



Regione  
Lombardia



# Air quality and climate actions: analysis and perspectives in Lombardia Region

Guido Lanzani

Head of Air Quality Unit - Environmental Monitoring Area  
Arpa Lombardia [g.lanzani@arpalombardia.it](mailto:g.lanzani@arpalombardia.it)

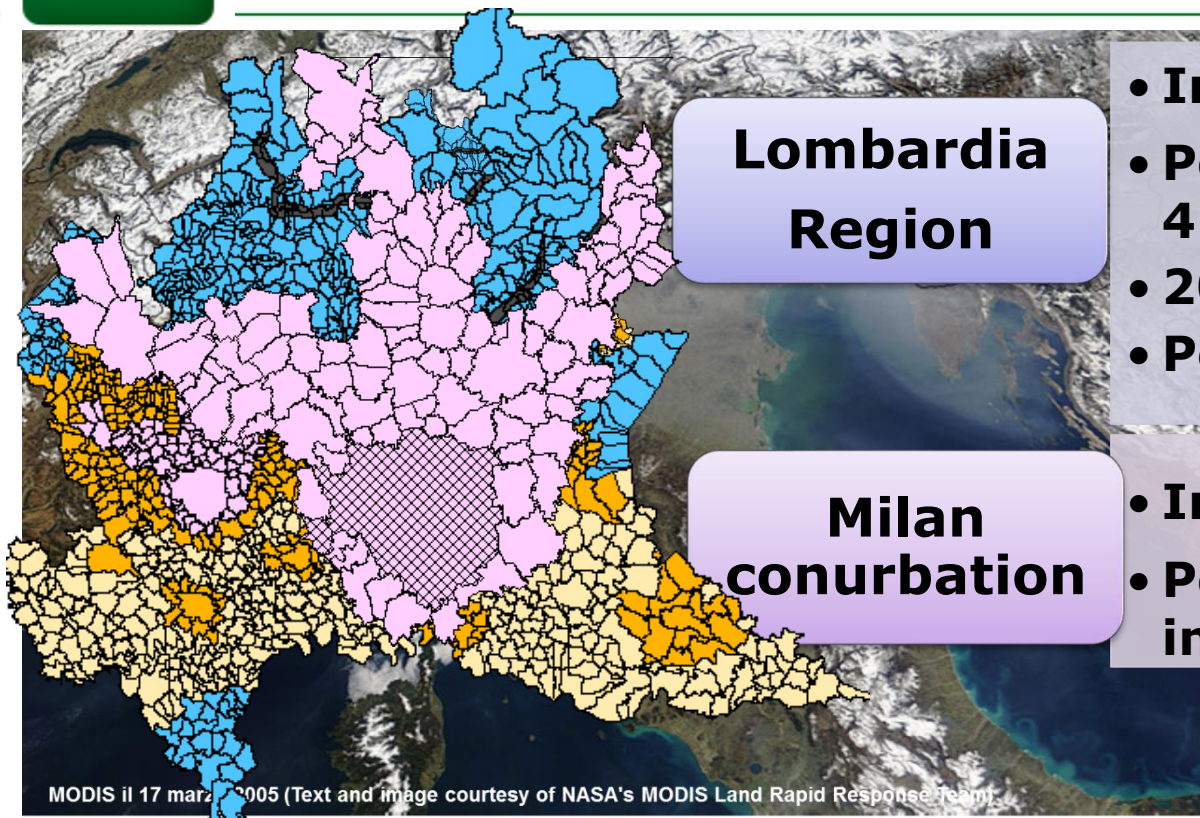
Gian Luca Gurrieri

Head of Air Quality and Climate Unit  
Regione Lombardia [gian\\_luca\\_gurrieri@regione.lombardia.it](mailto:gian_luca_gurrieri@regione.lombardia.it)

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# Milano and Lombardia: Where and how many



**Lombardia  
Region**

- **Inhabitants: 9,9 milion**
- **Population density: 419inab/km2**
- **2017 GDP: 366 M Euro**
- **Per capita GDP 37.000 Euro**

**Milan  
conurbation**

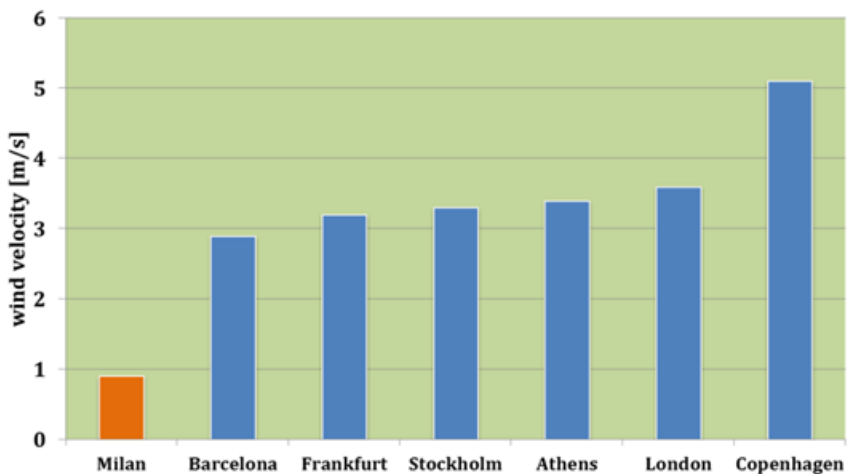
- **Inhabitants: 3,6 milion**
- **Population density: 3141 inab/km2**

- Po Valley: closed by mountains exceeding 2500 m a.s.l. on three sides (highest peaks exceeding 4000 m a.s.l.)
- Meteorological conditions often adverse to air pollution dispersion



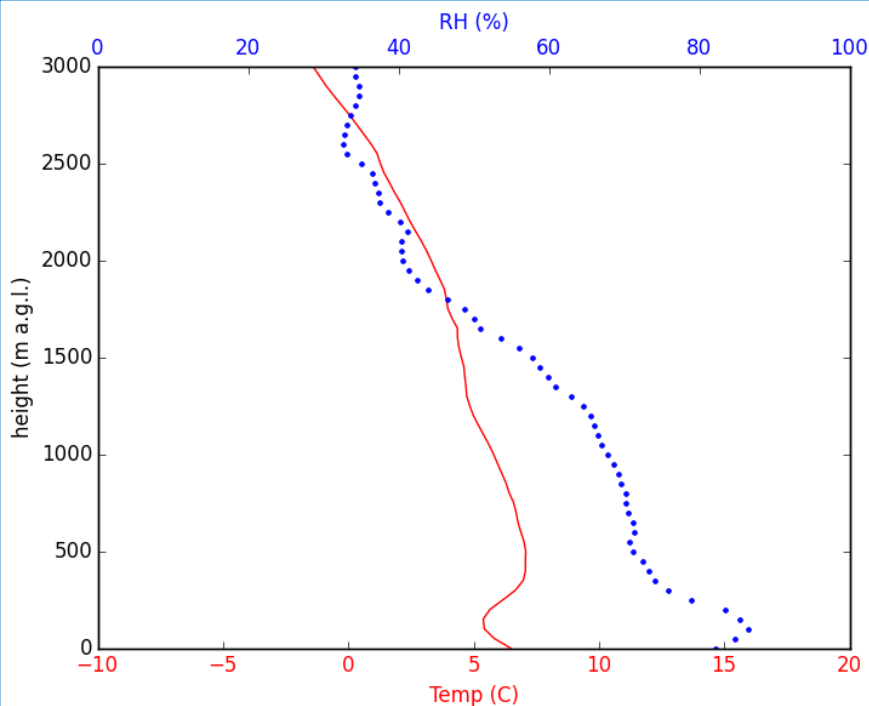
# Meteorological conditions often adverse to air pollution dispersion

Wind velocity



**Lack in wind**

**comparison 20 years annual average wind**



**Frequent very stable thermal conditions**

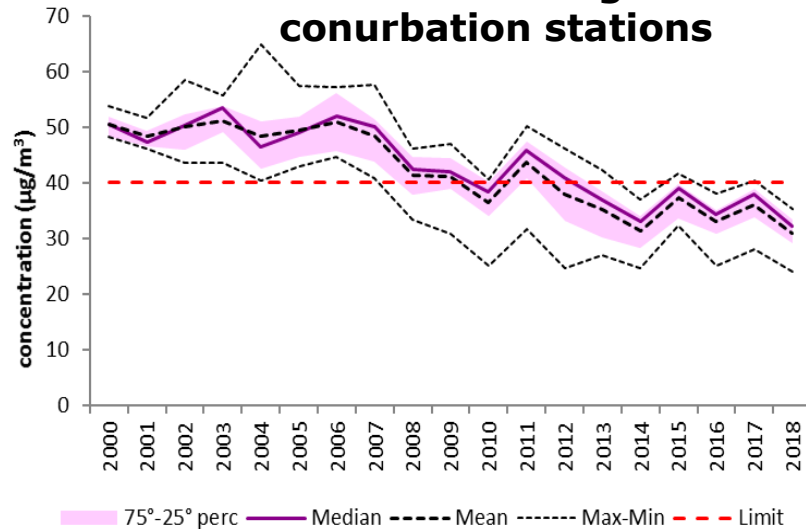
MI-Linate December 2015  
Monthly mean temperature and humidity at 12:00 GMT



# Air Quality

## Concentrations are decreasing but

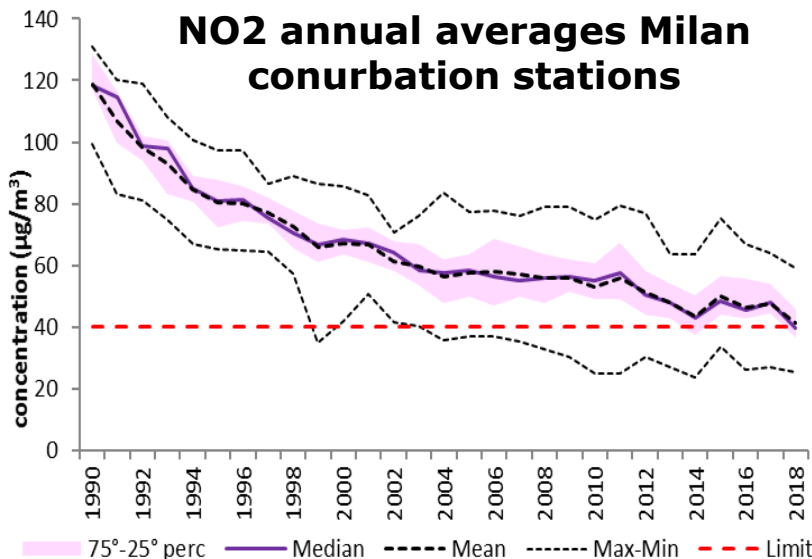
### PM10 annual averages Milan conurbation stations



- Widespread **PM10** daily limit exceedances (42-79 in Milan in 2018)

- NO2** annual limit exceedances, especially in traffic stations (2018 worst annual mean 59 µg/m3)

### NO2 annual averages Milan conurbation stations

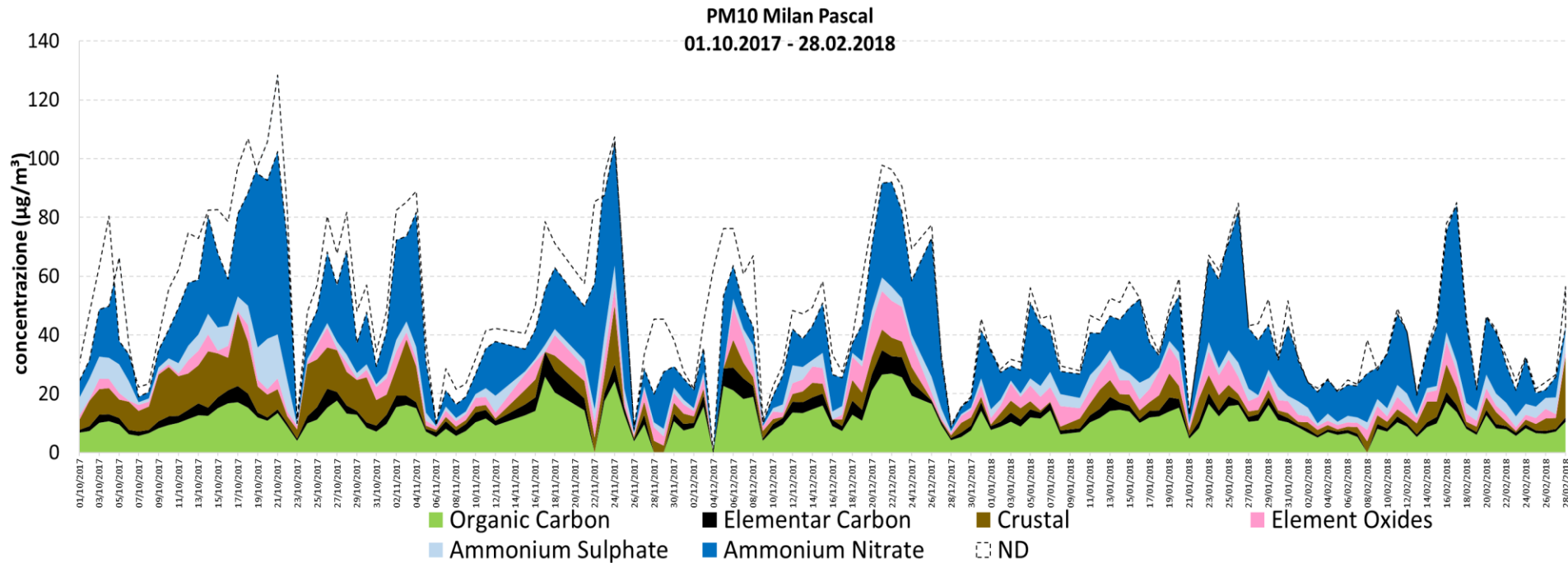


- B(a)P** standard non achieved where wood burning is more diffuse(outside downtown)
- Widespread exceedances of both health and vegetation **Ozone** protection standards (above all leeward of the town)



# Milan PM composition

## Urban background station annual average



- The scale of secondary PM is the whole basin
- Local actions alone are not very effective for secondary PM
- It is necessary to limit precursors emissions, s.a.  $\text{NO}_x$  in basin and  $\text{NH}_3$ , too



# Lombardia Emissions (by sector)

Sector	NO <sub>x</sub>	NH <sub>3</sub>	PM10	CO <sub>2</sub> eq
Energy production and refineries	5 %	0 %	1 %	16 %
Residential combustion	9 %	0 %	43 %	20 %
Industrial combustion	17 %	0 %	9 %	17 %
Production processes	1 %	0 %	3 %	4 %
Extraction and distribution of fuels	0 %	0 %	0 %	3 %
Solven use	0 %	0 %	6 %	4 %
Road Transport	53 %	1 %	25 %	25 %
Other mobile sources	11 %	0 %	3 %	2 %
Waste treatment and disposal	3 %	1 %	0 %	4 %
Agriculture	1 %	98 %	6 %	12 %
Other sources and sinks	0 %	0 %	4 %	-7 %

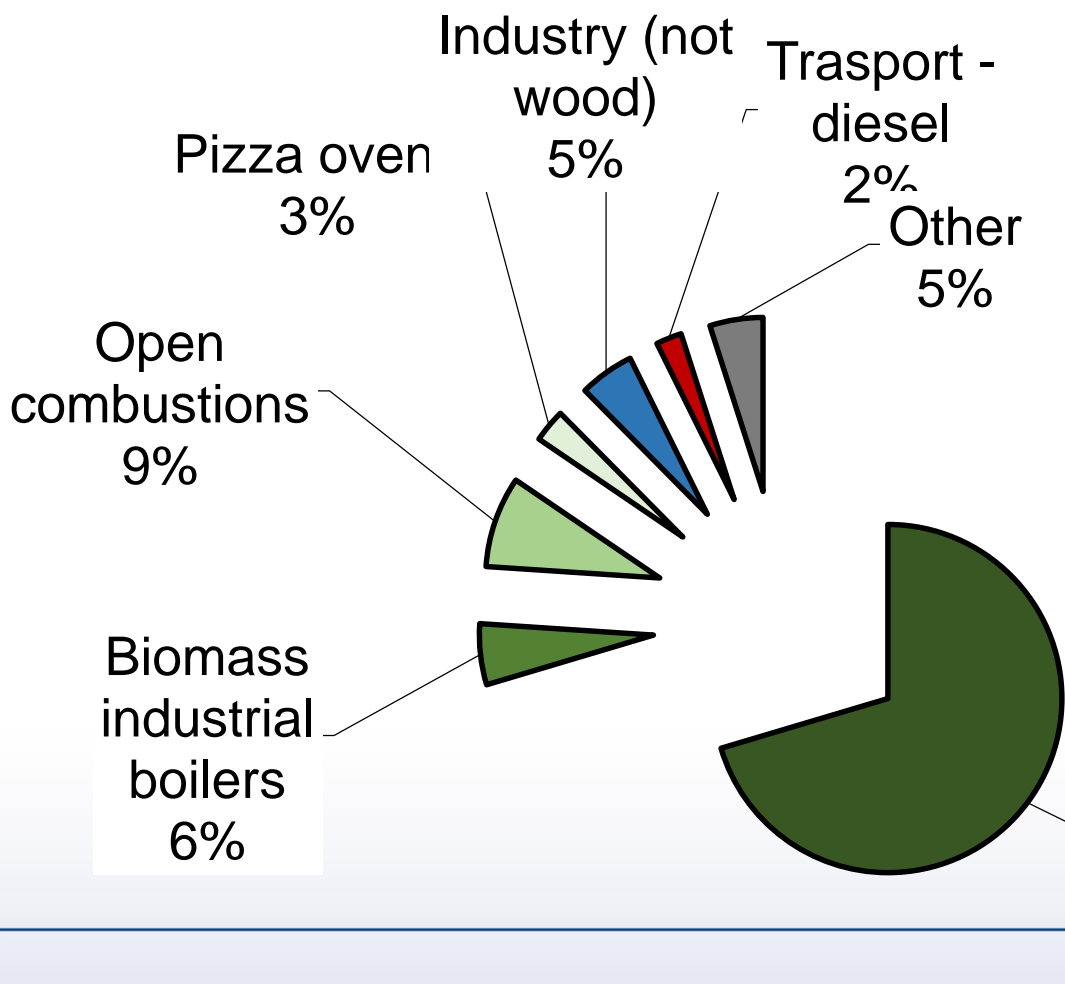
**98%  
from  
wood**

Source: INEMAR - ARPA Lombardia (2017), INEMAR, Inventario Emissioni in Atmosfera: emissioni in regione Lombardia nell'anno 2014 - ARPA Lombardia Settore Monitoraggi Ambientali.



# B(a)P emissions by fuel (tons/year)

## Lombardia region



Wood combustion for domestic heating is the first source of BaP

***Wood combustion is important also from a toxicological point of view***

Wood Stoves and fireplaces  
70%



# Some important historical measures

Coal and heavy oil ban for domestic heating from 2002

Methane distribution network in 98% of territory

Ban for low-efficiency households biomass burning (from 2007) Wood burning forbidden in stoves and fireplaces with a yield  $< 63\%$  or CO emissions  $> 0,5\%$  (ref.  $13\% O_2$ )

Large-scale traffic limitations

Authorizations and limits for all kind of plants not only large plants (from 1988) more stringent and undertaken before than European provisions.

Thermal power plants only if fuelled by natural gas in combined cycle turbine power plants (NOx Emission limit of  $30 \text{ mg/Nm}^3$ )





# PRIA: Regional plan of actions on air quality

## TRANSPORT AND MOBILITY

40 measures

- Big LEZ: limitations up to euro 3 diesel cars
- Area C (an area in which you pay to enter) in Milan centre
- Bikes and car sharing
- 2 new underground lines
- Highway speed limits reduction (under study)

## STATIONARY SOURCES

37 measures

- Promotion of energy efficiency and rational use of energy
- Wood combustion rules and limitations
- Industrial plants and waste treatment: BAT and limitations to resettle of new plants

## AGRICULTURAL AND BREEDING SECTOR

14 measures

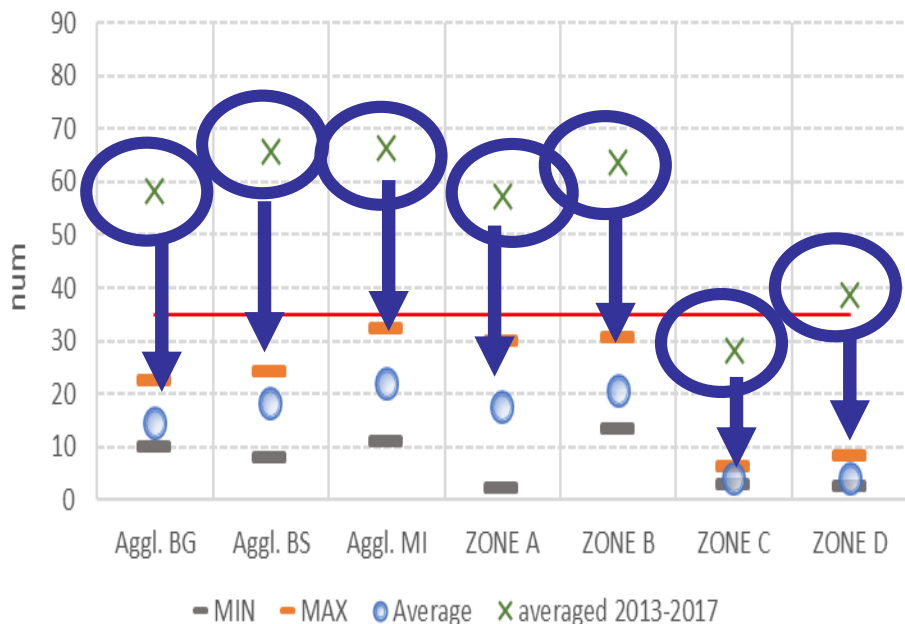
- Anaerobic digestion of manure and direct injection in the field



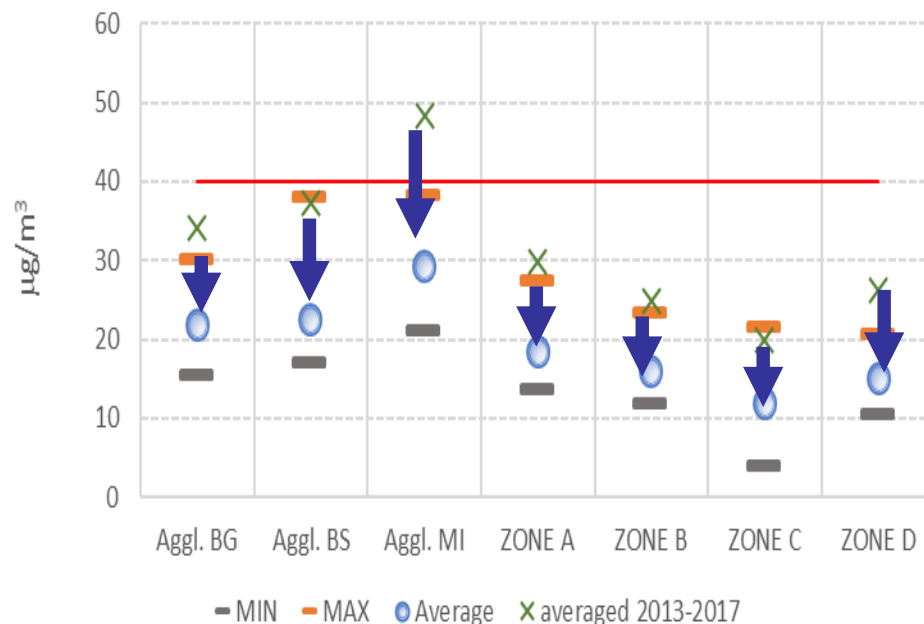


# PM10 and NO2 concentrations foreseen With updated regional air quality plan

### PM<sub>10</sub> exceedances with Air Quality Plan



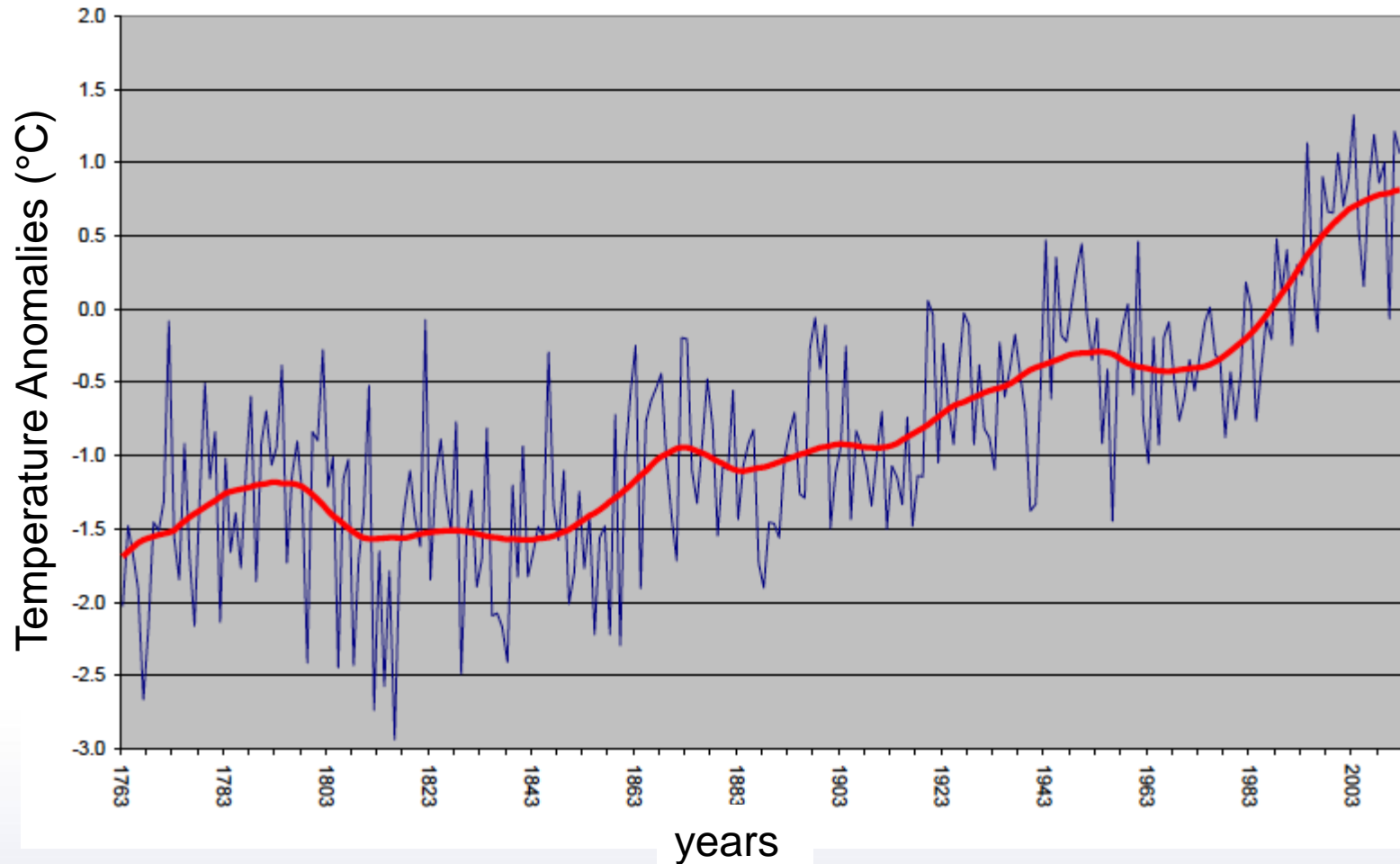
### Annual average NO<sub>2</sub> with Air Quality Plan



In 2025 a full respect of standards for PM and NO2 UE standards is foreseen



# Annual average temperature anomalies in Lombardia 1763-2012 (respect to 1971-2000)



*Source: Maugeri et al 2013 ISAC/UNIMI*



# International Commitments of Lombardia Region

GHG emissions (not ETS):

-20% (2020)

-40% (2030) - baseline 2005



Total energy consumption = - 10%

Res / gross final consumption = 15,5%

Total GHG emissions - 80% (2050)  
baseline 1990



Subnational Global Climate  
Leadership Memorandum of  
Understanding

Global network to keep world of  
under 2°C of global warming and  
greater prosperity for all, without delay.

**THE CLIMATE GROUP**

Adopt a regional plan or strategy on  
climate change adaptation within 2017



**REGIONSADAPT**

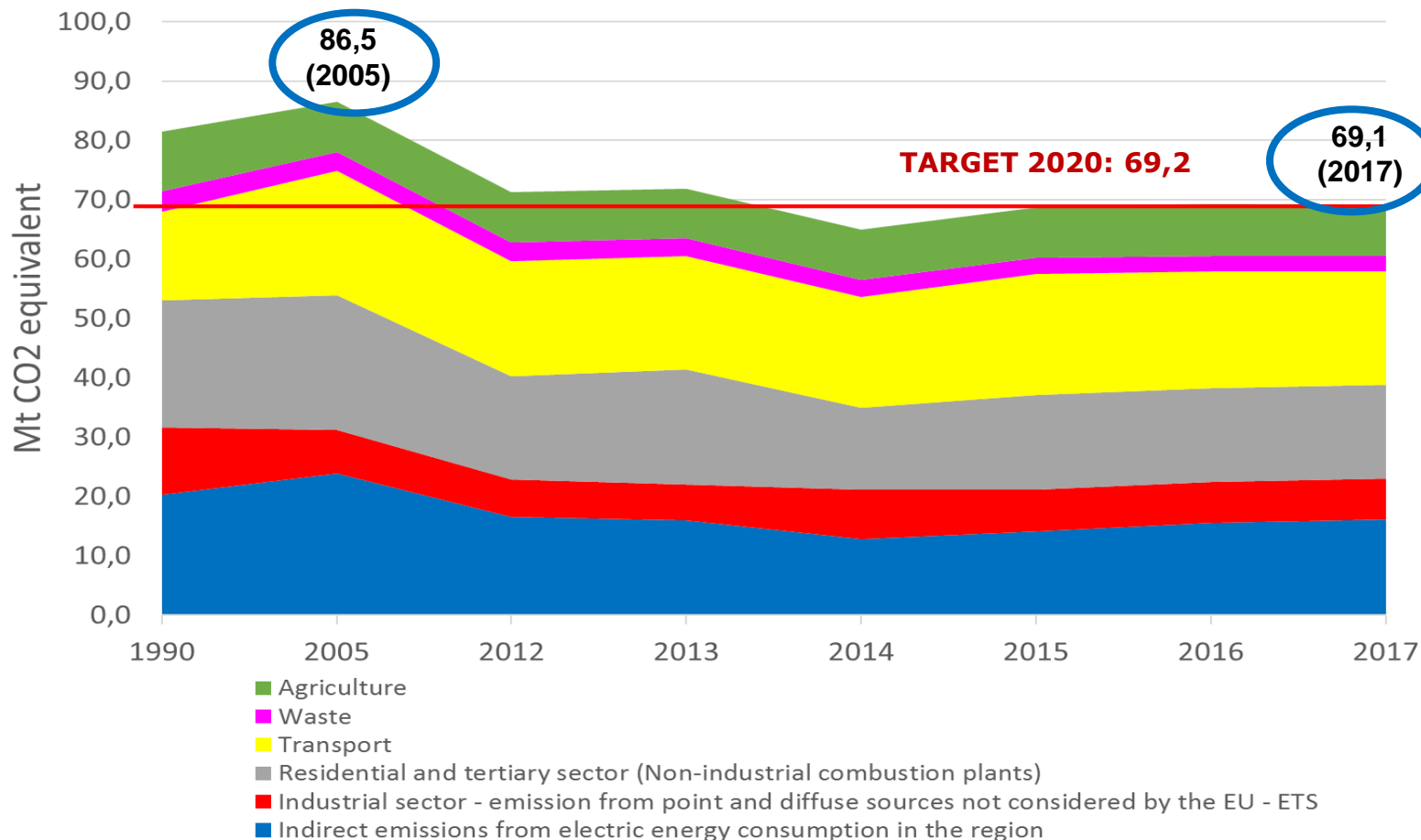
Mitigation

Adaptation



# Mitigation scenarios: Lombardia region GHSs

GHGs total emissions considered for Lombardia target



- 20% before 2020 (compared to 2005)
- 40% before 2030 (compared to 2005)
- 80% before 2050 (compared to 1990)

Under Compact of States and Regions  
Under Compact of States and Regions  
Under 2MoU

**OK**  
**HOW??**  
**HOW??**



# Mitigation scenarios (examples)

## Energy requalification of buildings

### Lombardia

**AVERAGE ENERGY  
REQUIREMENT OF  
STANDARD  
BUILDINGS :  
250 Kwh/m2 year**



**-74%**



**AVERAGE ENERGY  
REQUIREMENT OF  
BUILDINGS  
«ALMOST ZERO»:  
65 KWh/m2 year**



**residential area in Lombardy: 372 M m2**



**Possibile energy savings:**

**5,5 M tep**

**8 M t of CO2**



# Mitigation scenarios (examples) Towards electric vehicles

		<b>2017</b>	<b>2030 Low</b>	<b>2030 Medium</b>	<b>2030 High</b>
	Electric Cars	14.647 (0.04% of stock)	2 mln (5% of stock)	5 mln (14% of stock)	5 mln (24% of stock)
	Electric Ligh Duty Vehicles	4.454 (0.1% of stock)	202.763 (6% of stock)	350.265 (10% of stock)	630.478 (18% of stock)

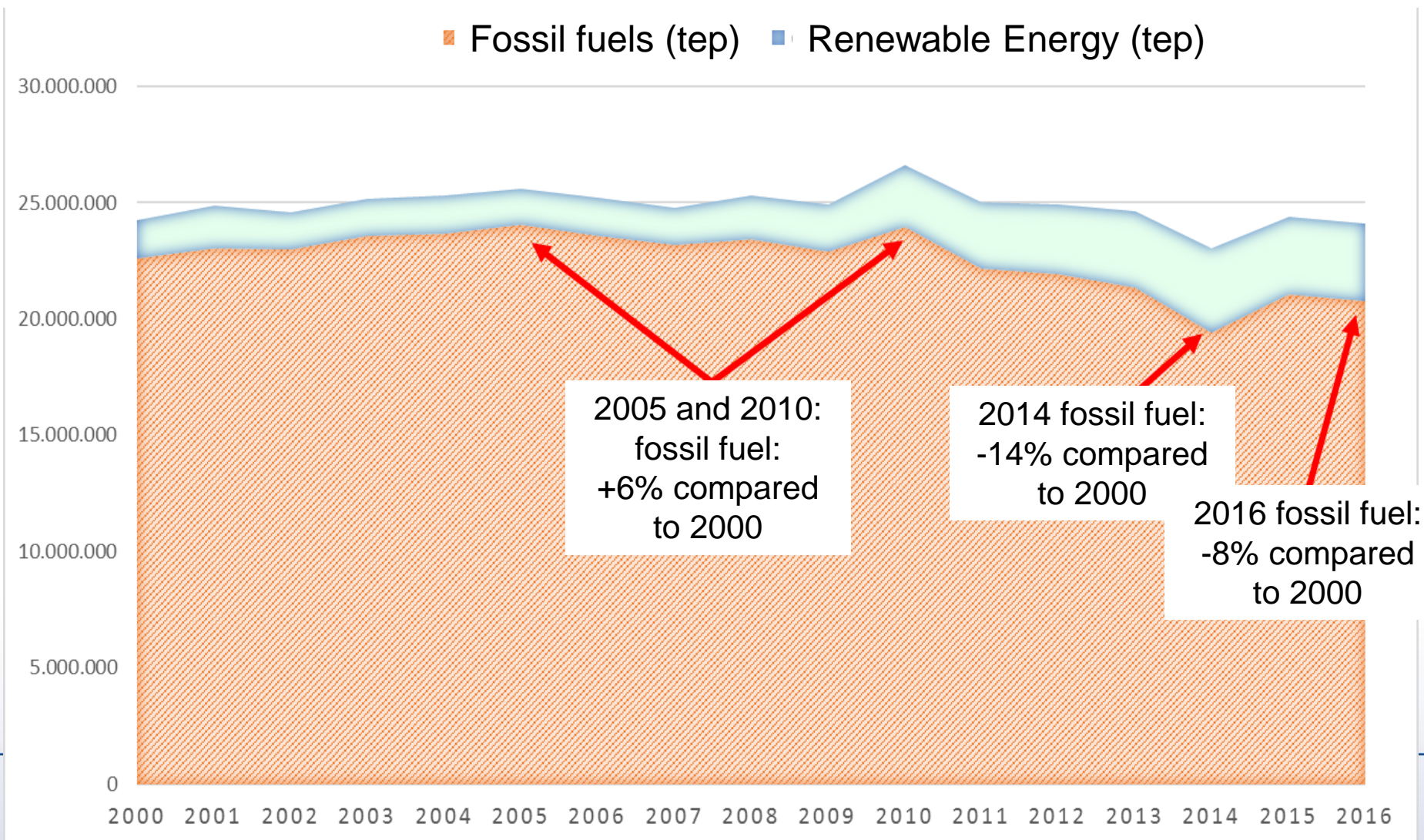
Evolution scenario of electric vehicles in Italy

Source: Elaboration from The European House Ambrosetti, 2018



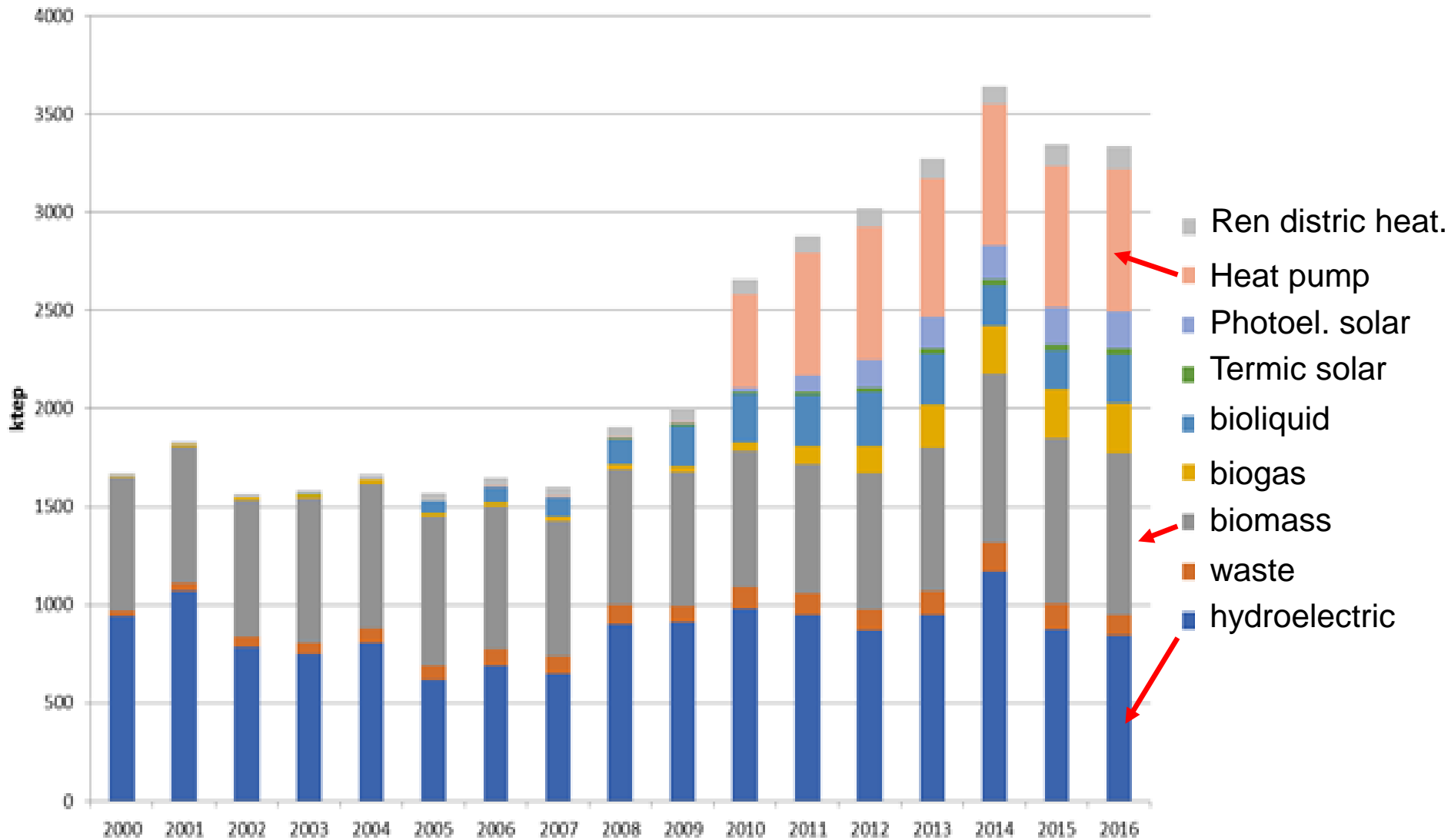


# Mitigation scenarios (examples) Development of Renewable Energy Sources respect to Fossil Fuels





# Mitigation scenarios (examples) Development of Renewable Energy Sources respect to Fossil Fuels





# The Regulation of wood burning in Lombardia

## Identification of different emission classes of stoves and incentives for substitution of the worst ones

- Different PM10, NOx, CO and OGC classes of emissions are defined for wood stoves and fireplaces
- Incentives to substitute the worst stoves with better performing ones

## Rules on maintenance and control

- Regulatory measures for stoves and fireplaces regarding their maintenance and control: they must follow the same rules of all the other heating domestic systems and be registered **in Regional census database**

## Rules for installation and use of the stoves and fireplaces step by step more ambitious

- Wood burning is forbidden from 15.10 to 15.4 in stoves and fireplaces with a yield <63% or CO emissions > 0,5% (ref. 13% O2) from 2006
- The requirements for new stoves are step by step more ambitious in terms of number of stars required: 3 stars from 1.10.18 and 4 stars from 1.1.20
- Progressive ban of the already installed stoves of the less performing classes, starting during high pollution episodes



# Key implementation challenges

## Cultural – INFORMATION is a KEY FACTOR

- Wood burning is seen as “bio” “green” “environmental friendly”
- Mass media are often skeptical
- People don't appreciate the impact of this source on air quality and health, so it is difficult to implement actions

## Legal:

- In Italy it is very difficult to control inside private houses (the best way of action is to work on the rules for new appliances)

## Economical:

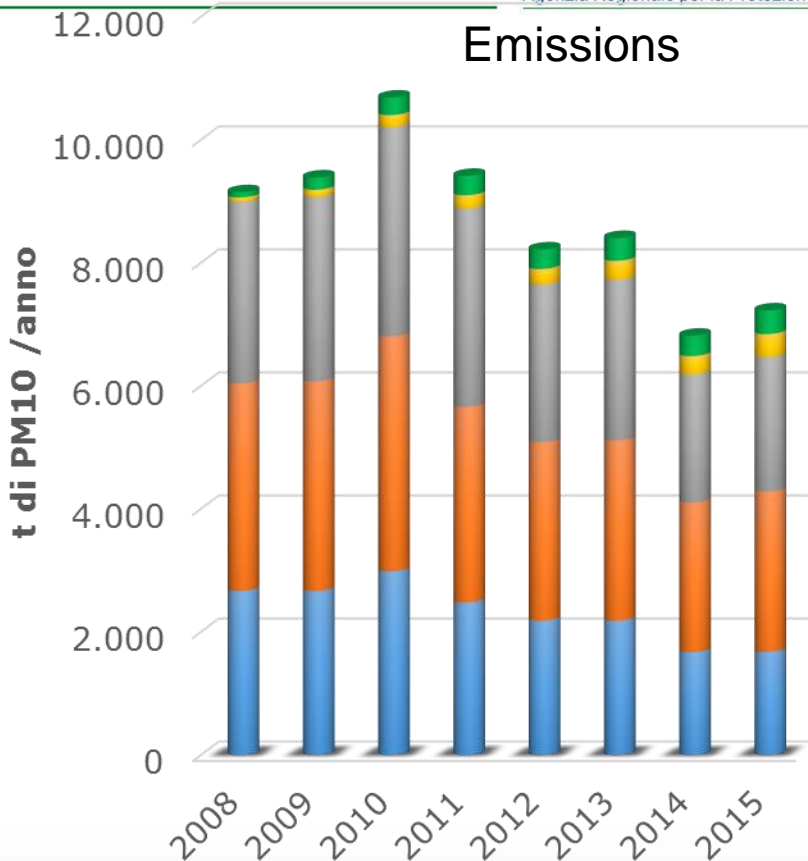
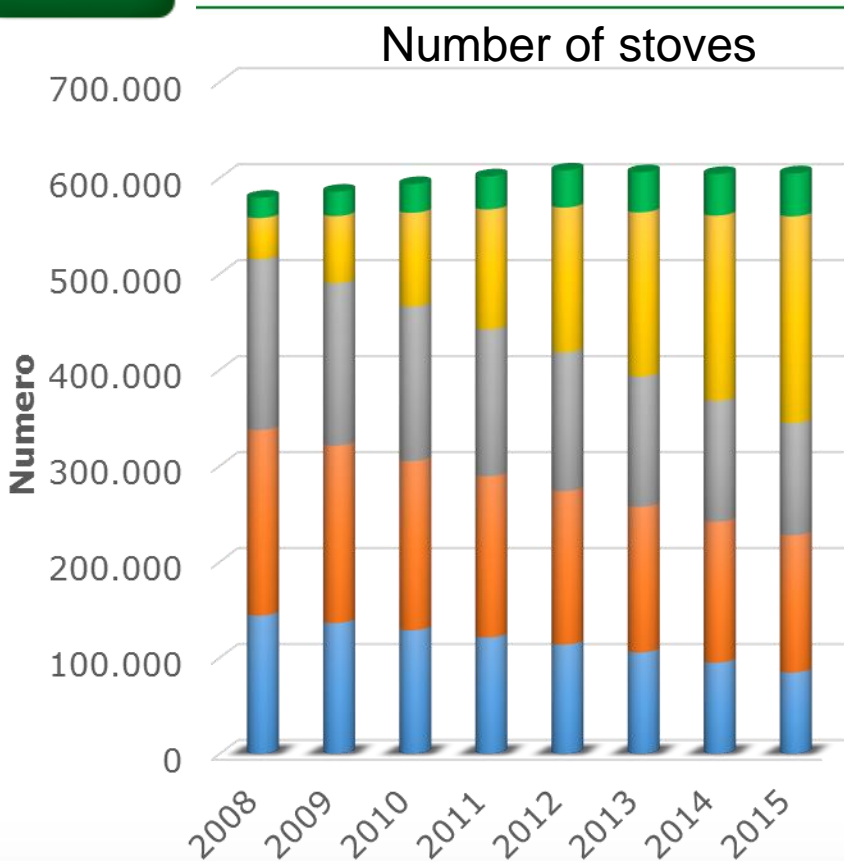
- Now heating by wood costs half than by methane or light oil

## Technical - technological:

- Methods to measure PM emissions must represent real emissions to avoid another.. Dieselgate also in this field.
- It is necessary to go on in developing products really compatible with air quality



# Number of wood stoves <35 kW vs. emissions



- 2.2.9 Innovative stoves
- 2.2.10 Pellets stoves
- 2.2.7 Traditional stoves
- 2.2.8 Traditional close fireplaces
- 2.2.6 Traditional open fireplaces



# Adaptation

Methodological and technological measures

Economical and financial

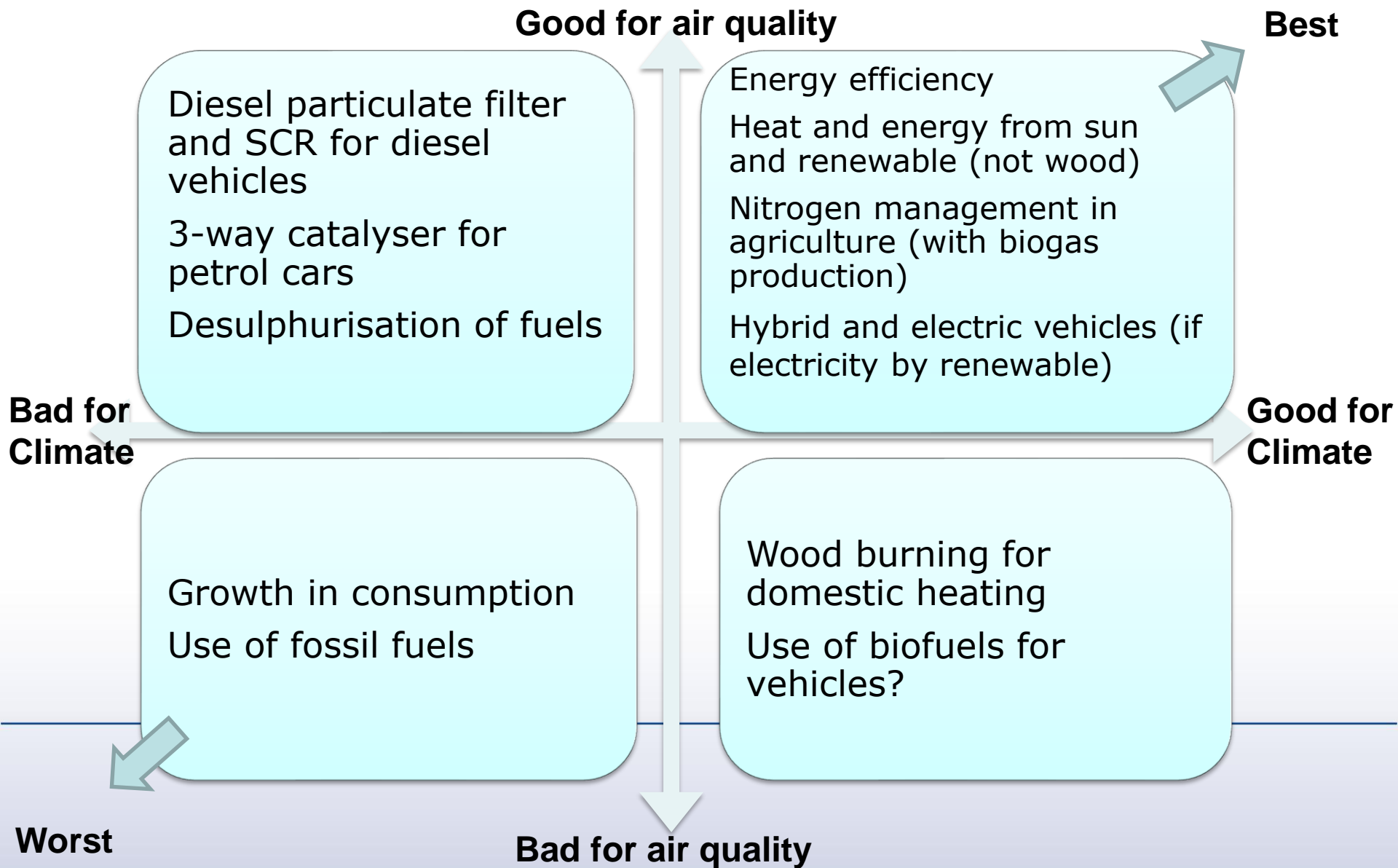
Knowledge and capacity building

## AREAS OF ACTION, IN RELATION TO REGIONAL CHARACTERISTICS

1. Human health and air quality
2. Soil and territory protection
3. Water management and quality
4. Agriculture and Biodiversity
5. Tourism and Sport



# Air vs. Climate change





Thank you for your attention

Grazie per l'attenzione 谢谢你的关注