Improvements of air quality and exposure patterns through Voluntary EV policies in cities

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ROMA CAPITALE

OBJECTIVES: To assess urban co-health benefits associated with widespread introduction of EV's

1

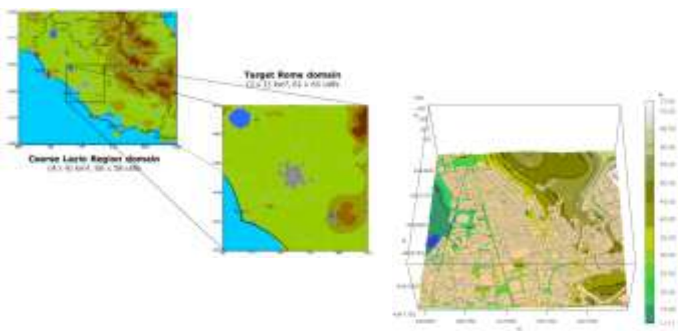
Calculation of changes in the **emissions inventory**, taking into account changes in fleet composition (EV / Thermal)
Impact on thermal power stations of the additional power supply needed

2

Numerical simulation of air pollutants (Nitrogen dioxide, benzene, particulates, carbon monoxide, ozone) by taking into account the dispersion (weather, season), chemistry (large scale), traffic density & patterns…

2 simulation domains

large regional scale (50*50km), street level (1*1 km)



2 scenarios for 2020

- **Base case**(S0) business as usual without any EV introduction
- **Voluntary scenario** (S1)

⇨ EV targeted Public fleet renewal
⇨ Voluntary promotion of EV powered LDV for good delivery

Roma central ZTL Zone:
~25% of EV's for personal vehicles, Light duty Vehicles & 2 wheelers
Replacement of the oldest categories
+ ZTL policy strengthening

Other zones:
~10% of EV's for personal vehicles & Light duty fleet

3

Benefits related to population exposure
Assessment of the improvements by the mean of IPP index calculation (Population x concentration)

Significant reductions for emissions visible on major traffic zones

1

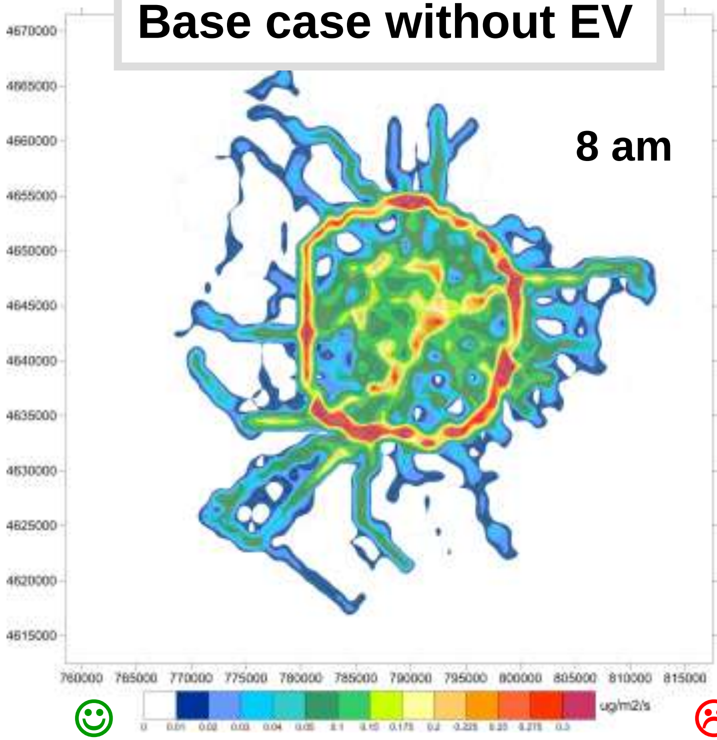
- ↘ 14% for NO, NO_2 and PM_{10}
- ↘ ~30% for CO and Benzene

} ↘ of traffic contribution to global emissions (Max 5%)

- Small impact of additional energy demand on global emissions (~ 0,2% for NOx & CO)

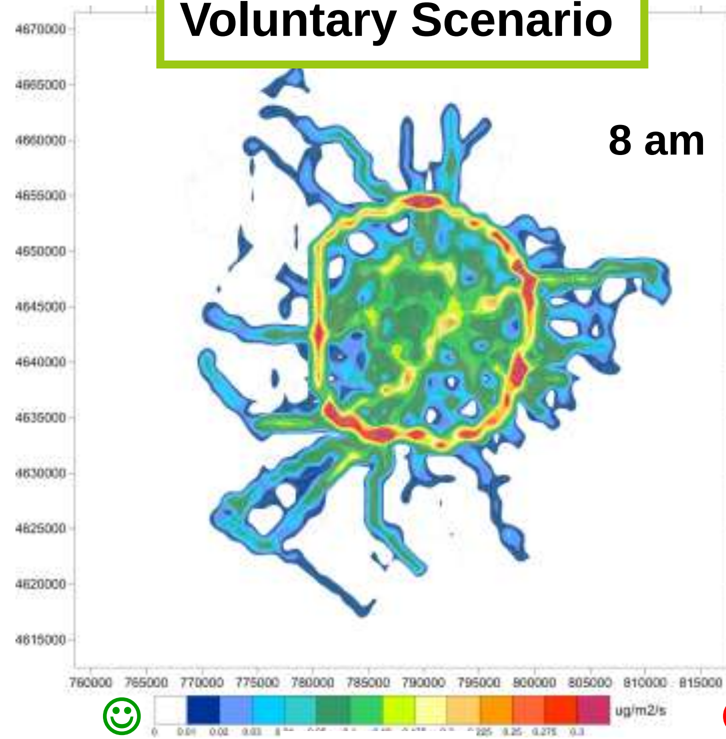
NO_2

Base case without EV



50*50 km

Voluntary Scenario



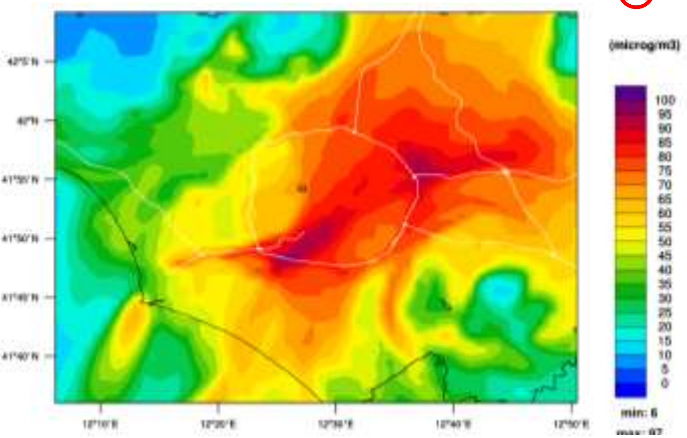
50*50 km

Large scale domain: Huge impact over the entire domain and especially over the city center

2 **NO_2** ❑ **Winter** (Daily maximum): the average concentrations can be reduced up to 9%, (2,5 µg/m3) decrease for central Rome

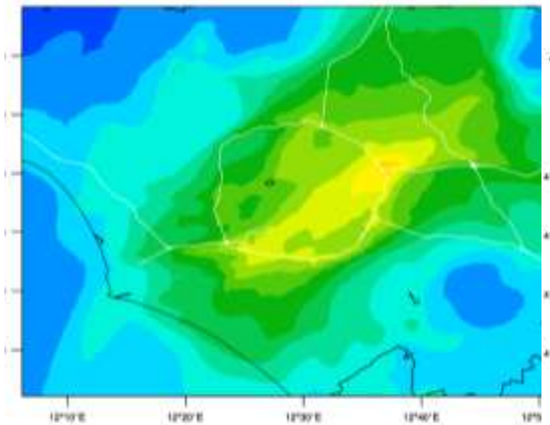
❑ **Summer** (Average over 24 hours): -10 to 25% over maximum and average values, Up to 5 µg/m3 decrease for central Rome

Winter period: Base case
Absolute concentration
Maximum day 1 (µg/m3)



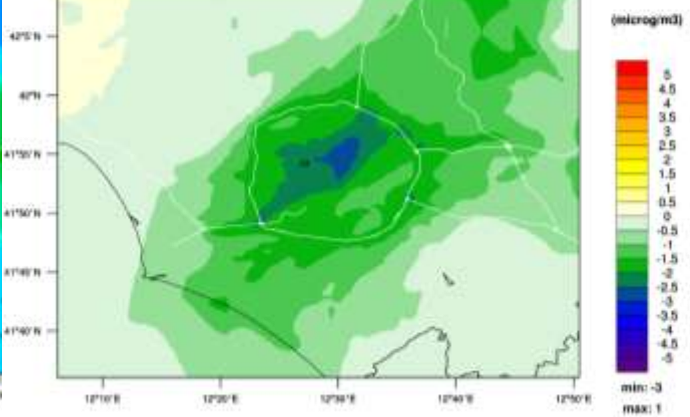
50*50 km

Winter period: Base case
Absolute concentration
Mean value day 1 (µg/m3)



50*50 km

Winter period: Voluntary / Base case
concentration variation
Mean value day 1 (µg/m3)



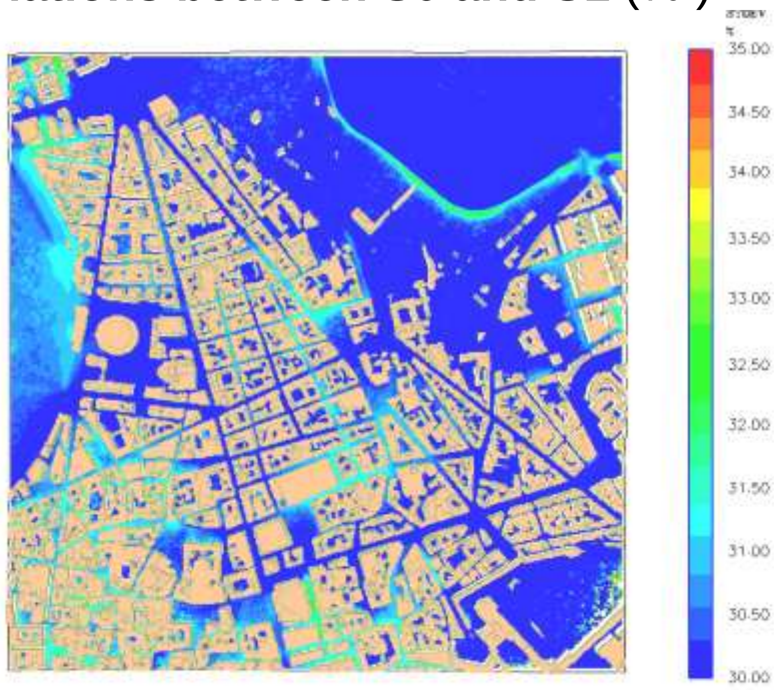
50*50 km

Micro scale domain: visible improvements especially near road network
(below 2m above the ground)

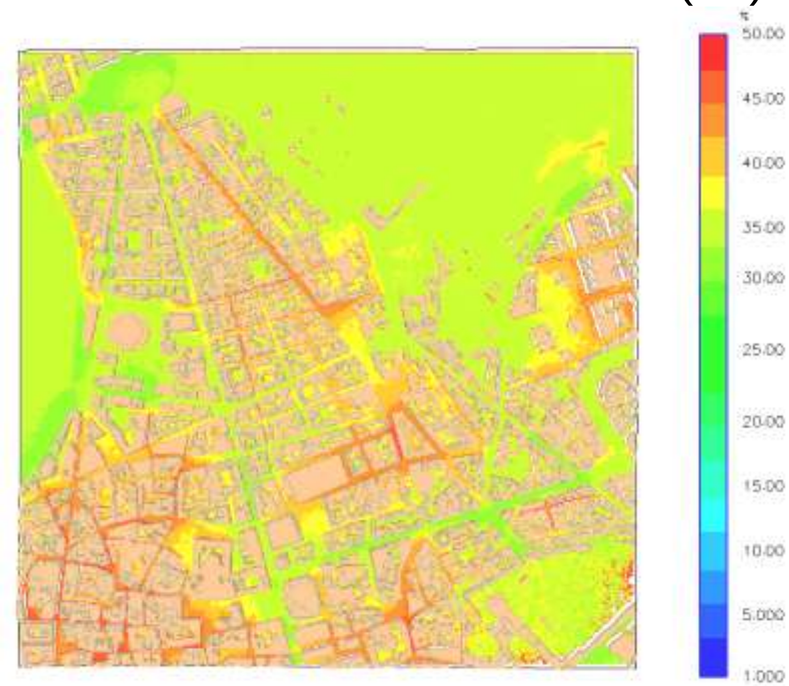
2

- **PM_{10}:** ↘ 2 to 4 µg/m^3; up to 10 µg/m^3 (~30%) reduction for hot spots
- **NO_2:** ↘ 25 to 40 µg/m^3 (~45%) for main network

PM_{10} concentrations
Variations between S0 and S1 (%)



NO_2 concentrations
Variations between S0 and S1 (%)

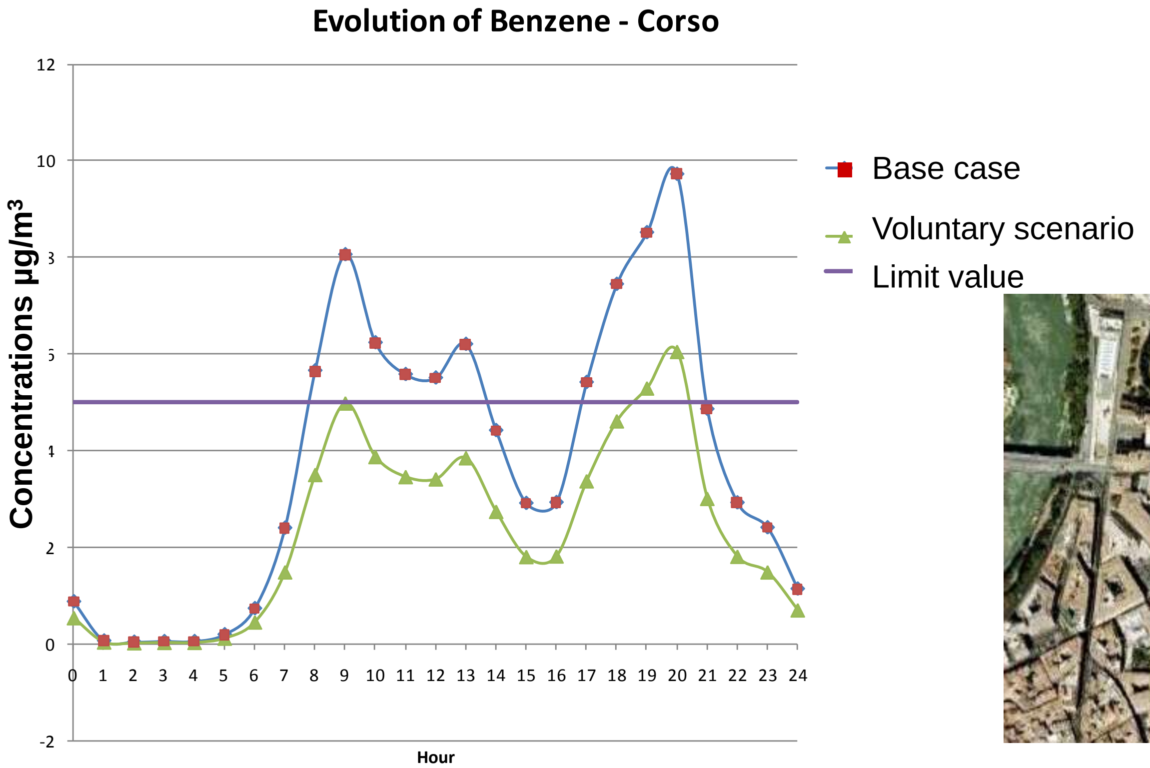


On a micro scale: benzene levels may fall below the limit value

2

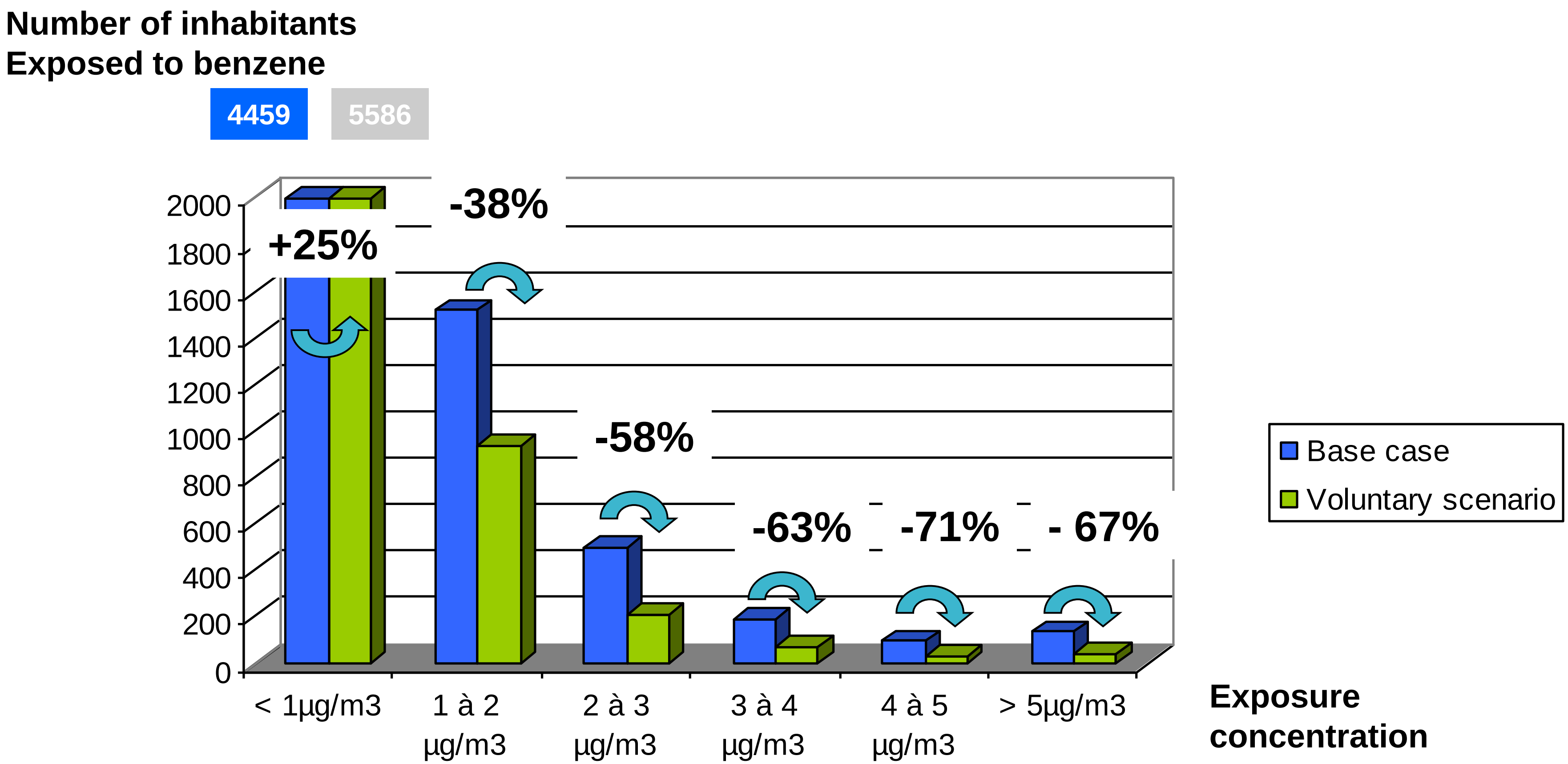
❑ **Reductions for voluntary Scenario** (maximum level at 8pm)

Benzene: - 38% ; NO_x: - 34%; CO: - 33%; PM_{10}: - 29%; $PM_{2,5}$: - 22%



The electric vehicle is part of the very effective measures to reduce the exposure of the citizens

3 **Voluntary scenario very effective for population exposure reduction**
47% of the exposed population (inhabitants) and an additional 43% of tourists are preserved from concentrations above 2µg/m3



Conclusions

- **Public policies and voluntary traffic management in favour of the cleanest car categories will have a positive impact on urban air quality in 2020 with compliance to the ambient limit values.**

- On a local scale, **dedicated mobility policies in favour of zero or low emission cars** will enable to **achieve the limit values in a shorter time frame**

➔***Significant impact on emissions can be achieved and major reductions on ambient concentrations can be observed***

- Those policies will be **very effective to reduce cost for society** through **significant improvement of population exposure.** The initial investment will compensate the savings in health costs.