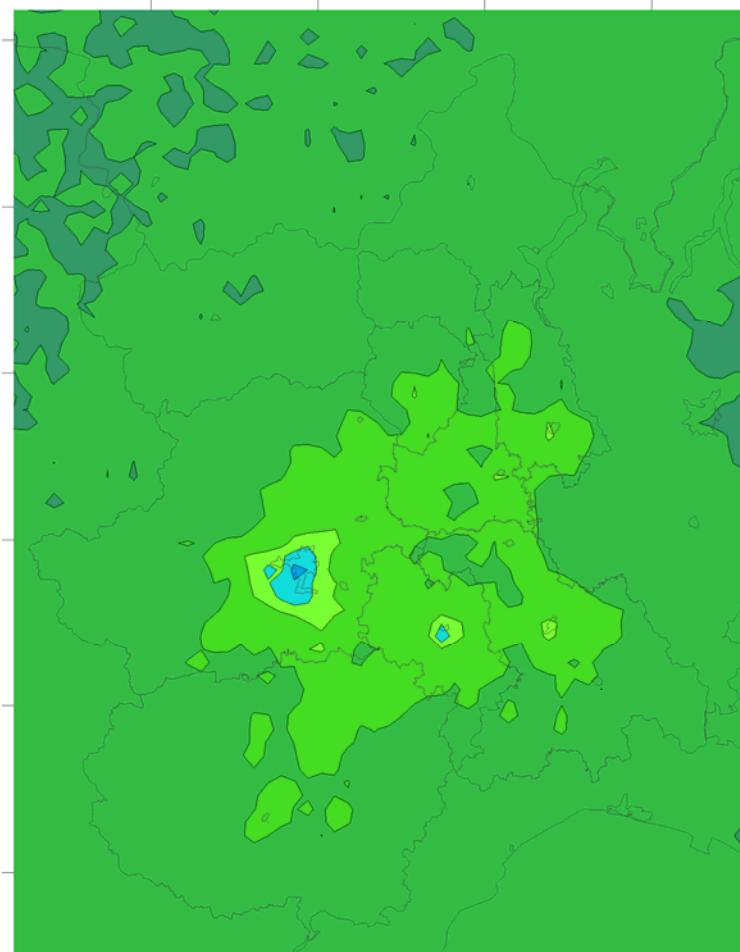
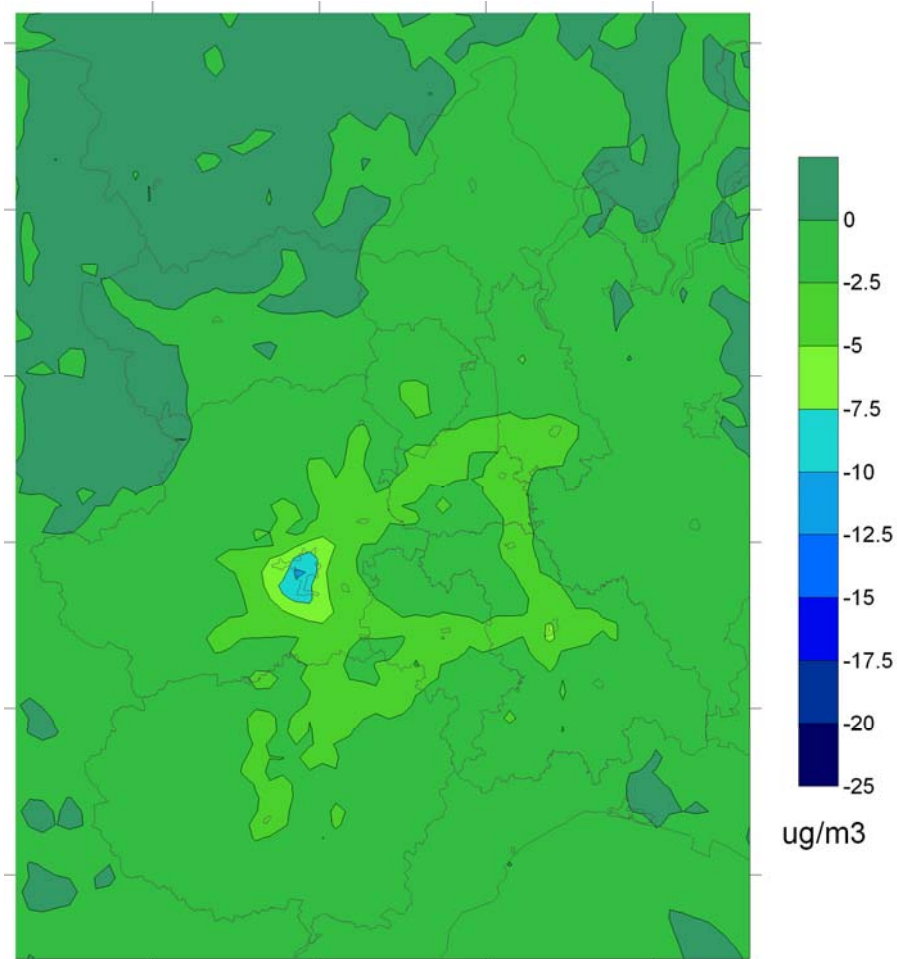




# NO<sub>2</sub> concentrations, yearly averages

**“Reference 2010” vs. “Baseline 2005”**  
(CLE)

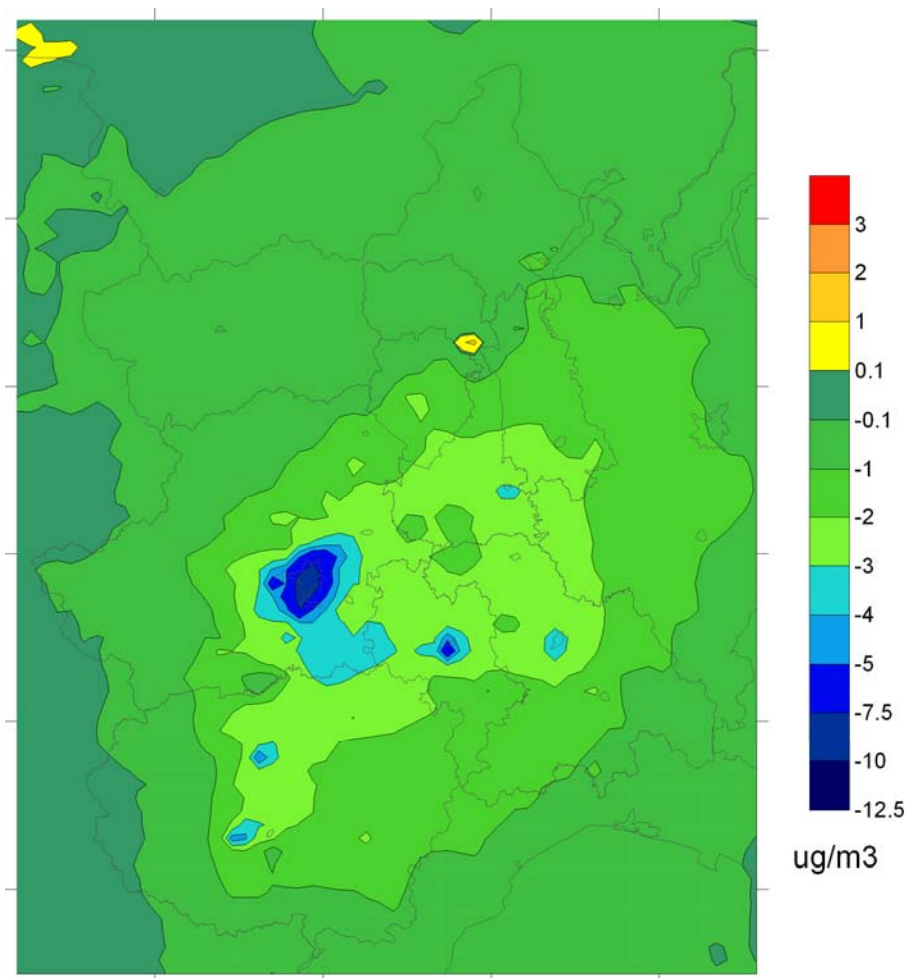
**“Plan-R 2010” vs. “Reference 2010”**  
(local measures only)





PM<sub>10</sub> concentrations, yearly averages

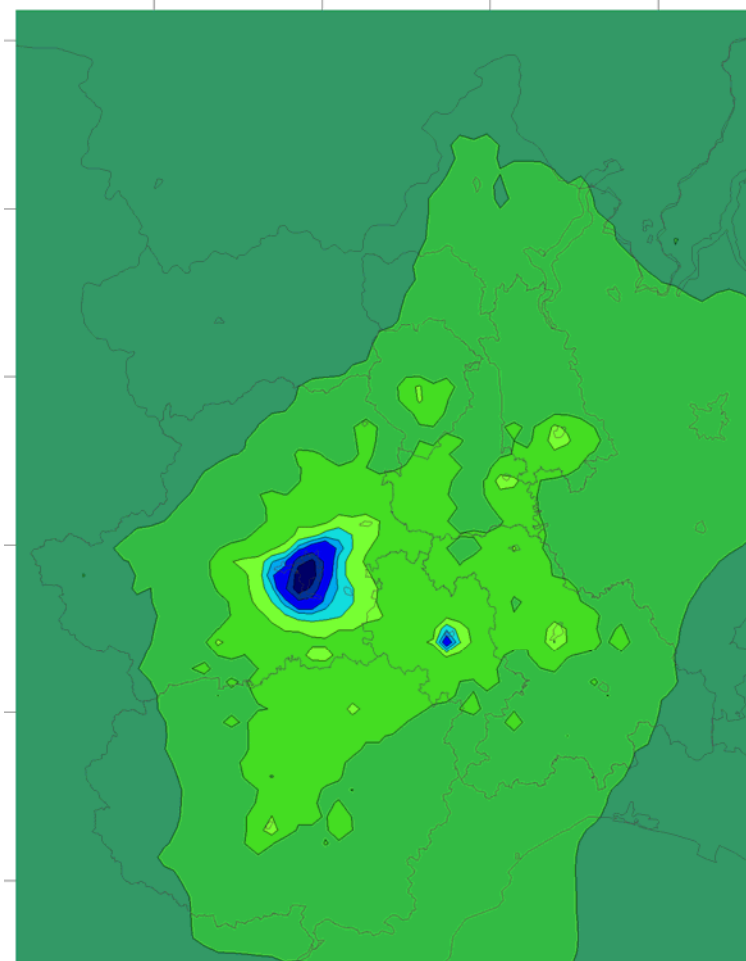
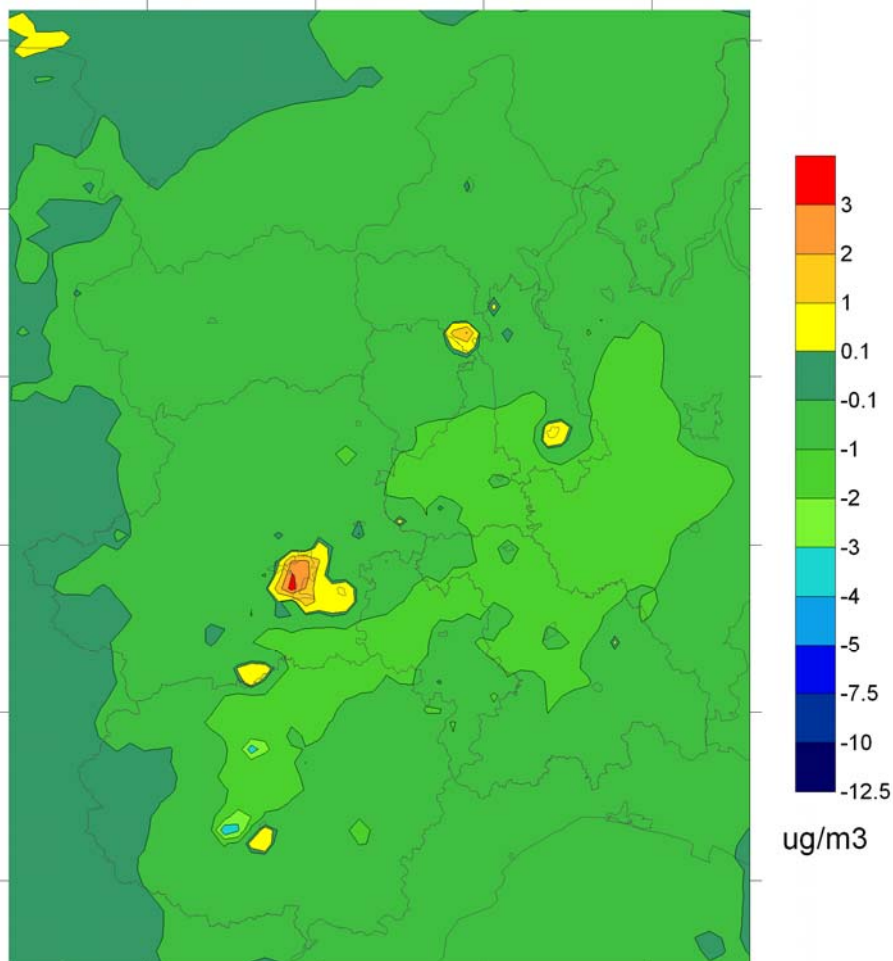
**“Plan-R 2010” vs. “Baseline 2005”**  
(CLE + local measures)



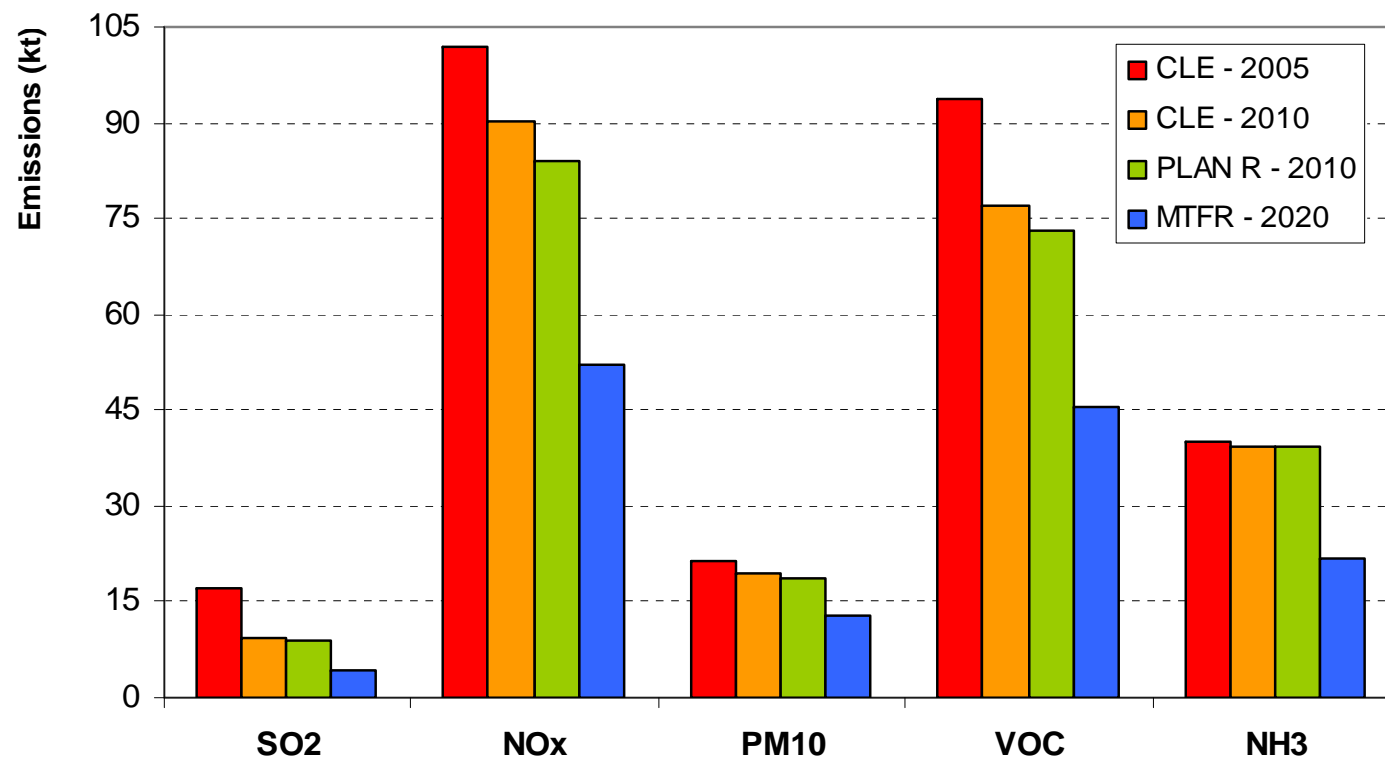
# PM<sub>10</sub> concentrations, yearly averages

**“Reference 2010” vs. “Baseline 2005”**  
(CLE)

**“Plan-R 2010” vs. “Reference 2010”**  
(local measures only)



# Room for improvement?



*(RAINS – technical measures)*

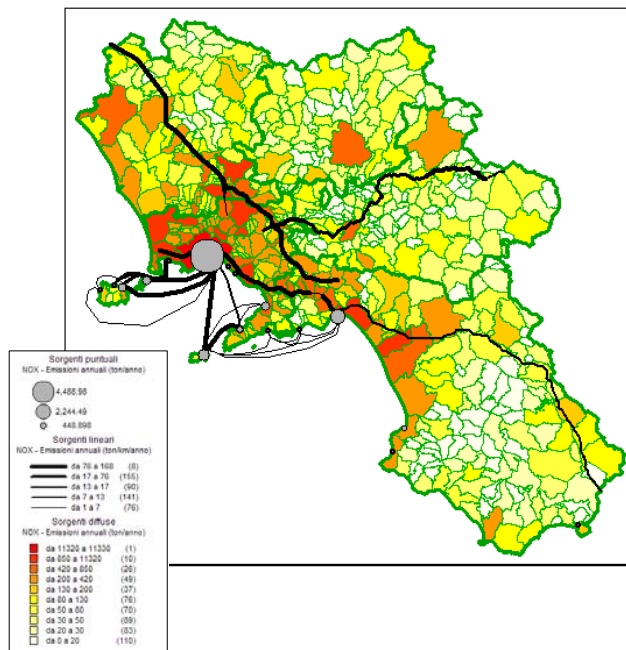
## Campania case

## Regional Modelling System

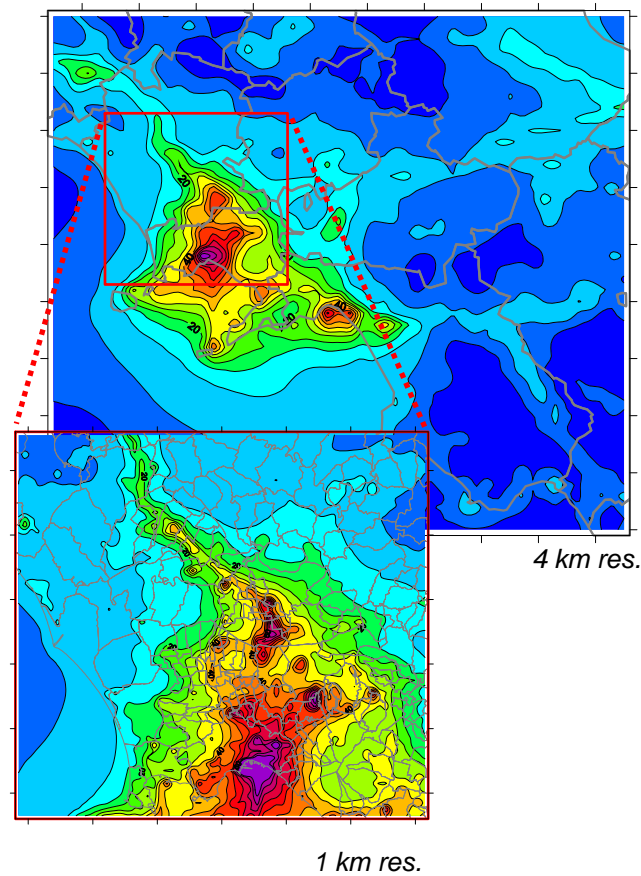


Major issues:  
NO<sub>2</sub>, PM<sub>10</sub>, O<sub>3</sub>

Emission inventory



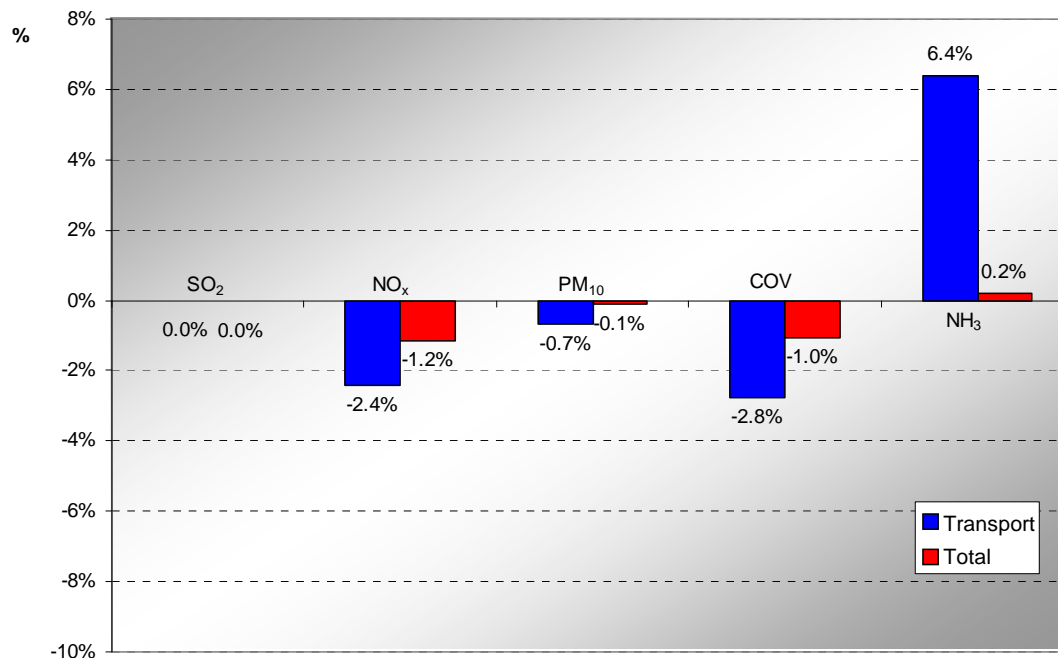
Downscaled AMS-Italy



## Measures at 2010

- renovation of public buses fleet
- enhancement of regional railway system
- “sea metro”
- traffic bans on selected days (Naples & surroundings)
- restricted traffic zone in Salerno

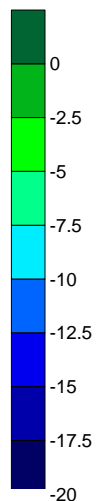
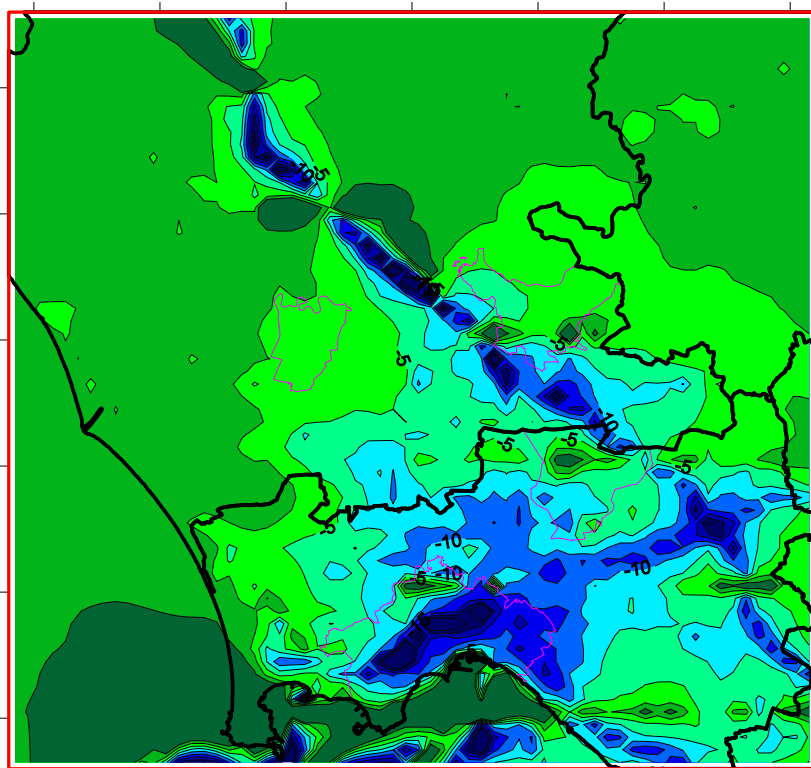
## Effects on emissions: “Plan 2010” vs. “Reference 2010” variations



# “Plan 2010” vs. “Baseline 2002”

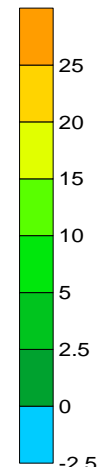
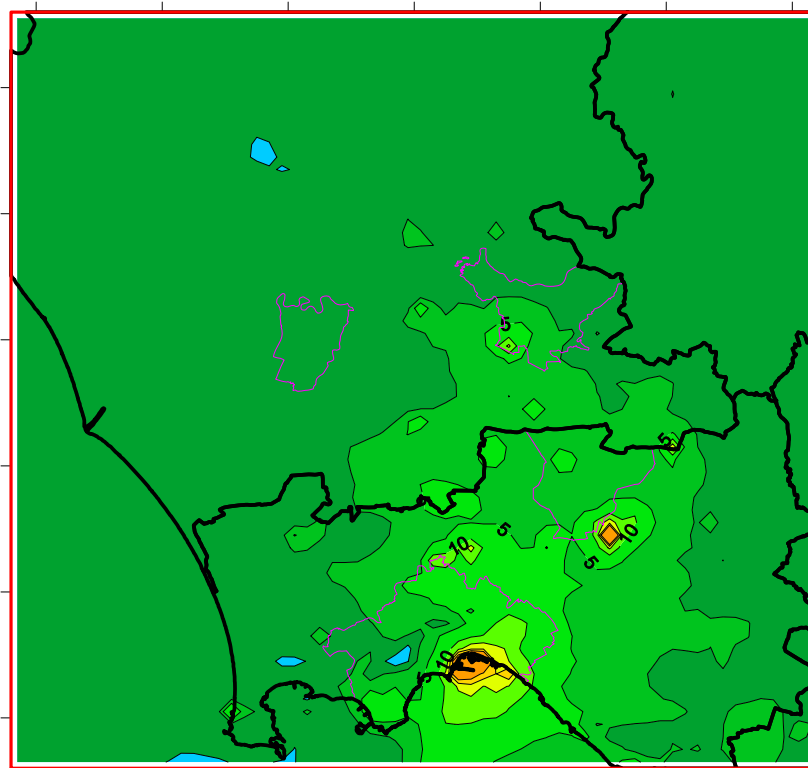
Yearly averages (absolute variations)

NO<sub>2</sub>



ug/m3

PM<sub>10</sub>



ug/m3

### “... implementing integrated N policies: difficulties & suggestions”

- **There is room for local, coordinated policies**
- **... supported by regional- and urban-scale analyses** (spatial details, hotspots)
- **... linked to broader context**
- **... multiple models: need of consistent tools & data - harmonization**
  
- **Long-term perspective** (4/5 years...)
- **Lack of multidisciplinary connections** (e.g. mobility, agriculture)  
**especially on “quantitative approaches”**
- **... Italian peculiarity?**



## Contributions

***G. Calori, P. Radice, T. Pittini, G. Brusasca***



***T. Pignatelli, G. Vialetto, I. D'Elia***



***M. Contaldi***



***C. Contardi, F. Sordi, G. Truffo,  
G. Arduino, A. Benedetti***



Direzione Tutela Ambientale  
Settore Risanamento Acustico  
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## Sponsorship

