ASSESSMENT AND FORECAST OF URBAN AIR QUALITY IN COIMBRA

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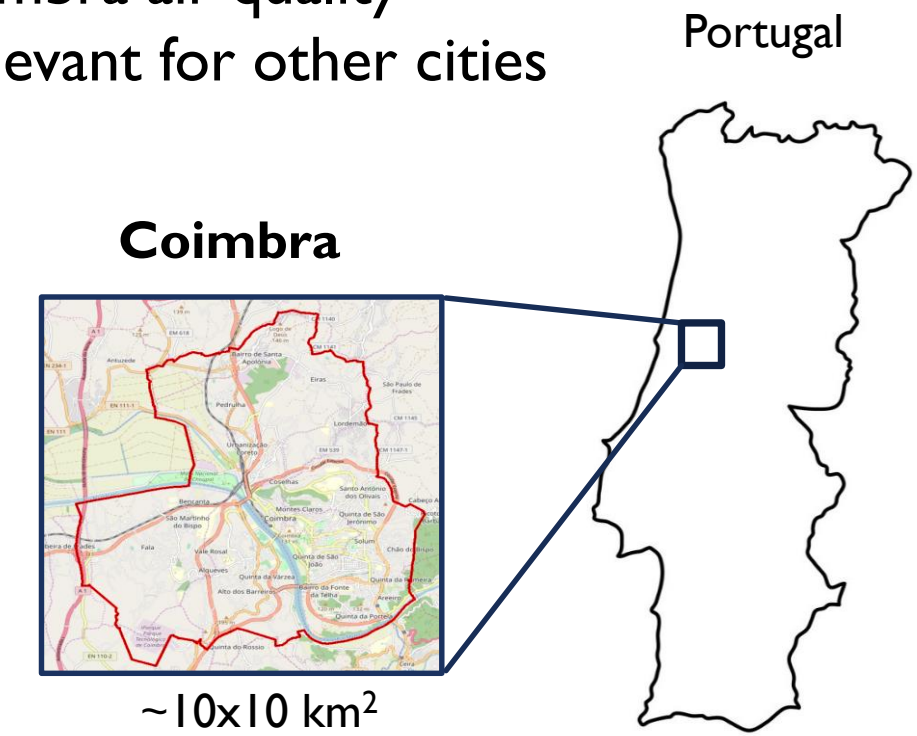
TOWARDS CLEAN AIR IN CITIES, BRATISLAVA, NOVEMBER 2019

OBJECTIVES:

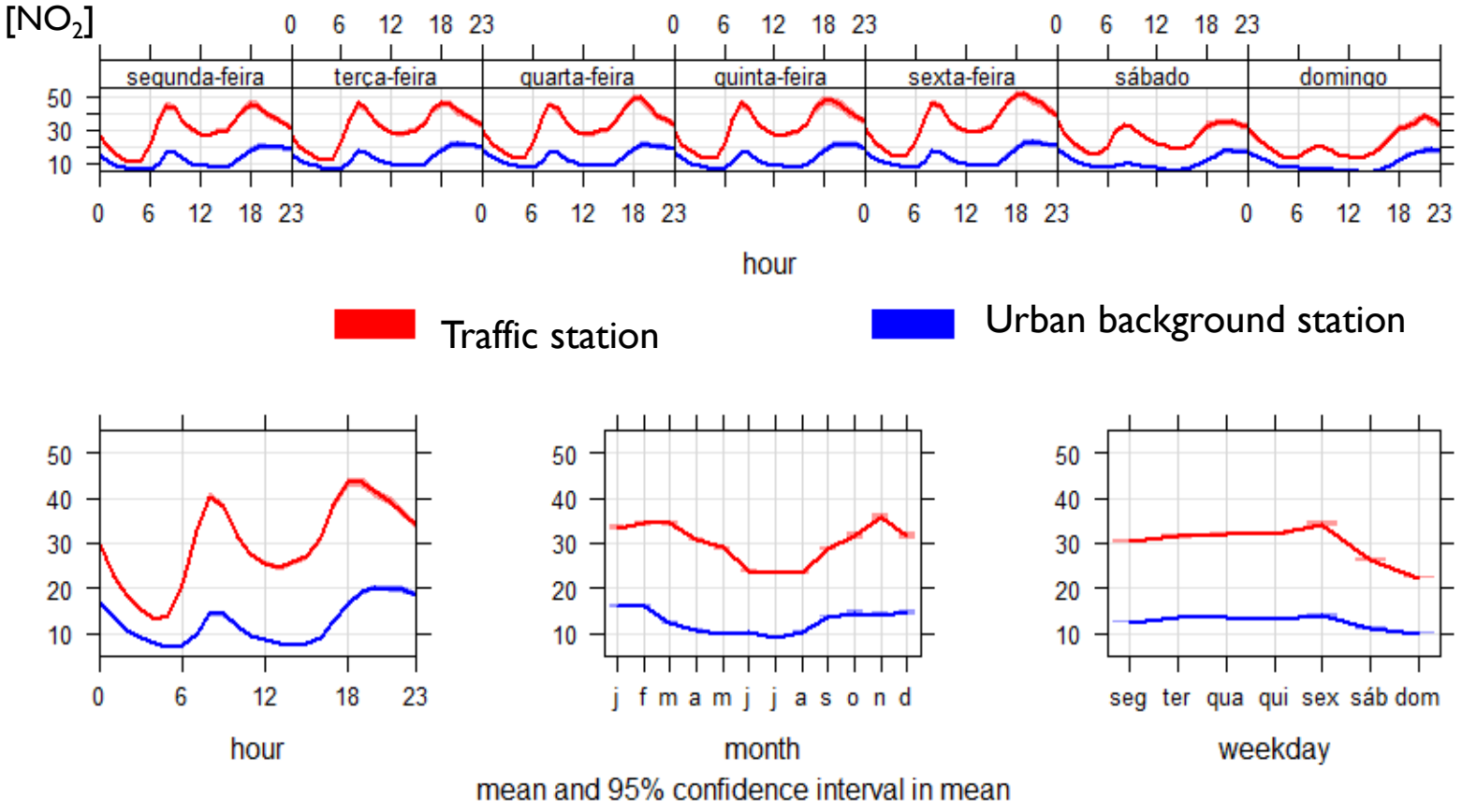
- To give an overview of several studies focused on Coimbra air quality
- To highlight some findings that potentially could be relevant for other cities

- Local measures to reduce traffic related pollution
- Population exposure modelling
- Air quality forecast - multiscale perspective

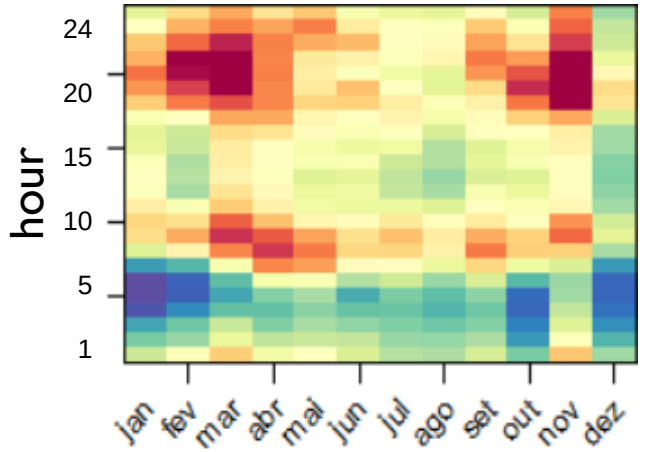


NO_2 MEASUREMENTS

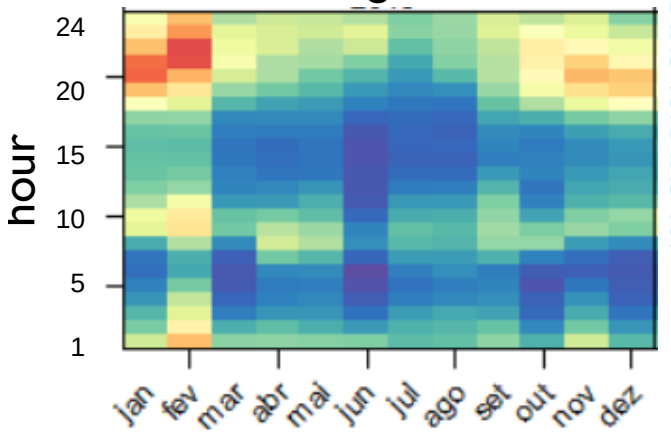
Time series for 6 years

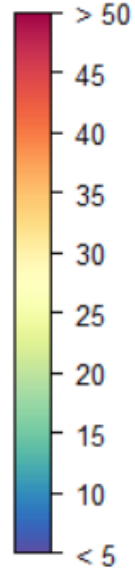


Traffic station



Urban background station



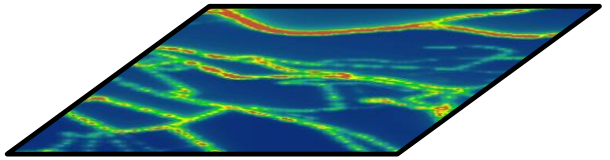


MODELLING APPROACH

Air Quality modelling

Meteorology data
Background concentrations
Urban morphology

ADMS-Roads

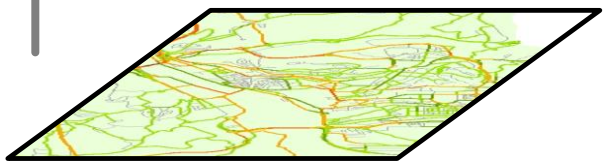


Pollutant concentrations

Emission modelling

Fleet composition

QTraffic

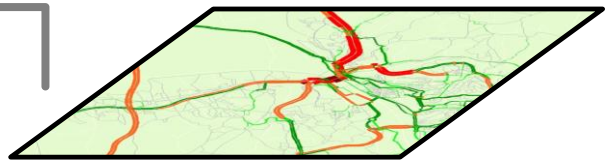


Exhaust emissions
Non-exhaust emissions

Transportation modelling

Origin/destination matrix
Network geometry

VISUM



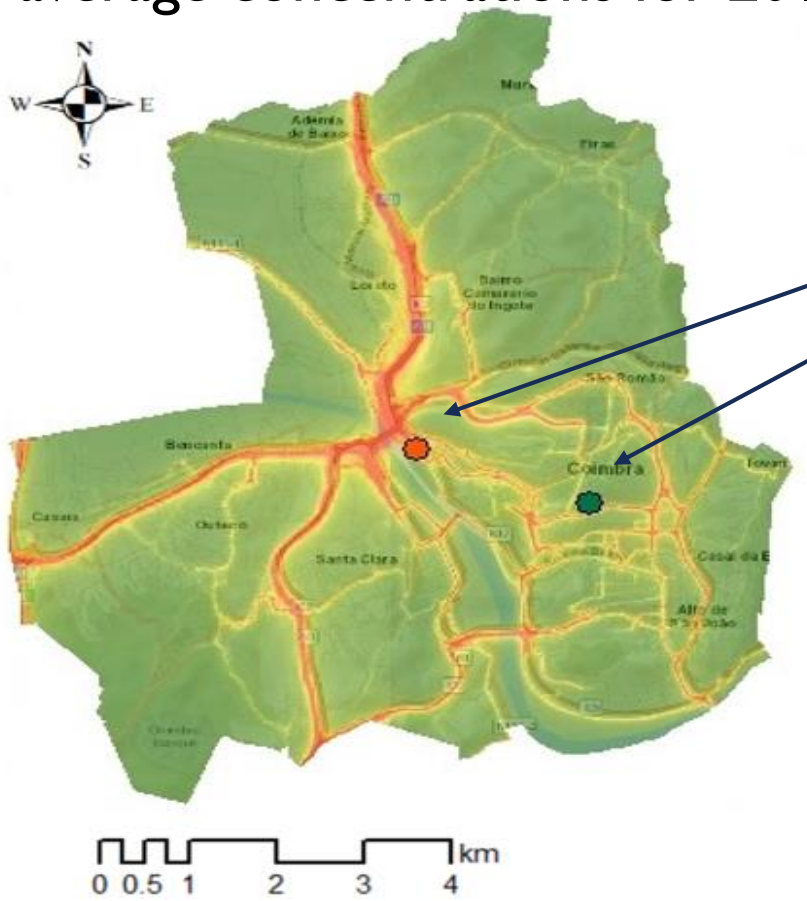
Traffic volume
Average speed

AIR QUALITY MODELLING – PM10

Modelling results: PM10 annual average concentrations for 2018

PM_{10} ($\mu g.m^{-3}$)

- 15 - 18
- 19 - 20
- 21 - 38



Measurements:
Traffic station = 25.6 $\mu g.m^{-3}$
Urban background = 14.6 $\mu g.m^{-3}$

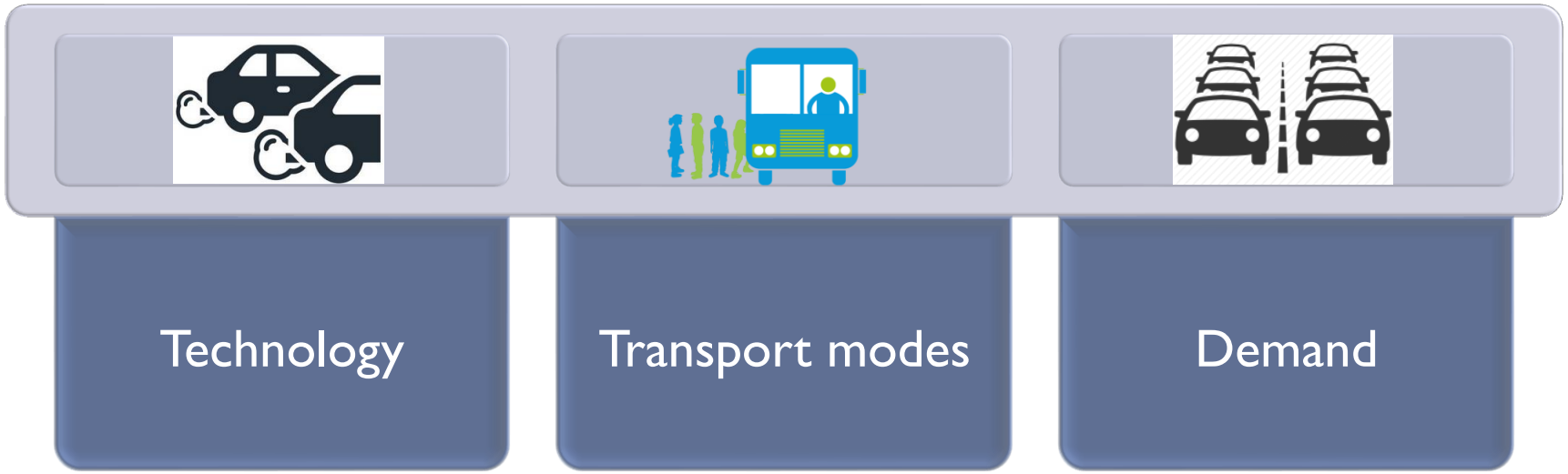
modelling performance criteria (FAIRMODE)
MQ_HD=0.536

- Local contribution
- Spatial representativeness of the measurements

LOCAL MEASURES TO REDUCE TRAFFIC RELATED POLLUTION

What measures could be defined at local/urban scale?

Improve, Shift, Avoid, Reduce



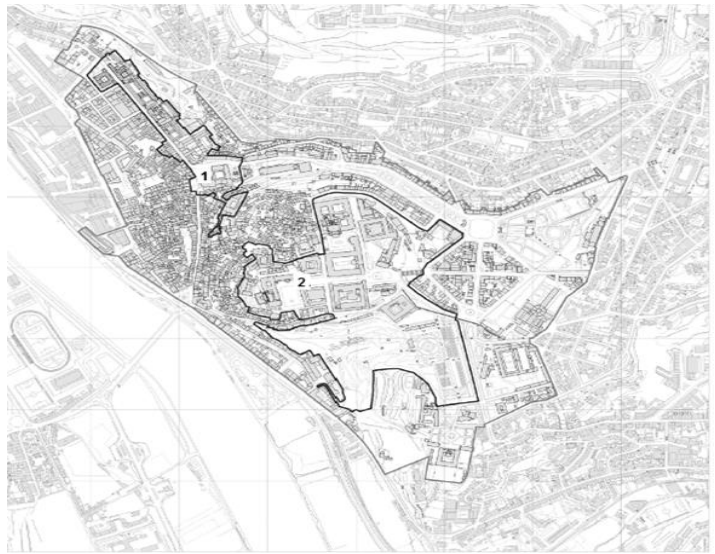
How to evaluate the effectiveness of these measures?

Impacts of traffic related measures are not uniform in time and in space!

LOW EMISSION ZONE

Zone limits:

Historic centre and
UNESCO World Heritage sites of Coimbra



- study was applied for 2011 episodes
- fleet composition data for 2011
- modal shift was not considered
- an academic study, no LEZ in Coimbra

Results:

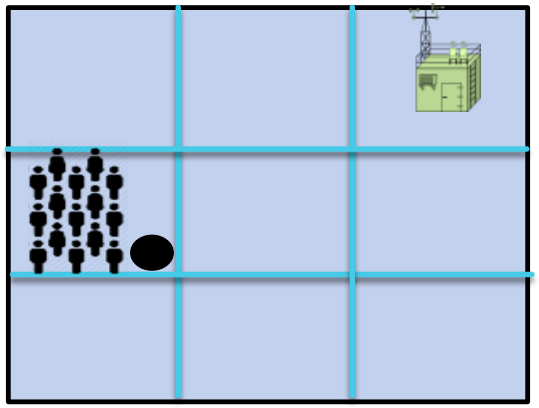
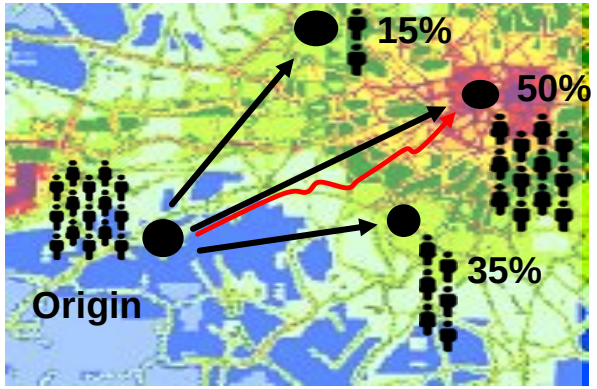
	inside the LEZ	City globally	in the vicinity to AQ station
Passenger cars (VKT per day)	↓ 27%	↑ 2%	↓ 40%
PM10 Emissions (total per day)	↓ 63%	↑ 1.2 %	↓ 71%
PM10 concentrations (max Δ for one day episode)	↓ 7.4 $\mu g.m^{-3}$	↑ 6.7 $\mu g.m^{-3}$	↓ 1.0 $\mu g.m^{-3}$

(Dias et al., JEMA 2016)

effectiveness will depends on LEZ configuration

selection of the indicators to evaluation the effectiveness is crucial

POPULATION EXPOSURE

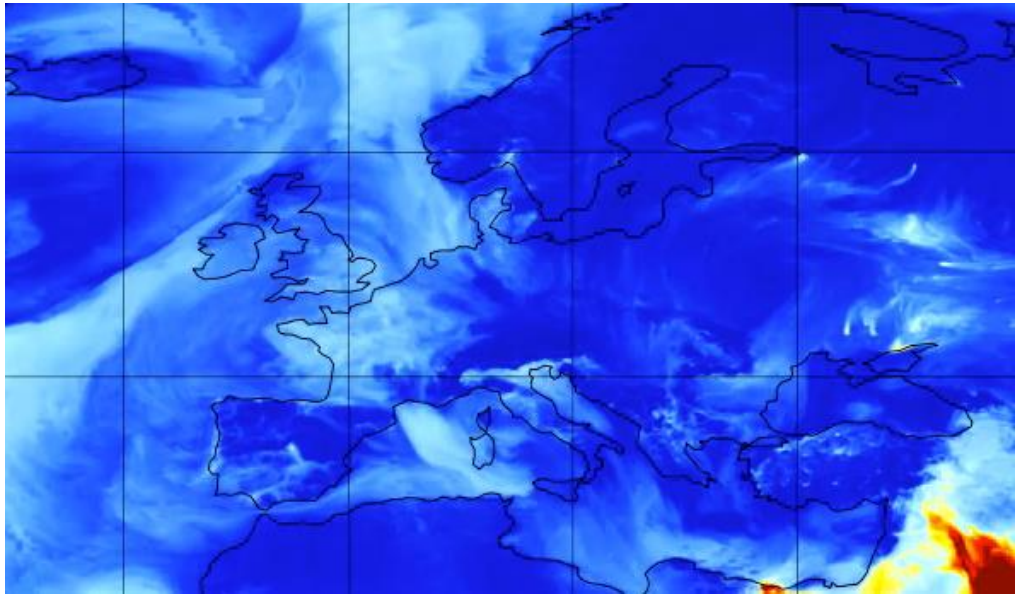
	activities	
	Residence-fixed	Time-activity pattern
Air Quality: Uniform		
Air Quality: Variable		

For each O/D alternative routes are anaysed based on the outputs from transportation model

(adapted from: Dias &Tchepel, IJERPH 2018)

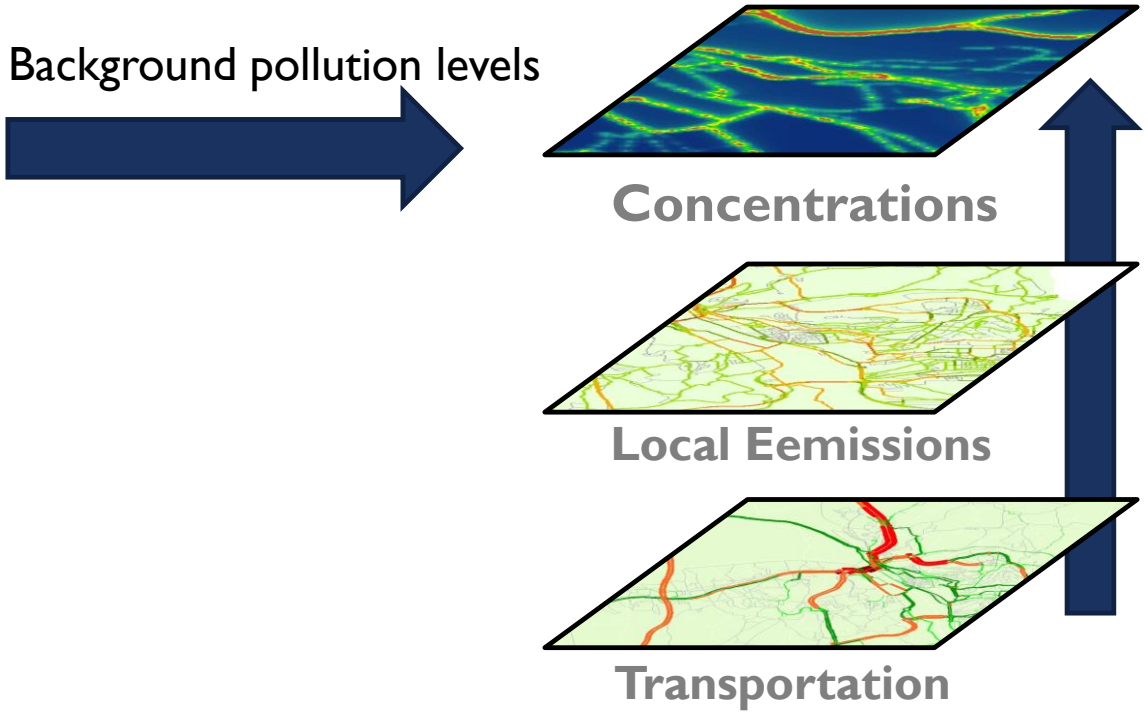
AIR QUALITY FORECAST

Air quality forecast - multiscale perspective



CAMS

Copernicus
Europe's eyes on Earth



(Tchepel et al., submitted to AIRQ)

FINAL REMARKS

- "fitness for purpose" of the defined measures should be considered
- "feedbacks" from the traffic related measures (e.g. on travel demand) should be identified
- effectiveness of the measures should be evaluated using consistent methodology
- urban air quality forecast is the next step that could contribute to short-term action plans

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PTDC /ECM-URB/3329/2014, POCI-01-0145-FEDER-016729
MIT-EXPL/IRA/0023/2017

THANK YOU

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