



New approach to assessment of air quality improvement at the local level

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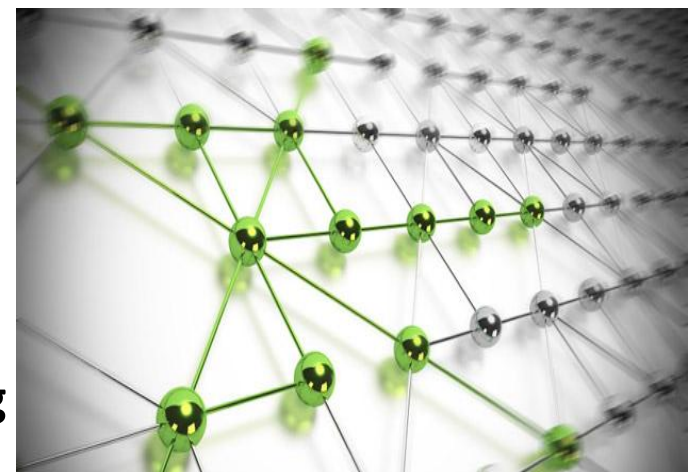


Content

- About IETU
- Background for air quality assessment in Silesia Region
- New approach for emission estimation from low level emission sources
- Example of implementation of new emission estimation method for local air protection action plan
- Conclusions



- ❑ **IETU is a R&D unit acting under the Ministry of Environment**
- ❑ **Ranked category A among scientific institutions in Poland**
- ❑ **A multidisciplinary staff of 98 including 4 professors**
- ❑ **Our potential is based on over 40 years of experience in performing research addressing environmental issues of industrialised and urbanised areas at home and internationally**
- ❑ **We perform research projects, studies and provide consulting services to public bodies and economy sector**





Research fields at IETU

- ❑ Impacts and mechanisms of green house gases emissions and atmospheric pollution



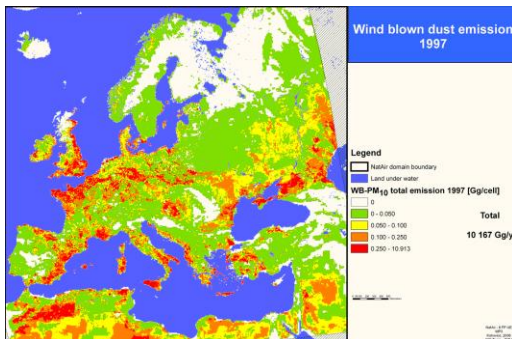
- ❑ strategies for sustainable land surface management, especially at degraded areas
- ❑ development and application of novel tools for environmental management and strategic planning



- ❑ Water cycle and soil research
- ❑ Soil remediation technologies
- ❑ Biodiversity and ecosystems



- ❑ Development of scientific principles in support of sustainable development, increasing resource efficiency and ecoinnovation policies
- ❑ Modelling of phenomena occurring in the environment due to human activity



A portfolio of novel solutions for integrated environmental management

- ❑ Tools for modelling and management of air quality at local, regional and European scale
- ❑ Tools for modelling and management of water quality in catchments
- ❑ Policies and measures for optimising waste management at local, regional and country level
- ❑ Methods for assessing health risk and environmental exposure
- ❑ Soil and groundwater remediation technologies
- ❑ Tools improving resource efficiency
- ❑ Tools for monitoring and assessing the phenomena occurring in the environment due to human activity





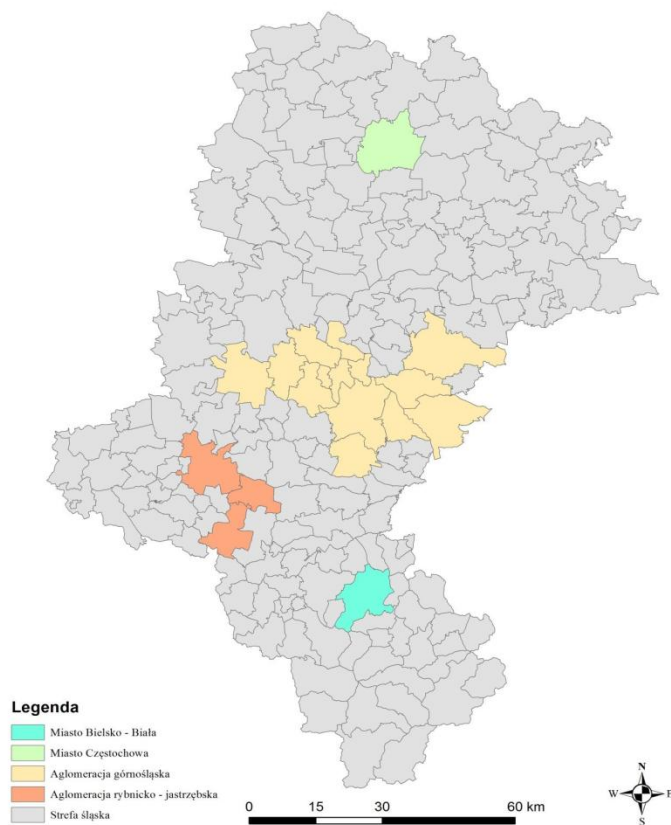
IETU as cooperation partner

- ❑ **extensive and long-term experience in international cooperation**
- ❑ **1995-2000 direct agreement of cooperation with the US Department of Energy in the area of environmental restoration**
- ❑ **Since 2002 partner in 52 European funded projects (FP 4,5,6, 7, e-Content, INTERREG, LIFE, CIP, Culture, HORIZON 2020)**
- ❑ **Ranked third position among Poland's most successful research institutes in FP6**
- ❑ **a privilege and opportunity to work with the most recognised centres performing environmental research in Europe**
- ❑ **multidisciplinary team of scientists open to undertake new research challenges**
- ❑ **strong position in the networking environment : coordination of two networks ENVITECH-Net and AIRCLIM and the Polish Platform of Environmental Technologies**

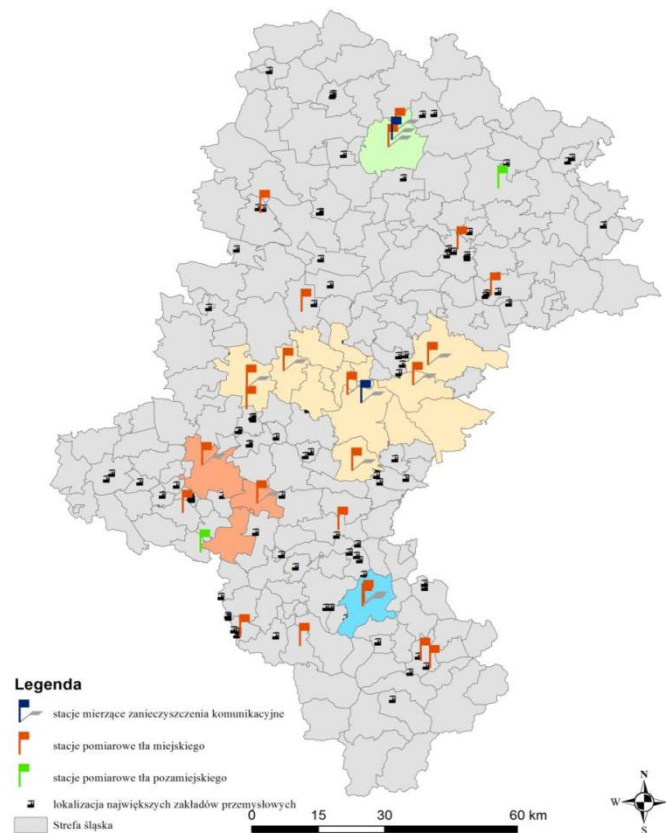


Monitoring of Air Quality in Silesia Region

Lokalizacja stref jakości powietrza w województwie śląskim



Strefa śląska
Lokalizacja stacji pomiarowych na terenie strefy

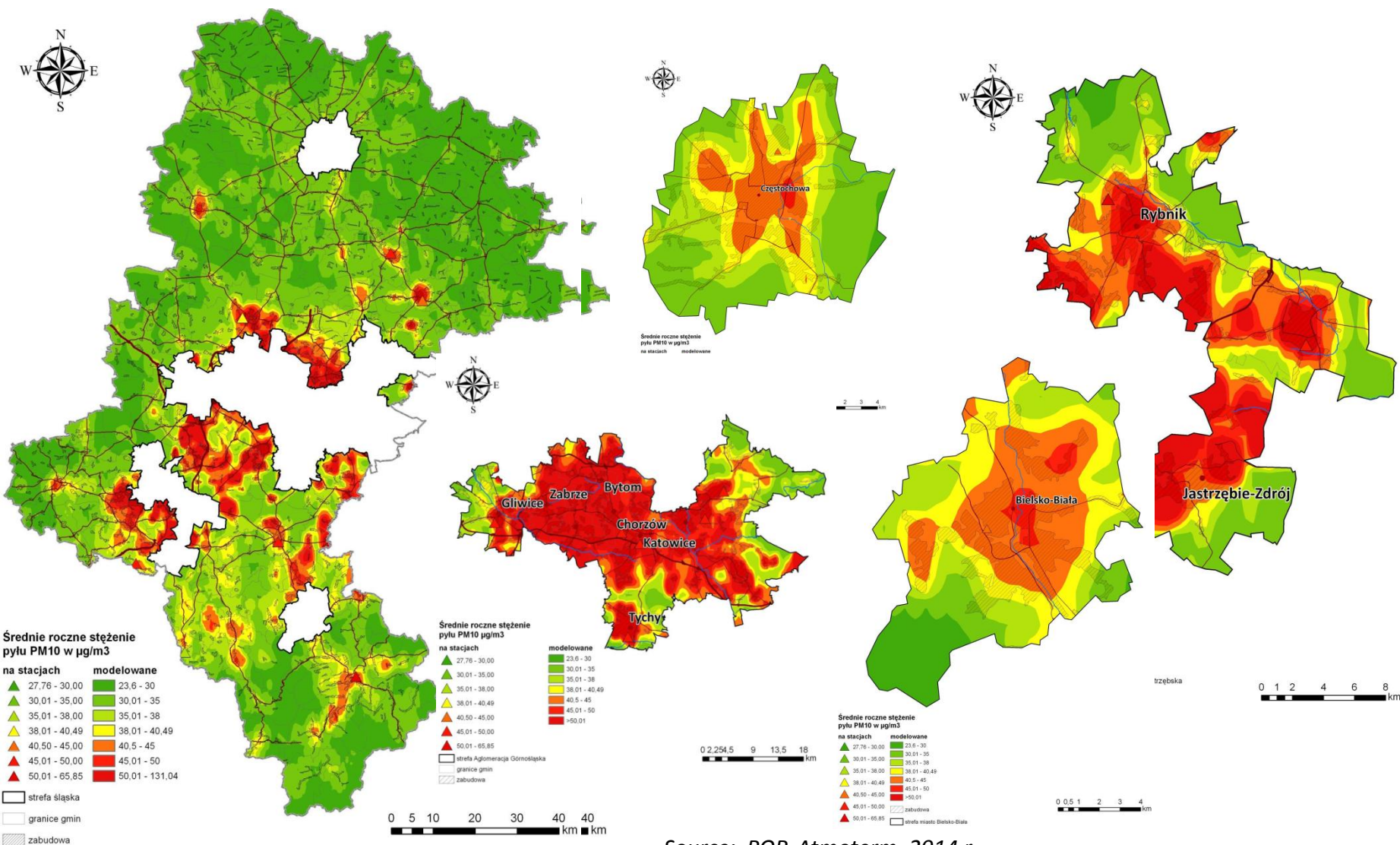


Air quality zones

Source: POP, Atmoterm, 2014 r.

Location of monitoring stations in Silesia

Annual PM 10 concentrations in the zones of Silesia Region in 2012 year



Source: POP, Atmoterm, 2014 r.

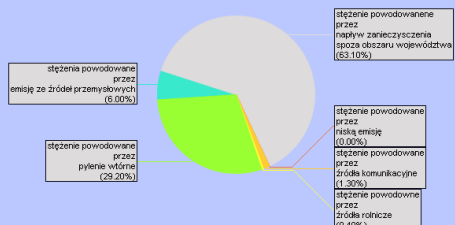


SYSTEM IDENTYFIKACJI NAPŁYWU ZANIECZYSZCZEŃ POWIETRZA

Czas lokalny: 2007-07-19 15:51

Opis do strony

Pył PM10
07-07-20 15:00

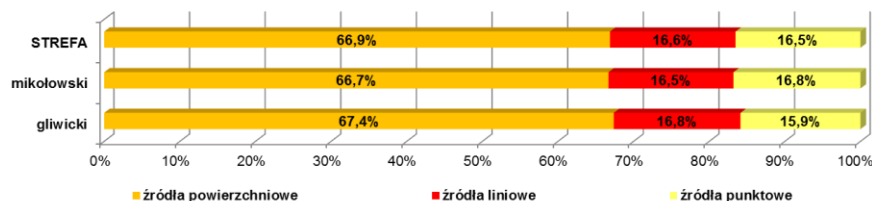


Katowice Monitoring Station – share of emission sources in PM10 concentrations

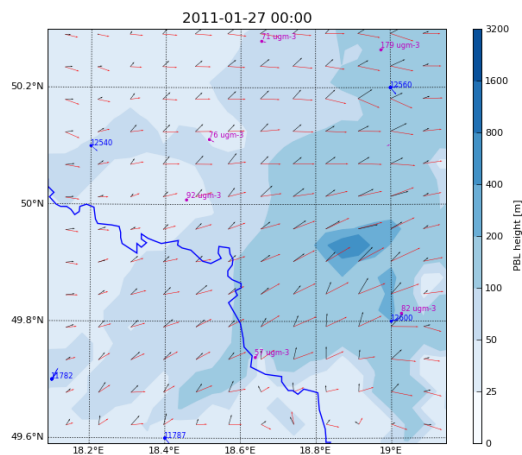
Air quality in Silesia Region is created by:

- meteorological conditions (thin mixing layer)
- long – range transport of pollutants with air masses
- low – level emission sources (municipal emissions)

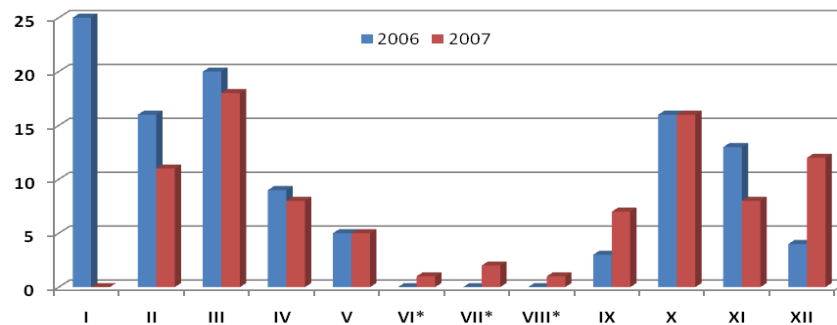
Udział w obszarze przekroczeń stężeń 24-godz. pyłu PM10



Structure of PM10 emission in Silesia Agglomeration source: POP, Atmoterm, 2011



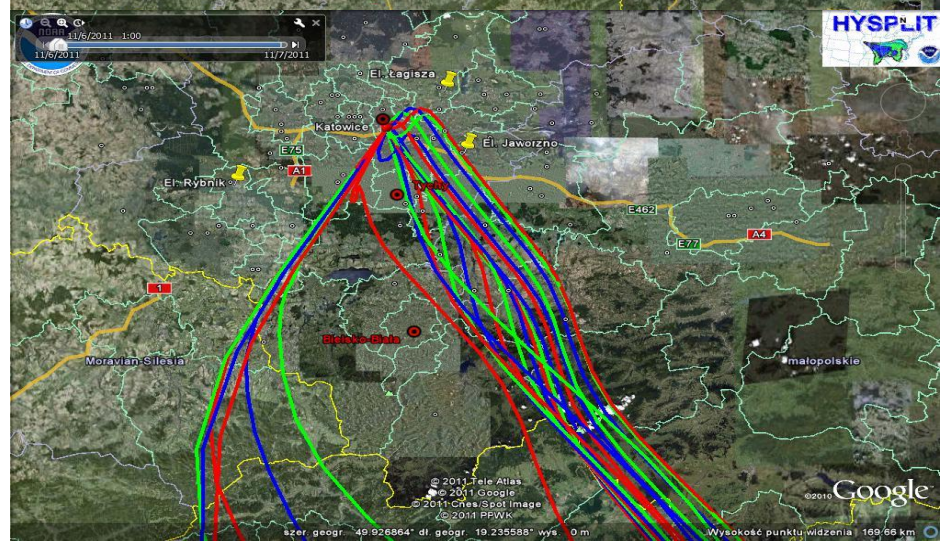
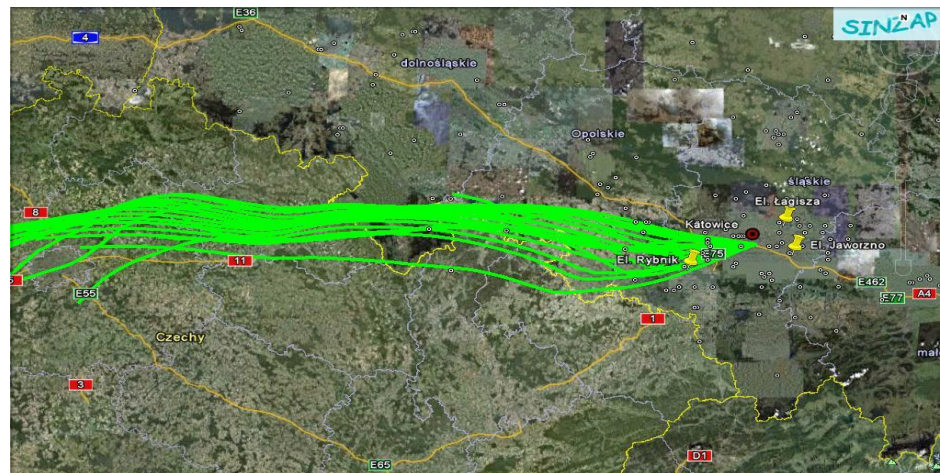
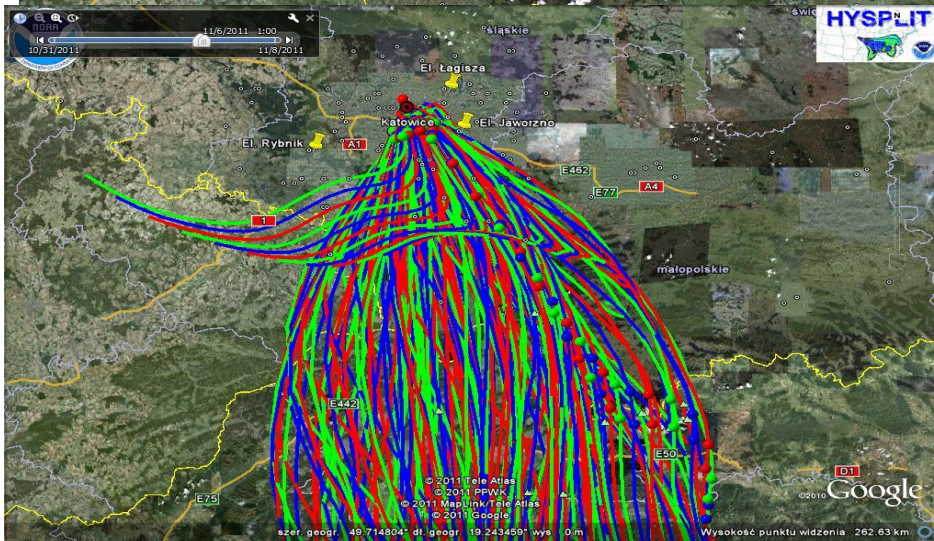
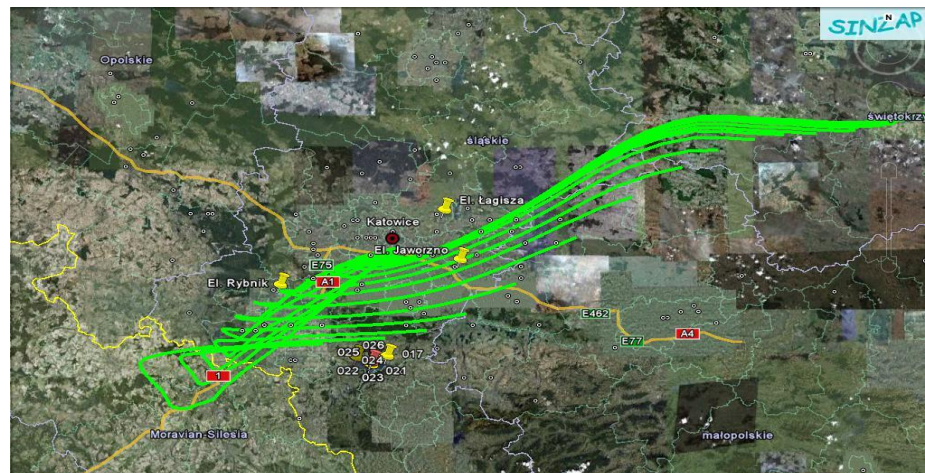
Ilość dni z przekroczeniami w Katowicach



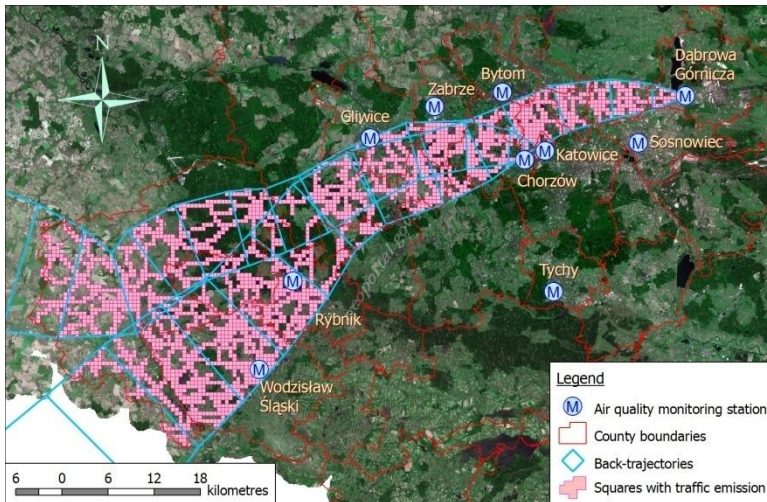
Number of days with exceedance of 24 – hours air quality standards source : POP, Atmoterm 2009



Trajectories of air pollutants transport over Silesia Voivodeship



Novel solutions for integrated environmental management

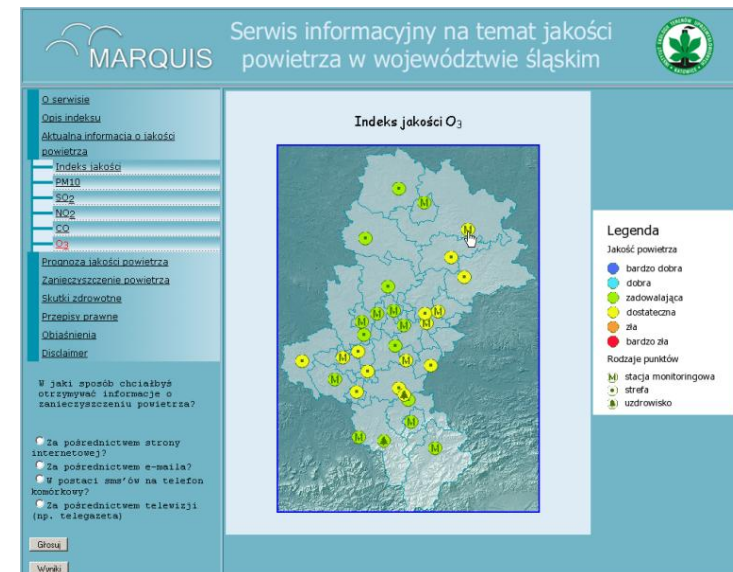


SINZAP: Identification System of Air Pollution Inflow

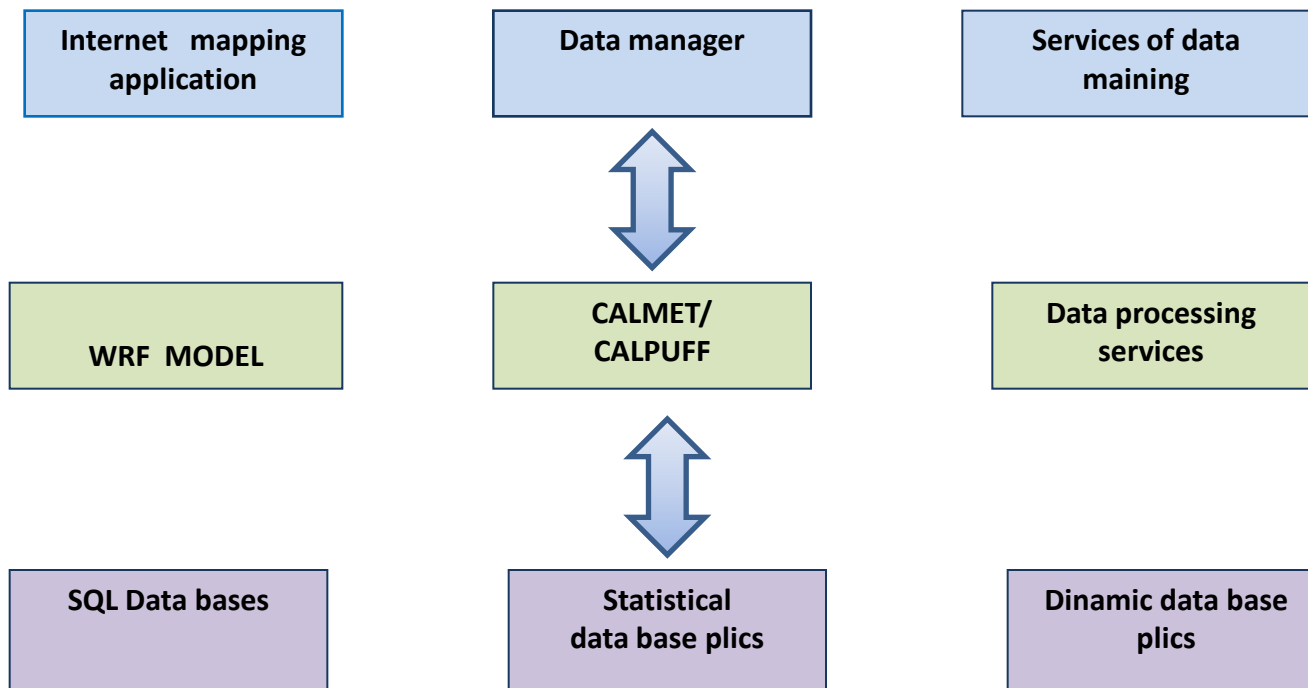
- real time operating system resembling a neural network
- designed for modelling of pollutant emissions and air pollutants concentrations
- addressed to experts and decision makers responsible for air quality management.

MARQUIS Light: an air quality information service

- The service provides information to the general public on air quality index and health precautions and recommendations related to it
- Current air pollution data: 5 pollutants SO_2 , NO_2 , CO , PM_{10} , ozone
- The users of the service include general public, especially people suffering from respiratory diseases, medical service, decision makers



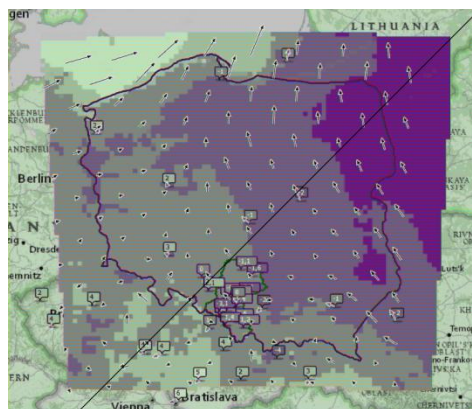
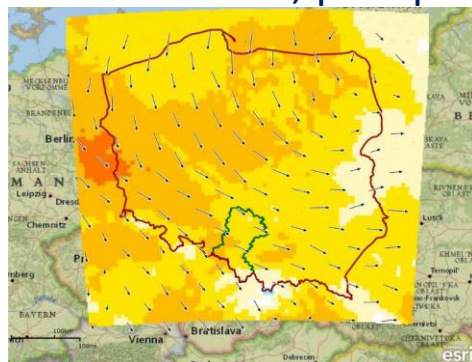
Architecture of SINZaP2 System



Functionality of SINZaP System

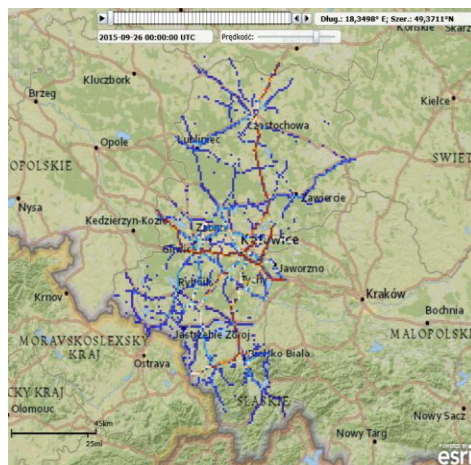
Meteorology:

Forecast of current and archive parameters of :
temperature, wind speed,
wind direction, precipitations



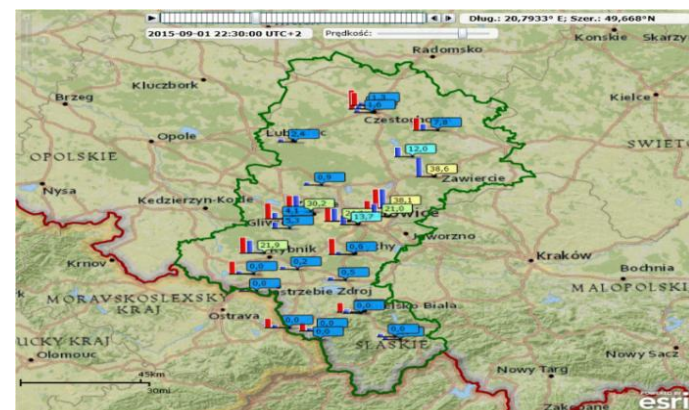
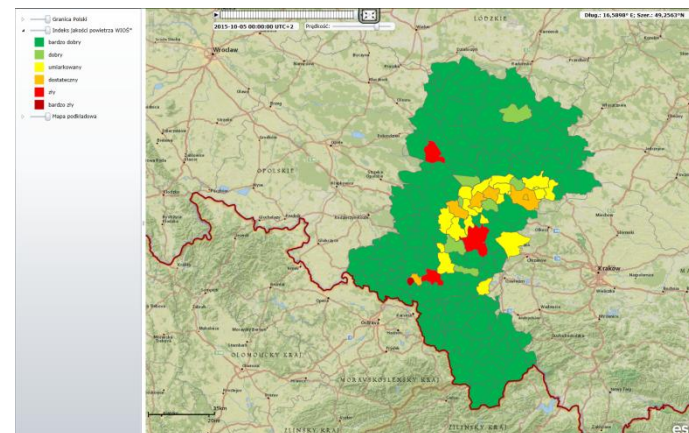
Emissions from

area sources
line sources
industrial sources

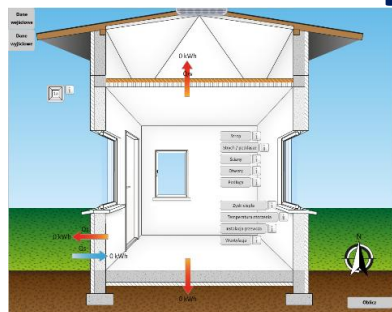


Air Quality

PM10, PM2,5, SO2, NOx
concentration every hour
and forecast for 48 h



PM10 and PM2.5 emission calculator calculation scheme



SURFACE OF FLATS, THERMAL INSULATION OF BUILDINGS, HEATING TYPE
(Main Statistical Office data , Municipalities)

**METEOROLOGICAL
DATA ON
TEMPERATURE
DISTRIBUTION**

**UNIT HEAT
DEMAND
 $\text{GJ/m}^2\text{K}$**

HEAT DEMAND

**THERMAL
EFFICIENCY OF
HEAT SOURCES**

FUEL CONSUMPTION

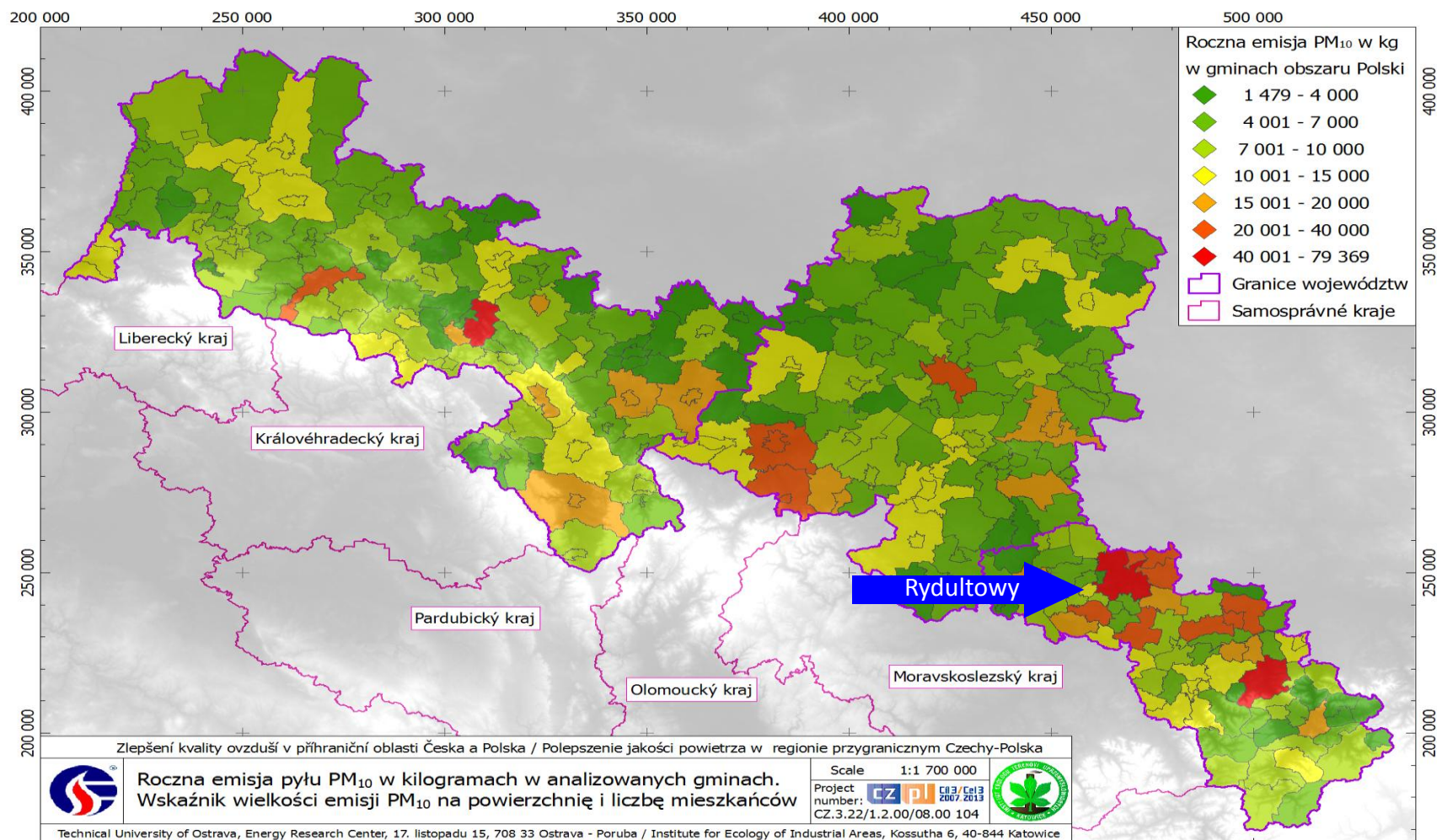
**PM10 and PM2.5
EMISSION FACTORS**

PM10 and PM2.5 ANNUAL EMISSIONS

**DATA ON
BUILDING
AREA AND
POPULATION**

INDICATORS OF EXPOSURE TO DUST EMISSION
[kg/capita], [g/m² of building area]

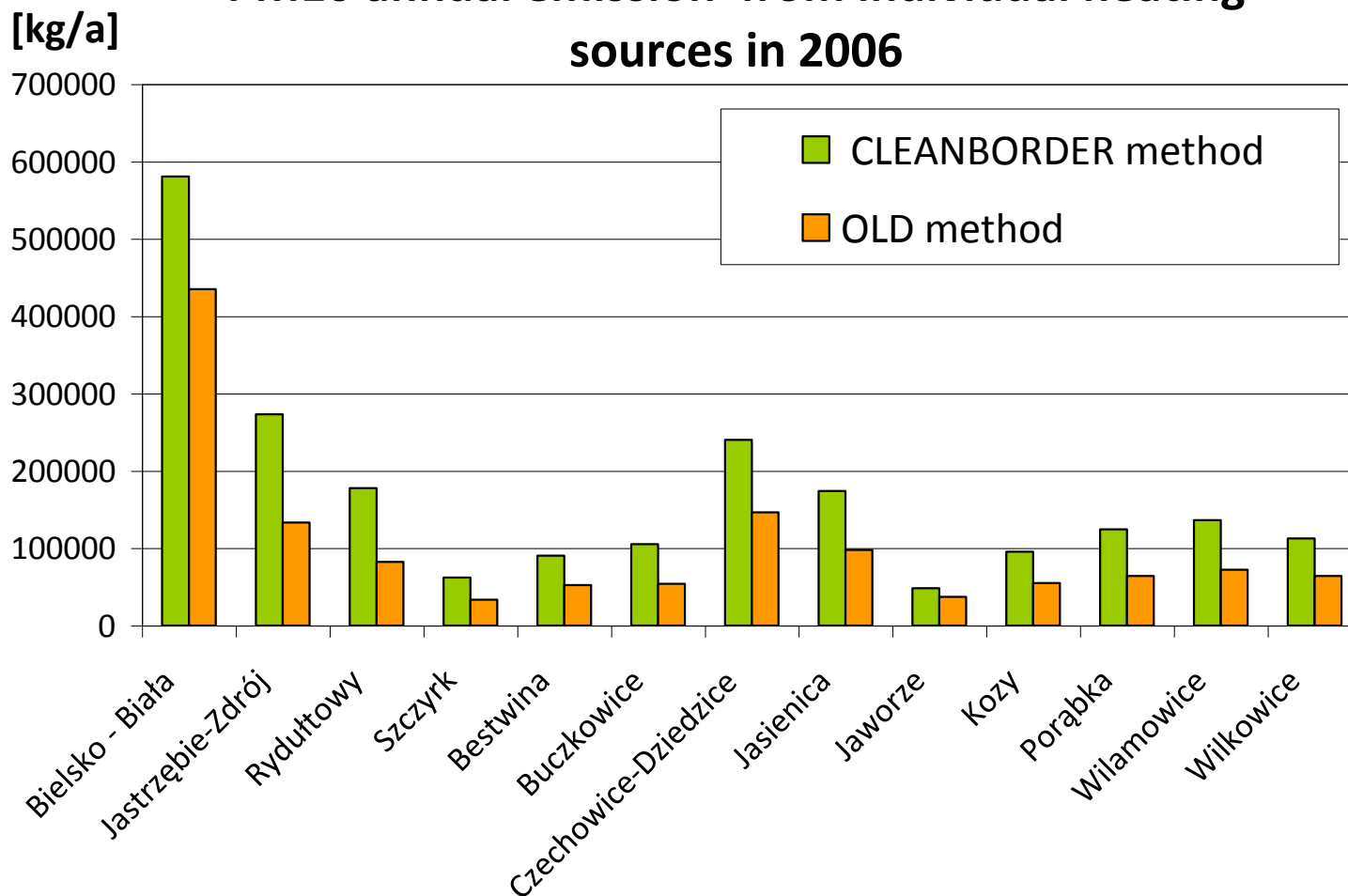
Results of the PM10 emission modelling from residential sources in the vicinity of Czech border



PM10 dust emission in chosen municipalities

The comparison of the results from two methods for emission estimating (CLEANBORDER and the old one)

PM10 annual emission from individual heating sources in 2006



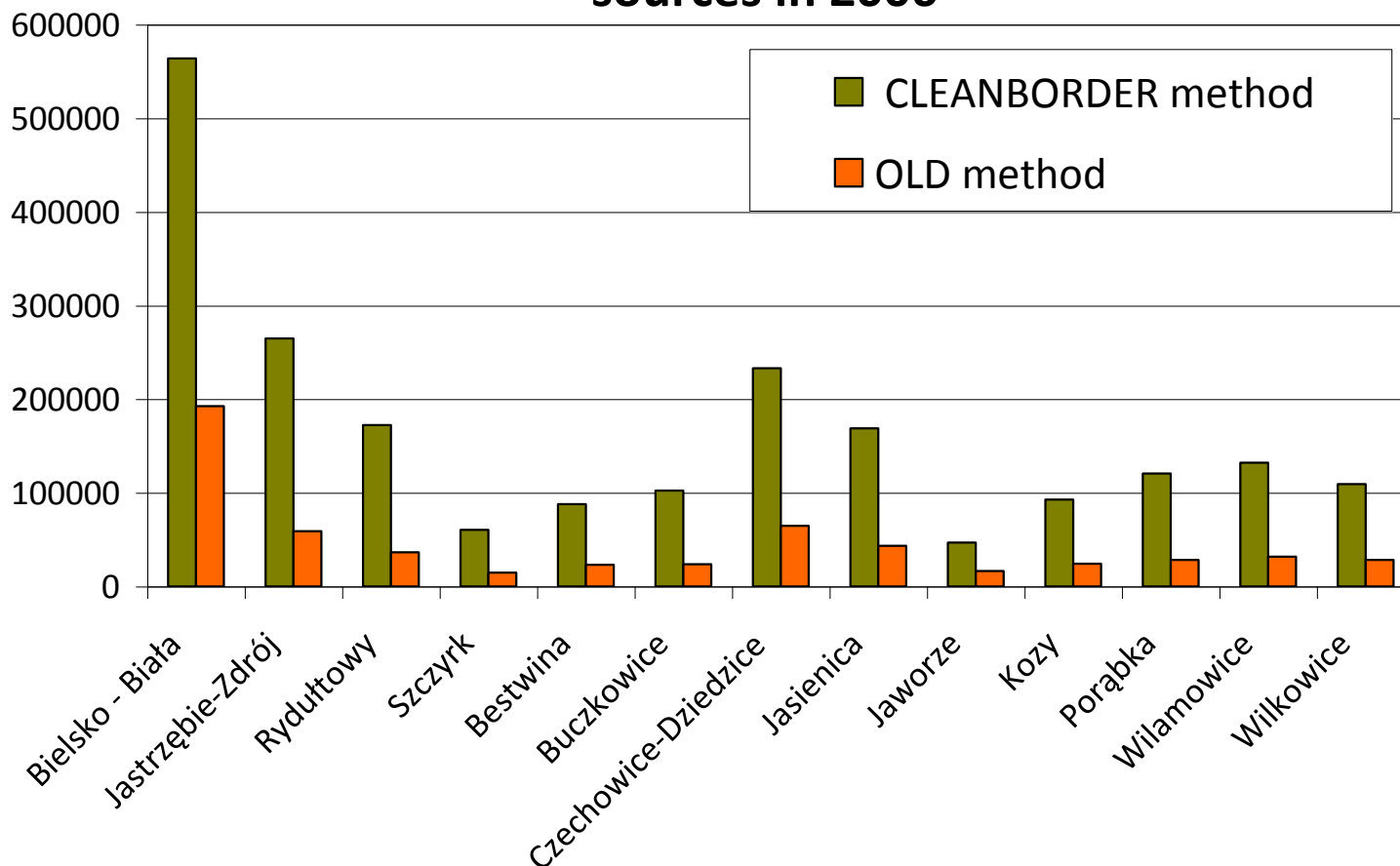


PM2.5 dust emission in chosen municipalities

The comparison of the results from two methods for emission estimating (CLEANBORDER and the old one)

PM2.5 annual emission from individual heating sources in 2006

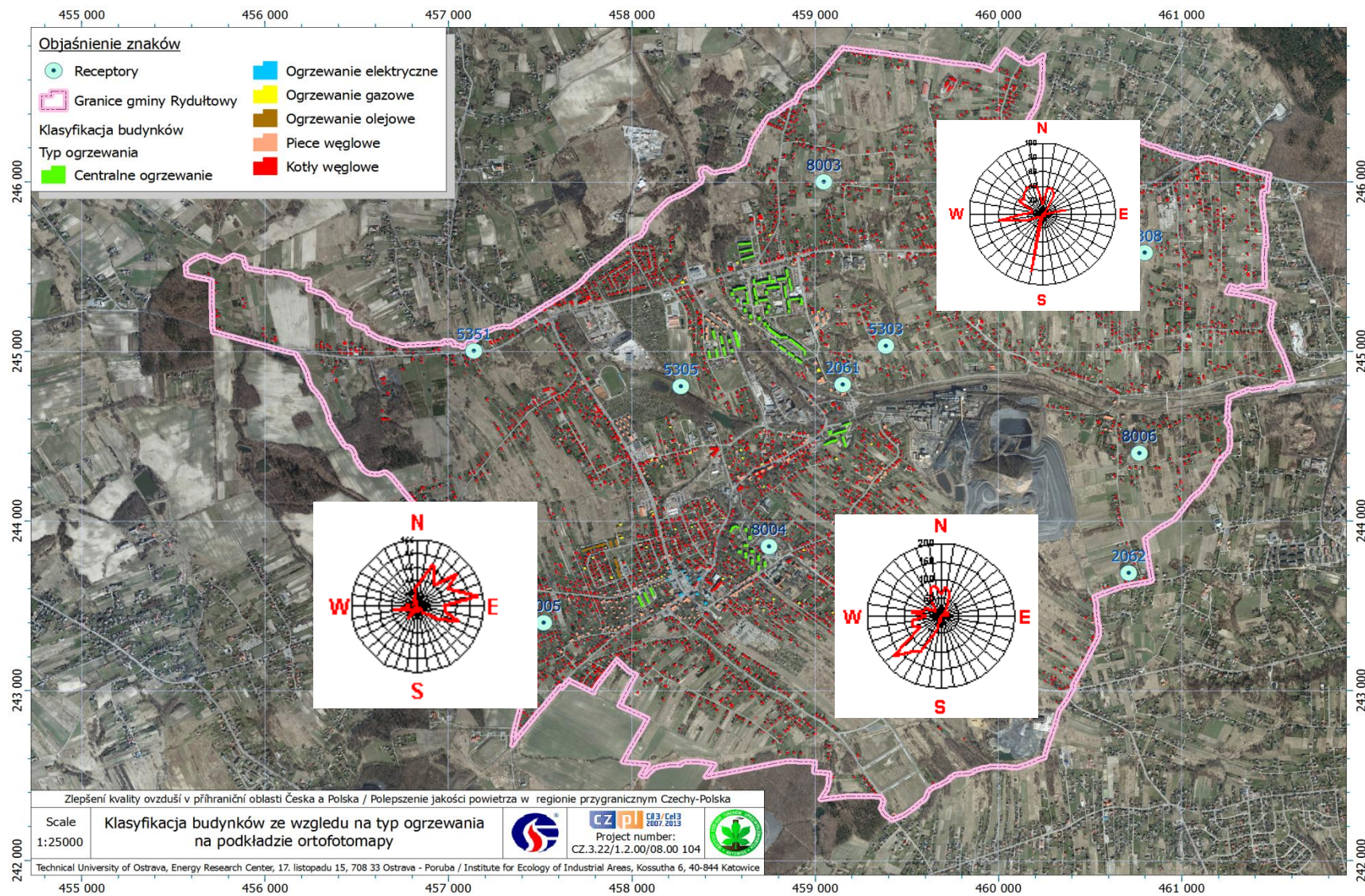
[kg/a]



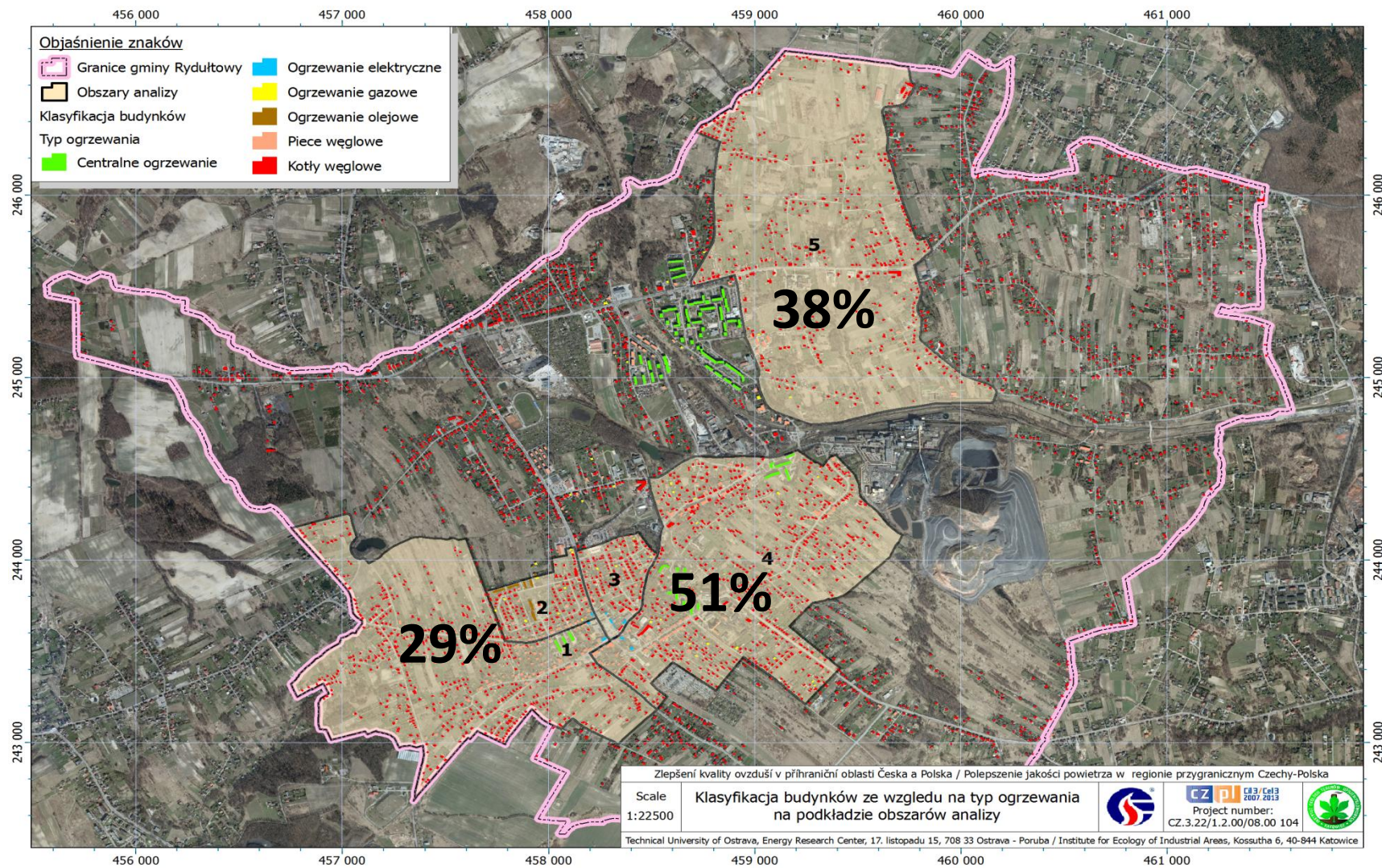
Classification of residential buildings due to the heat losses



Directions of the dust inflow on the receptor points



Choice of areas requiring emission reduction



The advantages and applicability of SINZaP2 System and emission calculator in Polish conditions

- ☐ In Poland, due to the complex market of fuels, especially coal market, there is no statistical data on coal consumption in residential houses, especially on the level of small administrative units, for example the municipality or province level. Even if such data exist, they are incomplete.
- ☐ This is the reason, the estimates of emissions from the residential sector can not be done on the basis of statistical data on fuel consumption.
- ☐ The developed calculator allows to determine the emissions of PM10 and PM2.5 based only on the characteristics of housing and on local weather conditions.
- ☐ Calculator allows on the assessment of the environmental impact of the various policy options at the municipal level.
- ☐ The use of calculator is possible through the CLEANBORDER project website (www.cleanborder.eu), which allows each municipality to optimise activities taken on its area in order to improve air quality.



The advantages and applicability of SINZaP2 System and emission calculator in Polish conditions (2)

- ☐ Developed SINZaP 2 System within IN2IN project allows for forecast of air quality and its verification
- ☐ Quality of the forecast depends on accuracy of input data used for calculations
- ☐ SINZaP2 can be implemented in different scales – town municipality, region
- ☐ Using this system it can be established a virtual air quality station in any location and provide necessary information on air quality and human and environmental risk



Thank you for the attention