

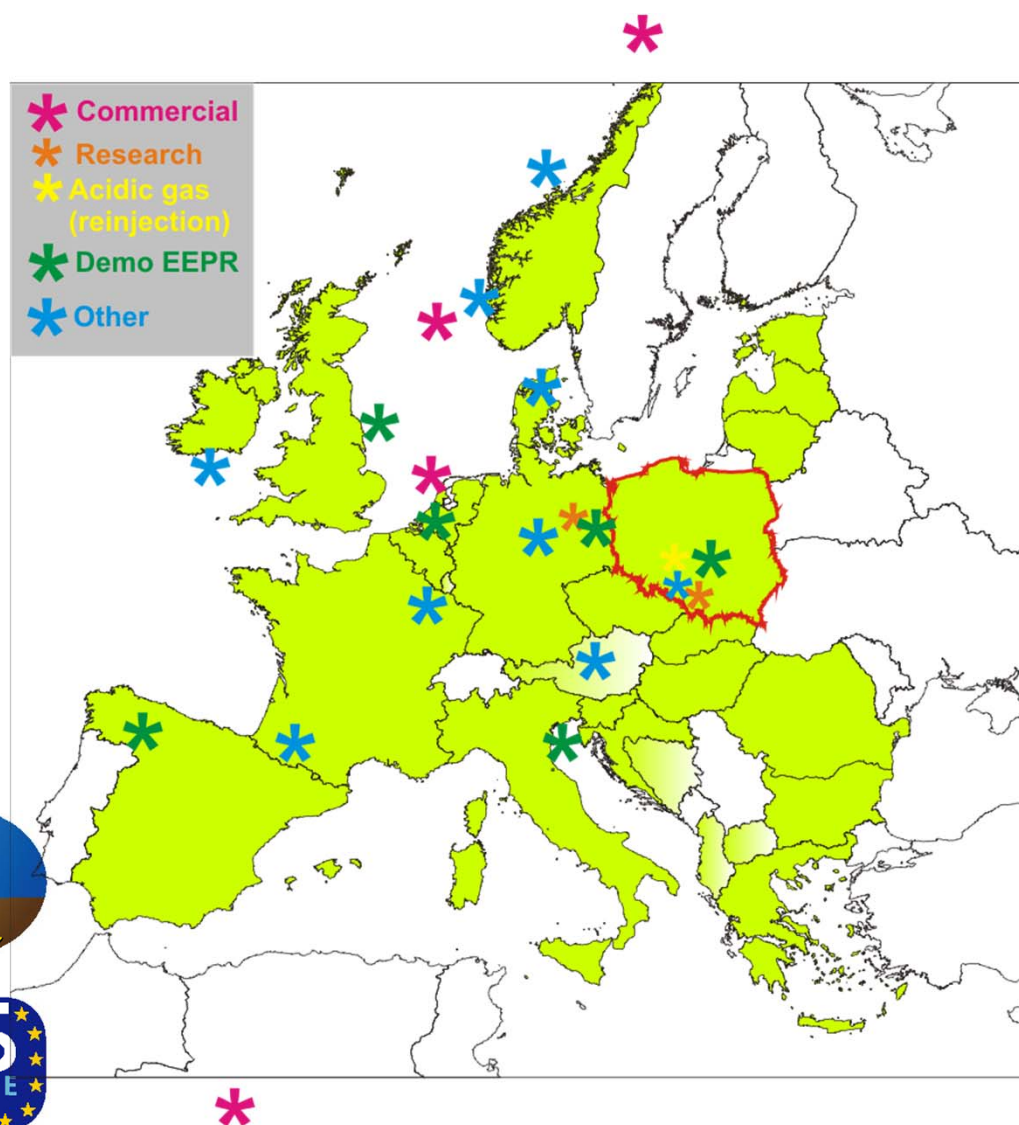


Poland – Bełchatów: storage in an onshore saline aquifer

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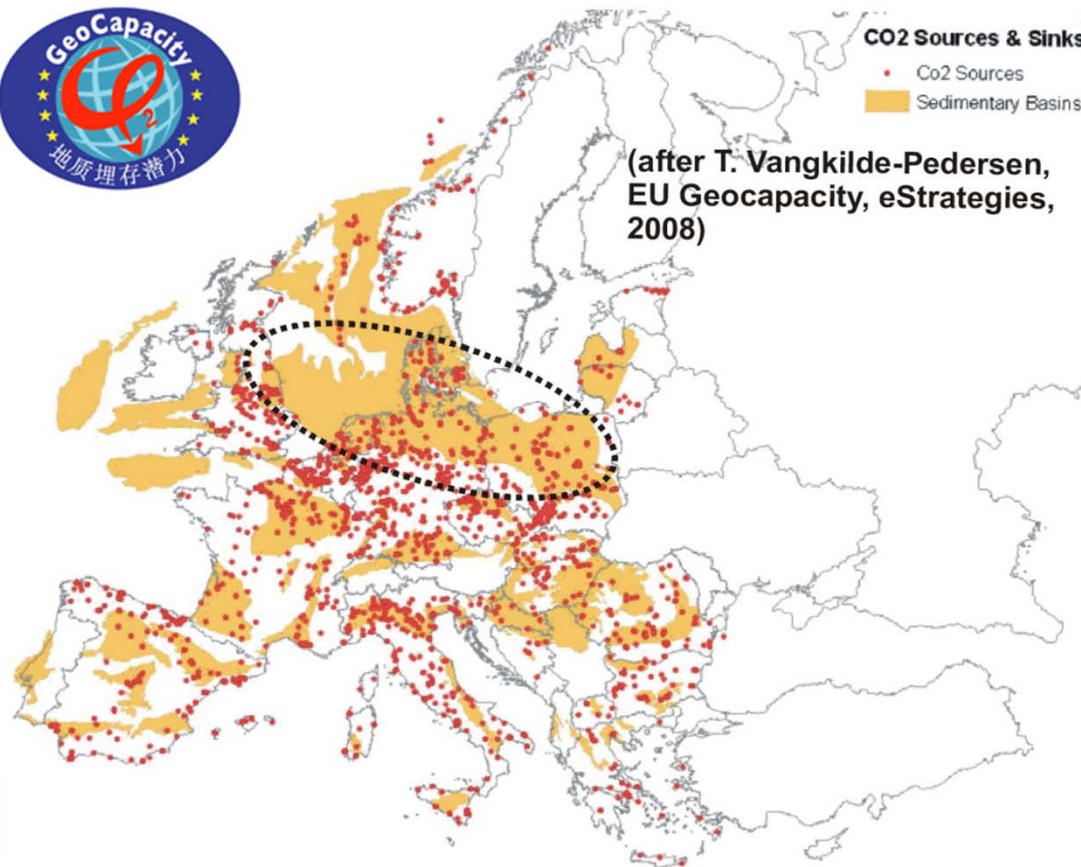
CO2 storage projects - Poland



- 1995-.. **Borzecin** gas field (acidic gas – 60% CO2)
- 2004-2008 **Kaniów** coal beds (RECOPOL & MoVeCBM)
- **Bełchatów** demo CCS project (EEPR)
- **Kędzierzyn** demo CCS project to be relocated
- **Regional studies**



CO2 storage prospects in Europe

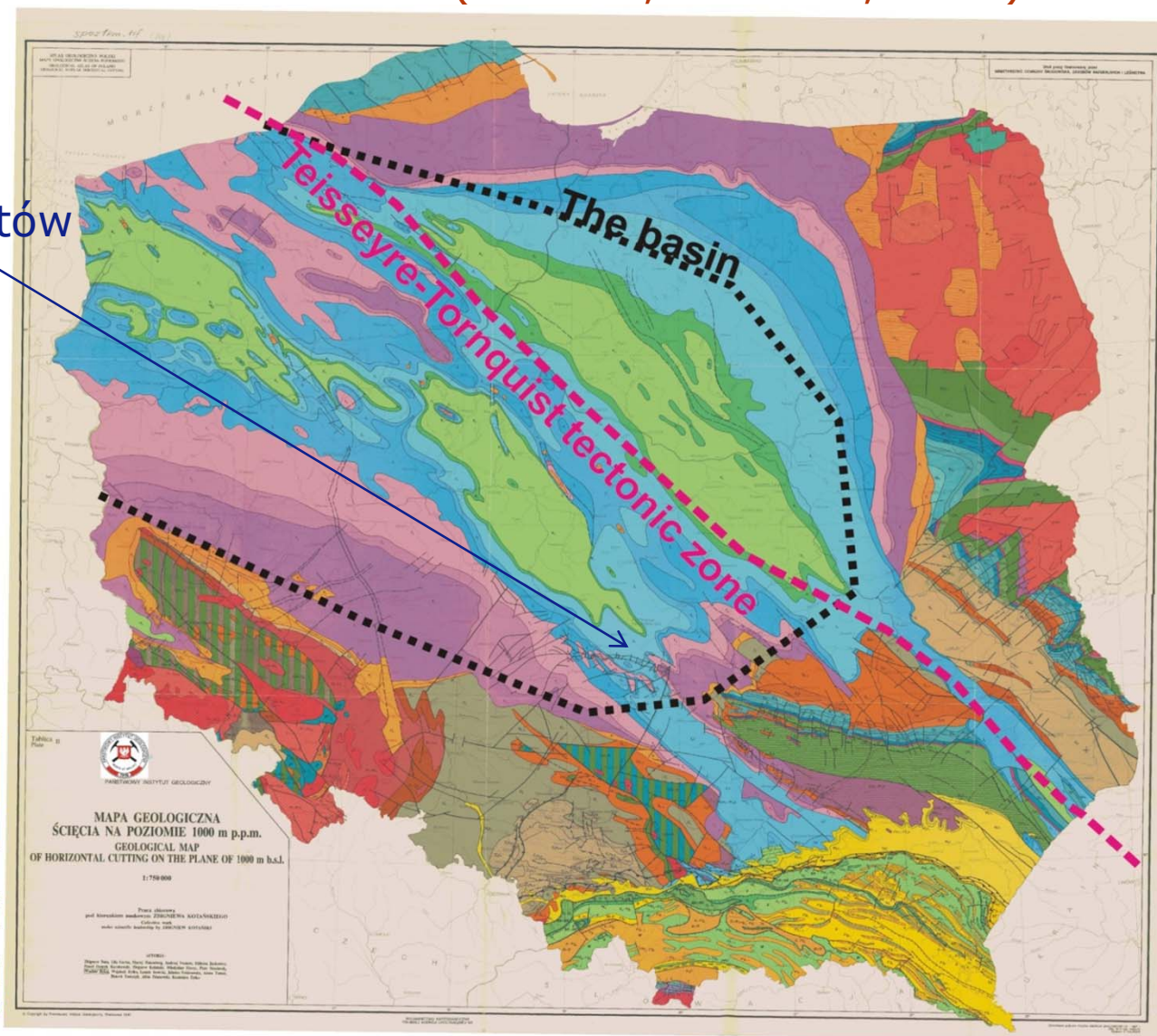


- EU GeoCapacity project mapped perspective sedimentary basins of Europe,
- (southern) Permian-Mezozoic basin is the biggest one,
- It covers a large portion of Poland, so the country (onshore) CO2 storage potential is above the average.



The onshore aquifers of Polish basin (z= 1km; Kotański, 1997)

Bełchatów



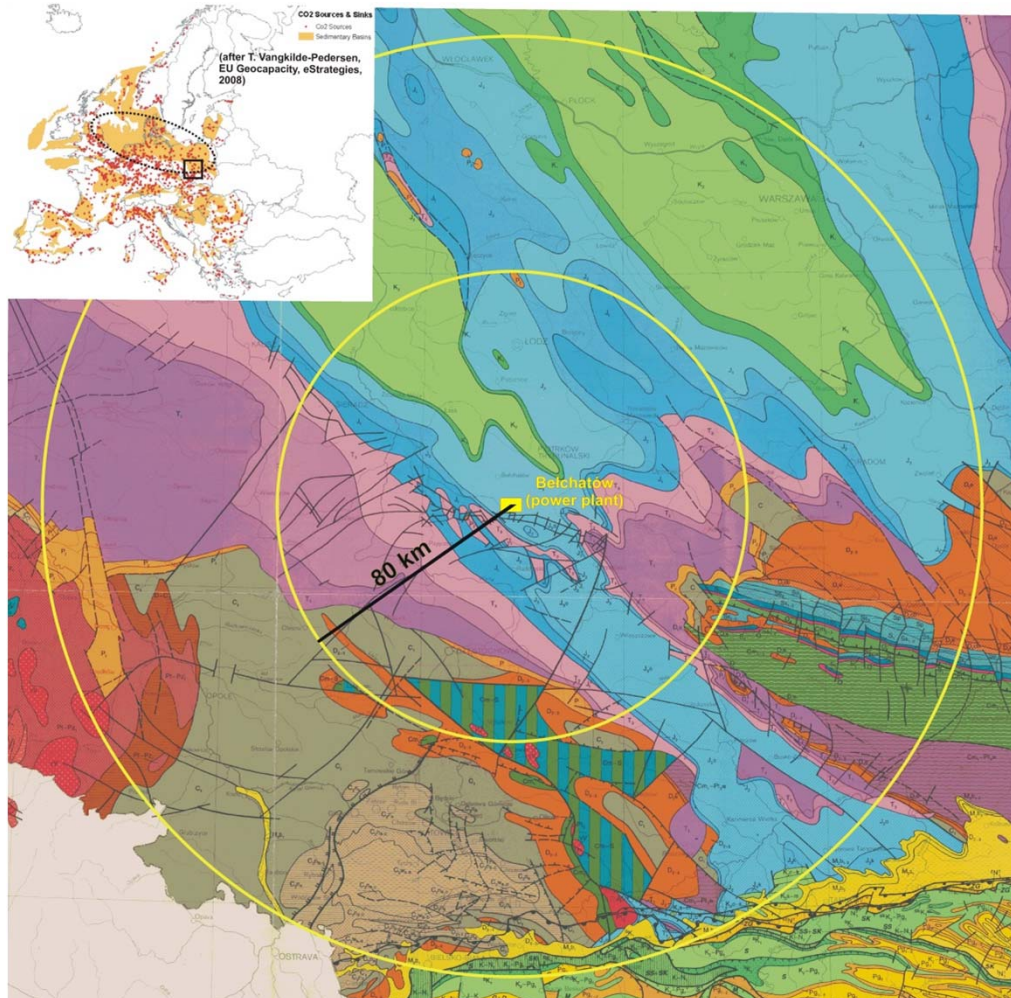
→ **Lower Jurassic**

→ **Triassic**

→ **Lower Cretaceous**



Geology around Bełchatów (z=1km)



- South of the plant location Neogene tectonic zone appears.
- This system of troughs is related to development of Carpathians
- Neotectonic together with lignite mining was the cause of 1980 and 2009 quakes (Richter 4.3).



The Bełchatów power plant



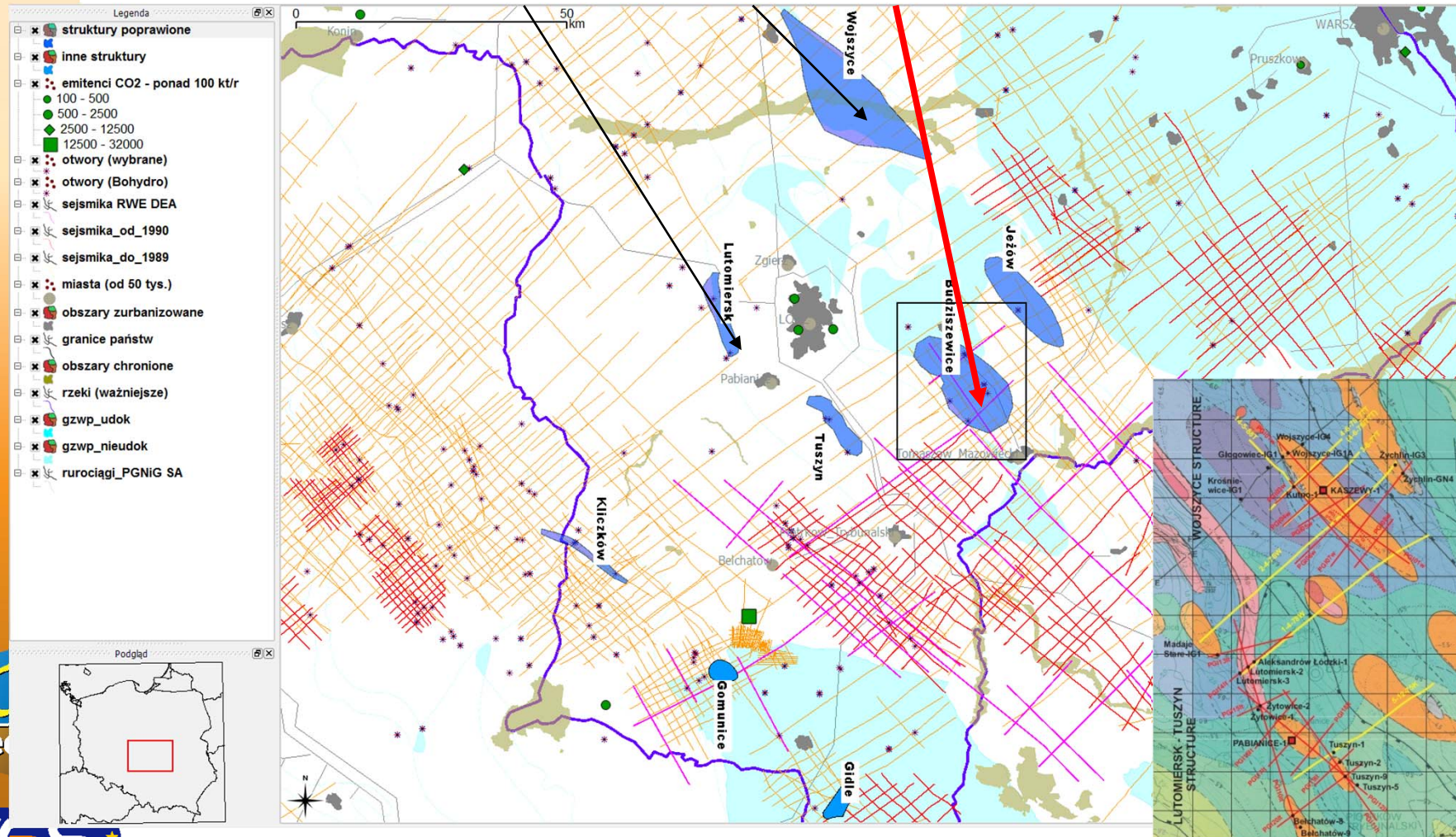
- The biggest lignite fired plant in Europe (4.4 GW)
- Also the biggest single emittant in EU – 32 Mt/yr
- The plant is located close to lignite outcrop 300 m deep, providing fuel

Status of the Bełchatów CCS project

- New 858 MW lignite fired block completed,
- Construction of post combustion capture facility (1.8 MT/yr) in progress,
- PGE (the plant operator) got EEPR grant in 2009 and has applied for NER300 support in 2011,
- Three potential storage sites/areas proposed by PGI and are being evaluated,
- Pipeline routes designed for all these three options,
- One site assessed under National Programme ordered and funded by the government (Ministry of Environment, NFOSiGW),
- Two backup sites/areas explored by 2-D seismic (~400 km) and research wells (2 wells drilled),
- Applying for exploration (site characterization) and storage permits depends on the progress of the CCS Directive implementation in Poland.

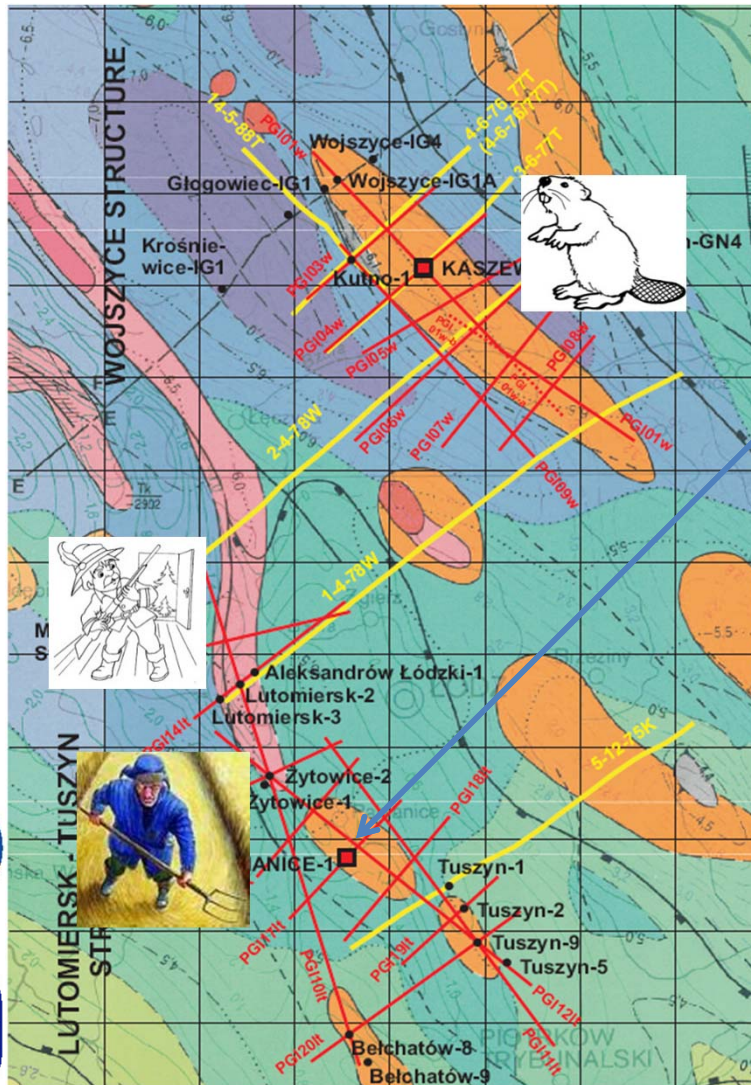


The potential storage sites



B-Z structure of sufficient data coverage as assessed and two backup sites/areas were proposed to the investor (PGE).

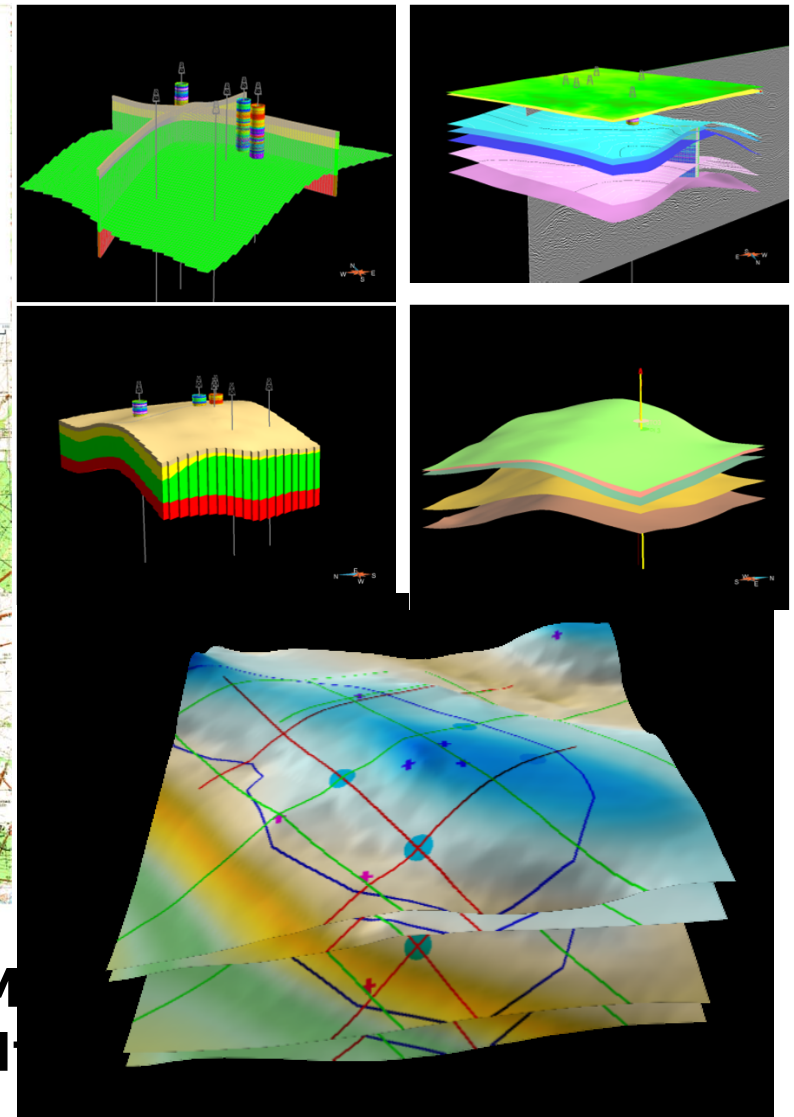
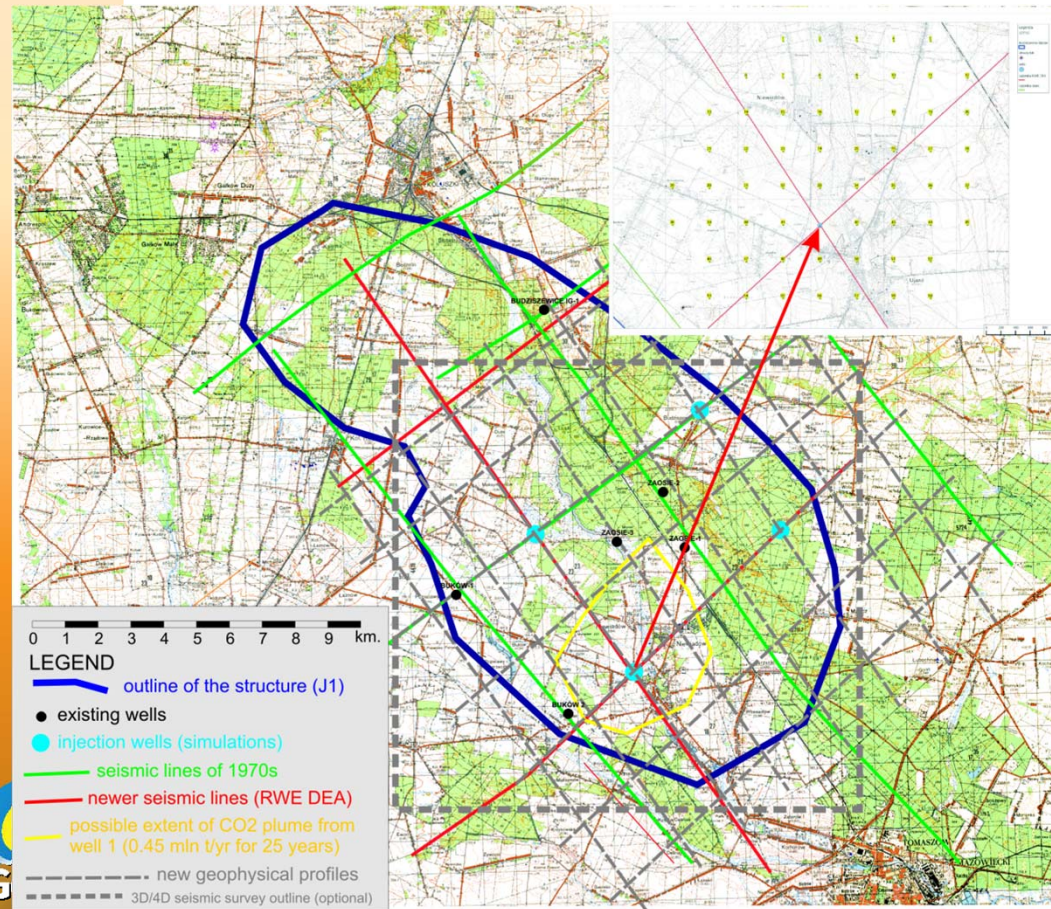
Field works of PGE Bełchatów (the backup structures)



- ➔ The backup sites were explored (2D seismic, 2 wells) and models are being constructed,
- ➔ In NE there is nature protected area – longer approval procedures,
- ➔ In SW public opposition encountered (an NGO), a few lines relocated.

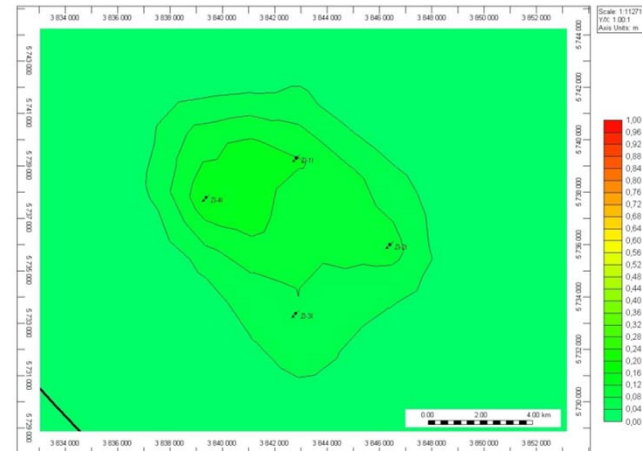
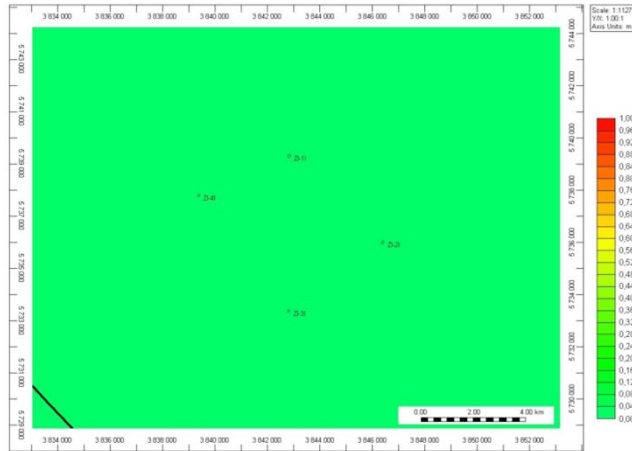


Models and proposed surveys of the B-Z site (site characterization and baseline monitoring)

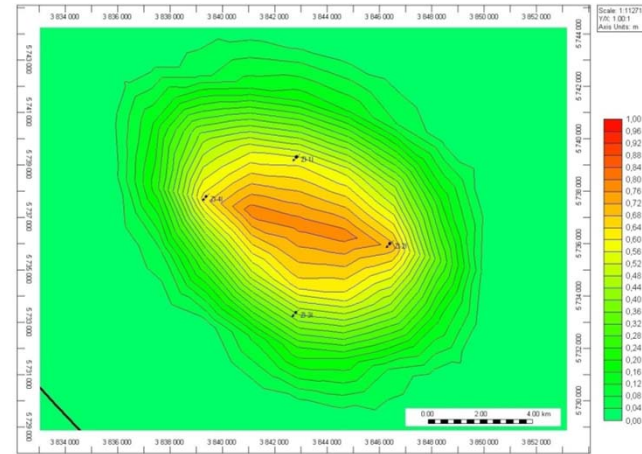
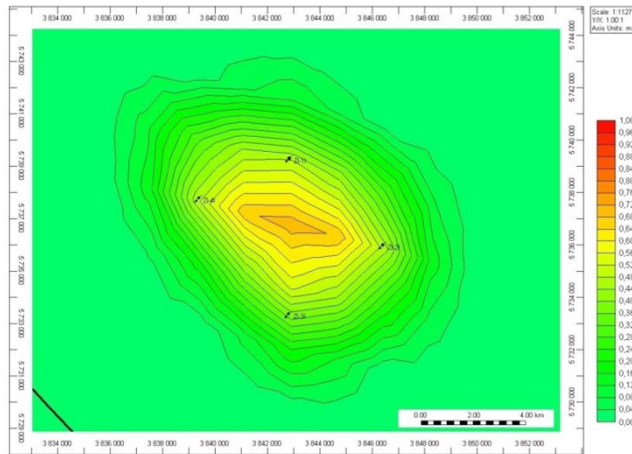


Static capacity (J1) – 370 M
(Bełchatów needs 45 M)

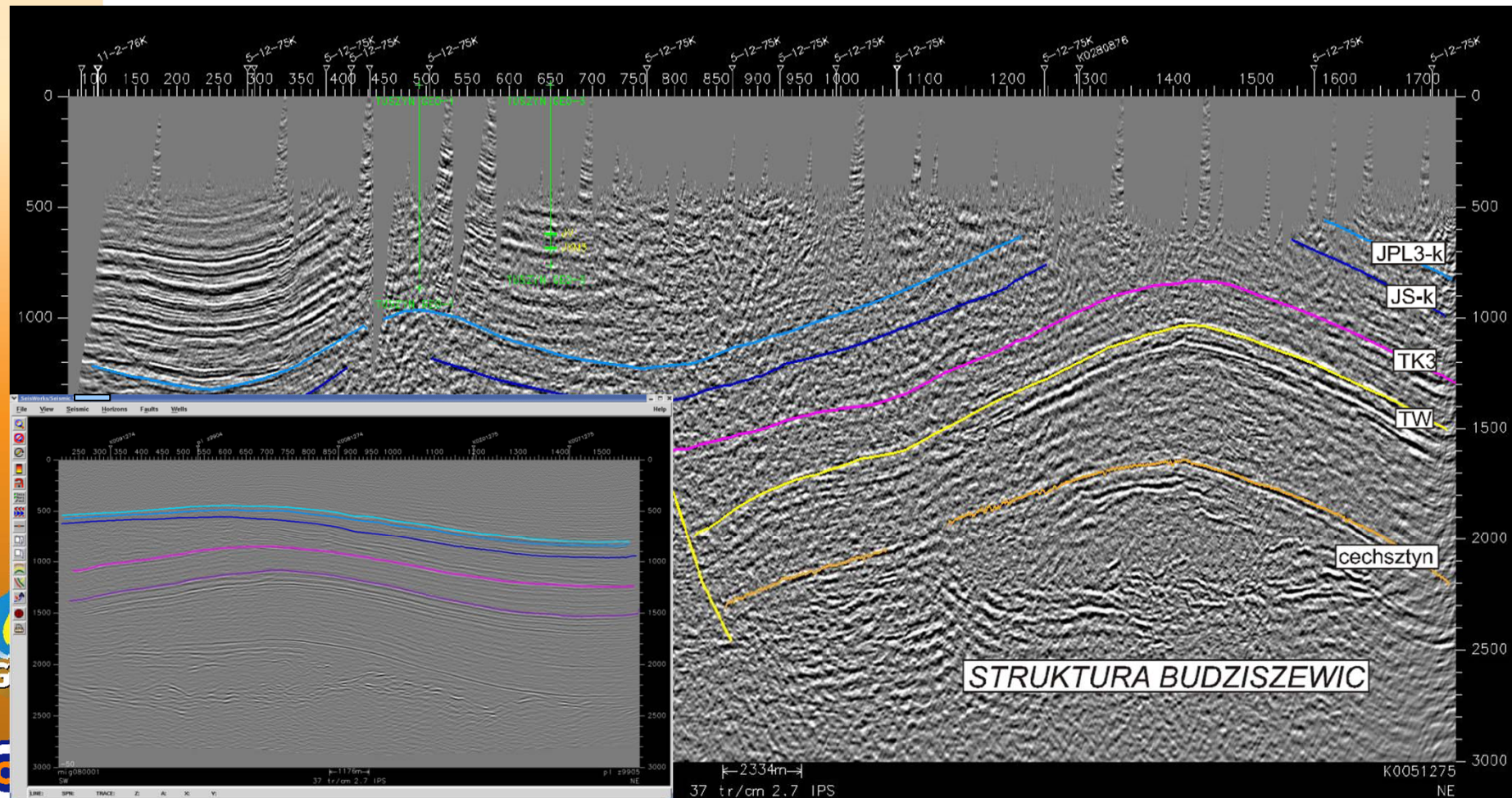
Injection simulations (AGH-UST) of J1 (0, 5, 20 y. of injection; 25 y. after; storage capacity 100-500 Mt)



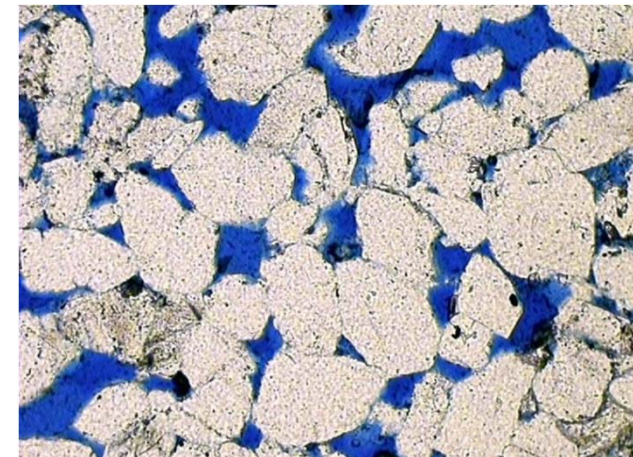
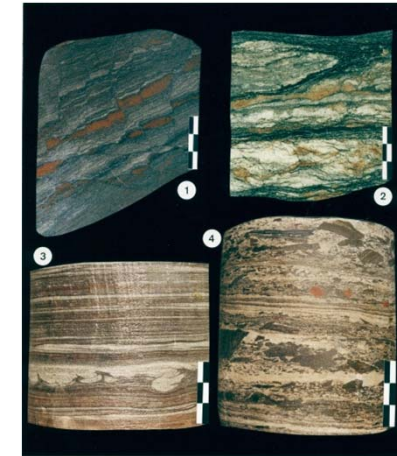
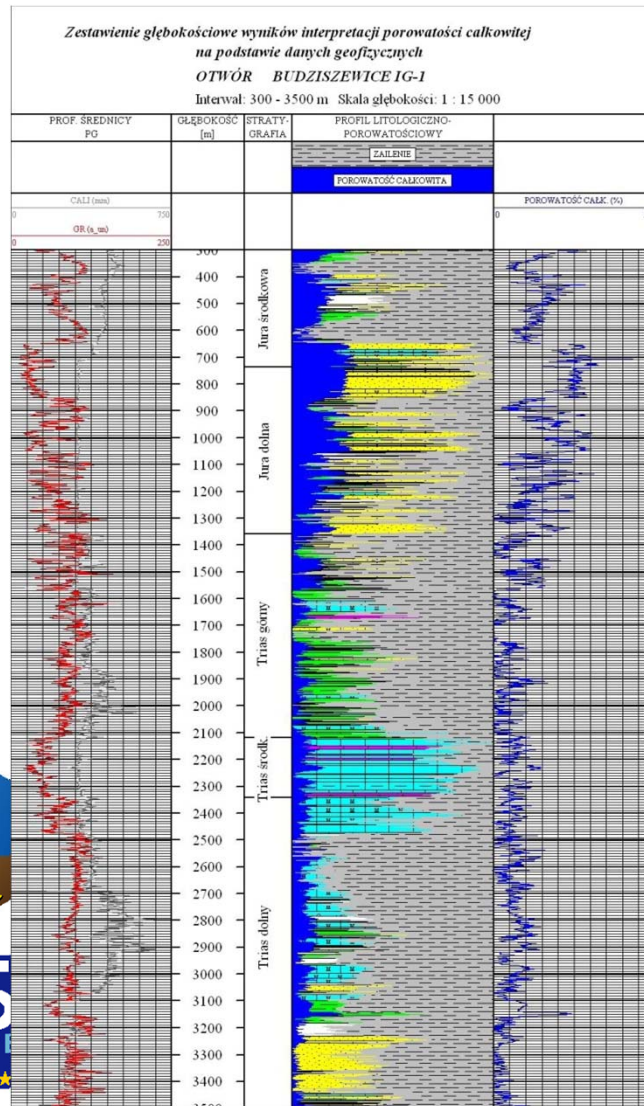
CO₂ na plume area ~14 x 14 km (max.)



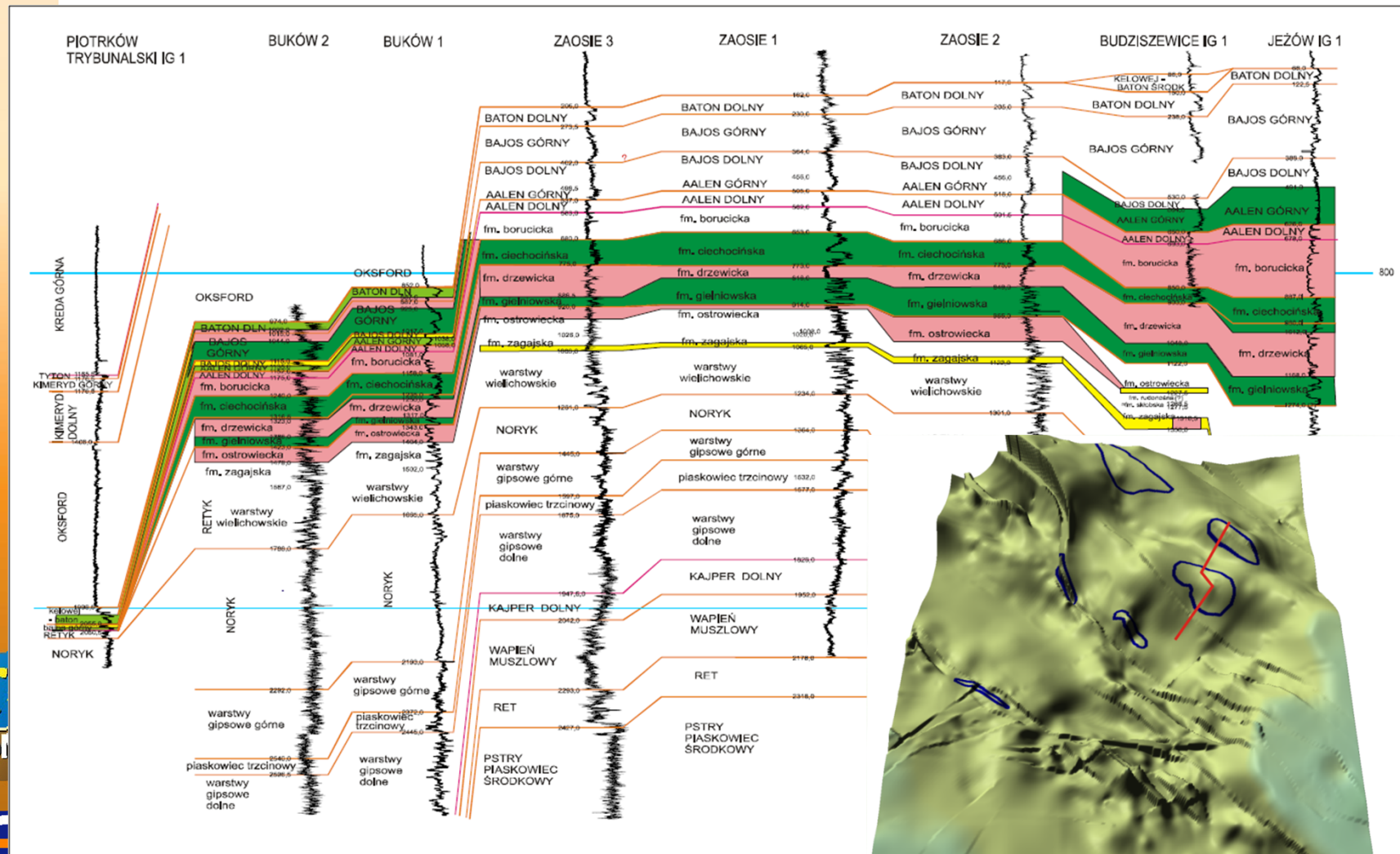
2-D seismic for the site (17 old lines, 3 newer)



Well data analyzes (6 wells within B-Z structure)

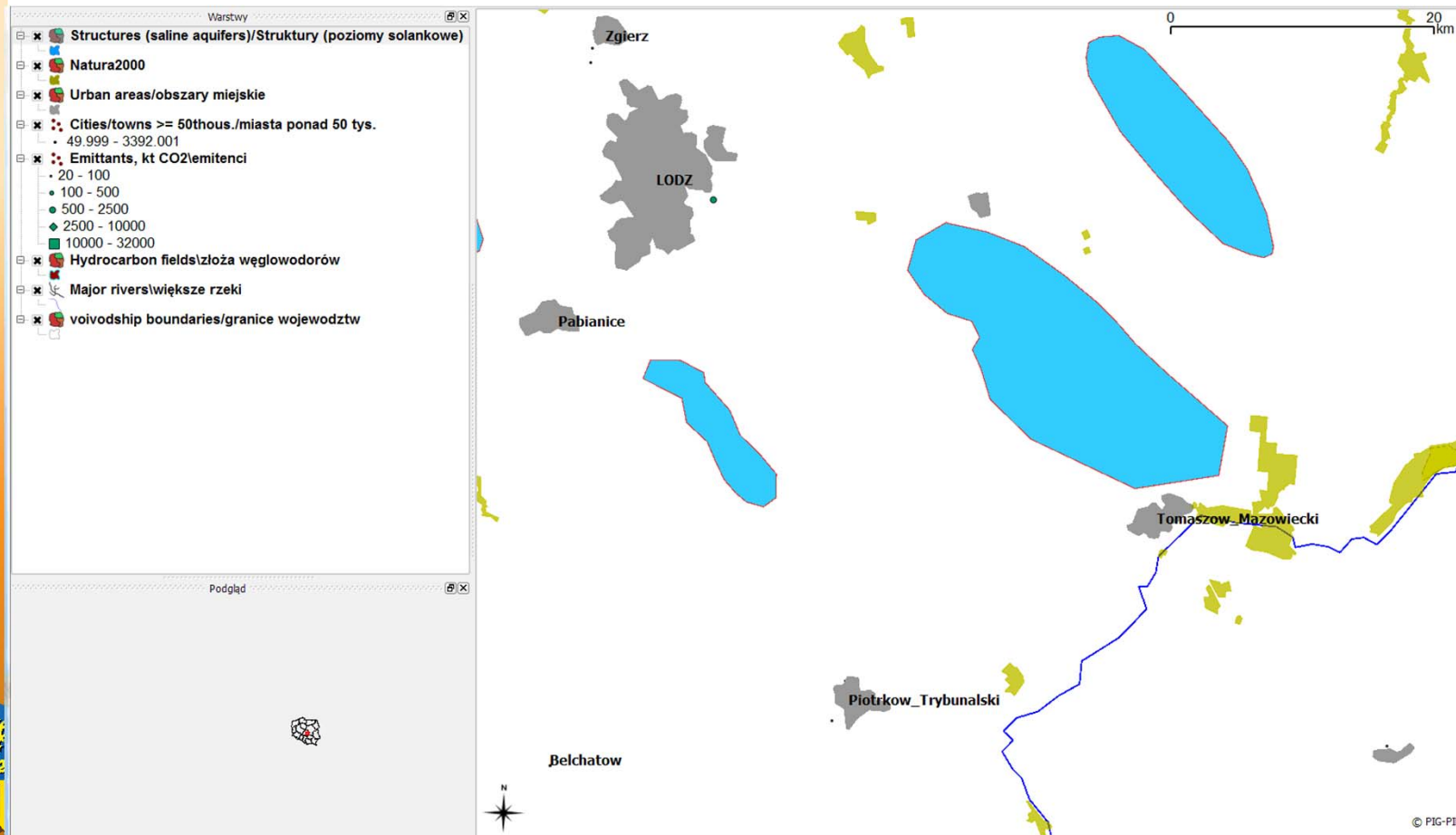


Well correlation and aquifer mapping



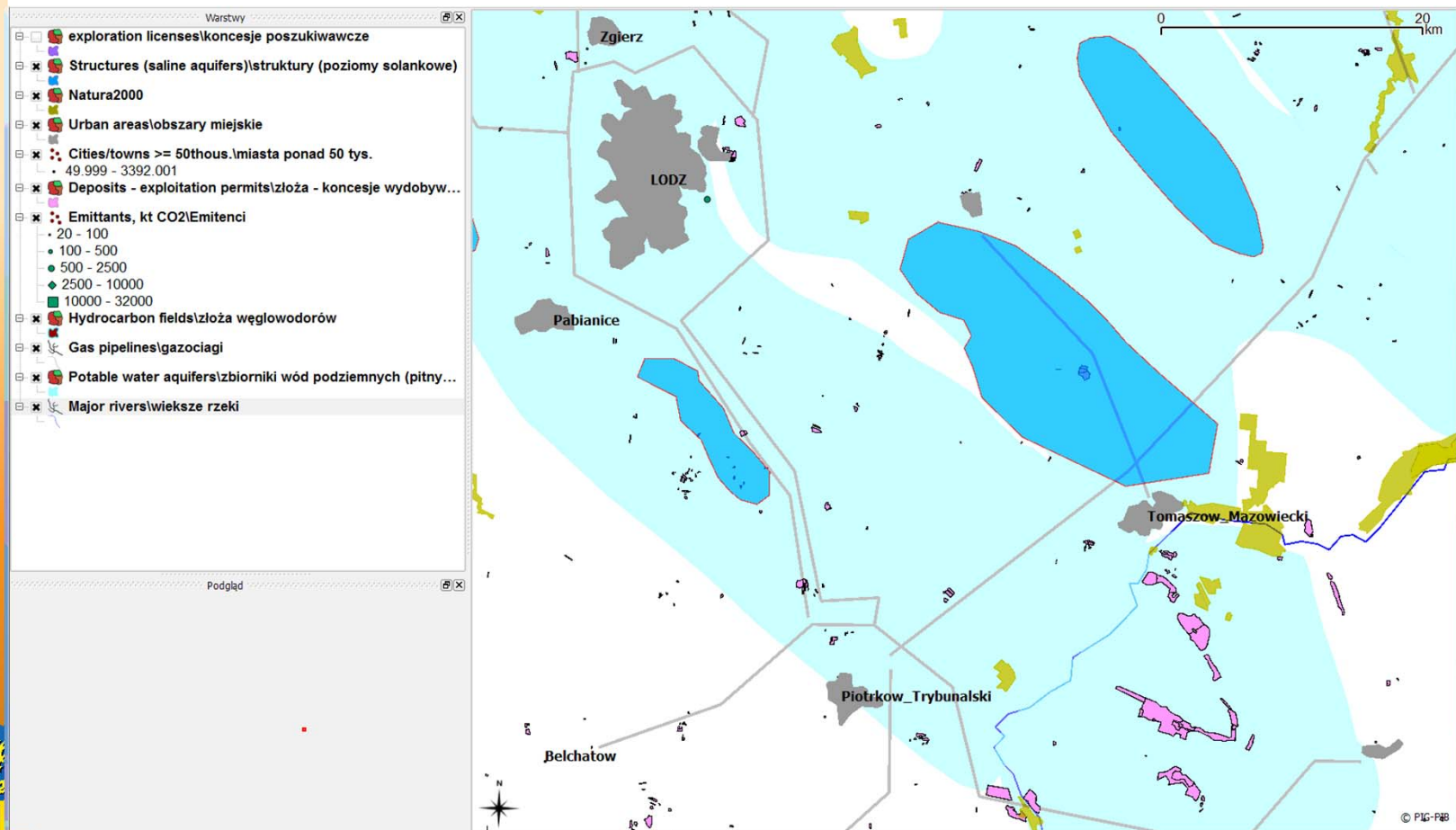
J1 caprock and aquifer formations within the supercritical range

Possible conflicts of use – protected areas



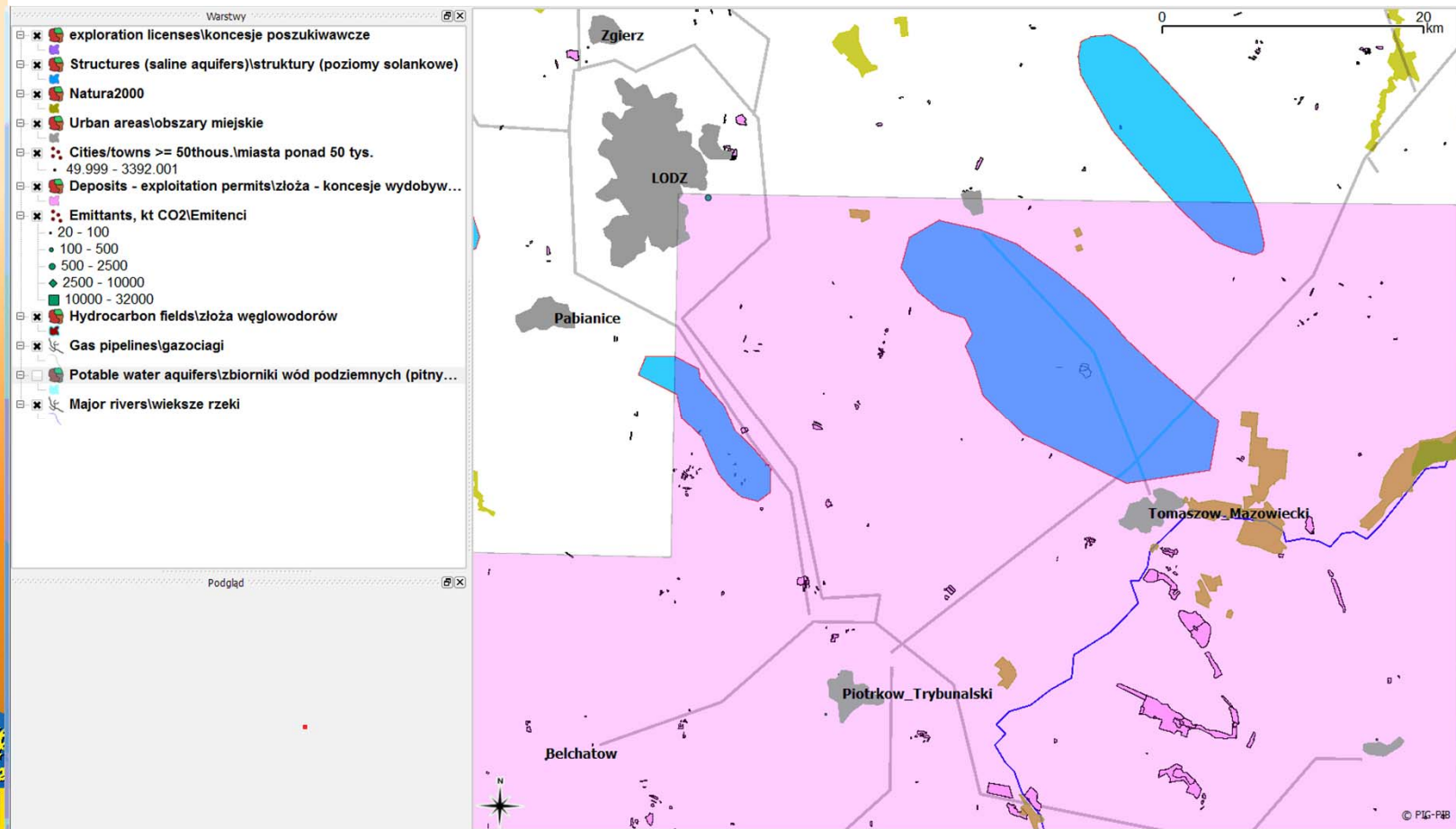
➔ No protected areas within the structure area

Possible conflicts of use – deep potable aquifers



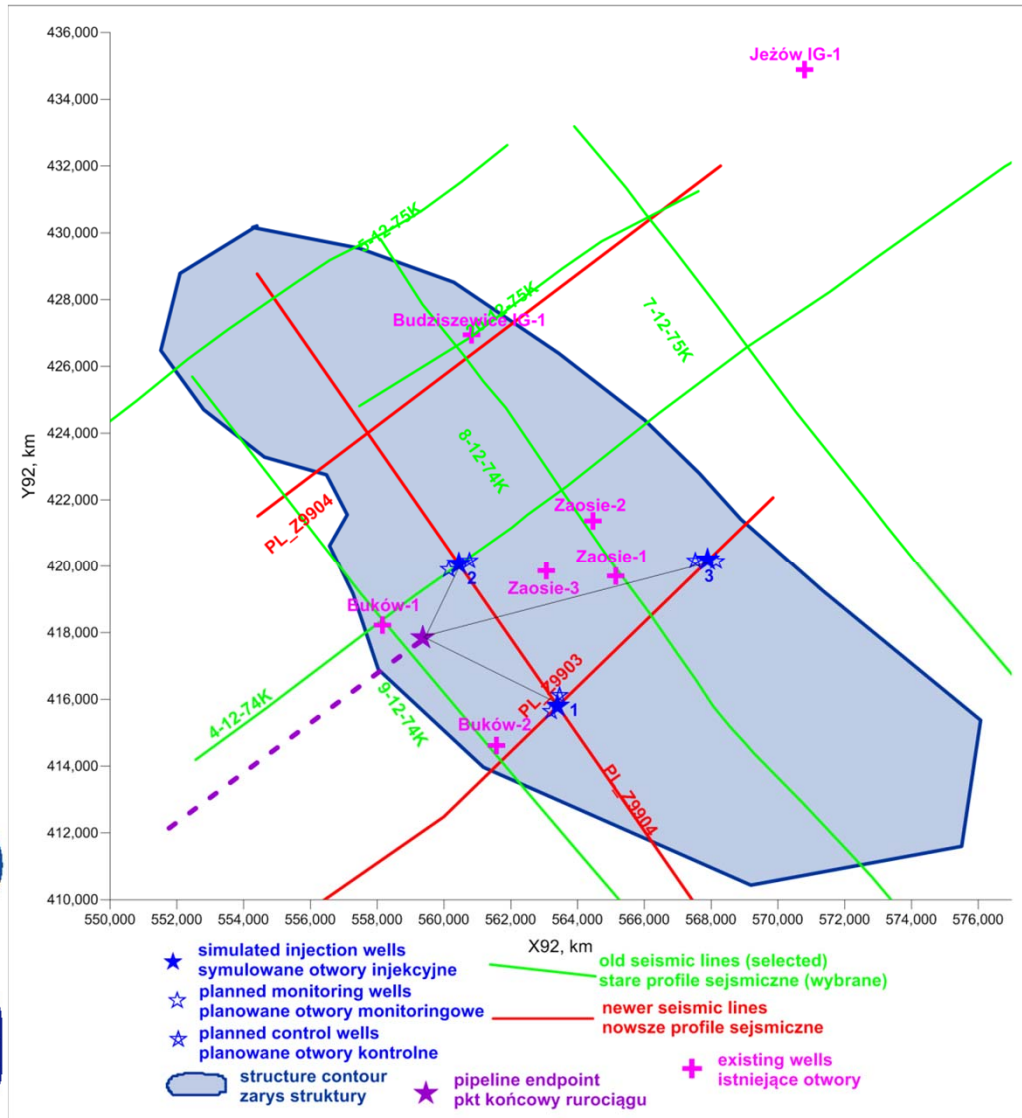
- Potable aquifers of Upper Jurassic and younger formations,
- Three good caprock formations (Jto1, Ja3 and Jbj3) exclude any leak possibility

Possible conflicts of use – other natural resources



➔ Exploration licence on conventional hydrocarbons of DPV encloses the structure area but this is a peripheral part of the license, of low hydrocarbon prospects.

The injection concept



- ➔ Reservoir properties of Lower Jurassic saline aquifers are a quite good (porosity $\sim 20\%$, permeability 200-500 mD)
- ➔ As a possible injection scenaria either 1 horizontal well (1.8 Mt/yr) or three vertical wells (0.6 Mt/yr) are considered.



Conclusions

- The Bełchatów project is one of EPR funded CCS demo projects, and the only active in this moment in Poland
- The storage complex in this case is within Jurassic formations,
- These formations, especially Lower Jurassic, are the most perspective for onshore CO₂ storage in Poland,
- Paralelly to the demo project the pilot injection into this aquifer has been prepared and is being launched now,
- Reservoir properties and storage safety of the most likely site are sufficient for the project needs,
- The main problems for the project schedule might be public acceptance and the progress of implementation of the CCS Directive in Poland.





Thank you for your attention:
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