



# Air quality modelling in support of environmental policy in Poland

Joanna Struzewska, Jacek W. Kaminski,  
Paweł Durka, Grzegorz Jeleniewicz, Paulina Jagiełło,  
Aneta Gienibor, Marcin Kawka, Aleksander Norowski

Department of Atmospheric and Climate Modelling  
Institute of Environmental Protection – National Research Institute

TFIAM 49 Webinar 20-22.04.2020



# Outline

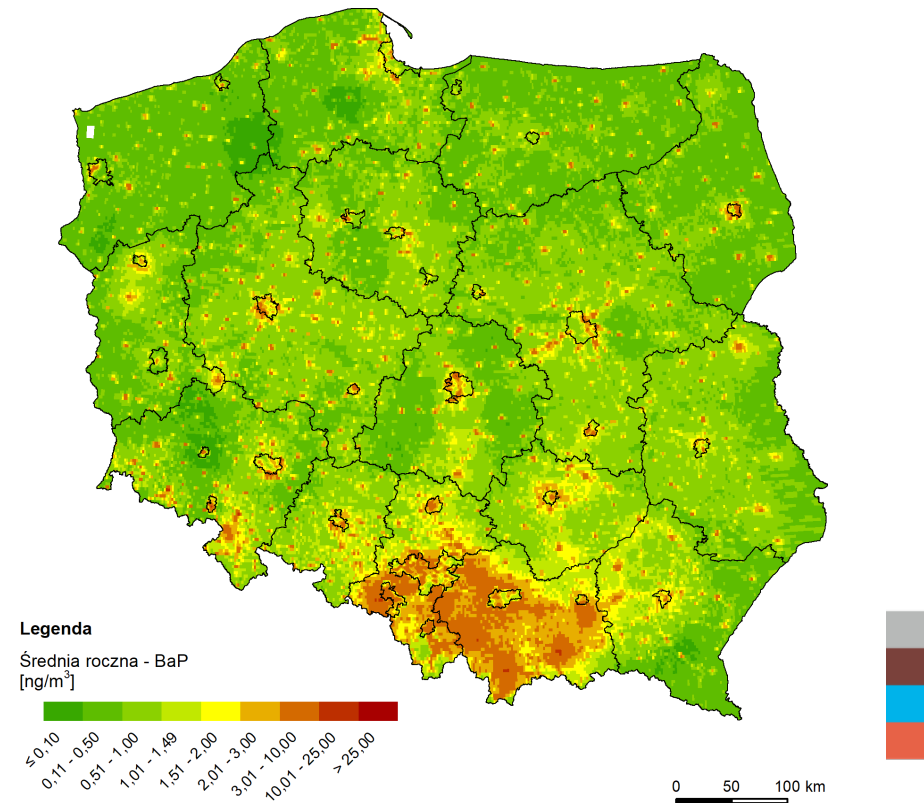
- Air quality modelling for policy support
- Scenario assessment
- International cooperation
- Ongoing tasks
- Message for policy makers



# Air Quality Modelling - policy support



Starting in 2018 the Institute of Environmental Protection – National Research Institute is responsible for modelling in support of air quality policy for Poland (reporting to the Ministry of Climate)

- Annual assessment (46 zones, including 30 urban zones)
- Transboundary transport assessment
- Representativeness of monitoring sites
- 5y assessment for the purpose of zone classification
- Decision support concerning National Air Quality Improvement Plans
- Operational air quality forecasting

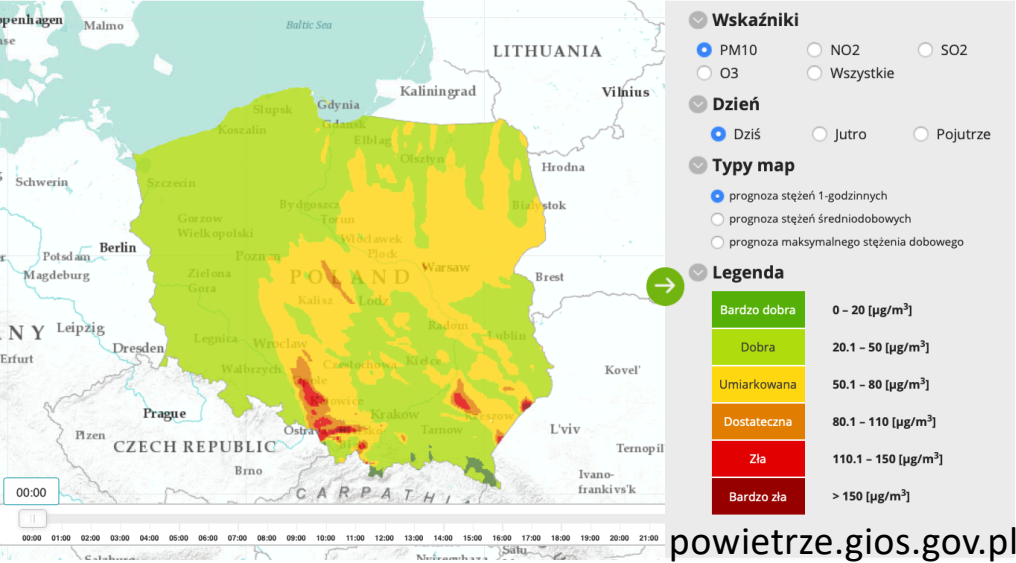


# AQ forecast

- A 3-day forecast is provided every day to the Chief Inspectorate of Environmental Protection
- Alerts distributed to the Government Centre for Security and Voivodeship Crisis Management Centres

Menu   [Strona główna](#) [Kim jesteśmy](#) [Kontakt](#) **Official web-service**

Strona główna » [Prognozy zanieczyszczeń powietrza](#)



**Wskaźniki**

- PM10
- NO2
- SO2
- O3
- Wszystkie

**Dzień**

- Dziś
- Jutro
- Pojutrze

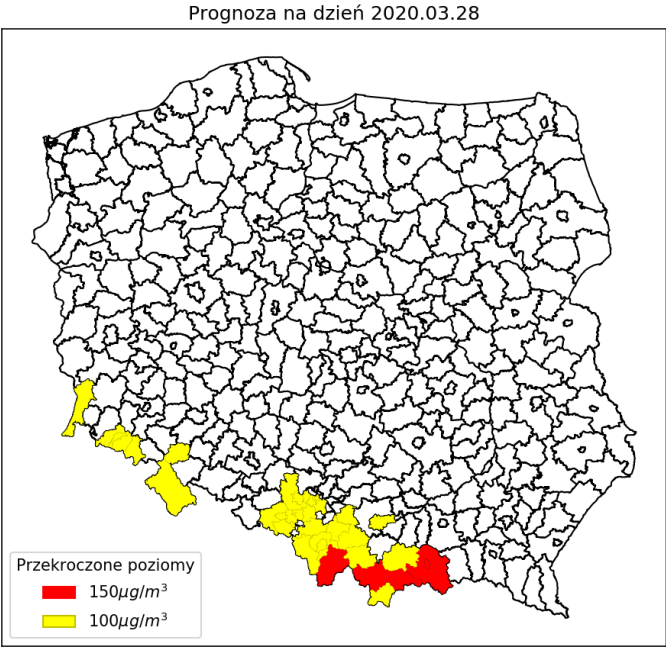
**Typy map**

- prognoza stężeń 1-godzinnych
- prognoza stężeń średniodobowych
- prognoza maksymalnego stężenia dobowego

**Legenda**

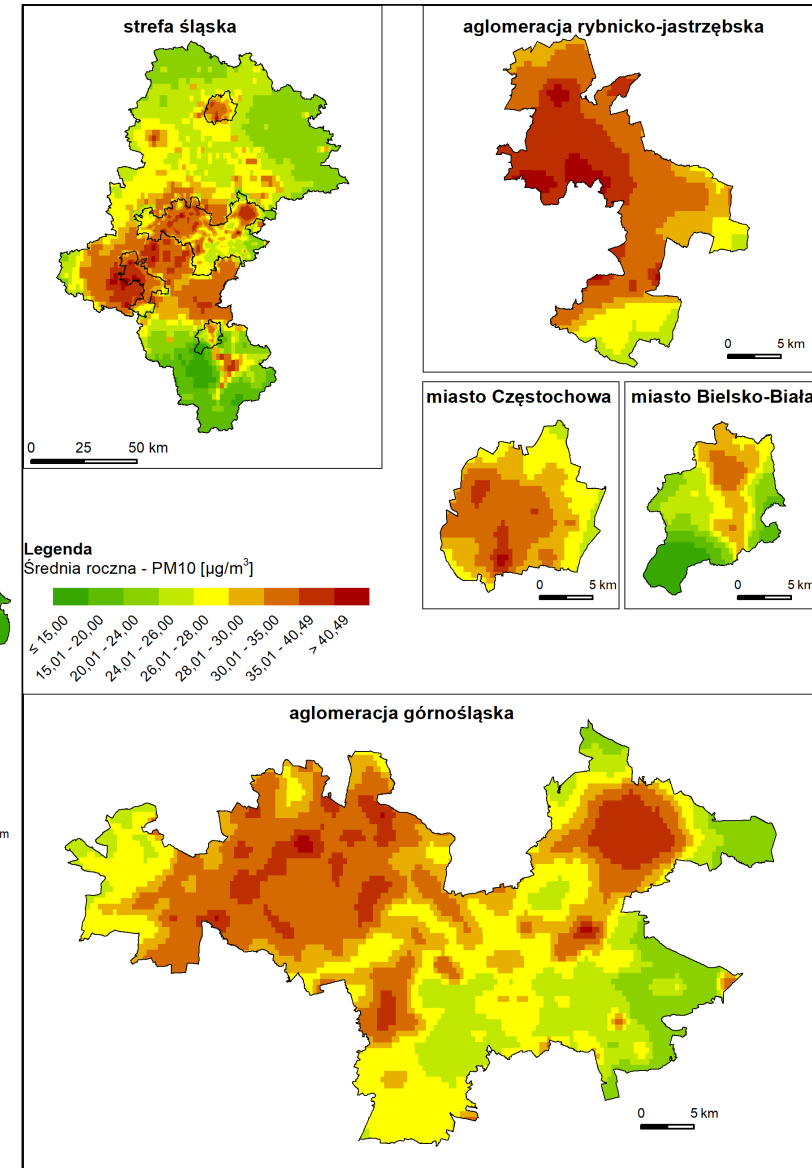
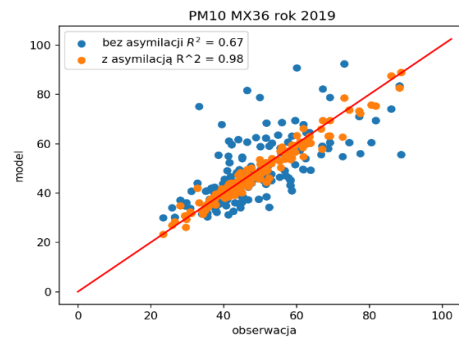
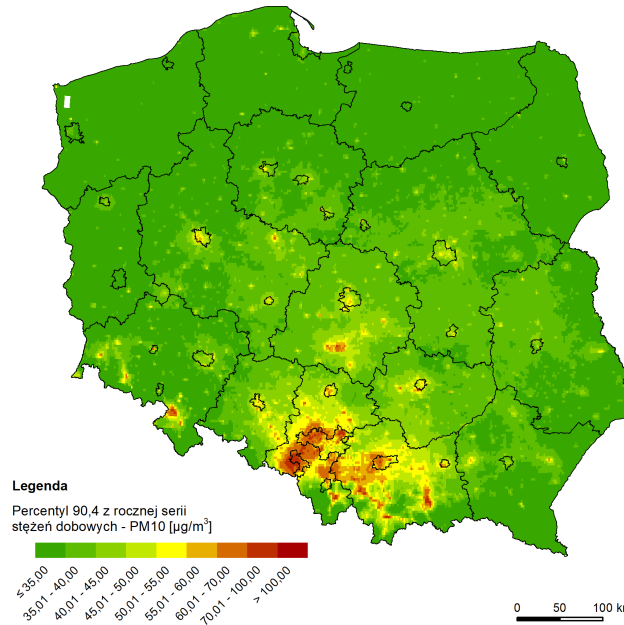
Bardzo dobra	0 – 20 [ $\mu\text{g}/\text{m}^3$ ]
Dobra	20.1 – 50 [ $\mu\text{g}/\text{m}^3$ ]
Umiarkowana	50.1 – 80 [ $\mu\text{g}/\text{m}^3$ ]
Dostateczna	80.1 – 110 [ $\mu\text{g}/\text{m}^3$ ]
Zła	110.1 – 150 [ $\mu\text{g}/\text{m}^3$ ]
Bardzo zła	> 150 [ $\mu\text{g}/\text{m}^3$ ]

powietrze.gios.gov.pl



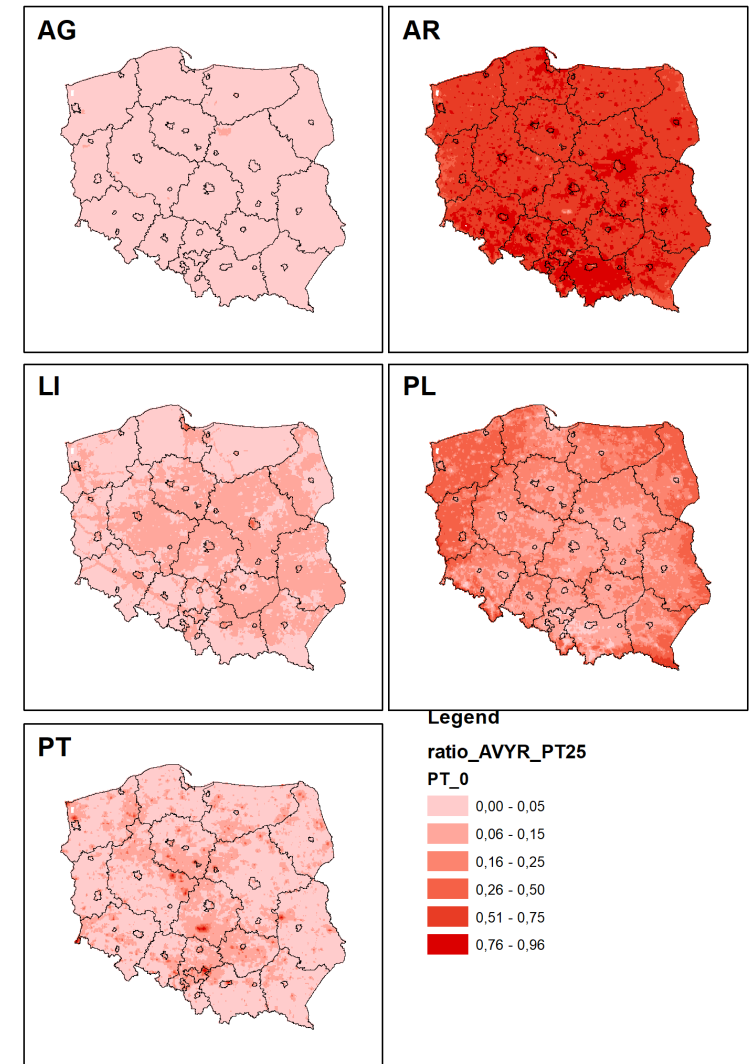
# AQ annual assessment

- Based on national high resolution bottom-up inventory updated every year (0.5 km resolution)
- Evaluation
- Data assimilation
- 2.5 km county scale
- 0.5 km agglomeration (with >100K inhabitants)

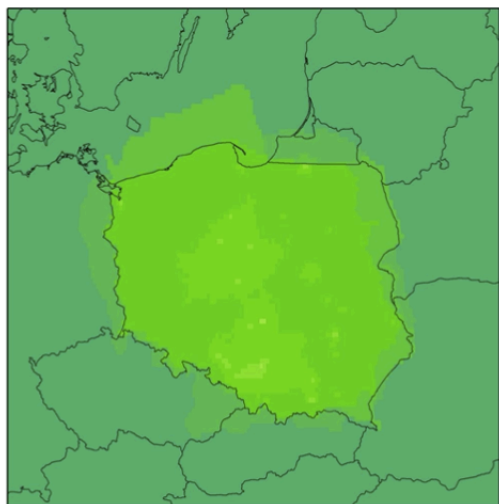


# Source contribution

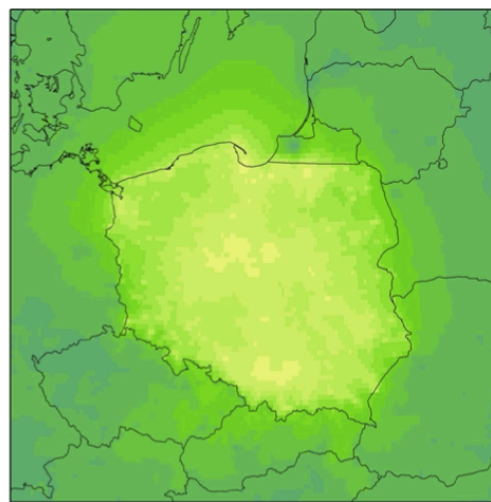
- Supplement to the annual assessment
  - Agriculture (AG)
  - Area sources (AR)
  - Line sources (LI)
  - Energy sector and industry (PT)
  - Transboundary (PL)
- Calculated for  $PM_{10}$  and  $PM_{25}$



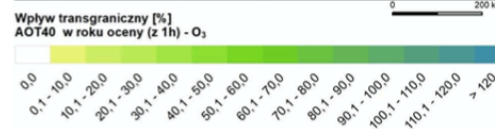
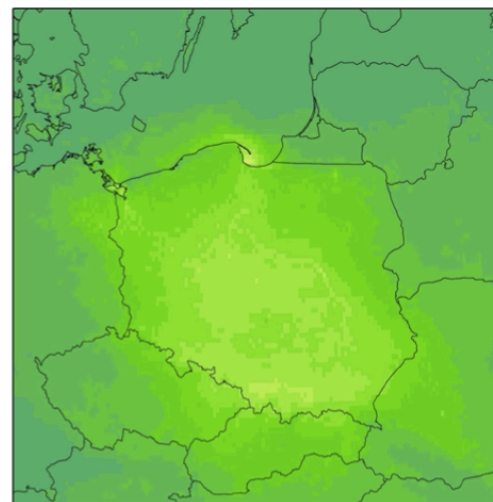
# Transboundary transport assessment



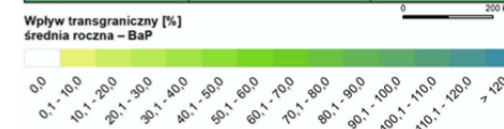
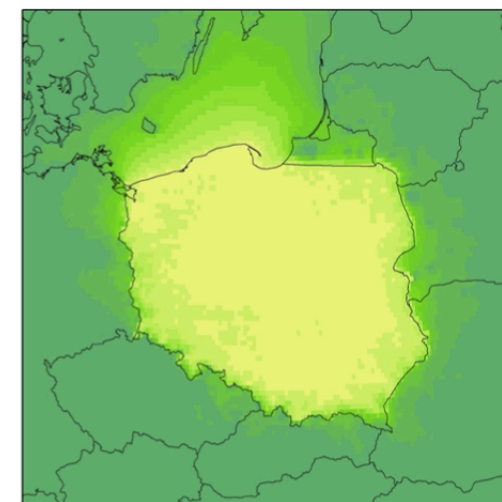
PM10



SO<sub>2</sub>



AOT40

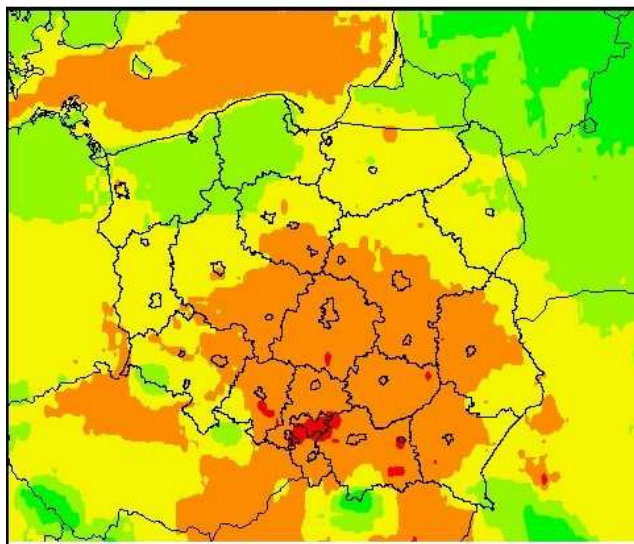


B[a]P

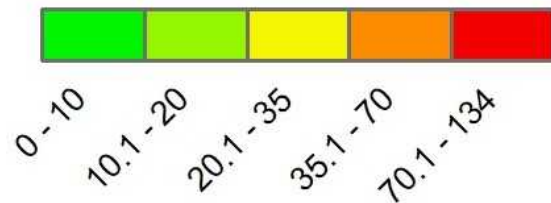


# AQP effectiveness – PM<sub>10</sub> (no of days concentrations > 50ug/m<sup>3</sup>)

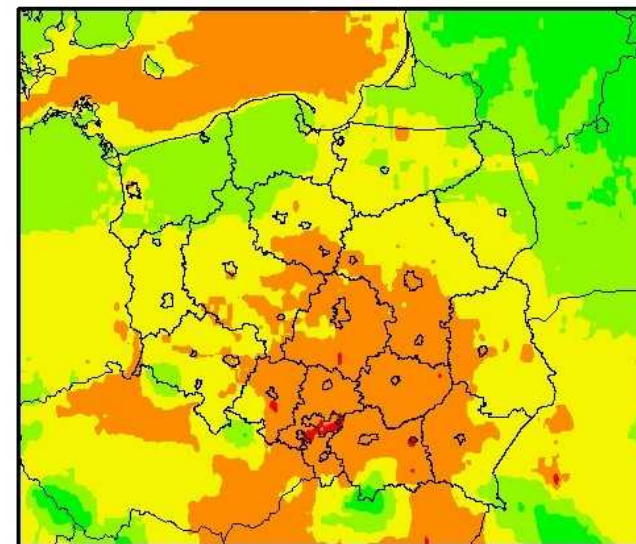
**BASE**



Liczba dni z przekroczeniem 50 (z 24h)



**All local AQPs**

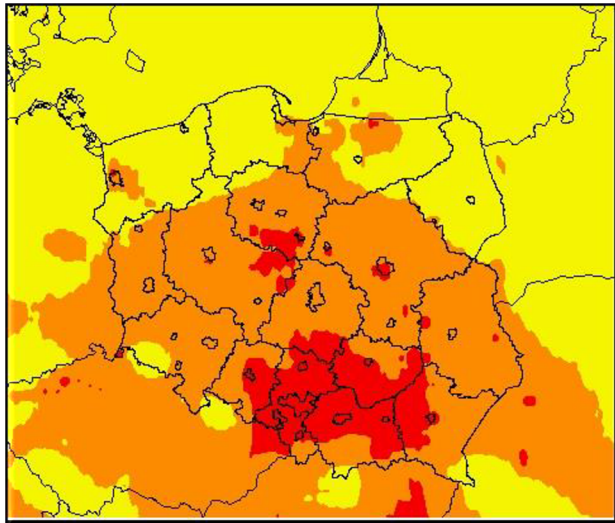


0 200 400 km

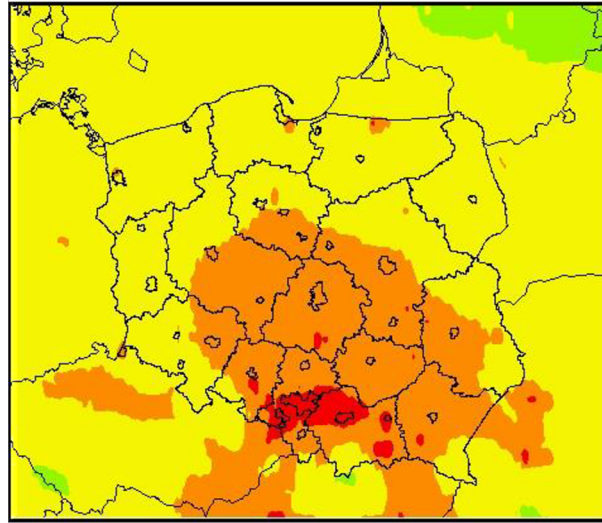


# Impact of NEC Directive reductions on PM<sub>2.5</sub> concentrations

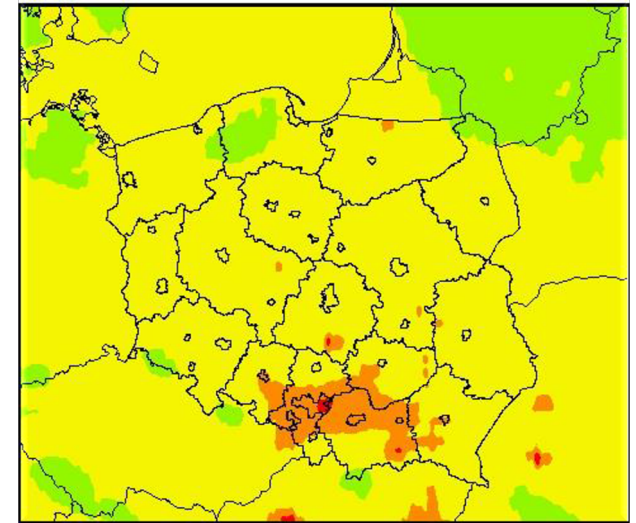
Base scenario



2025



2030



Annual average – PM 2.5 [ $\mu\text{m}^3$ ]



9.2 - 10

10.1 - 15

15.1 - 20

20.1 - 25

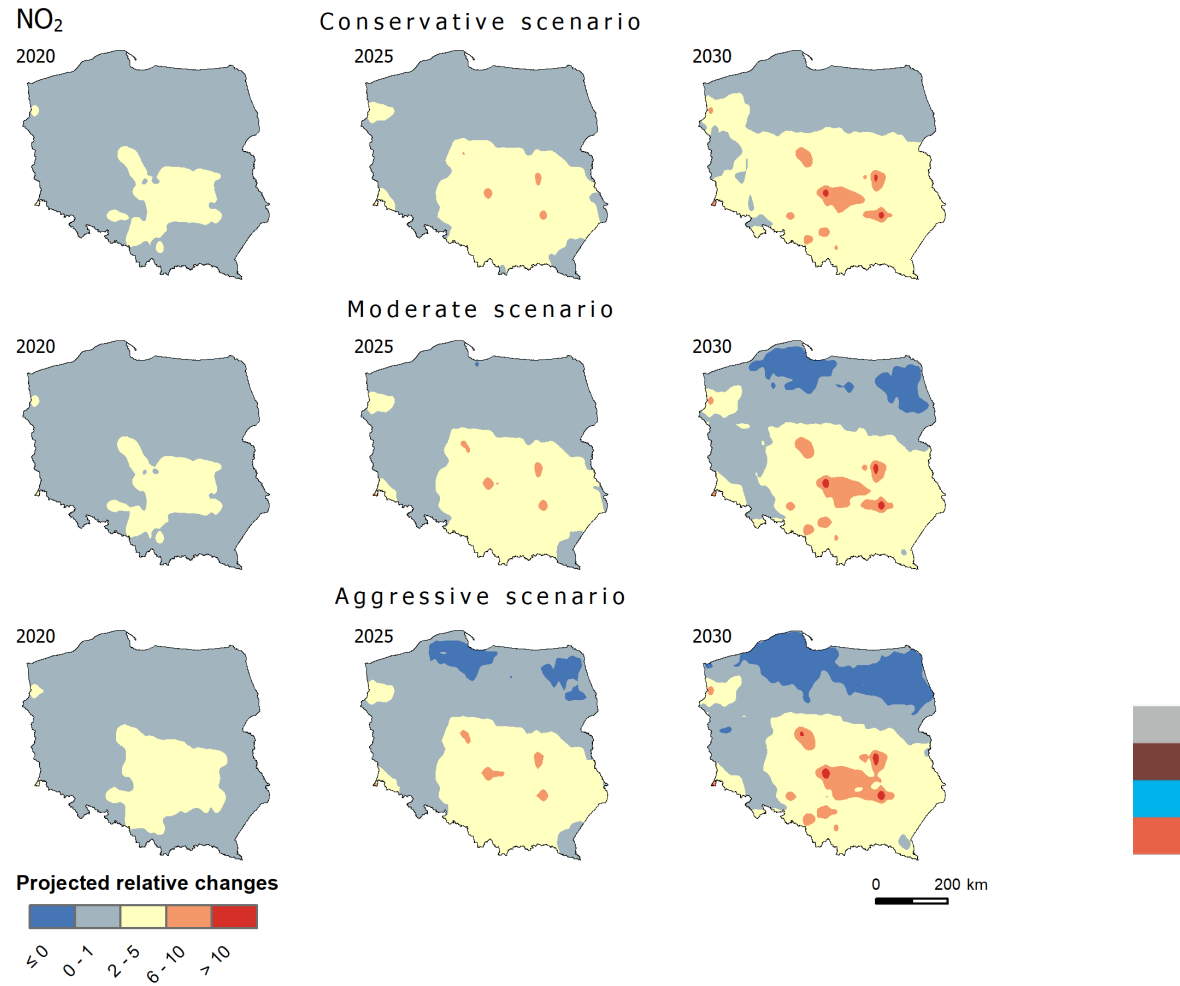
25.1 - 40.9



# Emission scenarios assessment

- Impact of electromobility development in Poland on Air Quality

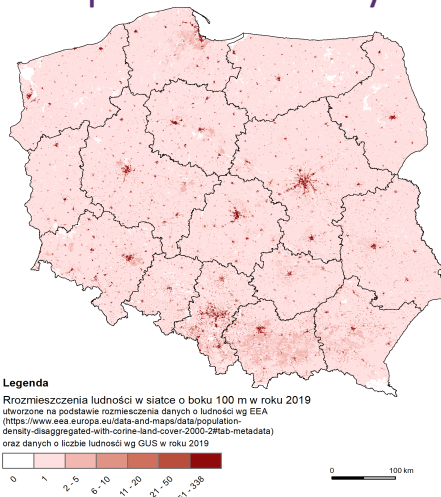
Relative change [%] of NO<sub>2</sub> concentrations in three scenarios as compared to 2015



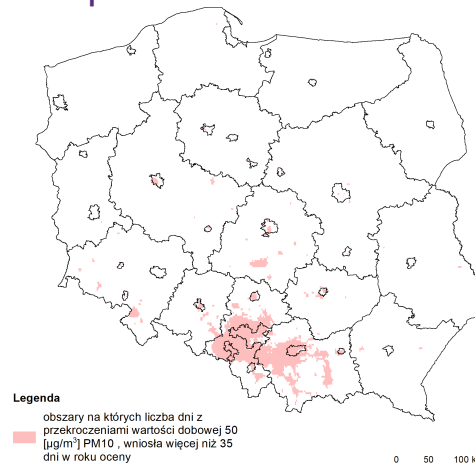
# Ongoing tasks

- Scenario assessment – cooperation with industry
  - PGE – impact of gasification (country scale)
  - Termika S.A. (Warsaw agglomeration)
- Health effects based on modelling results (spatial distribution, annual basis)

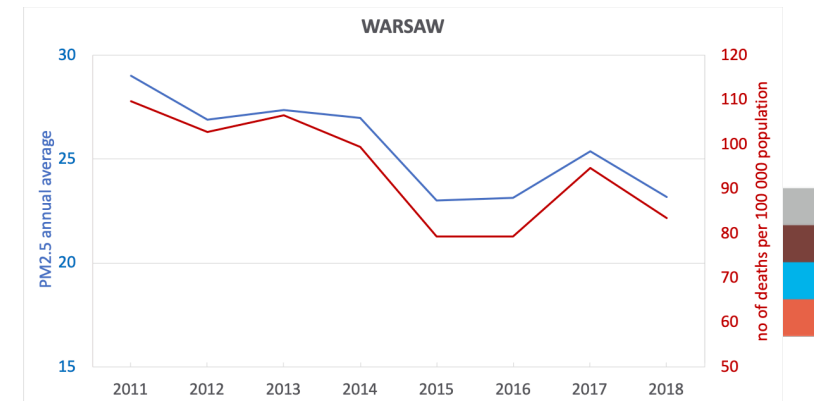
Population density



Exposure area 2019



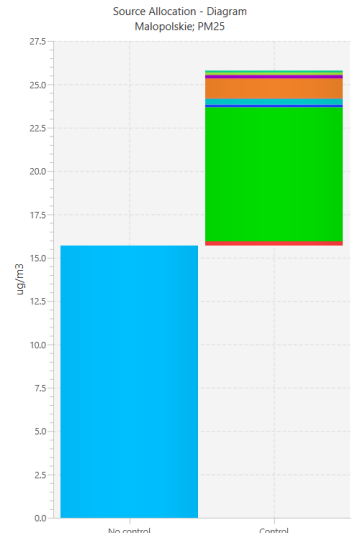
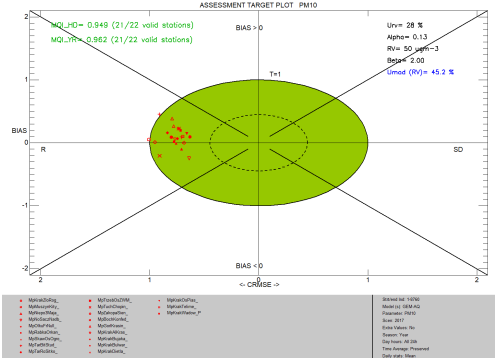
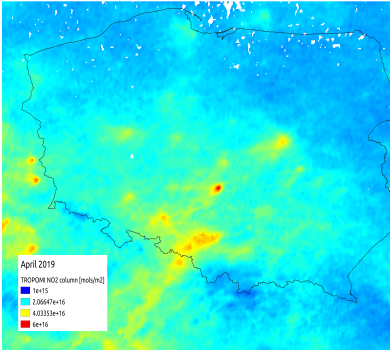
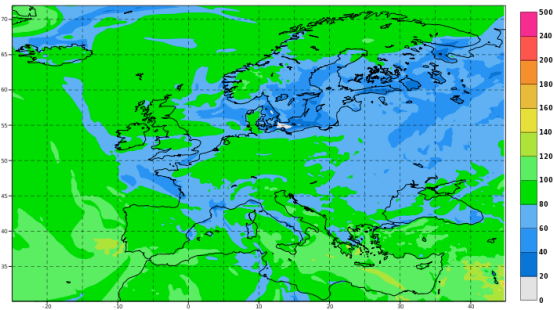
Measurement based AirQ+



# International cooperation – European context

- LRTAP: HTAP, TFFM (EurodeltaCarb)
- CAMS\_50
- EMEP-East - BaP case study for PL (cooperation with Czech)
- TROPOMI (S5P)
- FAIRMODE (Sherpa bottom-up, RIAT+)

Monday 20 April 2020 00UTC CAMS Forecast t+014 VT: Monday 20 April 2020 14UTC  
Model: GEMAO Height level: Surface Parameter: Ozone [  $\mu\text{g}/\text{m}^3$  ]



# Summary

- Integrated system for different applications to support Ministry of Climate (previously Ministry of Environment)
- Coherent treatment of emission assessment (NCEIP is also a part of IEP-NRI)
  - Updated and verified emission inventory
  - Correction of spatial distribution for EMEP
  - Cooperation with other groups in emission unit – NEC / reduction strategies
- Routine activity is a base for the impact assessment analysis and modelling (in terms of spatial distribution and scenarios)
  - Health effects
  - Deposition
- Ammonia – not required in any modelling for the Ministry but available in our results for CAMS\_50



# Message for policy makers

- Emission reduction strategies for AQP developed locally will not be efficient
- Requirements for AQP should be reformulated
- Analysis of transboundary impact requires the same emission resolution on both sides → need for bilateral scientific cooperation and data exchange



# Thank you!

