Air quality in Poland – Exceedance situation indicators

Department of Atmospheric and Climate Modelling

Institute of Environmental Protection - National Research Institute
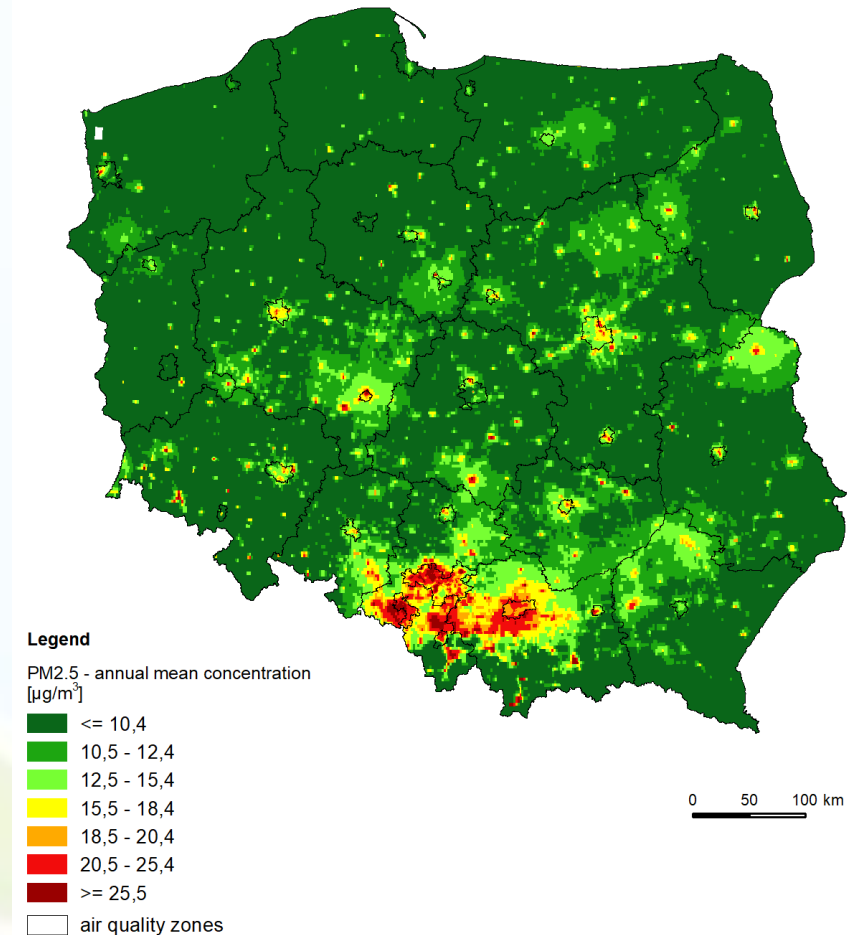
mgr inż. **Grzegorz Jeleniewicz**

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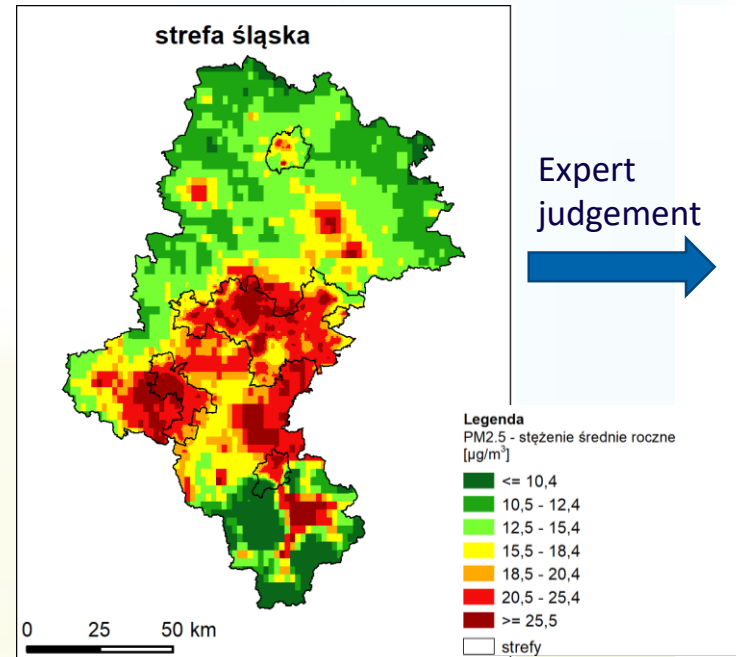# Annual Air Quality Assessment - Poland

1. Annual assessment (45 zones, including 29 urban areas)

2. Pollutants: NO_2, NOx, PM_{10}, $PM_{2.5}$, BaP ,O_3, SO_2, CO, C_6H_6, Pb, As, Cd, Ni

3. Institute of Environmental Protection - National Research Institute (IEP-NRI) is responsible for modelling in support of the Annual Air Quality Assessment since 2018. (GEM-AQ model)

4. **Chief Inspectorate Of Environmental Protection is responsible for the Annual Air Quality Assessment based on modelling results and pollution concentrations measurements from monitoring network (16 documents one for each voivodeship)**

Legend

PM2.5 - annual mean concentration [μg/m³]

- <= 10,4
- 10,5 - 12,4
- 12,5 - 15,4
- 15,5 - 18,4
- 18,5 - 20,4
- 20,5 - 25,4
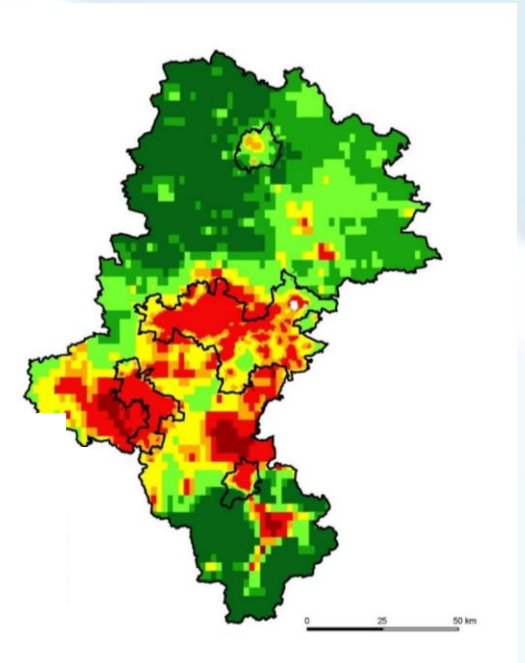- >= 25,5
- air quality zones

0   50   100 km

Areas of exceedance situations

1. Air quality modeling – GEM-AQ
2. Expert judgement (based on pollution measurements emission data, land cover data, SR areas)
3. Exclusions – industrial areas

Model results – PM2.5

Expert judgment– PM2.5

strefa śląska

Expert judgement

Legenda
PM2.5 - stężenie średnie roczne [µg/m³]
- <= 10,4
- 10,5 - 12,4
- 12,5 - 15,4
- 15,5 - 18,4
- 18,5 - 20,4
- 20,5 - 25,4
- >= 25,5
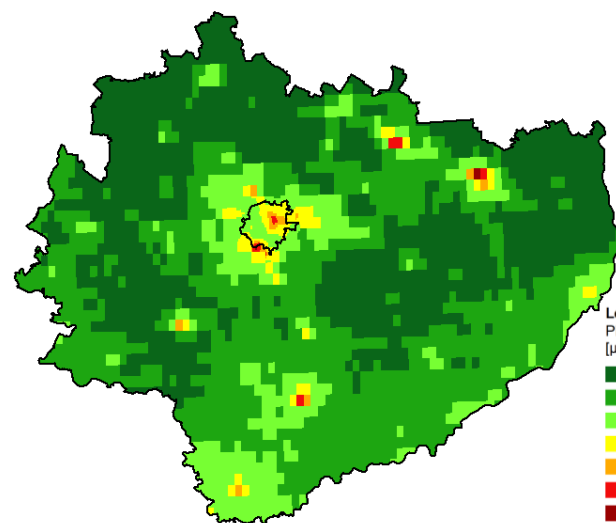- strefy

0   25   50 km

Areas of exceedance situations – expert judgement

When expert judgement is used:

1. Model results shows exceedance situation and measurement result of pollution concentration is lower than a given threshold
2. Measurement result shows exceedance situation and model results shows value below a given threshold
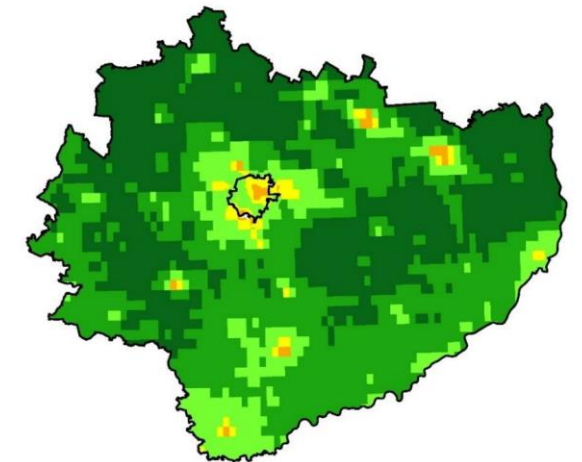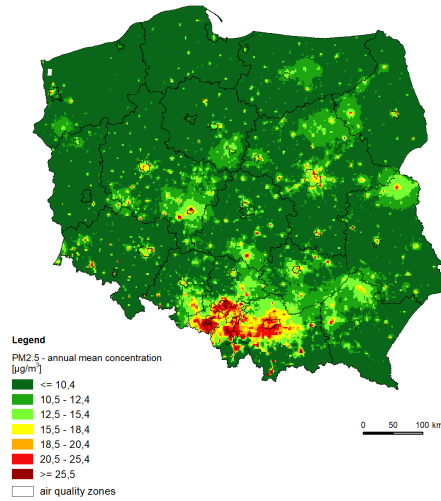3. Wrong emission data (e.g. high emissions from households combustions at areas apartment buildings.
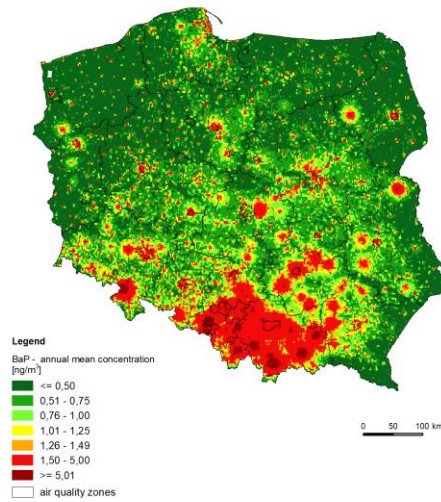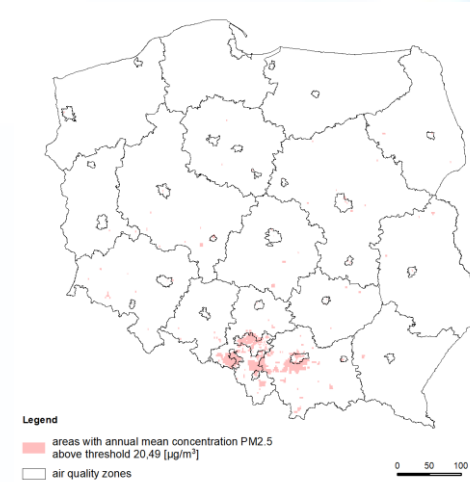
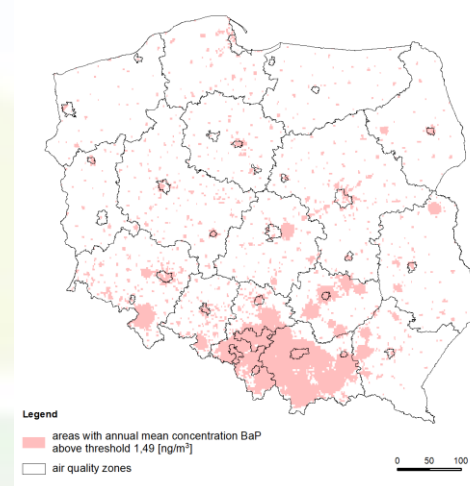Model results – PM2.5

Expert judgement

Expert judgment– PM2.5

Legenda
PM2.5 - stężenie średnie roczne [µg/m³]

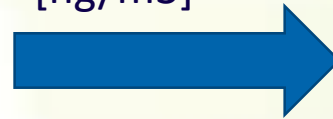|	
■	<= 10,4
■	10,5 - 12,4
■	12,5 - 15,4
■	15,5 - 18,4
■	18,5 - 20,4
■	20,5 - 25,4
■	>= 25,5
□	strefy

Areas of exceedance situations

above
20,49
[μg/m3]

above
1,49
[ng/m3]

Areas of exceedance situations - difficulties and doubts

- Exceedance area covers mainly industrial area excluded from annual assessment

- Small area with exceedance situation beyond industrial area – to report or not?
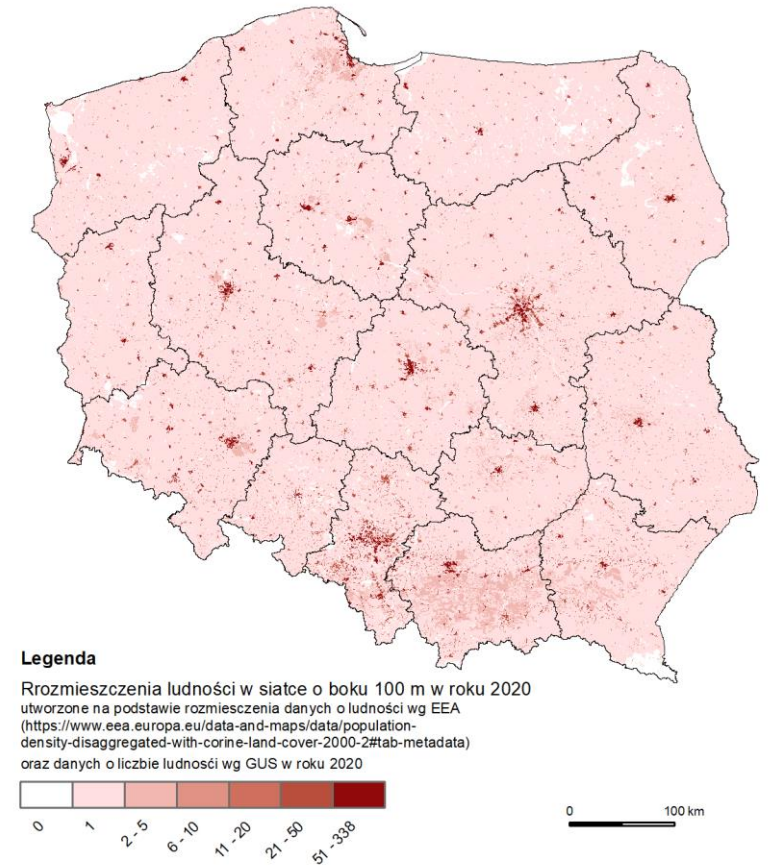

exceedance situations - industrial area
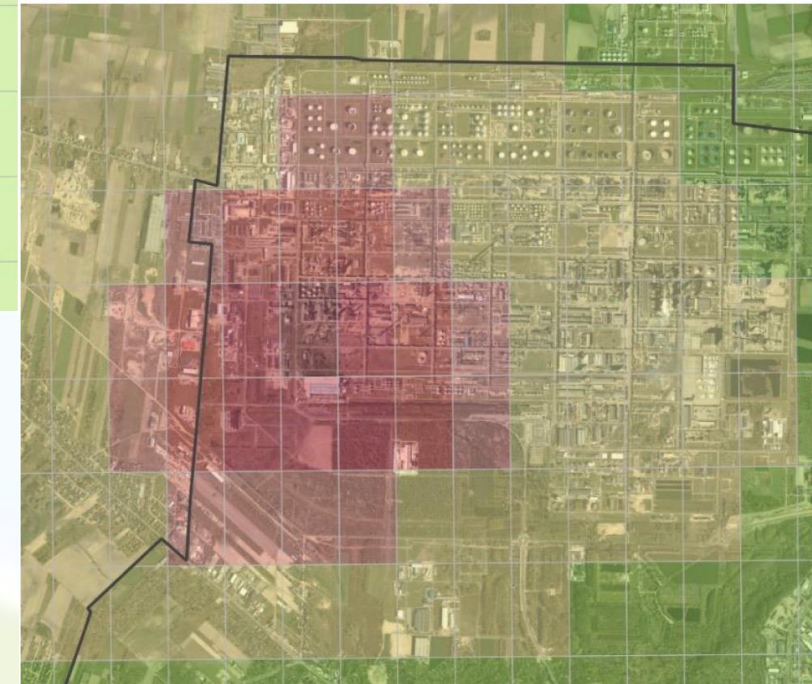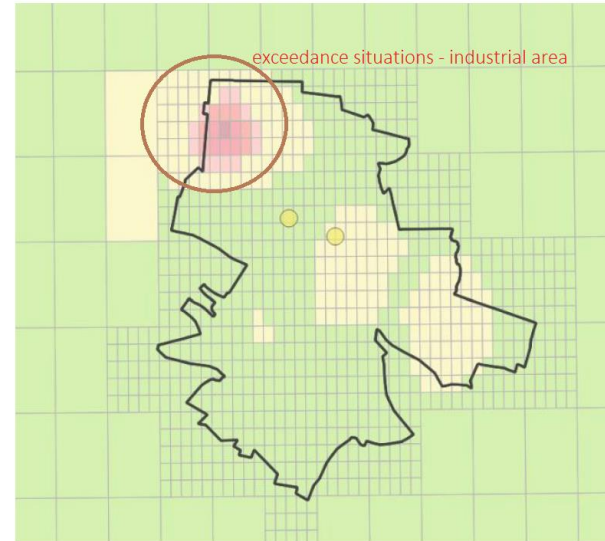
Areas of exceedance situations – difficulties and doubts

- Exceedance area located mainly in one air quality zone
- Should we classify zone no 2. as exceedance area

Air qualitu zone no. 1

exceedance area

Air qualitu zone no. 2
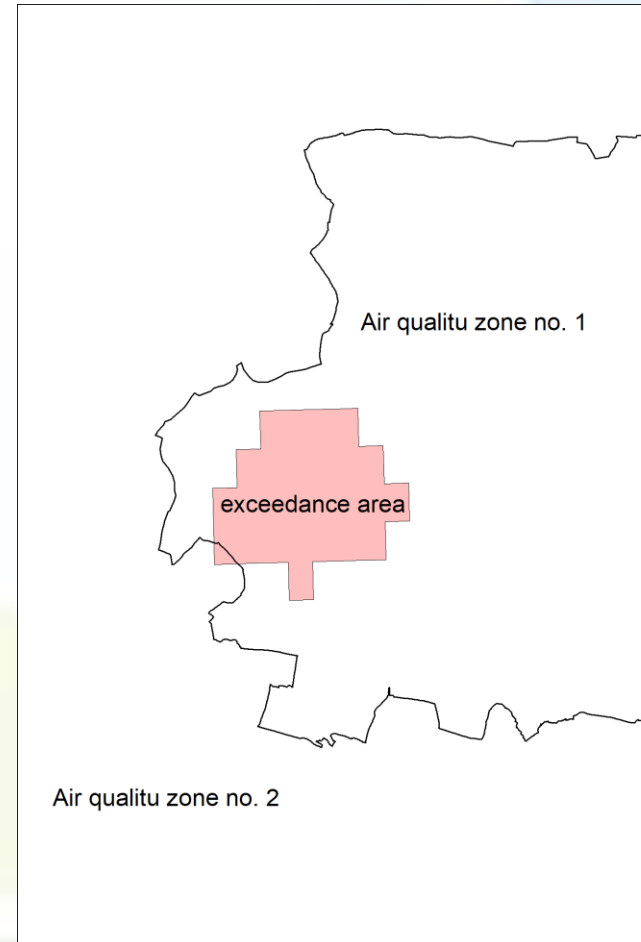
Exceedance situations indicators – population

- Spatial distribution based on Corine Land Cover by EEA
  https://www.eea.europa.eu/data-and-maps/data/population-density-disaggregated-with-corine-land-cover-2000-2#tab-metadata

- Update based on population data from Statistics Poland for municipalities

- Census data are colleceted in 2021 – spatial distributon for next Annual Assessment

Legenda

Rrozmieszczenia ludności w siatce o boku 100 m w roku 2020
utworzone na podstawie rozmieszczenia danych o ludności wg EEA
(https://www.eea.europa.eu/data-and-maps/data/population-density-disaggregated-with-corine-land-cover-2000-2#tab-metadata)
oraz danych o liczbie ludnośći wg GUS w roku 2020

0   1   2 - 5   6 - 10   11 - 20   21 - 50   51 - 338

0   100 km

Summary

- In Poland, modelling is an essential part of the annual AQ assessment and is used to detect exceedance areas (after expert corrections if necessary)

- According to the legislation for the annual assessment modelling results are requested for PM_{10}, $PM_{2.5}$, NOx, NO_2, SO_2, O_3 and BaP (for metals in PM_{10}, C_6H_6 and CO modelling is provided only for defining station representativeness)

- Issues:
  - Need to develop more objective method of field correction than „expert judgment" (Landuse Regression Model ?)
  - Inconsistencies at the boundaries of urban (0.5km) and non-urban (2.5km) regions
  - The higher the resolution the higher the uncertainty of emission data and the hot spot location (more difficult to verify with measurement)
  - How/when to use the representativeness zones developed based on the modelling?

Thank you

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