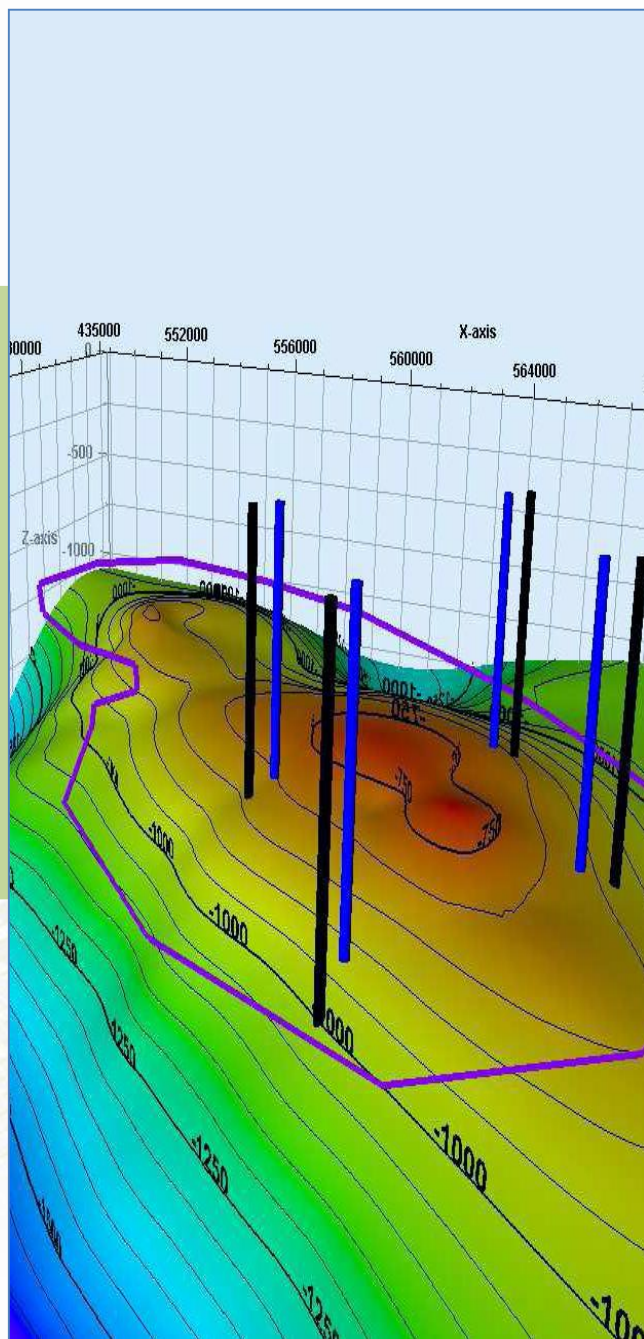




CENTRAL  
MINING  
INSTITUTE



# Polish experience with CCS initiatives

D.Sc. Eng. Aleksandra Koteras

**3<sup>rd</sup> Baltic Sea Region CCS Conference on  
“Visions and Barriers”  
Warsaw 2015**

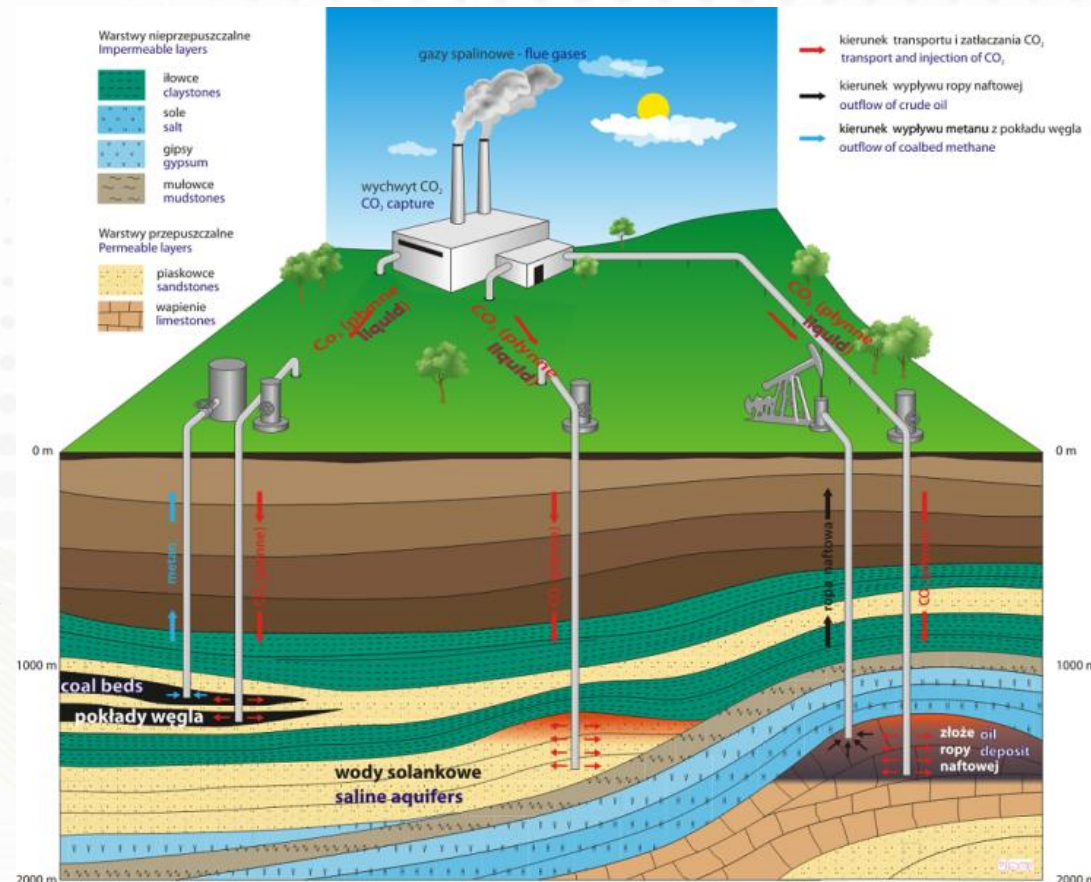


# POLISH EXPERIENCES IN CCS

## - EXAMPLES



1. „Borzęcin” – 1995
2. Kaniów/RECOPOL – 2001-2005
3. Ponętów – 2004
4. CASTOR WP1.2 – 2004-2006
5. CO2SINK – 2004
6. Jastrzębka Stara – 2005-2006
7. EU GeoCapacity – 2006-2008
8. CO2NET EAST – 2006-2009
9. MOVECBM – 2006-2008





# POLISH EXPERIENCES IN CCS

## – MAIN PROJECTS



Conducted by:



- *Assessment of formations and structures for safe CO<sub>2</sub> geological storage, including monitoring plans”*  
*National Program*

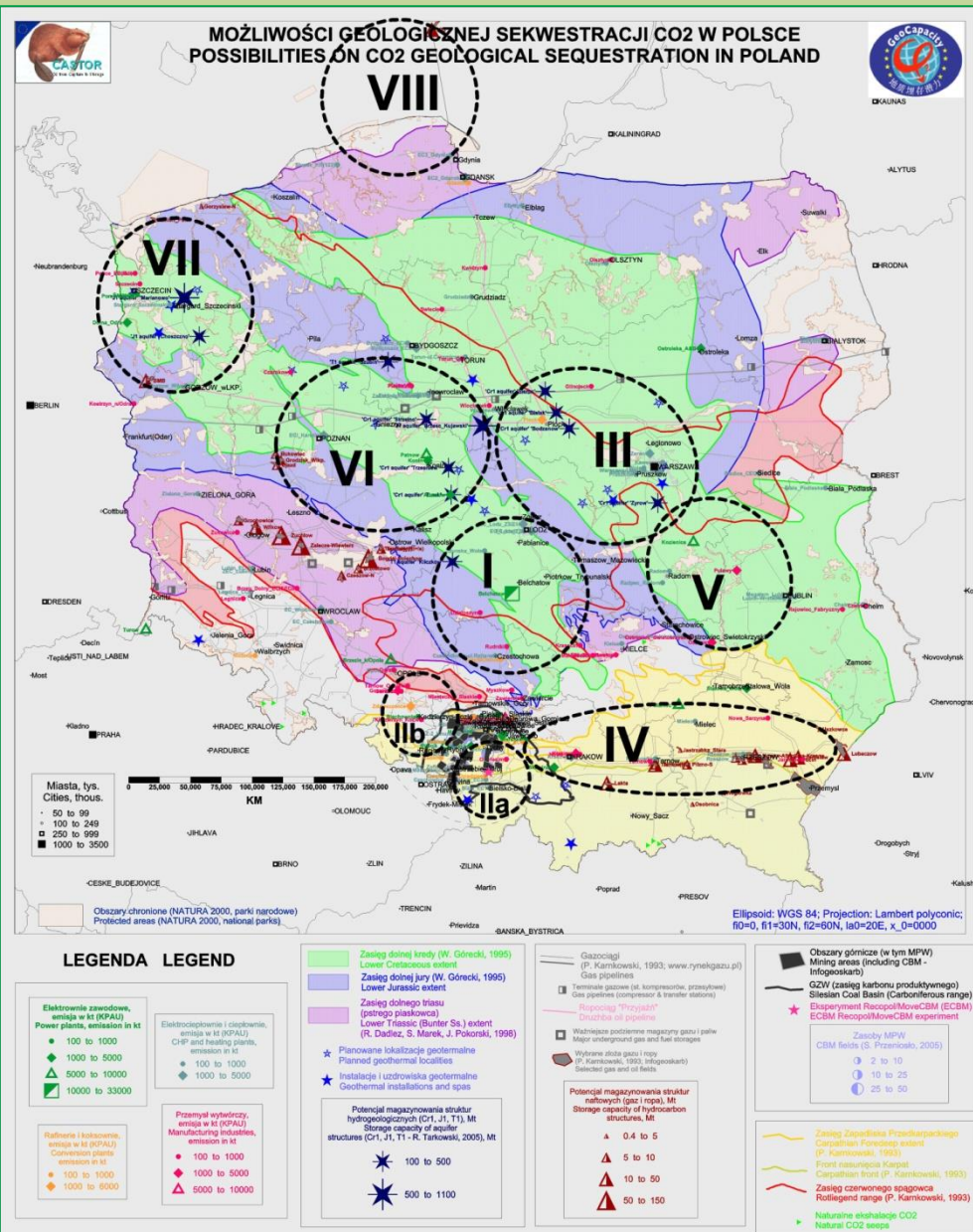
**Timeframe:**  
**10.2008 – 09.2012**

**Ordered by: Polish Ministry of the Environment  
National Fund for Environmental Protection and Water Management**





# THE SCOPE OF THE PROGRAMM



It covers entire territory of Poland and the Baltic economic zone, but is focused on\*:

- regional studies for 8 areas with saline aquifers,
- hydrocarbon fields and coal beds in general,
- case studies for saline aquifer structures (4),
- case studies for hydrocarbon fields (2) and coal beds (1).

reinterpretation of archive data, laboratory analyzes



# POLISH EXPERIENCES IN CCS

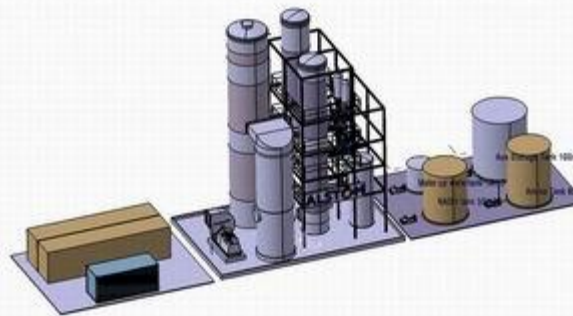
## – MAIN PROJECTS

- ***Bełchatów, Demonstration plant for carbon dioxide capture, transport and storage (CCS) – co-financed by EU (180 mln euro), lignite power plant: 858 MW, Storage in Saline Aquifer***



Co-financed by the European Union

European Energy Programme for Recovery



*Visualization of the pilot plant,  
planned for installation on the  
block No. 12*





# POLISH EXPERIENCES IN CCS

## – MAIN PROJECTS



Conducted by:  
Central Mining Institute

- *“Study for the safe storage of carbon dioxide on the example of the Silesian agglomeration”*, under a project of the Minister of Science and Higher Education “Technology Initiative I”

**Timeframe:**  
**2007 – 2011**

### **PHASE A ( 2007-2010)**

1. Study of potential of CO<sub>2</sub> storage capacity
2. Modeling of underground saline storage complex.
3. Recommended guidelines for the proper infrastructure for transport and injection of CO<sub>2</sub>
4. Developing a surface monitoring system for CO<sub>2</sub> storage in saline formations
5. Comprehensive safety analysis/ risk assessment

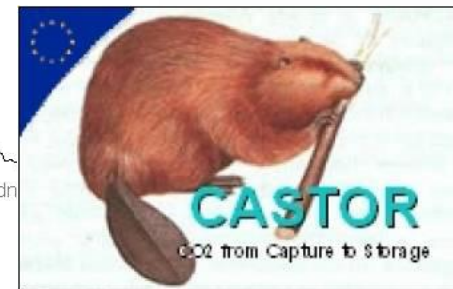
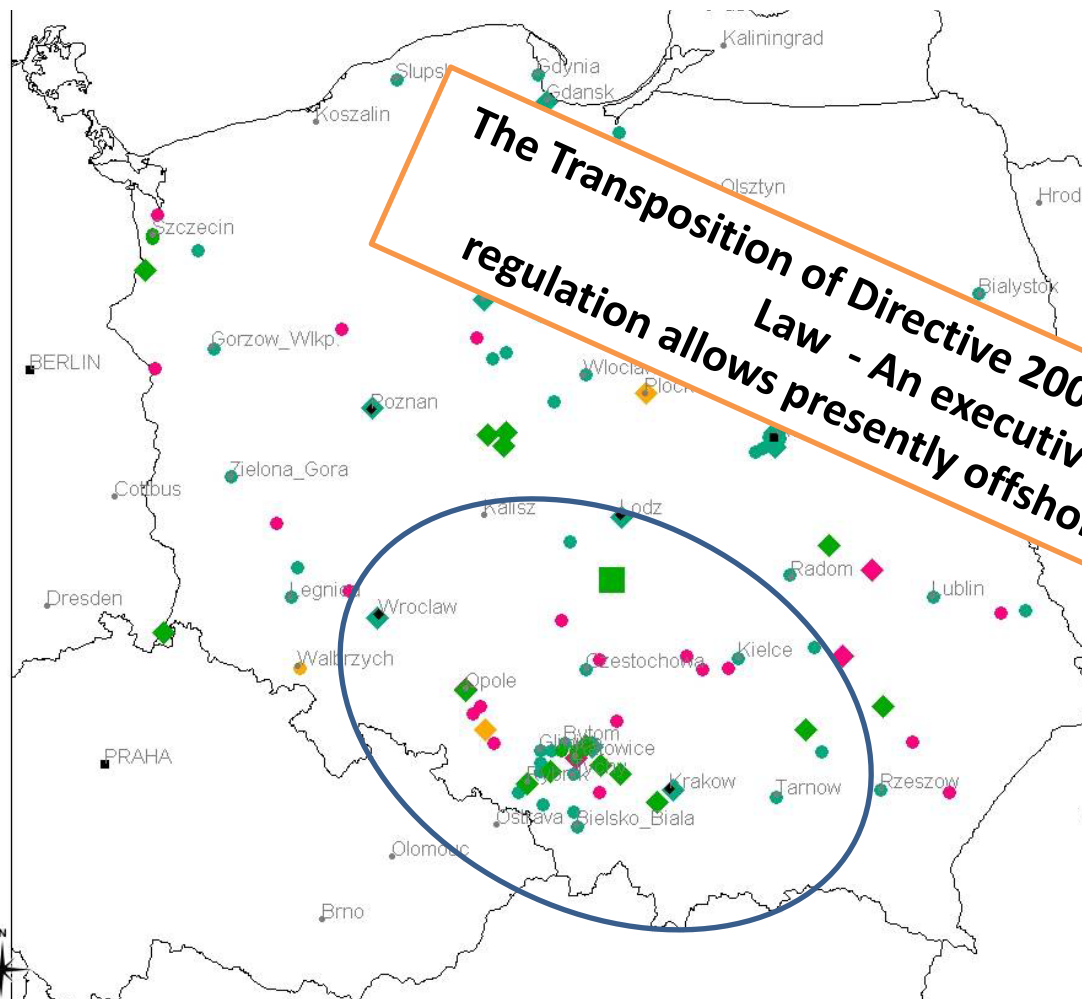
### **PHASE B (2010- 2011)**

1. Pre-documentation of the installation process for geological CO<sub>2</sub> storage



# CCS – WHAT HAVE WE LEARNT FROM CCS PROJECTS

## EMISSIONS FROM INDUSTRIAL SOURCES

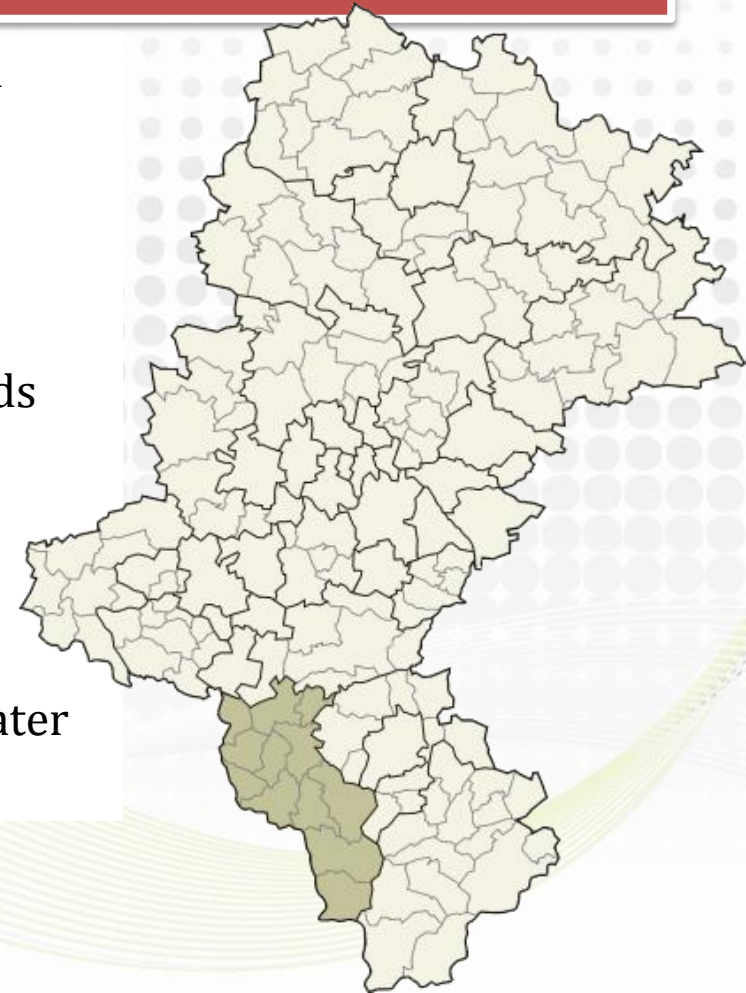




# CCS - MOST IMPORTANT PROBLEMS FOR SAFETY STORAGE

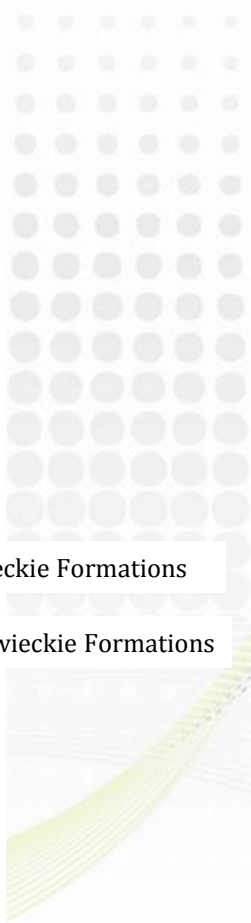
*based on the results from the “Study for the safe storage of carbon dioxide on the example of the Silesian agglomeration”*

- ❑ localization in the Upper Silesia region: with an urbanization about 78%
- ❑ Cieszyn County:
  - urbanization 48%
  - density 234.2/km<sup>2</sup>
  - buildings are scattered among the arable fields
- ❑ proximity to mining areas
- ❑ Natura 2000
- ❑ Goczałkowice Reservoir
- ❑ natural gas fields, bad methane
- ❑ therapeutic peat (Cieszyn Tufa Springs) and water treatment





# Bielsko storage complex





## Rozmieszczenie form ochrony przyrody w województwie śląskim

# Bielsko storage complex

## Natura 2000 in the Upper Silesia Region

### Legenda

-  Lokalizacja składowiska
-  Rezerваты Przyrody wraz z otulinami
-  Parki Krajobrazowe wraz z otulinami
-  Zespoły Przyrodniczo-Krajobrazowe
-  Obszary Ptasie Natura 2000
-  Obszary Siedliskowe Natura 2000
-  Propozycje obszarów N 2000 przedstawione przez WZS w 2008r.
-  granice gmin
-  główne gminy miejskie
-  granica województwa

0 5 10 20 30 km







**Bak**



**Bączek**



**Dzierzba  
czarnoczelna**



**Mewa  
czarnogłowa**



**Rybitwa białowłosa**



**czapla biała**



**Krwawodziób**

# **Goczałkowice Reservoir**

Artificial water reservoir.  
The area of the reservoir  
is 32 square kilometres  
and its capacity is 168  
million m<sup>3</sup>



**bocian biały**



**perkoz dwuczuby**

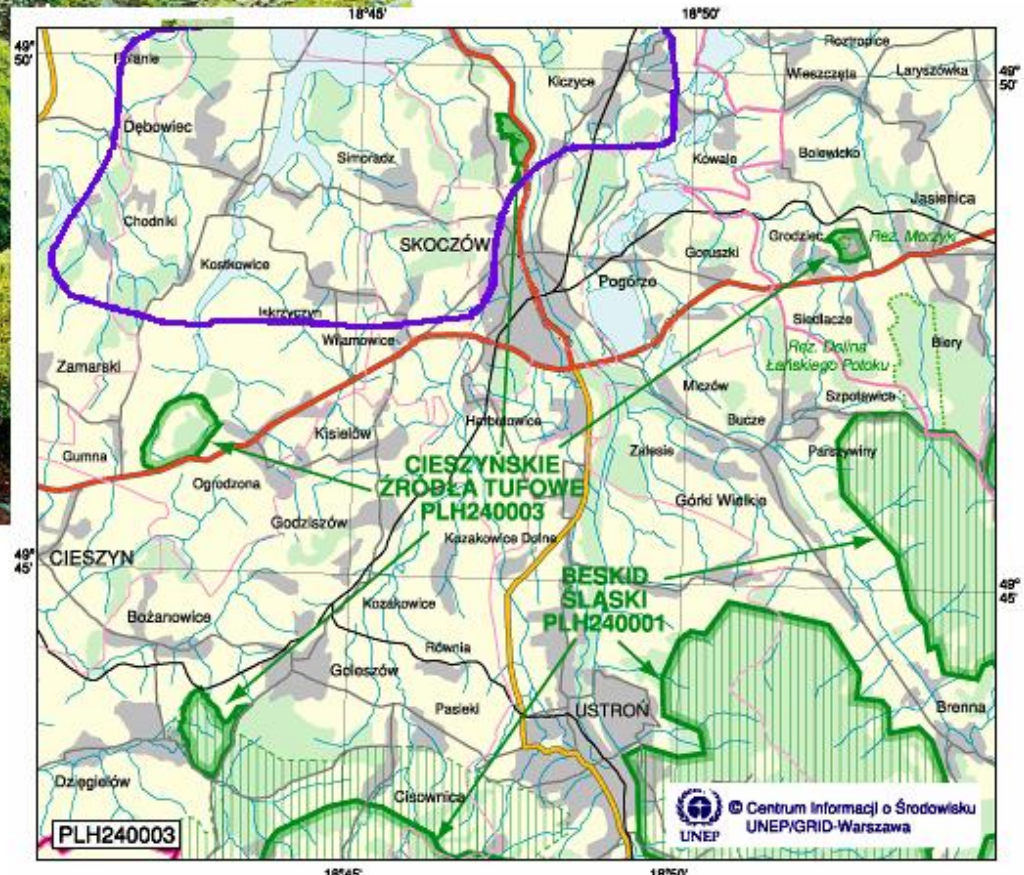




# THERAPEUTIC PEAT



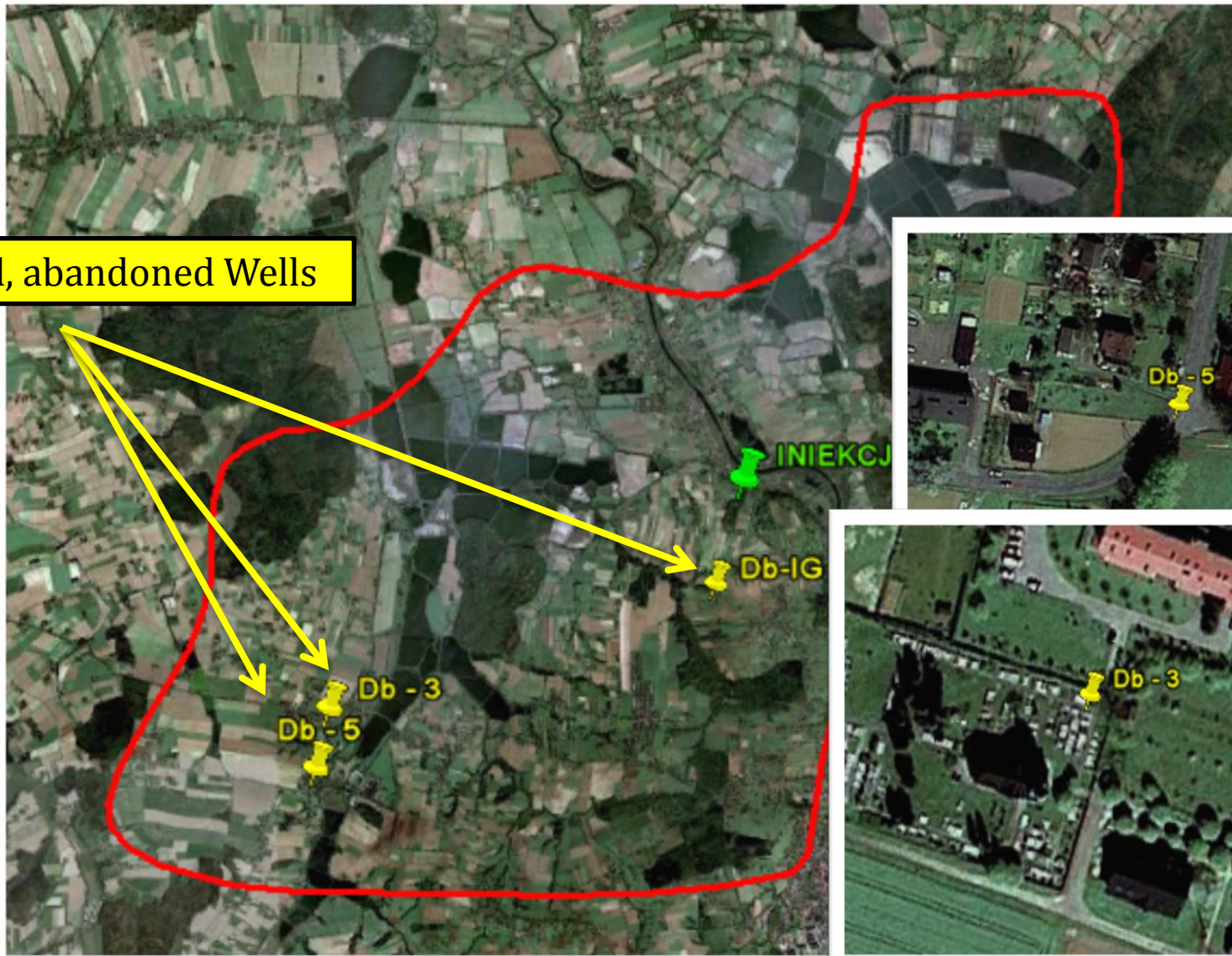
## Cieszyn Tufa Springs



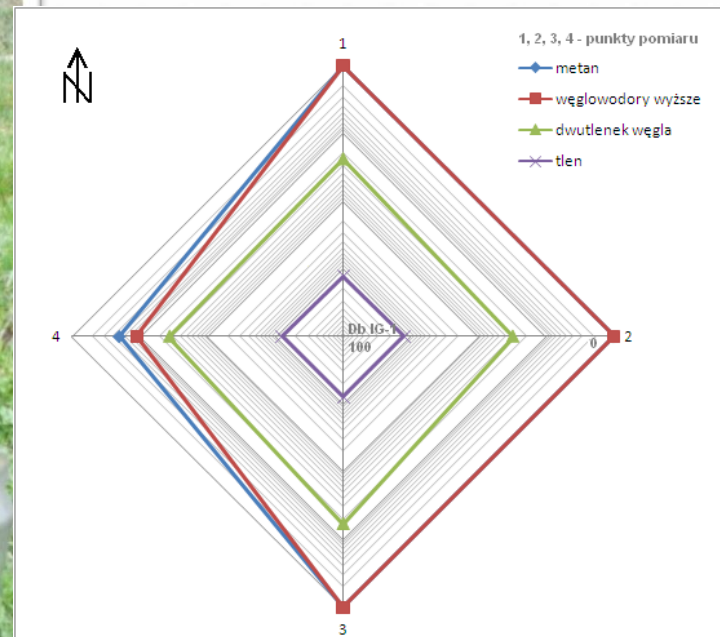


# HAZARDS IDENTIFICATION

Old, abandoned Wells





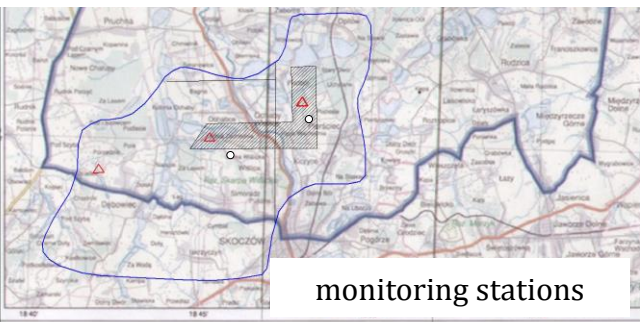


Parametr	Measurement I	Measurement II	Measurement III	Average
O <sub>2</sub> [%]	-1,04	-1,5	-1,09	-1,21
P, [Pa/mb]	982,66 / 29,47	984,8 / 29,37	982,97 / 29,48	983,47 / 29,44
PID18 [ppm]	0,0	0,0	0,0	0
CH <sub>4</sub> [ppm]	669460	669516	668942	669306
T.P. [ppm]	999999	999999	999999	999999
CO <sub>2</sub> [ppm]	8,4	12,0	10,4	10,27



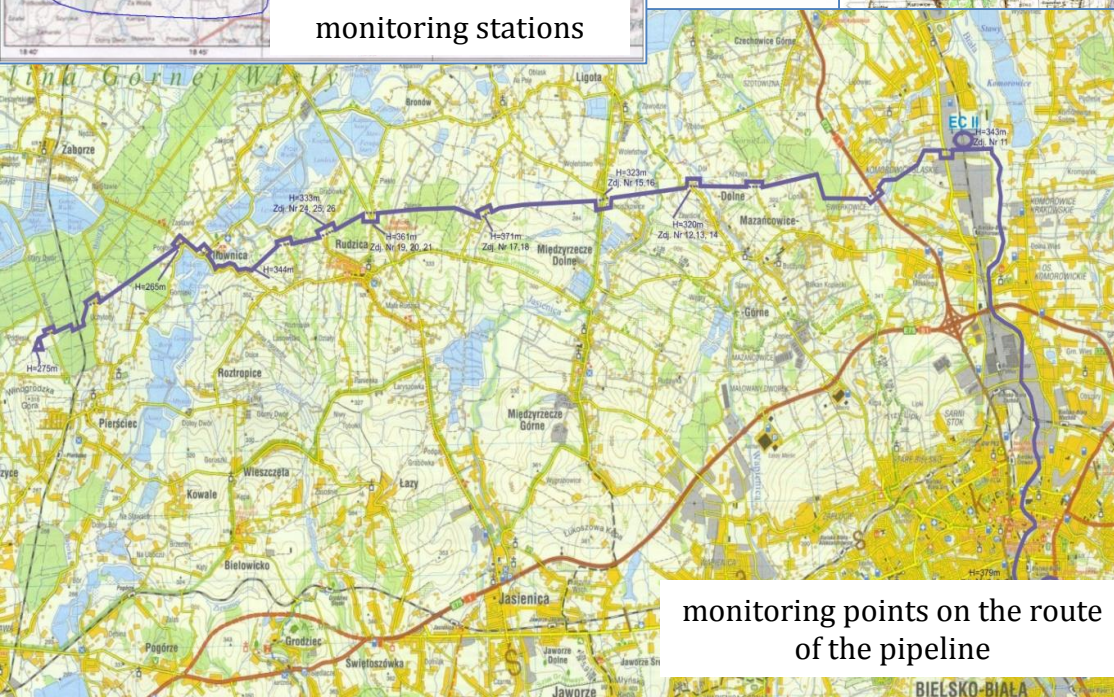
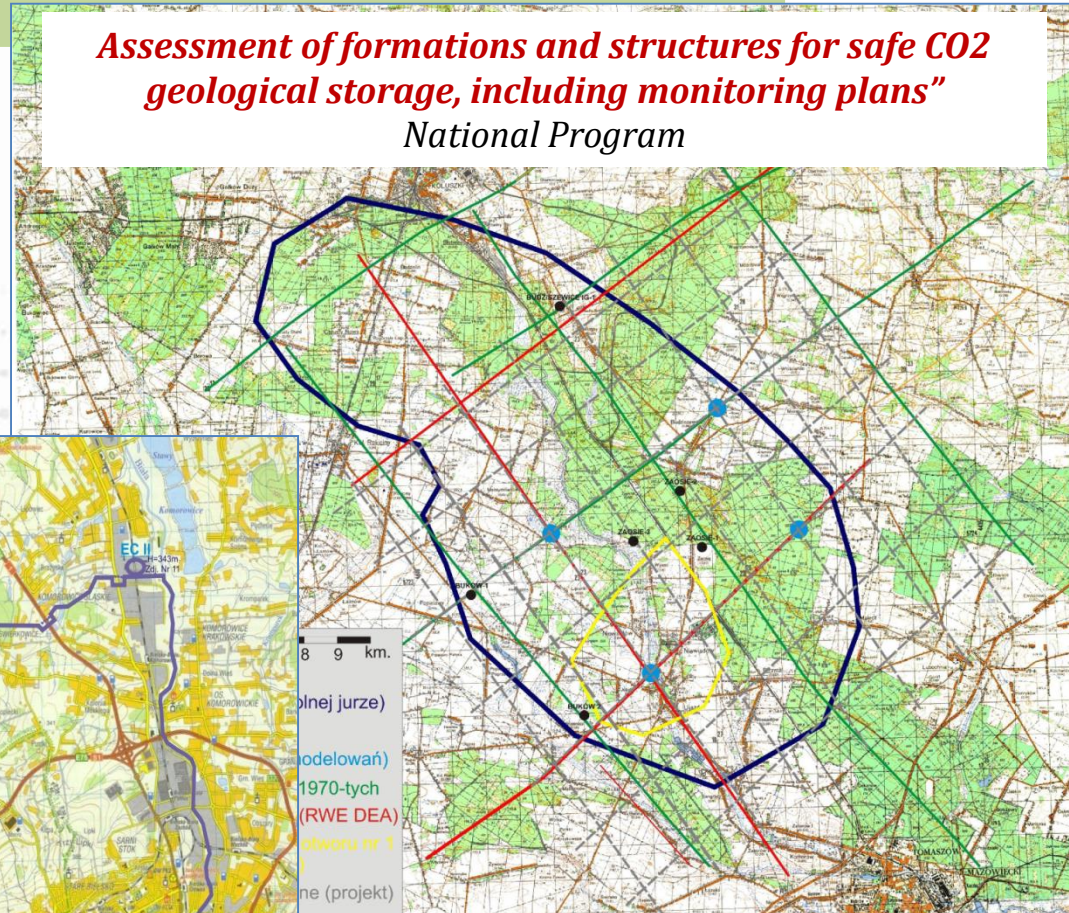
# NEXT STEP - MONITORING SYSTEM

*“Study for the safe storage of carbon dioxide on the example of the Silesian agglomeration”,*



*Assessment of formations and structures for safe CO<sub>2</sub> geological storage, including monitoring plans”*

*National Program*

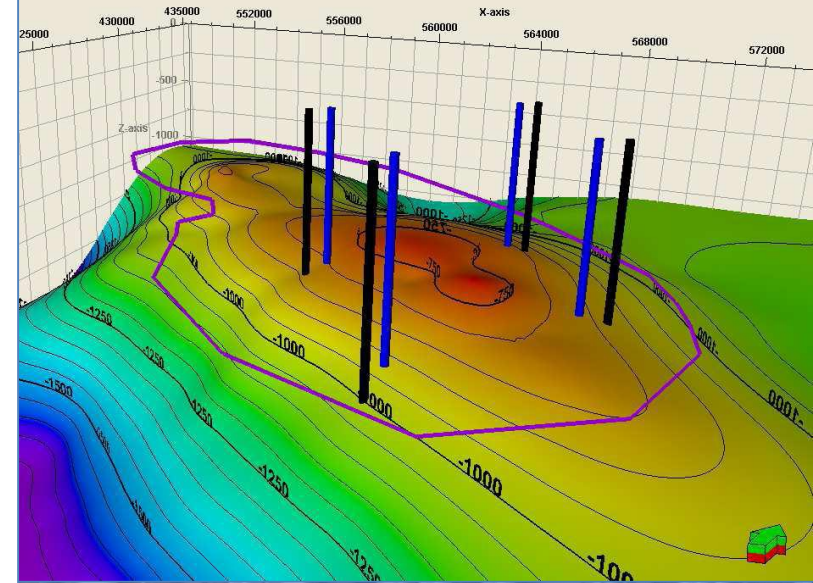




# MONITORING SYSTEM



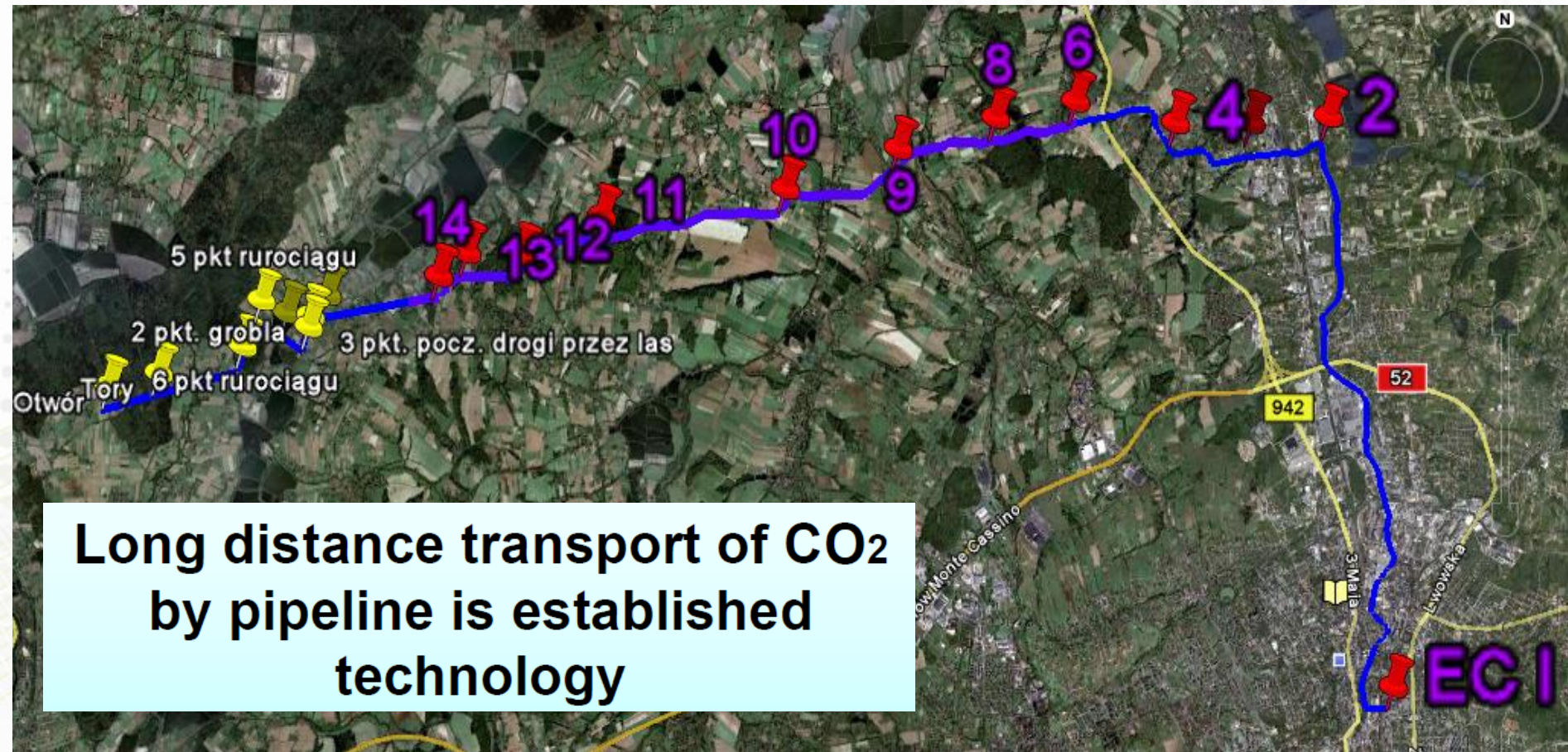
- 4D seismic monitoring of CO<sub>2</sub>
- 2D seismic and gravimetric monitoring as well as electromagnetic and electrical methods
- Seismogenic process monitoring and seismologic passive tomography
- Monitoring of seismic activity in the process of CO<sub>2</sub> storage.
- Microbiological monitoring and carbon dioxide concentration fluctuations in soil air
- Geochemical monitoring of the groundwater and soil quality around injection well



SlimWave geophone view (SERCEL)



# CO<sub>2</sub> TRANSPORT









# PUBLIC PERCEPTIONS OF CCS: POLISH CONTEXT



Łódzkie: protesty przeciw magazynowaniu CO<sub>2</sub> pod ziemią

Marcin Bereszczczyński 14 maja 2010 AKTUALIZACJA: 14 maja 2010 06:36

Geofizyka Toruń zawiesiła prowadzenie odwiertów, sondujących możliwość magazynowania dwutlenku węgla (CO<sub>2</sub>) w woj. łódzkim. To efekt licznych protestów.

Source: Polska Dziennik Łódzki  
2010-05-14,



autor: Rafał Klepczarek

źródło: Polska Dziennik Łódzki

2012-03-05, Aktualizacja: 2012-03-05 12:40



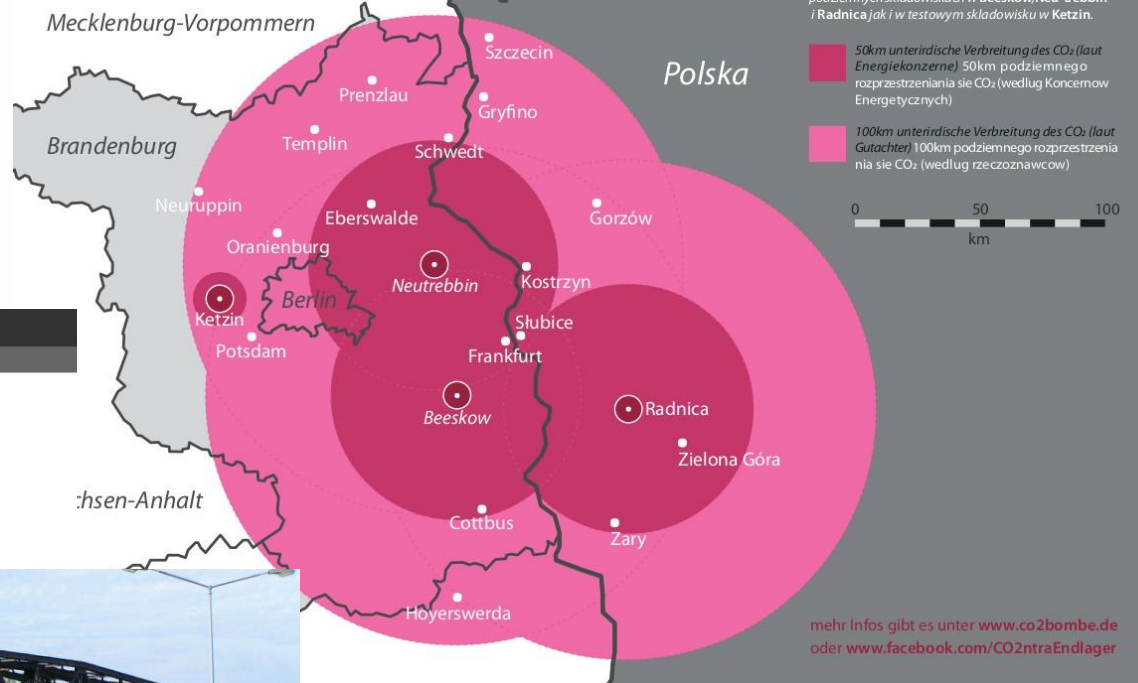
Source: Polska Dziennik Łódzki  
2012-04-02, Aktualizacja: 2012-04-03 12:14



# PUBLIC PERCEPTIONS OF CCS

## PROTESTS AGAINST THE PROJECT

**CO<sub>2</sub>-Endlager - weder hier noch anderswo**  
**CO<sub>2</sub> w podziemnych składowiskach - nie tutaj i nigdzie indziej**



Industries | Mon Dec 5, 2011 1:55pm EST  
**UPDATE 2-Vattenfall drops carbon capture project in Germany**

\* Vattenfall blames lack of political will

\* UK scrapped a leading CCS programme in October

Dec 5 (Reuters) - Swedish utility Vattenfall on Monday abandoned plans for a 1.5 billion euro (\$2 billion) carbon capture and storage (CCS) pilot project in Germany, due to popular opposition based on environmental fears.

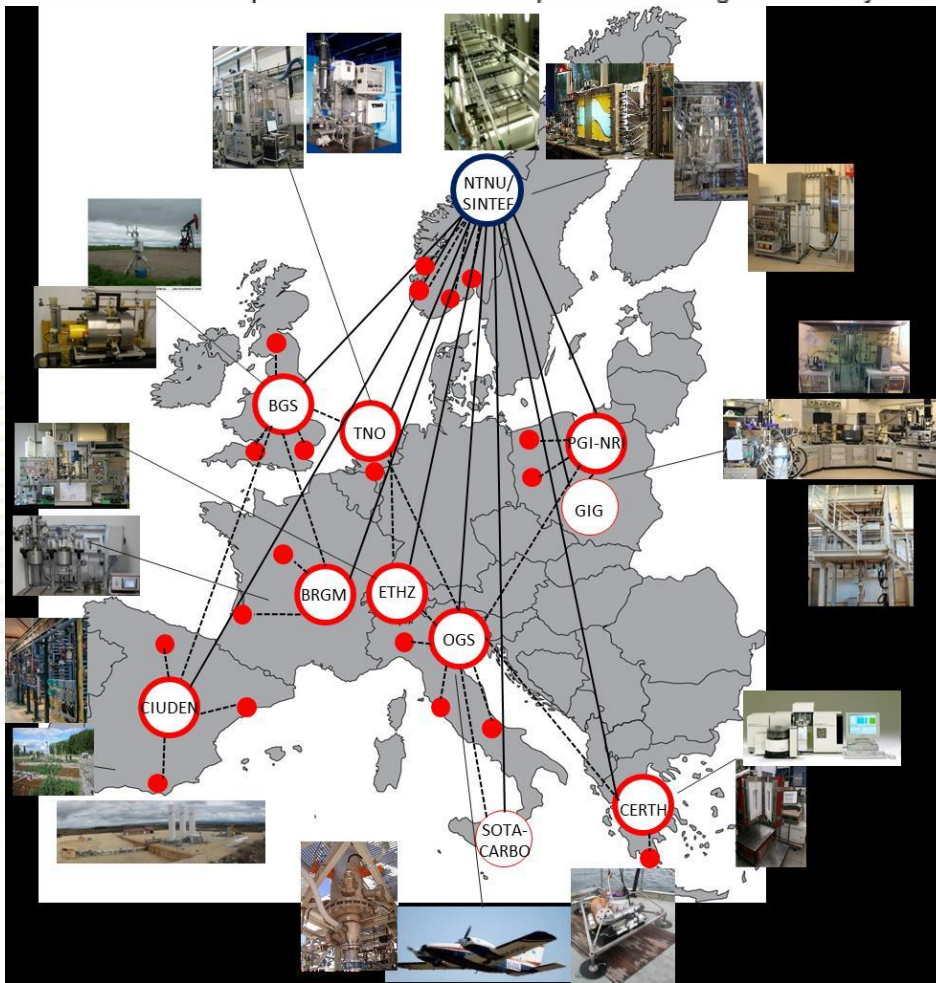
"We must unfortunately accept that there is currently insufficient will in German federal politics to implement the European directive so that a CCS demonstration project in Germany could be possible", said Tuomo Hatakka, head of the company's Business Division Production and its country manager for Germany.



Source: [www.co2bombe.de](http://www.co2bombe.de), [www.co2-endlager-stoppen.de](http://www.co2-endlager-stoppen.de), <http://ccs-protest.de>



# CURRENT ACTIVITIES



## Partners

- NTNU
- BGS, NERC
- BRGM
- CERTH / CPERI
- CIUDEN
- ETH Zurich (ETH-Z)
- GIG
- OGS
- PGI-NRI
- SINTEF
- SINTEF ER
- SINTEF PR
- SOTACARBO
- TNO



# CONCLUSION



- **Performance assessments and projects that have been conducted in Poland have shown that geologic settings are suitable for long-term storage of CO<sub>2</sub>.**
- **Application of the CCS legislation in Poland will concern only large scale demonstration projects.**
- **Several challenges still remain for the large-scale implementation of CCS projects in Poland - need for Commercial/Scale CCS Project Development**
- **An executive regulation allows presently offshore storage only as a result of the Transposition of Directive 2009/31/EC into Polish Law**
- **The economic use of CO<sub>2</sub> (CO-EOR, CO-ECBM) in Poland is limited;**
- **The opponents of CCS usually do not use scientific arguments - increasing citizens awareness about the CCS technology is crucial for it development.**
- **The comprehensive risk assessment of CO<sub>2</sub> geological storage have big importance for the public acceptance.**





**THANK YOU FOR YOUR  
ATTENTION !!!**

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