

# 15th International Scientific Conference on Energy and Climate Change

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## Using Earth Observation Application to Air Quality in Addition to in-situ monitoring: HARMONIA IRAP platform

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# Air Quality

a threat for urban health

## 3 different determined association:

- Long-term exposure
- Short-term exposure
- Exposure to high levels of pollution

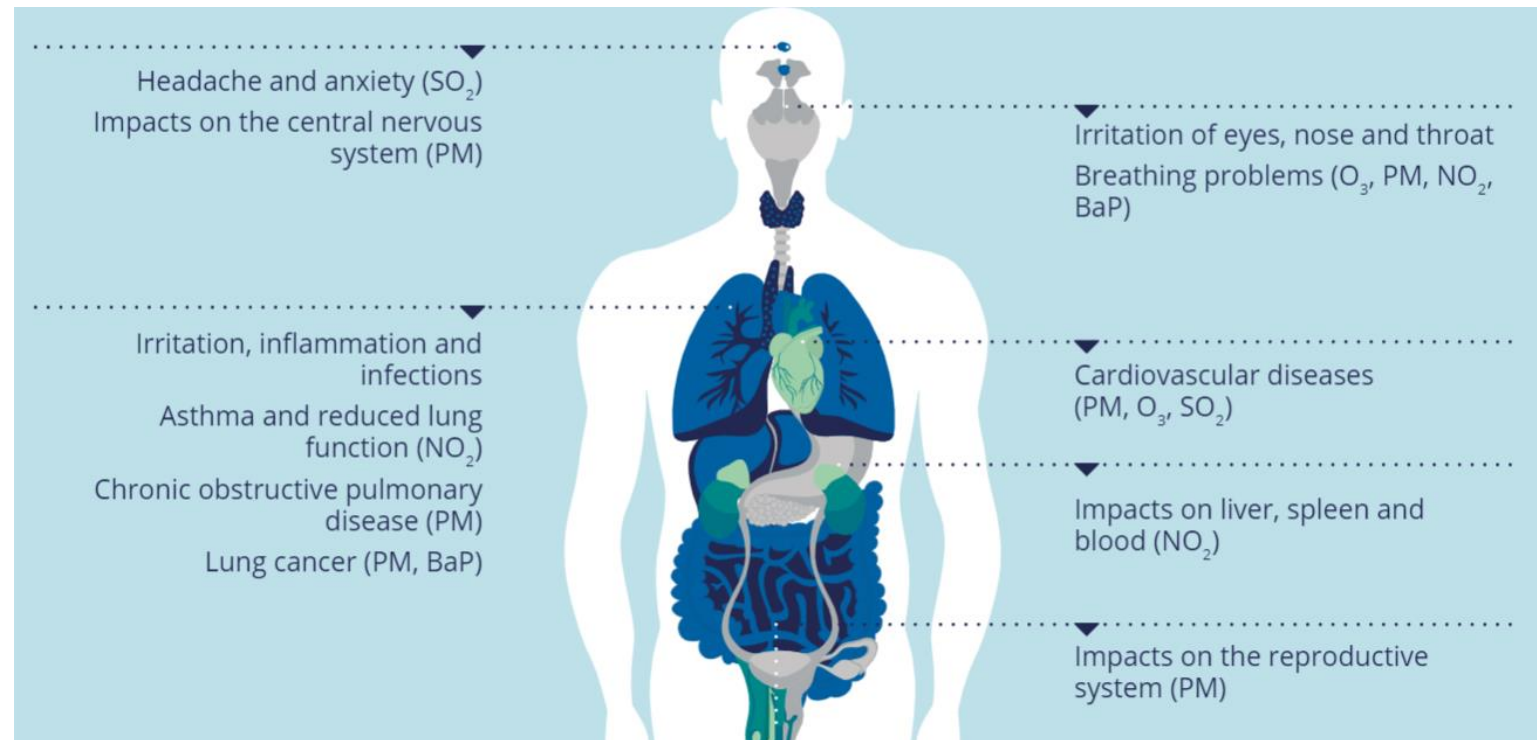


Air pollution in Milan, *BBC*

# Air Quality

## a threat for urban health

- stroke,
- chronic obstructive pulmonary disease,
- trachea,
- bronchus and lung cancers,
- aggravated asthma
- lower respiratory infections
- premature mortality

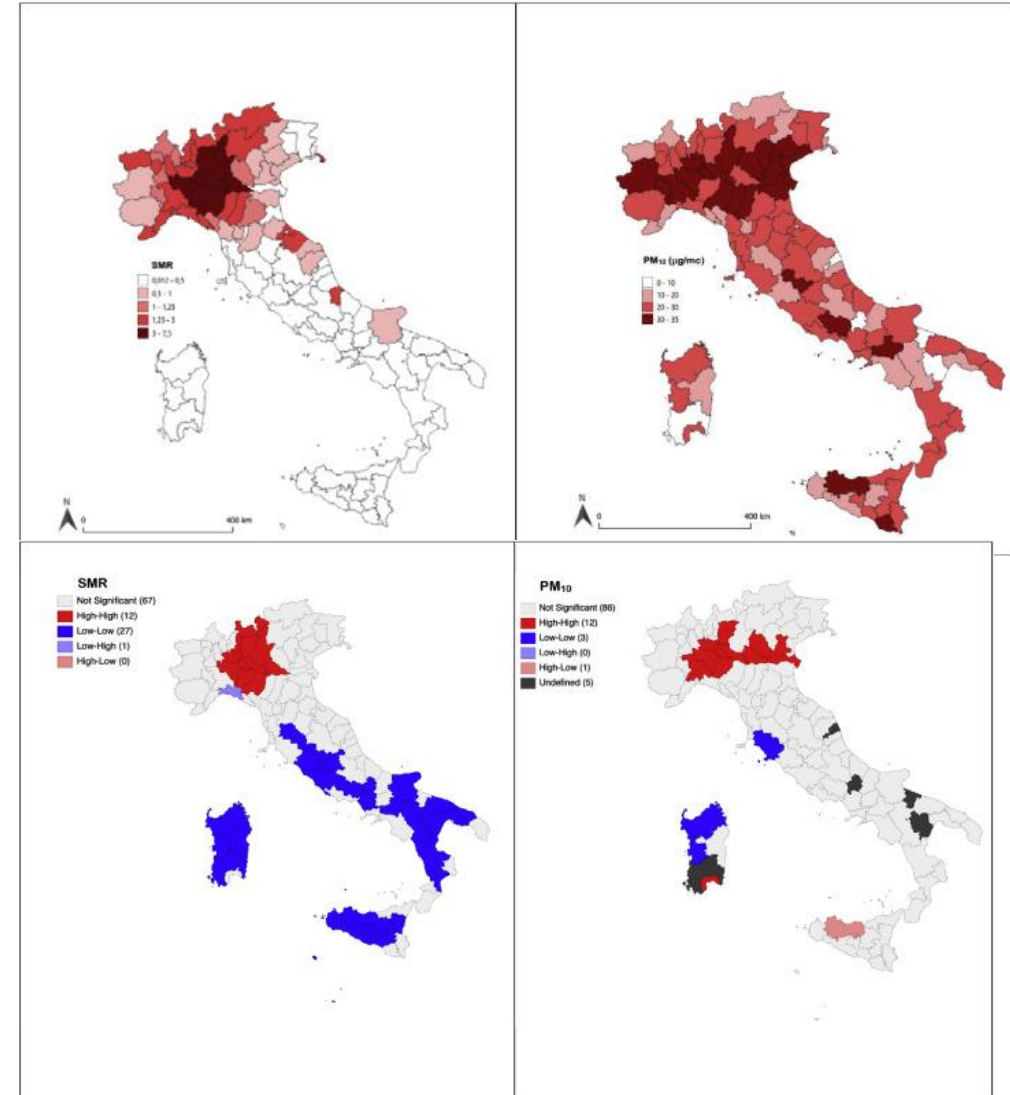




# Air Quality

## a threat for urban health

- High air pollution increases vulnerability to **COVID-19** by affecting the respiratory system.
- The virus remains in the polluted air longer.
- Pollutants carry several chemical and biological pollutants into the respiratory system.



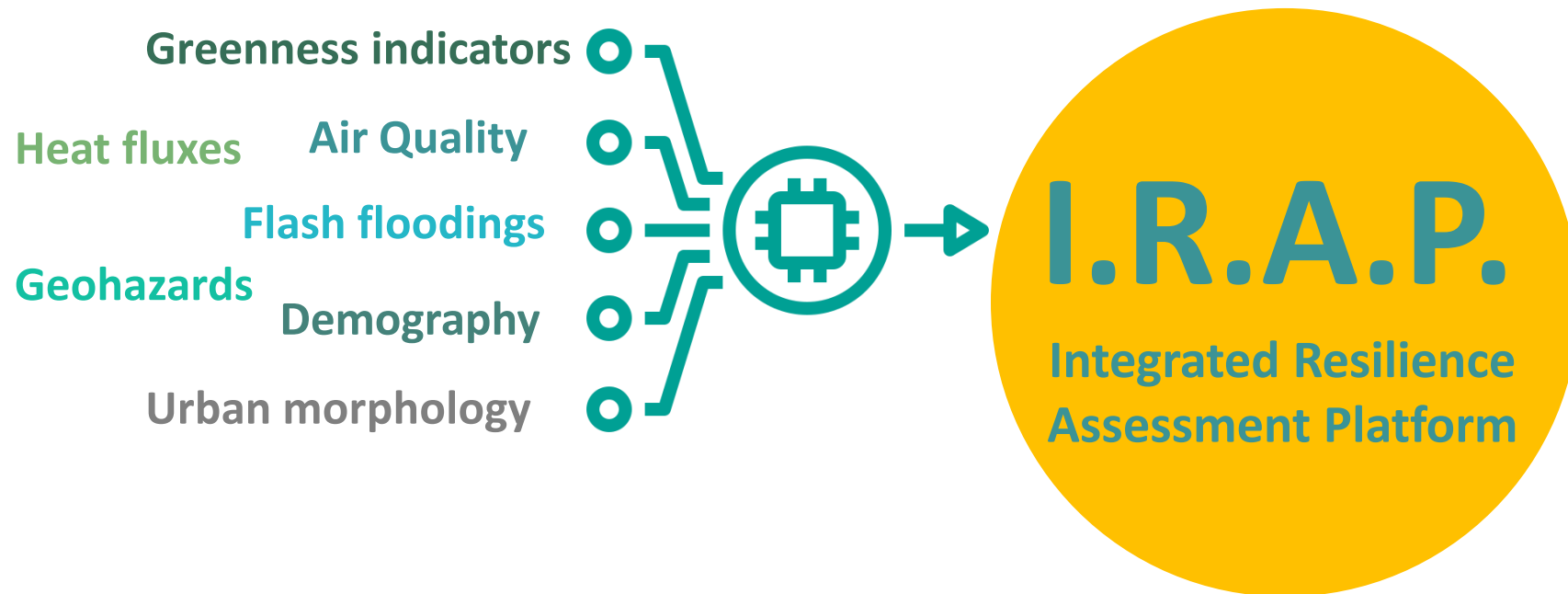
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Standardized  
Mortality  
Ratio per  
Italian  
Province and  
PM10 level  
per Italian  
provinces

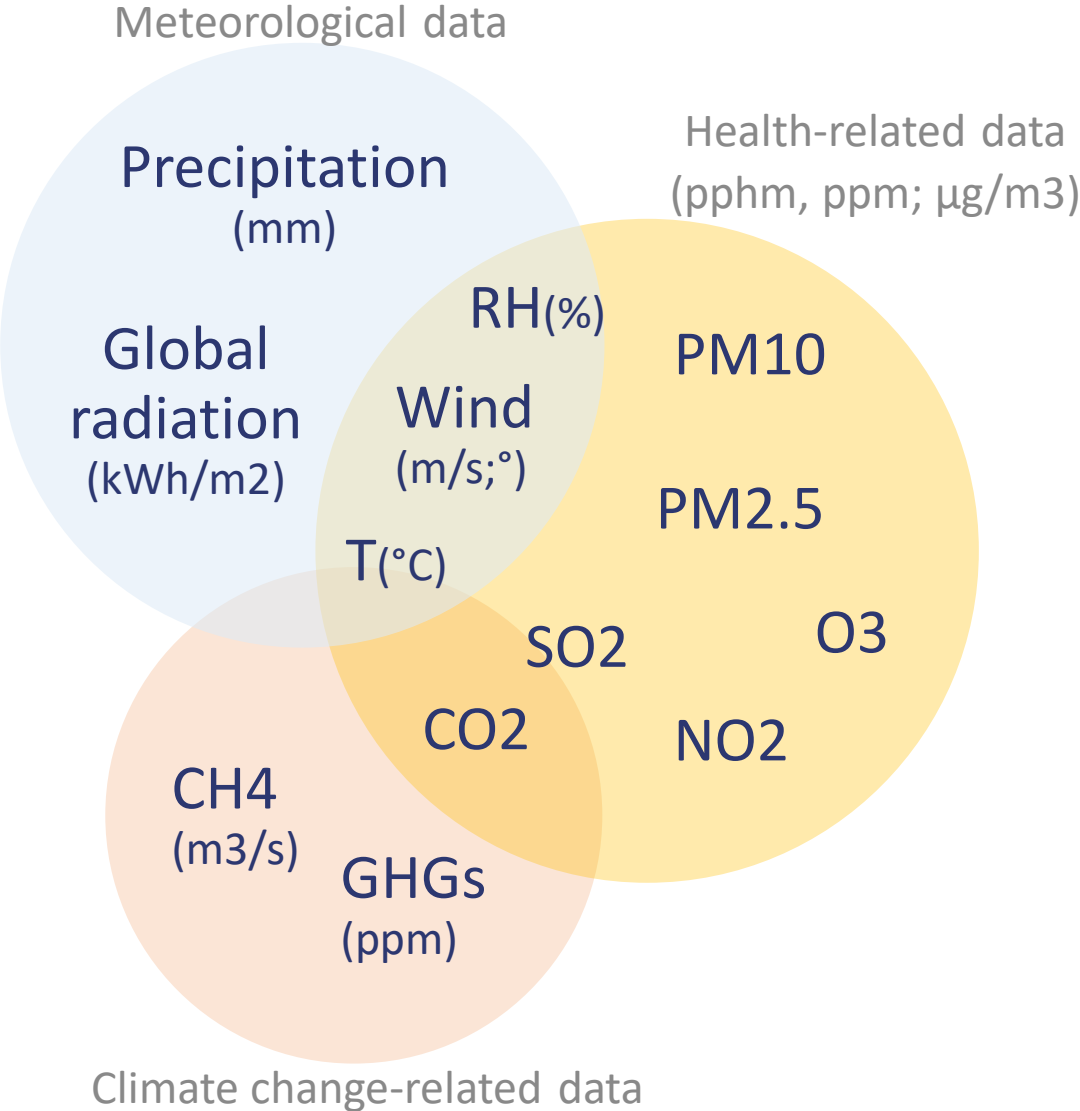
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Analysis of  
Spatial  
Autocorrelation  
– LISA. SMR and  
PM10

M.Dettori et. al. (2021). *Air pollutants and risk of death due to COVID-19 in Italy*, **Environmental Research**, 192: 110459, <https://doi.org/10.1016/j.envres.2020.110459>.

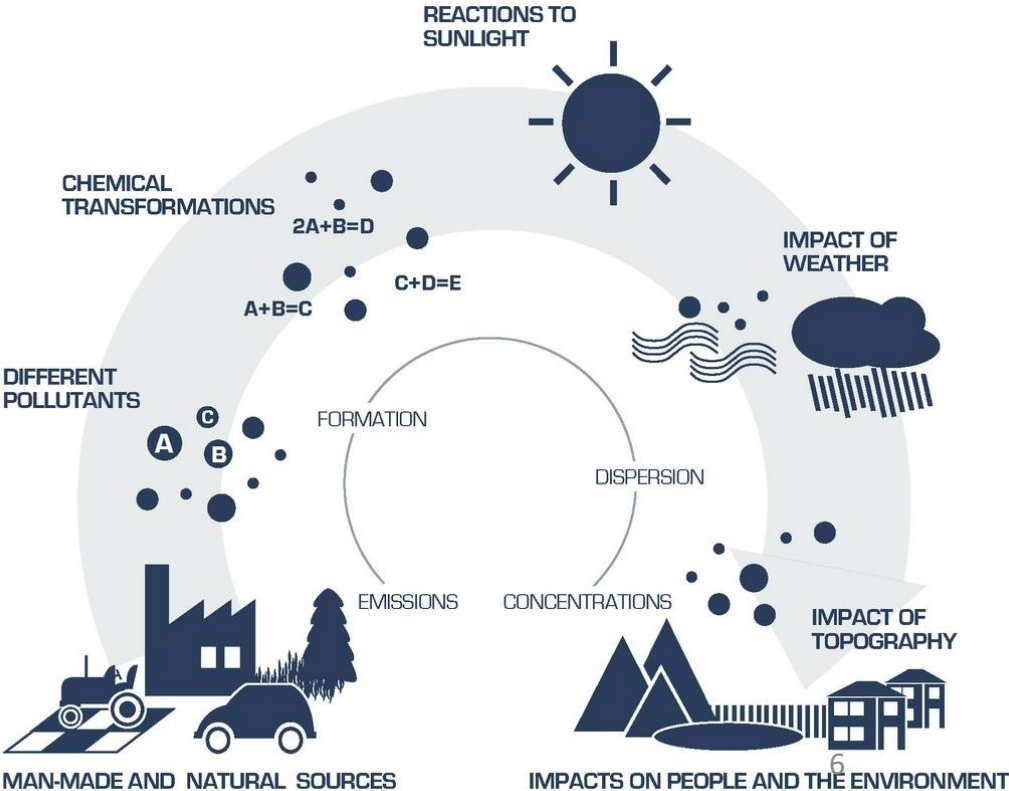
# An integrated approach

## Multi-hazard model






# Air data meteorological & pollution



## Complementary visions from the bottom / from the top


*Emitted pollutants are dispersed and thus diluted through the whole atmosphere, but both the emissions and the exposure all take place close to the surface of the earth - where in situ measurements are recorded.*

### In-situ



- Better resolution
- Local factors
- Validation of EO monitoring systems and forecasting models (especially regional models)
- Focused monitoring in critical areas

### EO

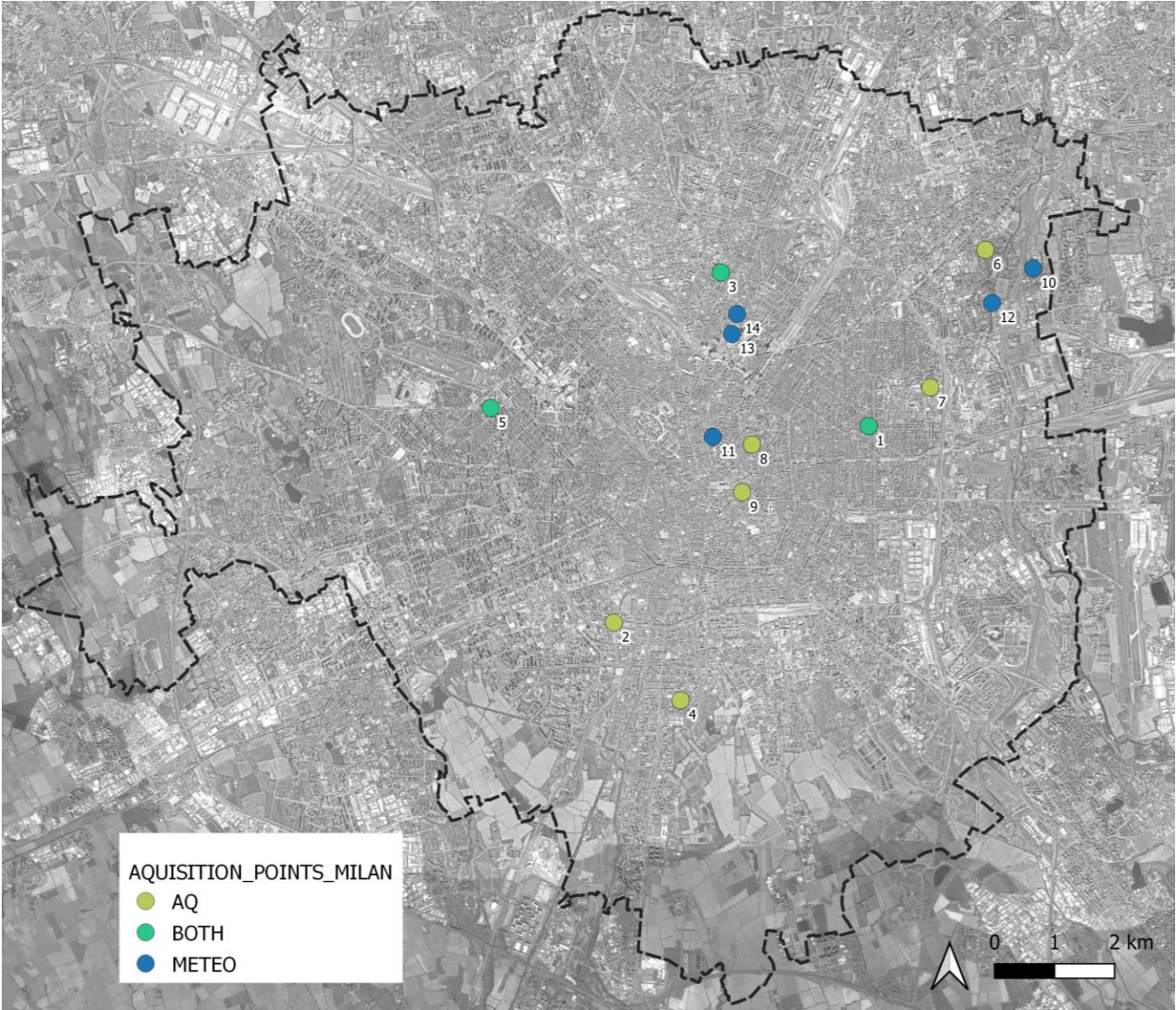


- Holistic vision
- Global factors
- Comprehensive global monitoring and forecasting system (e.g. Copernicus: 5-day forecast)
- + regional models are (4-day forecasts)
- Different depth of measurements (troposphere, stratosphere)



# In-situ monitoring network

MILAN, ITALY



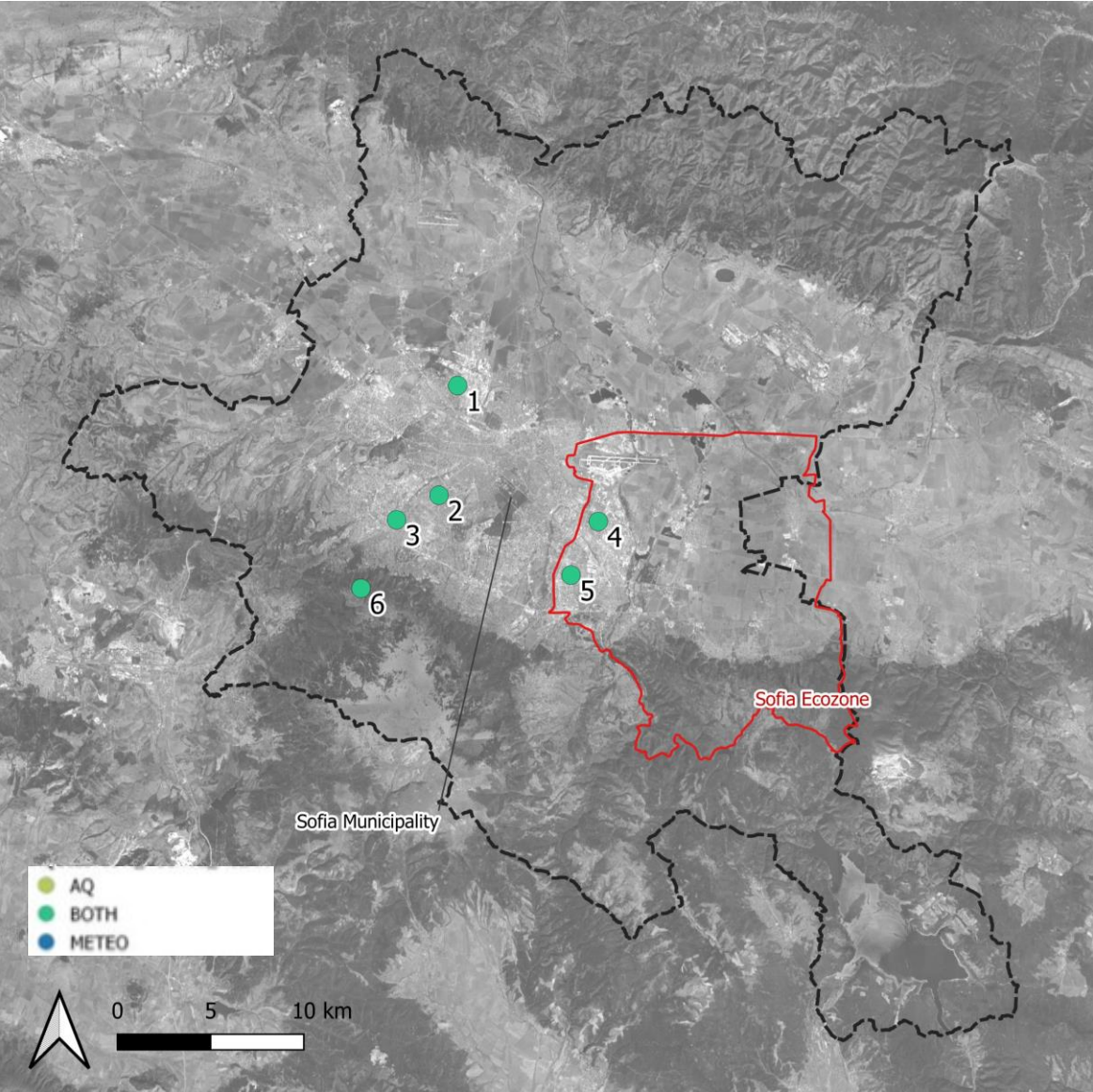
Monitoring network in Milan (DABC, POLIMI)





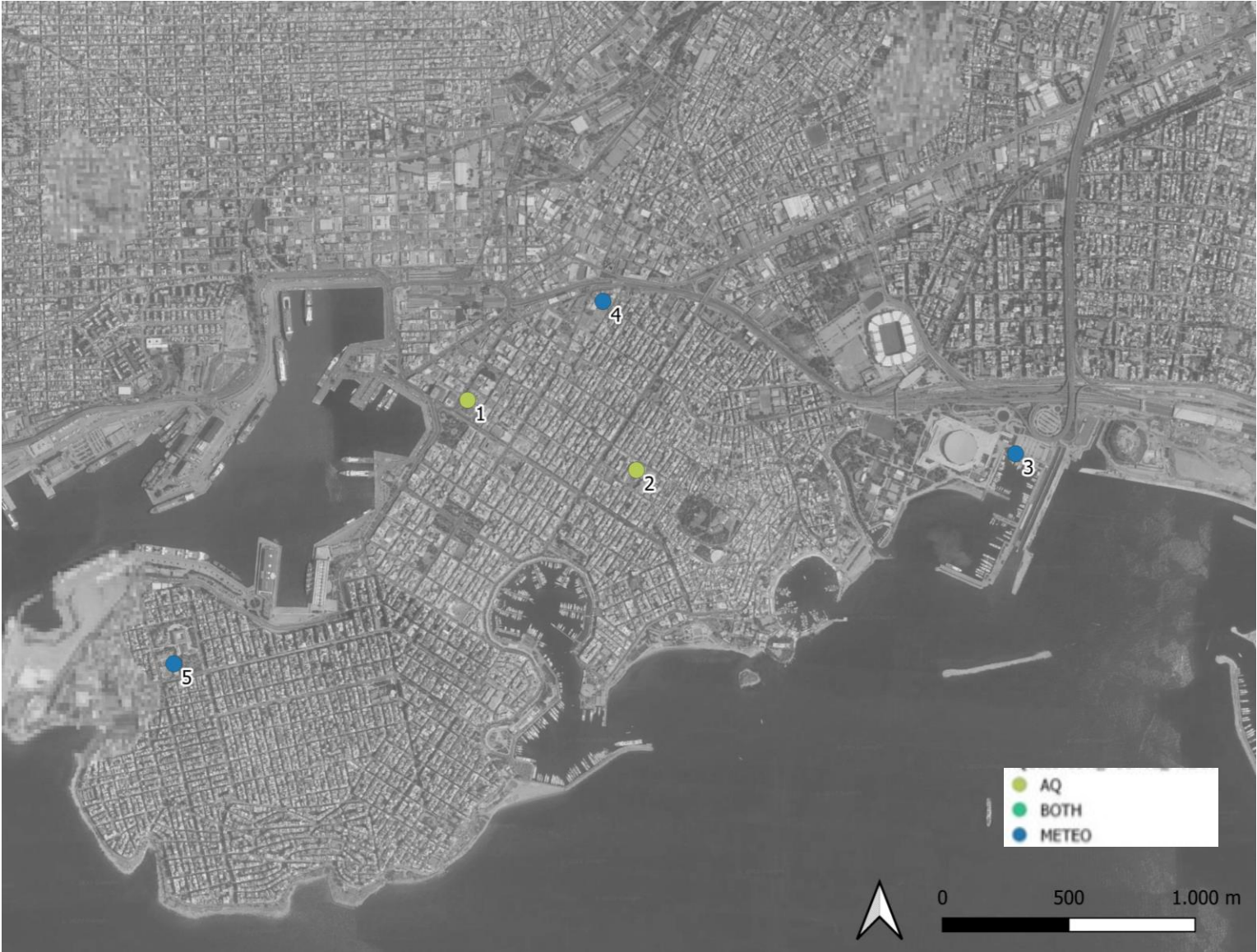
# In-situ monitoring network

SOFIA, BULGARIA



Monitoring network in Sofia (DABC, POLIMI)





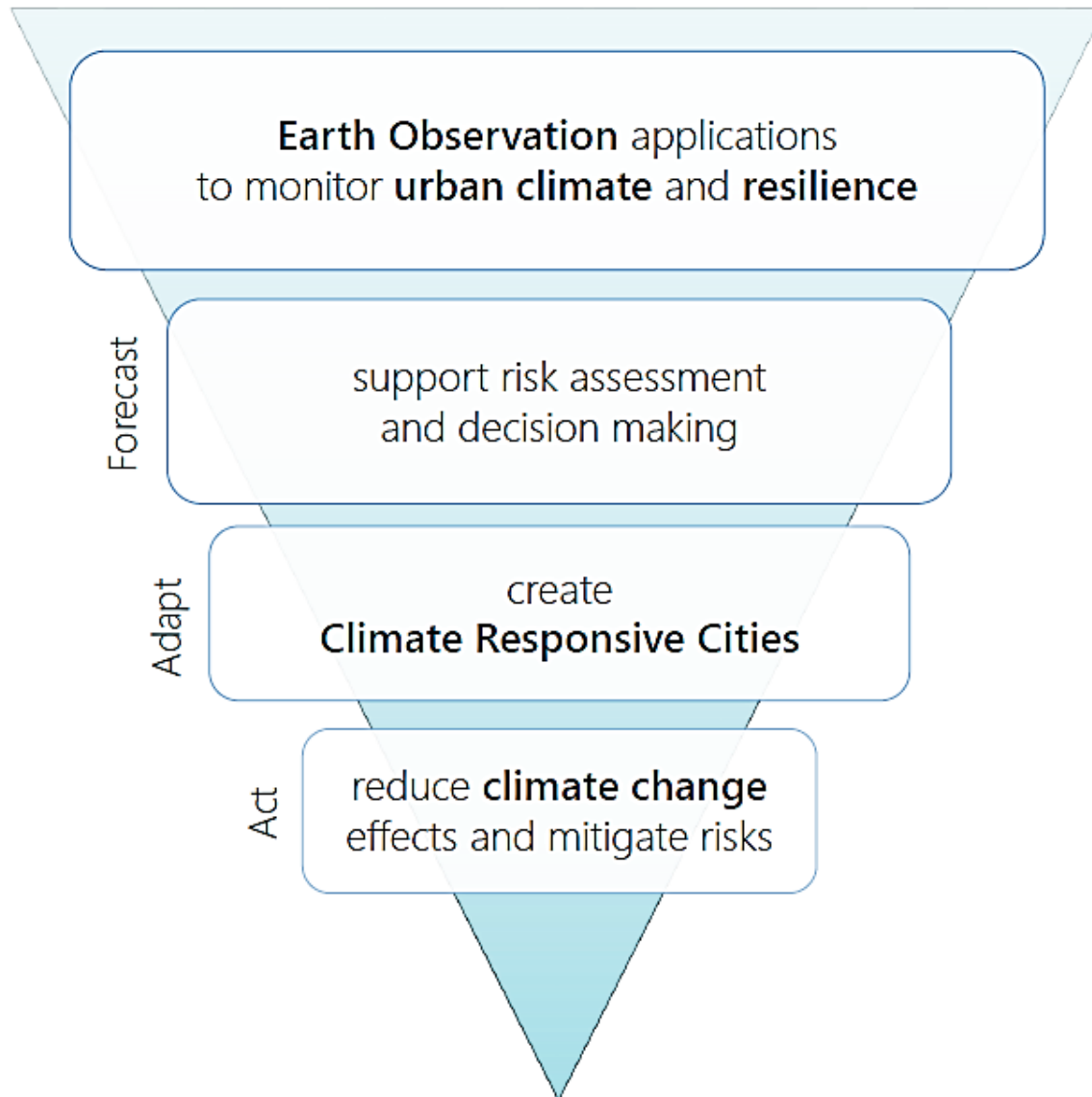
Monitoring network in Piraeus (DABC, POLIMI)

# In-situ monitoring network

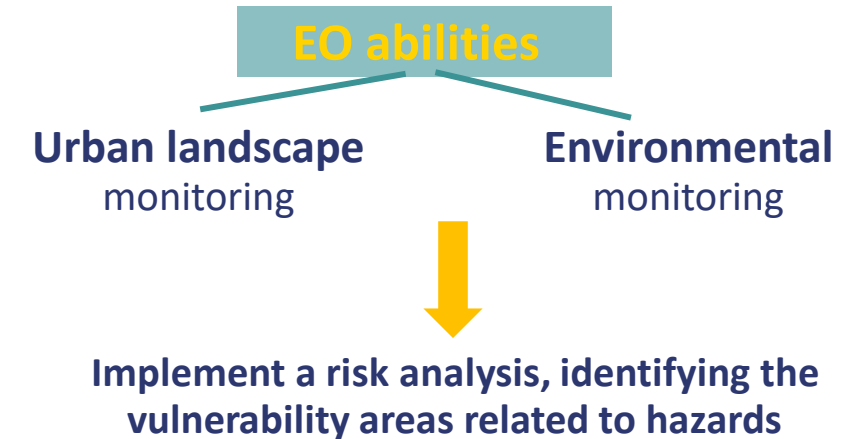
ATHENS, GREECE







# Earth Observation global monitoring



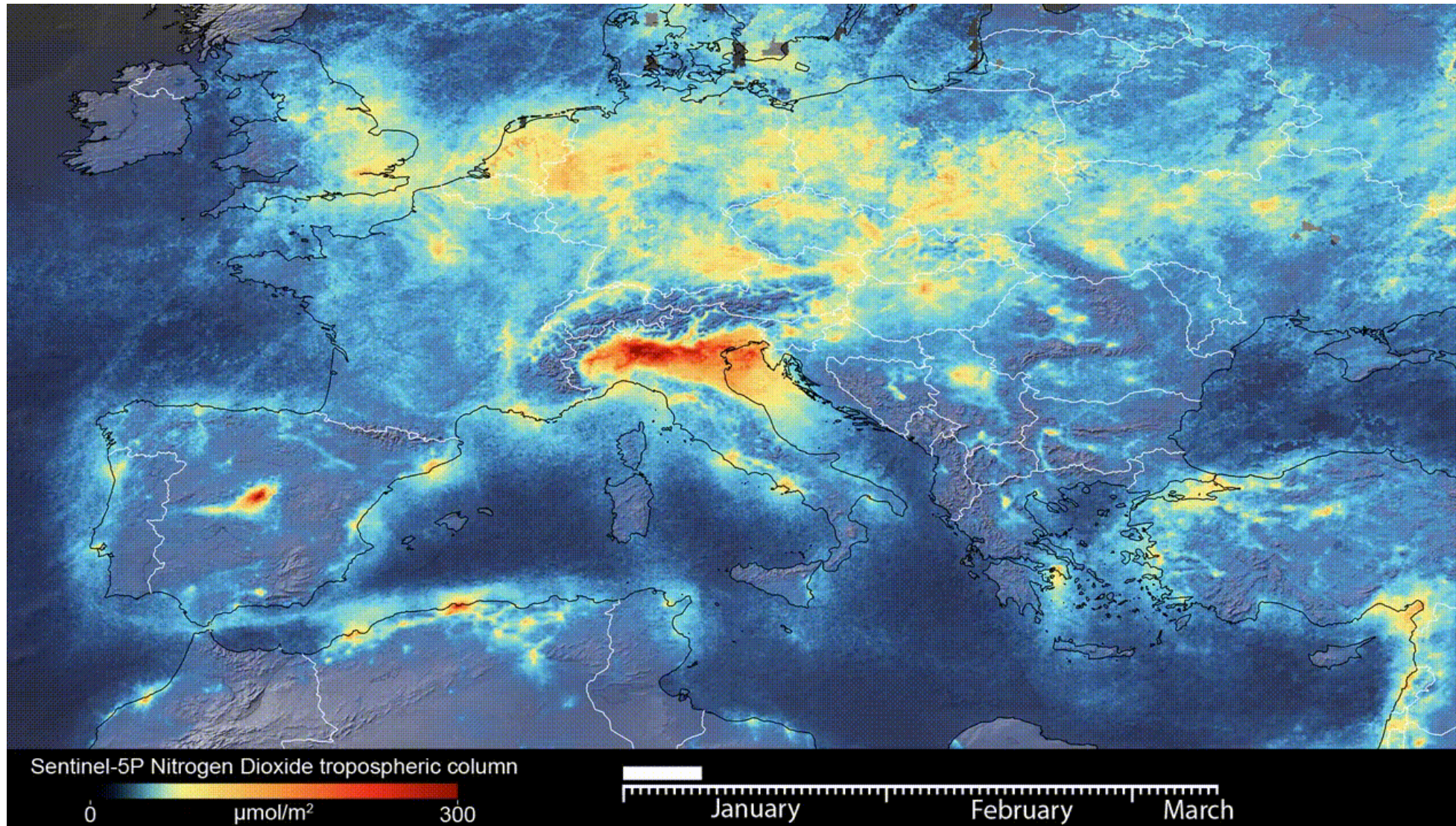
*In line with policies*

- Paris Agreement on CC
- European Green Deal
- NBS initiative
- European green deal targets
- Goals SDG11, SDG13  
(UN 2030 Agenda for Sustainable Development)





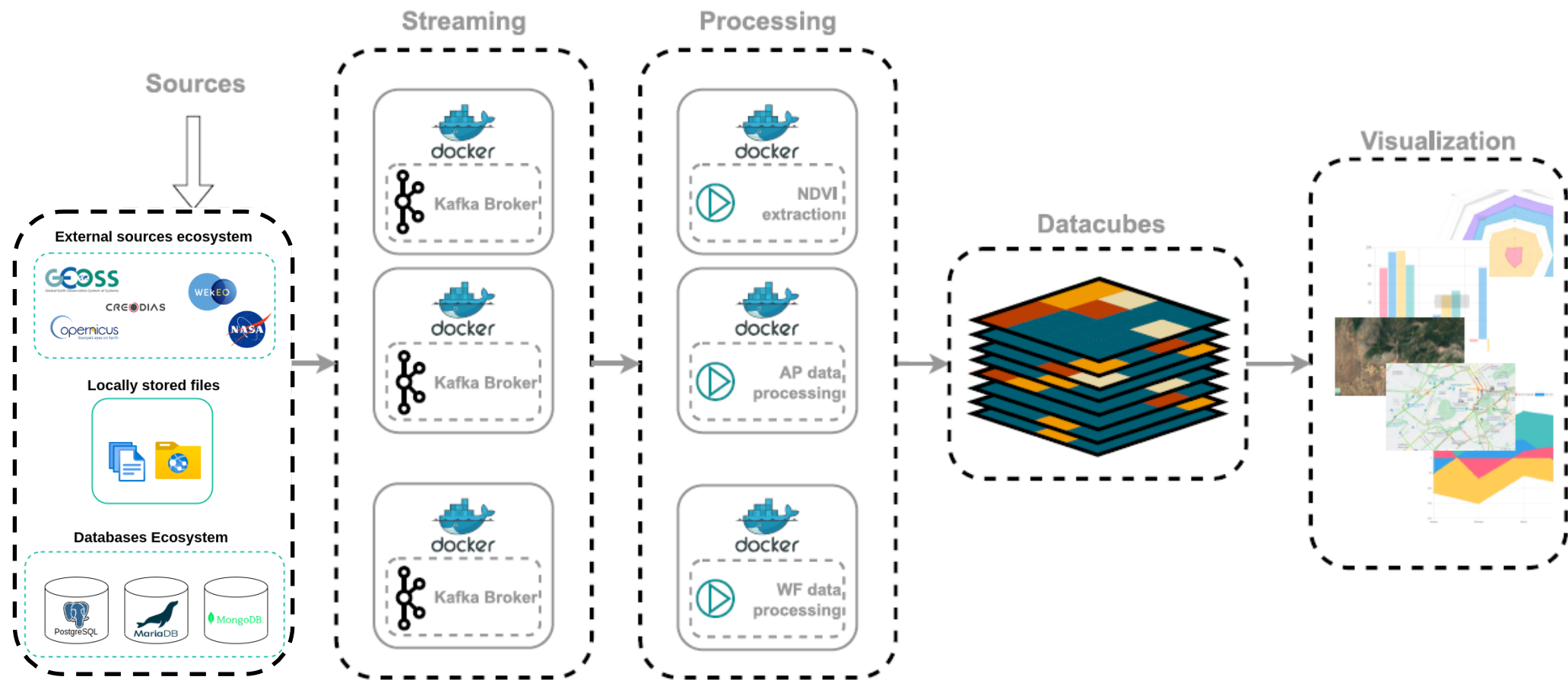
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Nitrogen dioxide emissions drop over Italy across Europe in **1 January 2020** (on the left) and **11 March 2020** (on the right) (data from the Copernicus Sentinel-5P satellite, European Space Agency (ESA))



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The conceptual architecture of IRAP platform (ICCS, NTUA)

Thanks for your attention!

