PilotSTRATEGY

Webinar 3 - Upper Silesia, Poland: Activities, results, challenges

24/10/24 | 14:00 - 15:00 | Online | Time shown is CEST

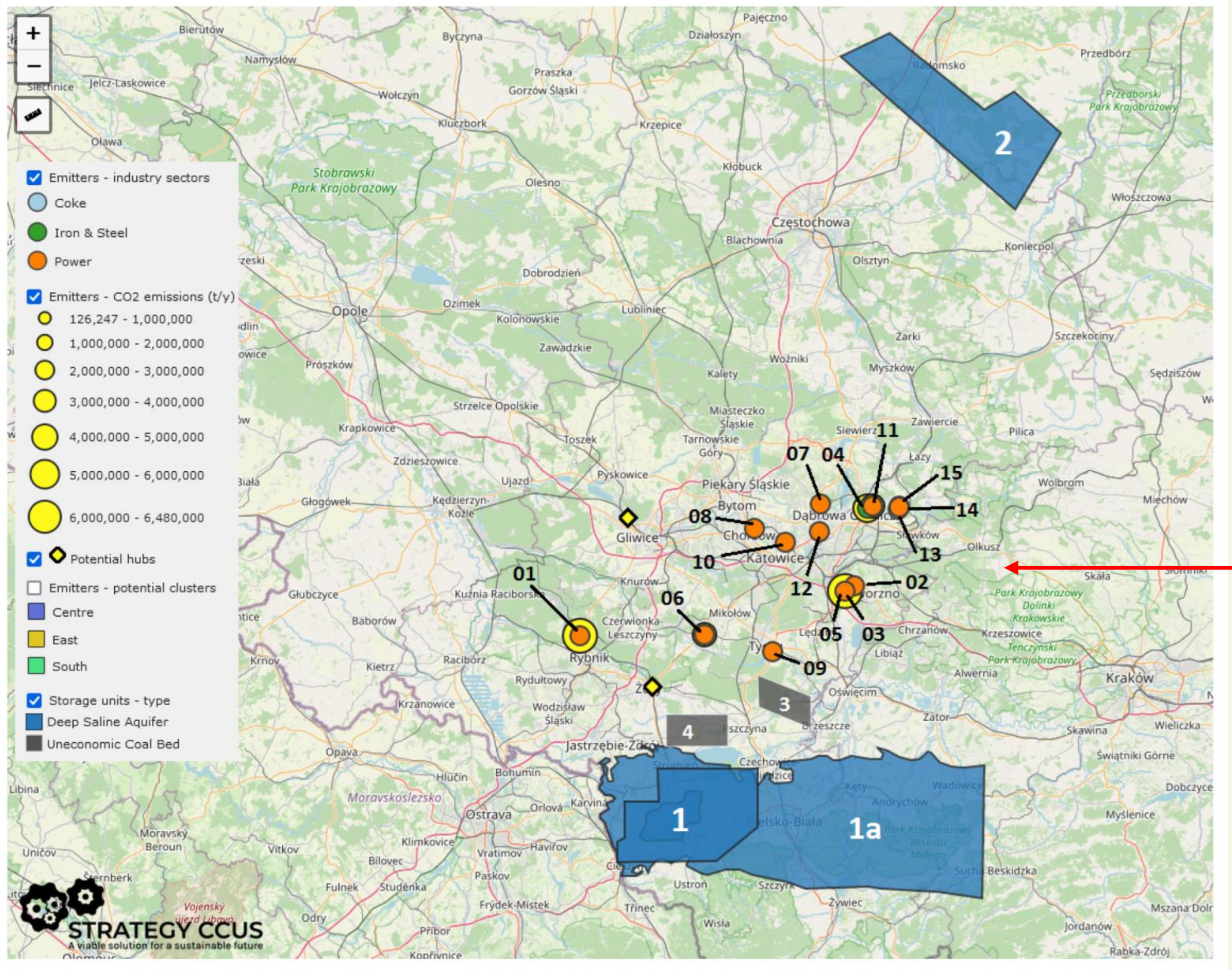
Krzysztof Stańczyk, Tomasz Urych and Aleksandra Koteras - Central Mining Institute (GIG-PIB)

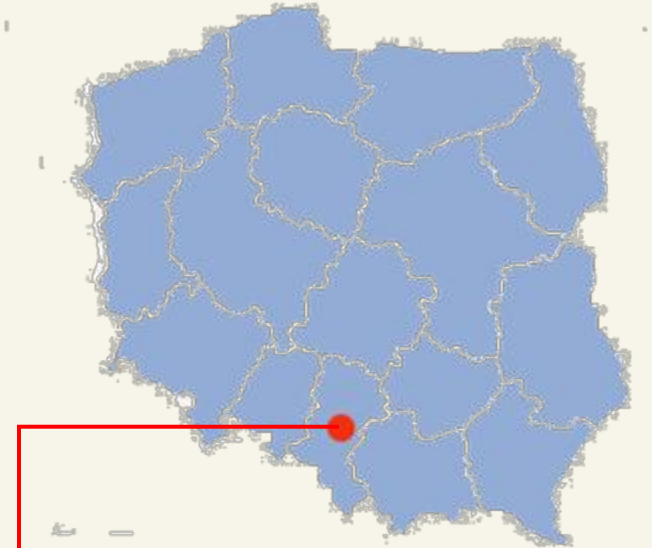
The PilotSTRATEGY project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101022664

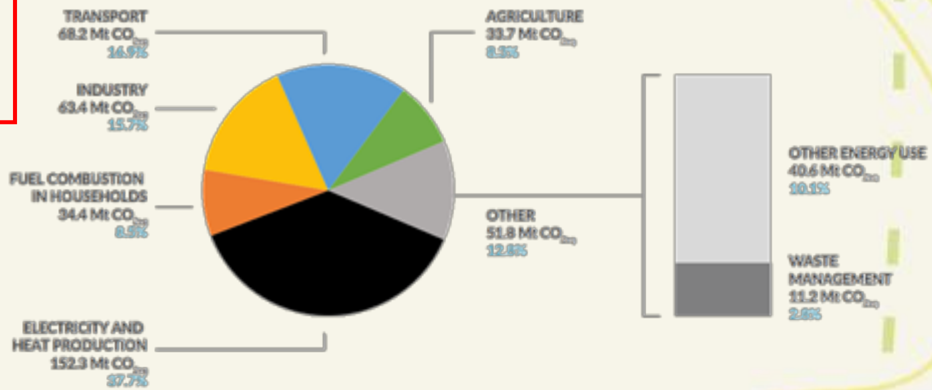
Presentation schema

- Geographic situation with potential emitters
- CCUS scenarios
- Social acceptance and community engagement in CCS technology development
- Geo-characterisation - storage potential of Upper Silesia
- Dynamic modelling and optimization of storage capacity
- Legal conditions for the use of the technology in Poland

Geographic situation of Upper Silesia Coal Basin and potential emitters of CO_2

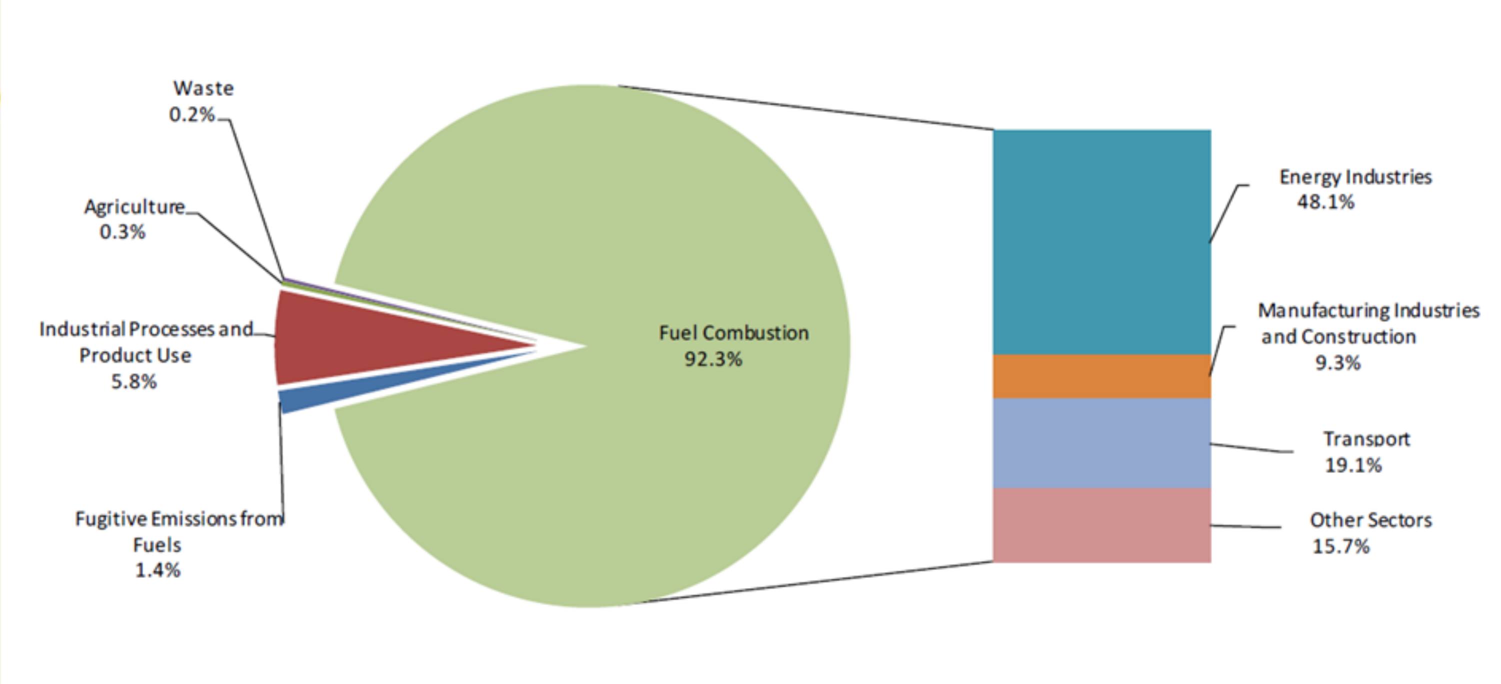






Structure of greenhouse gas emissions in Poland (2021)
Energy Transition in Poland 2023 Edition, Forum Energii 2024

CO_2 emission in the region



- Total annual CO_2 emissions exceeding 33 Mt
- Over 100 carbon dioxide emitters covered by the EU ETS
- Large industrial emitters (coal-fired power plants, heating plants, steelworks, coking plant)
- Air pollution associated with industrial sector and household heating
- Electricity and heat produced mainly from hard coal and natural gas
- Increasing share of RES

Upper Silesia, Poland

Location and storage potential of the region

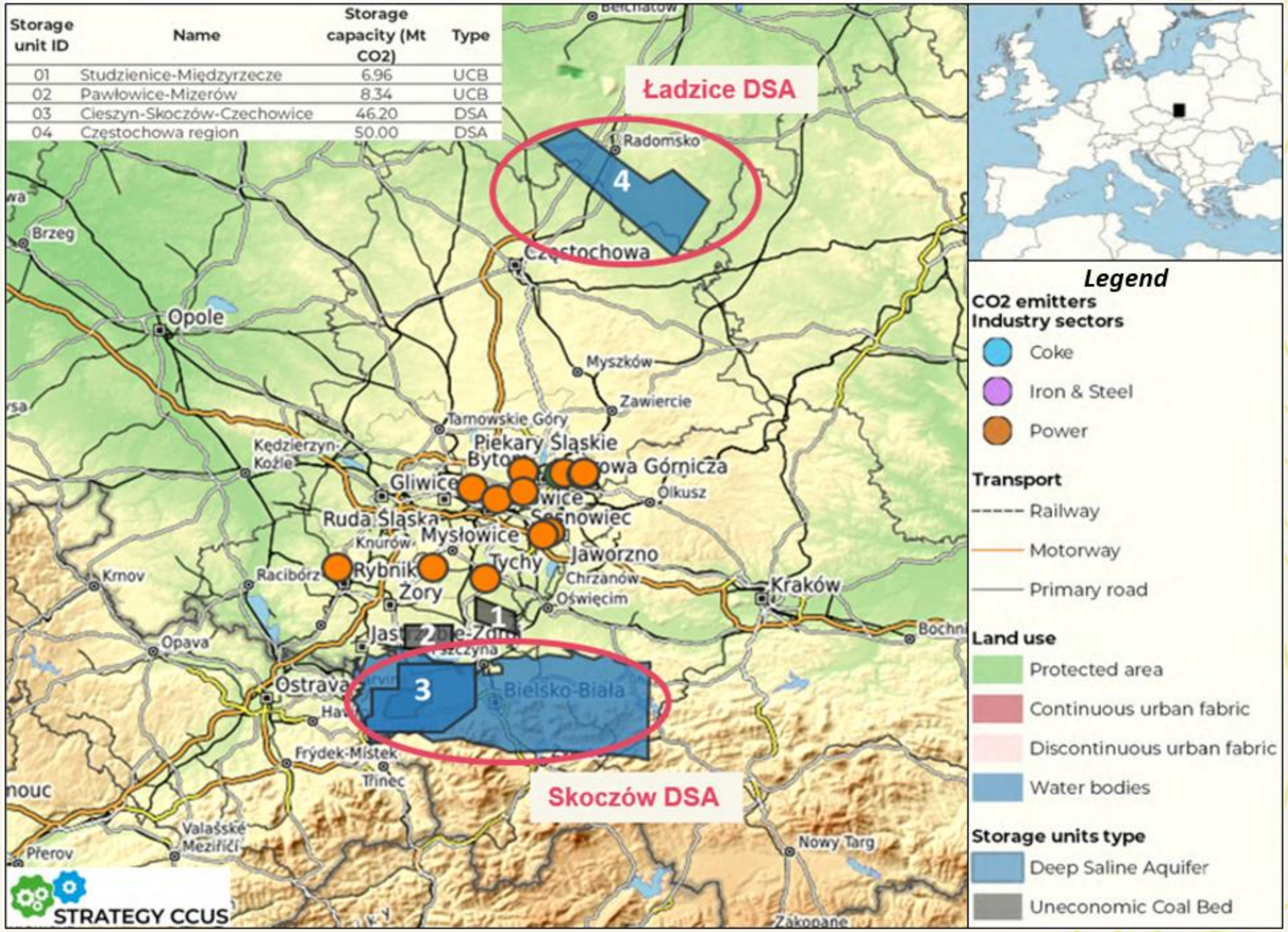
Two possible storage places have been identified in the region in deep saline aquifers:

- Skoczów DSA - Upper Silesian Coal Basin,
- Ładzice DSA - Jurassic Czestochowa District.

Potential CO_2 storage capacity of 0.1 Gt in DSA

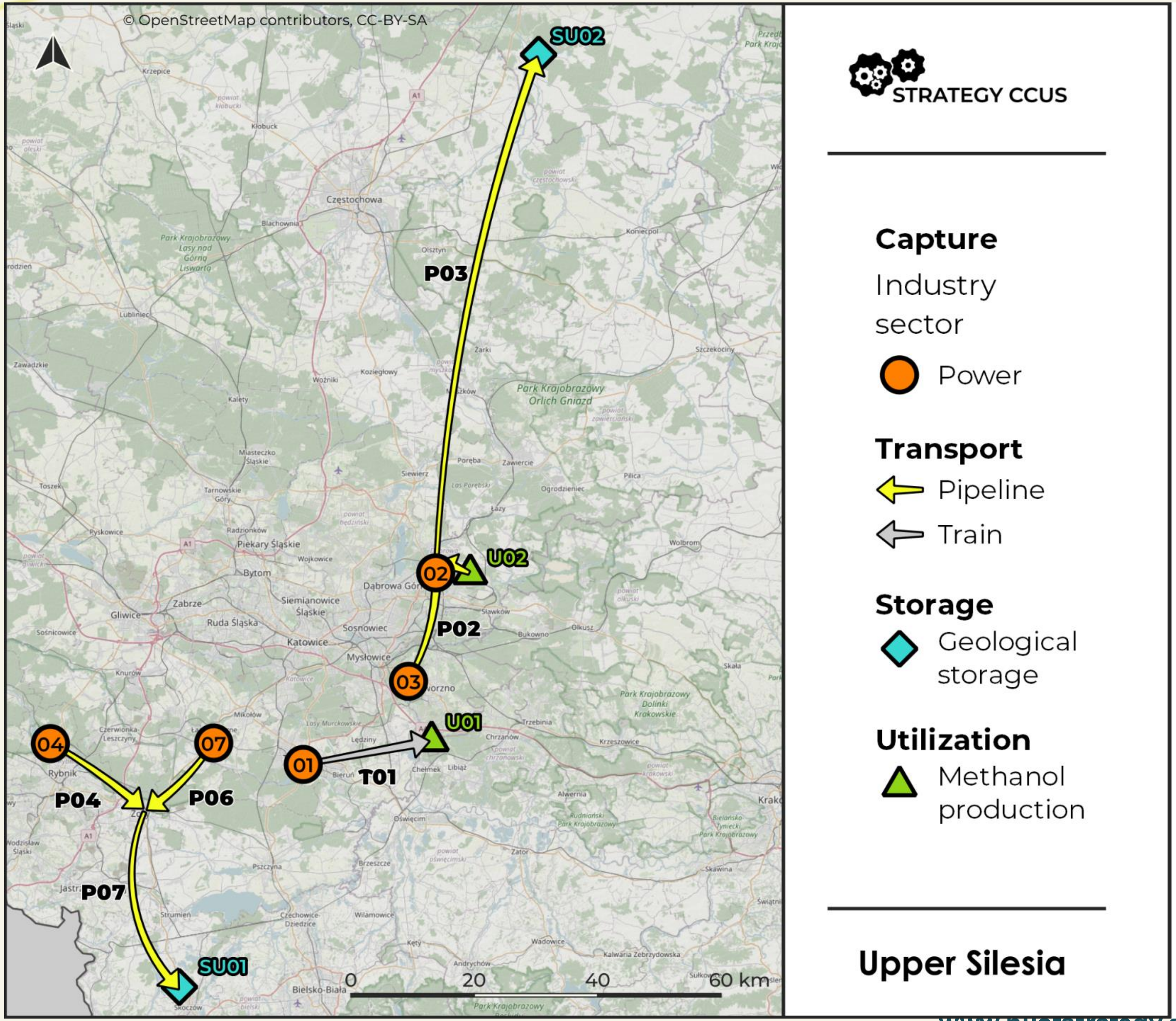
Potential to CCUS development in the region

Enhance the maturity and confidence level of CO_2 storage resources by studying new data, reprocessing current data (WP2) and conducting new dynamic simulation studies (WP3)



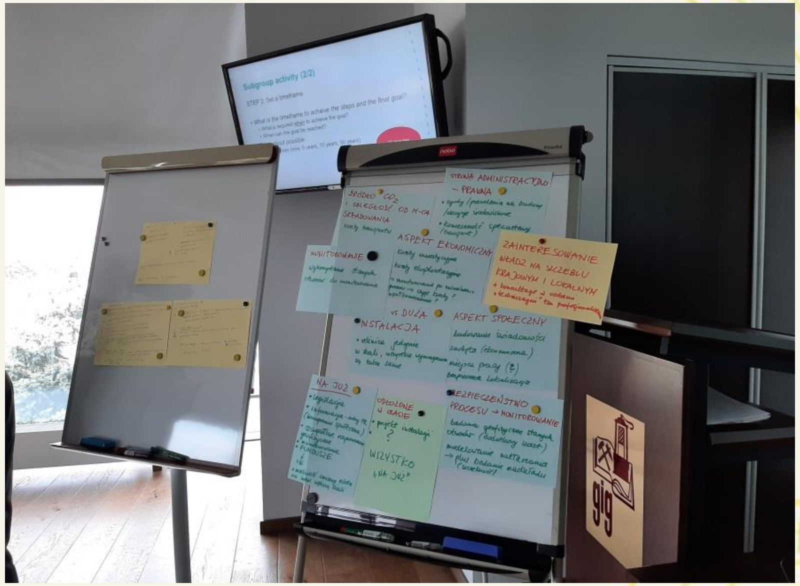
Storage unit ID	Name	Storage capacity (Mt CO2)	Type
01	Studzienice-Międzyrzecze	6.96	UCB
02	Pawłowice-Mizerów	8.34	UCB
03	Cieszyn-Skoczów-Czechowice	46.20	DSA
04	Czestochowa region	50.00	DSA

CCUS scenarios



Regional Stakeholder Committee Workshop

- Performed along with 1st Regional Stakeholders Committee Upper Silesia (Poland) on the 5th of October 2023
- Thirteen participants representing various branches (industry – power sector, mining sector, public administration, local authorities, policy makers, civil society organisations, and scientific community – six participants from GIG)
- Key issues identified during brainstorming: change of national regulation; social campaign; involving local politicians and relevant departments; sharing benefits with local community; research: 3D seismic surveys, geological modelling, monitoring



Regional Stakeholder Committee Workshop

1. It is necessary to conduct a large-scale social campaign aimed at providing residents with reliable information about CCS issues. The information should be specific and provided by reliable people who enjoy social trust and, due to their competences, may constitute an authority for people. At the moment, in Poland there are no authorities based on which public trust in CCS can be built.
2. Another detailed survey of the inhabitants of the areas considered for CO_2 storage after selecting specific locations.
3. Regulation of legal issues and involvement of national and local authorities in the development of CCS technology.
4. Finding a source of financing for the project (planning and creation of the Pilot; in the case of an industrial installation, it will probably be easier to find investors).
5. A comprehensive approach to the issue and the involvement of competent people at every stage of the project, starting from legislators through professional employees responsible for the technical side (geologists, designers, etc.).

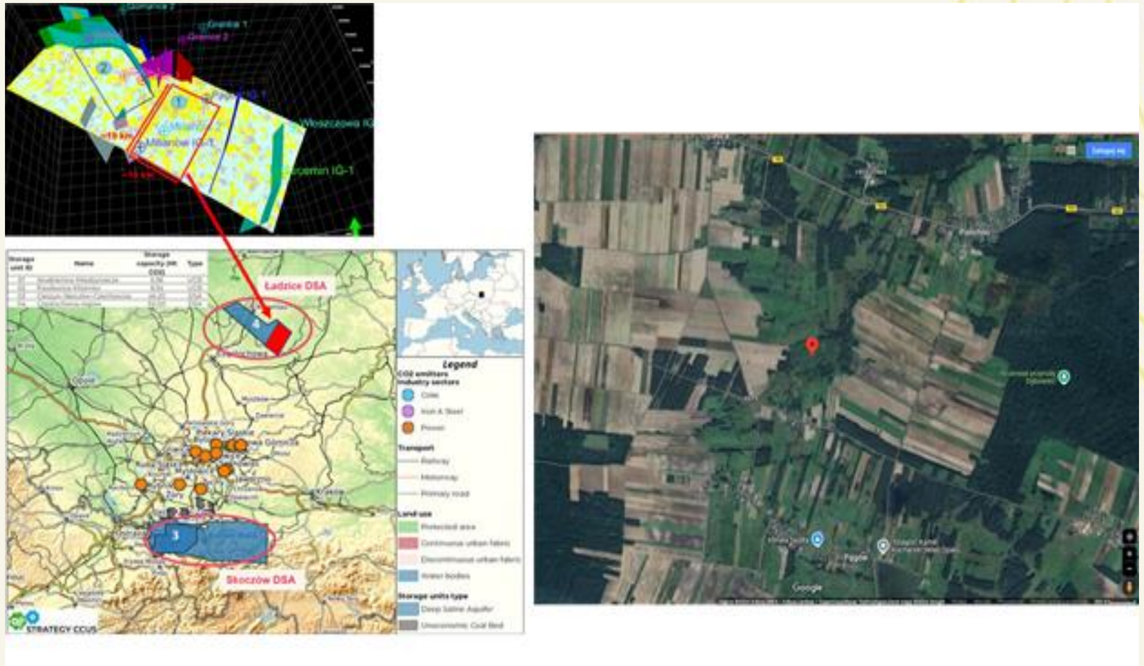
Conceptual scenarios definition to enable decision support
Upper Silesia – two strategic lines defined

1. Pilot fast track development at minimal cost to prove technical feasibility, pilot phase

Amount of CO_2	30 kt/y
Transport	road
Tank trucks	4*25 t/d=100 t/d * 300 d = 30 kt/y
Duration	3 years of injection

2. Commercial development to attract investors, commercial phase

Amount of CO_2	300 kt/y
Transport	pipeline
Duration	25 years of injection



Source: Gogle Map

- Total amount of CO_2 injected during both phases: 7,59 Mt
- Capacity of the storage site 30 Mt

PilotSTRATEGY

Upper Silesia region – Poland

Autumn Webinar Series
Poland: Activities, results, challenges

Results of research on the geological conditions of selected locations, storage potential and related challenges

GIG National Research Institute

24th of October 2024

The PilotSTRATEGY project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101022664

Agenda

1. **Location and storage potential of the region**
2. Research methods and tools used in tasks related to static and dynamic modelling
3. Results of research on the geological conditions of selected locations
   - Static modelling for Upper Silesian Coal Basin (Skoczów DSA)
   - Static and dynamic modelling for Jurassic Częstochowa District (Ładzice DSA)
4. Assessment of the storage capacity by simulations
5. **Next works**

Upper Silesia, Poland

Location and storage potential of the region

Two possible storage places have been identified in the region in deep saline aquifers :

- Skoczów DSA - Upper Silesian Coal Basin,
- Ładzice DSA - Jurassic Czestochowa District.

Potential CO_2 storage capacity in DSA is about 0.1 Gt

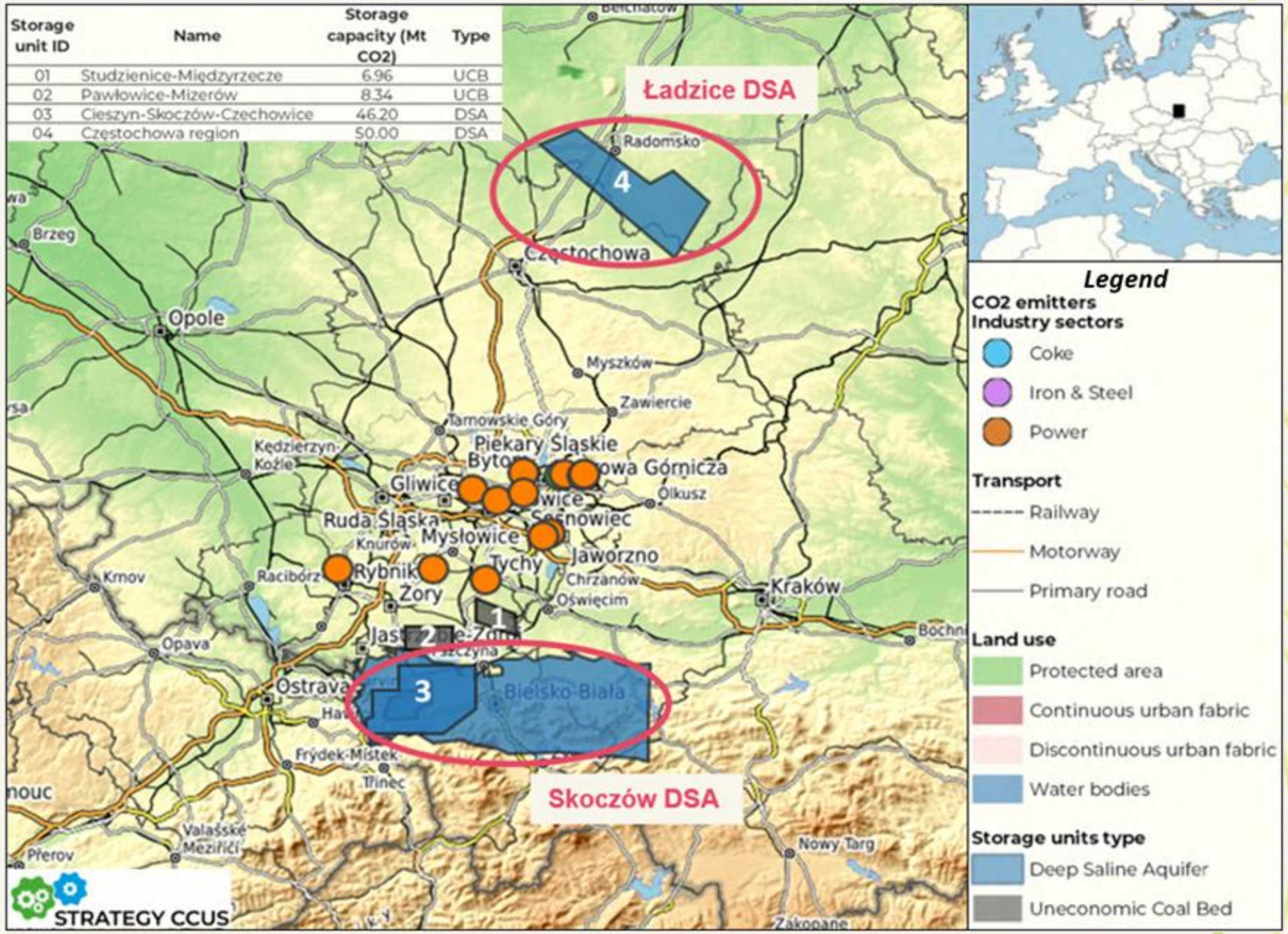
Potential to CCUS development in the region

Enhance the maturity and confidence level of CO_2 storage resources by studying new data, reprocessing current data (WP2) and conducting new dynamic simulation studies (WP3)

WP2: Geo-characterisation

For the Upper Silesia region data has been acquired and re-interpreted in order to advance the understanding of the prospects for CO_2 storage.

Main features of potential storage units in Upper Silesia



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04	Częstochowa region	50.00	DSA

WP2: GEO-CHARACTERISATION — **WP3**

1. REGIONAL GEOLOGY OF SEDIMENTARY BASINS
2. WELL DATA ANALYSIS
3. ELEMENTS OF GEOLOGICAL CONCEPTUAL MODELS

STATIC AND DYNAMIC SIMULATIONS

Task 3.1: Static modelling with uncertainties

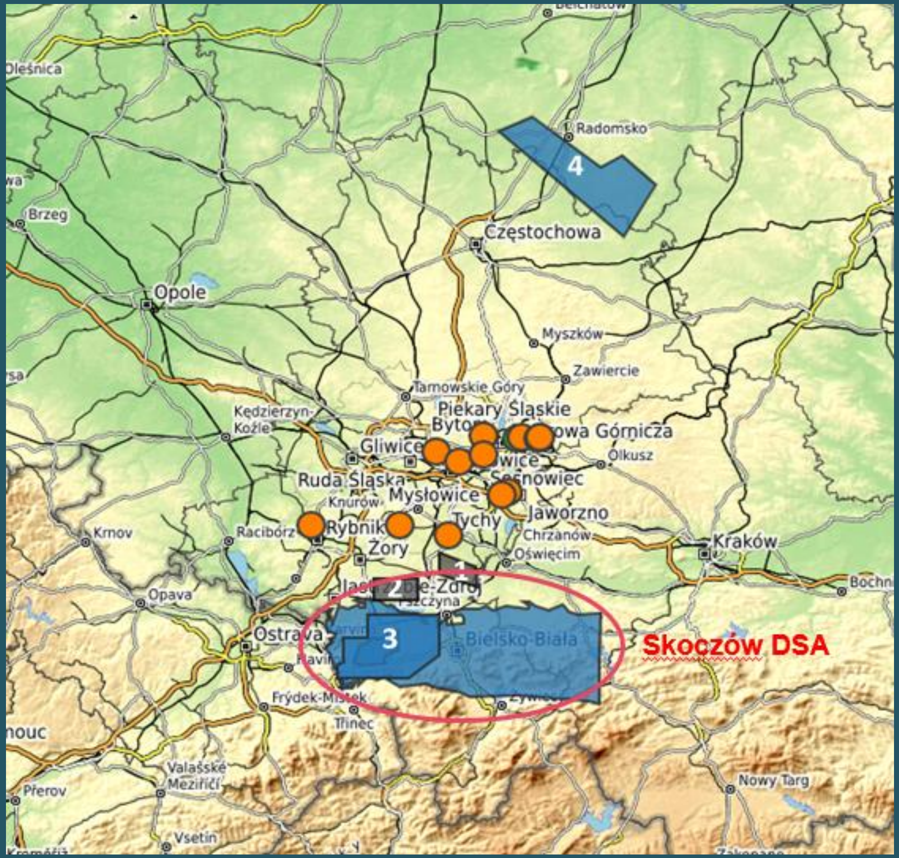
1. CONSTRUCTION OF GEOLOGICAL GRID	2. WELL LOGS UPSCALING	3. PROPERTY MODELLING	4.CONSIDERING THE GEOLOGICAL UNCERTAINTIES
• Fault model • Well data analysis • Geological horizons • Structural framework of geological model	• Well data discretisation (lithological data) • Well log data analysis • Well petrophysics	• Porosity • Permeability • VShale (shale volume)	• Facies • Petrophysical property • Structural model

Dynamic modeling:

Task 3.2	Task 3.3
Storage capacity optimization	CO_2 fate on the long-term

Static modelling – software tool: Schlumberger Petrel - Geoscience Core
Dynamic modelling: Schlumberger Petrel - Reservoir Engineering Core with Eclipse

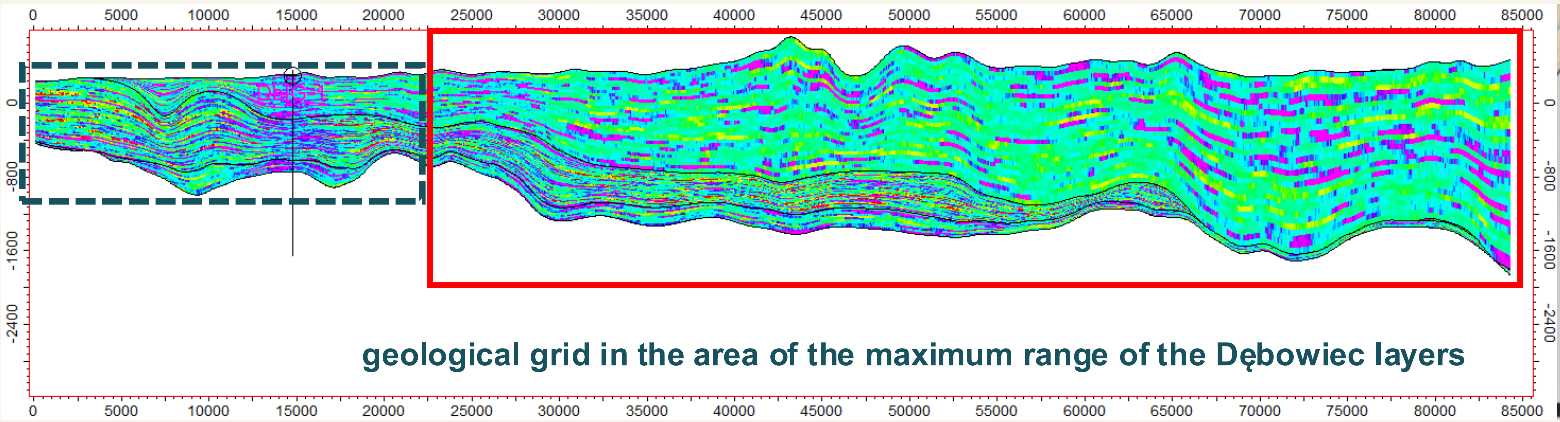
Upper Silesian Coal Basin (Skoczów DSA)



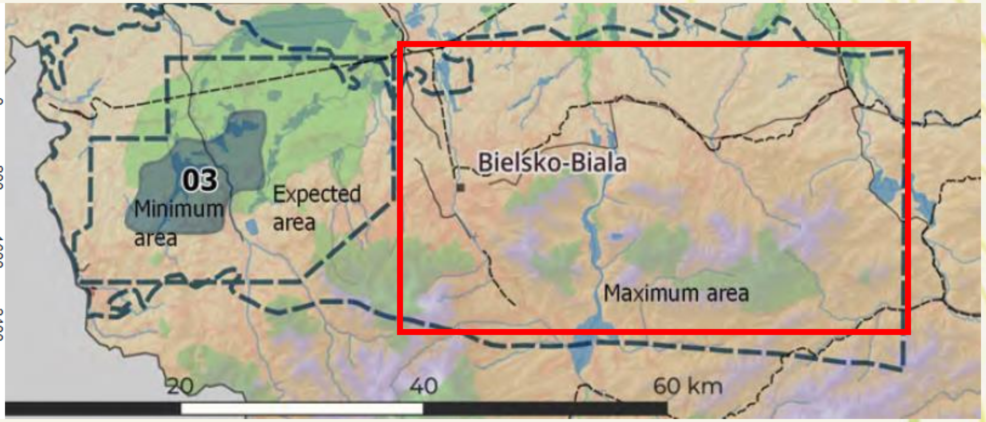
Upper Silesian Coal Basin (Skoczów DSA)

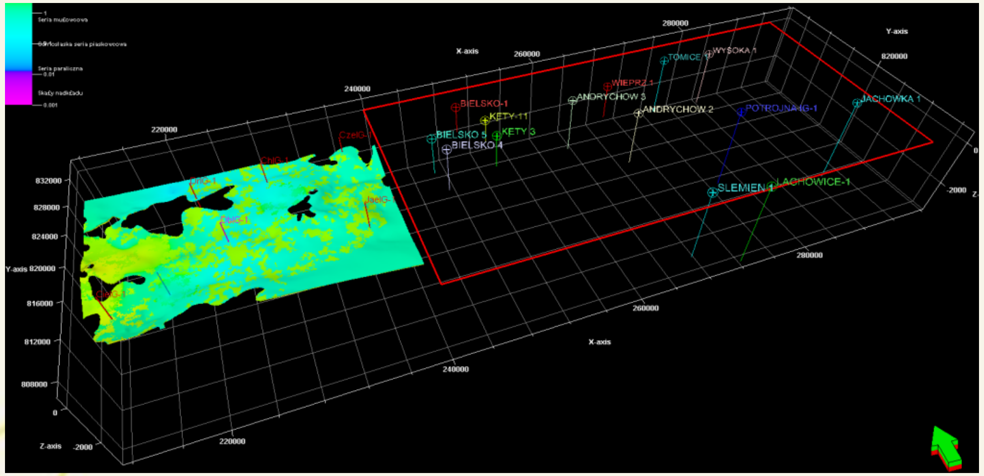
Introduction

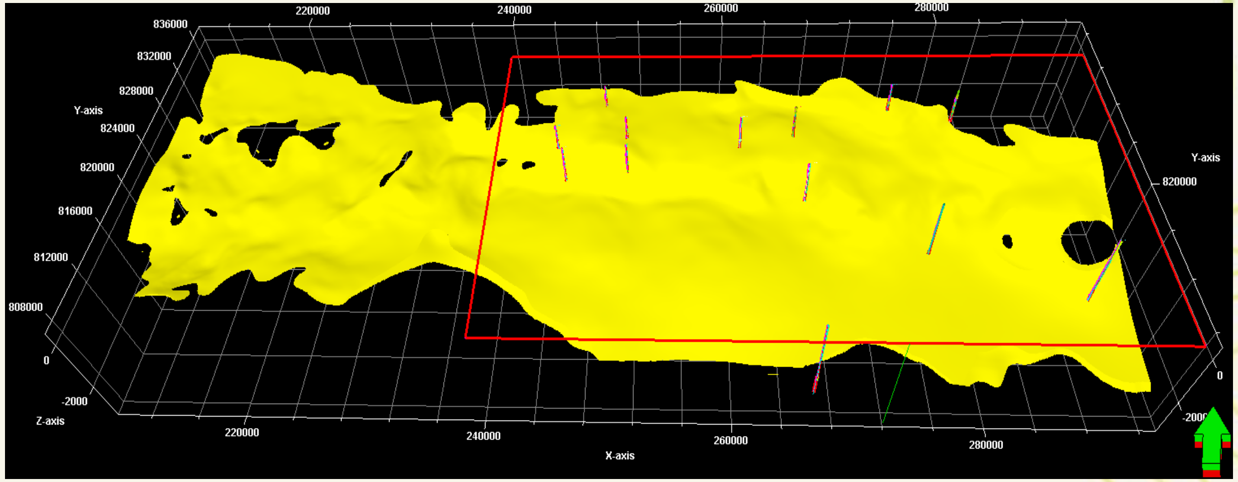
The work focused on determining the possibility of increasing the CO_2 storage potential in the Dębowiec layers through a detailed geological analysis of the area located east of Bielsko-Biała (the area marked in Figure with a red rectangle as 'Maximum area').



geological grid in the area of the maximum range of the Dębowiec layers







Upper Silesian Coal Basin (Skoczów DSA)

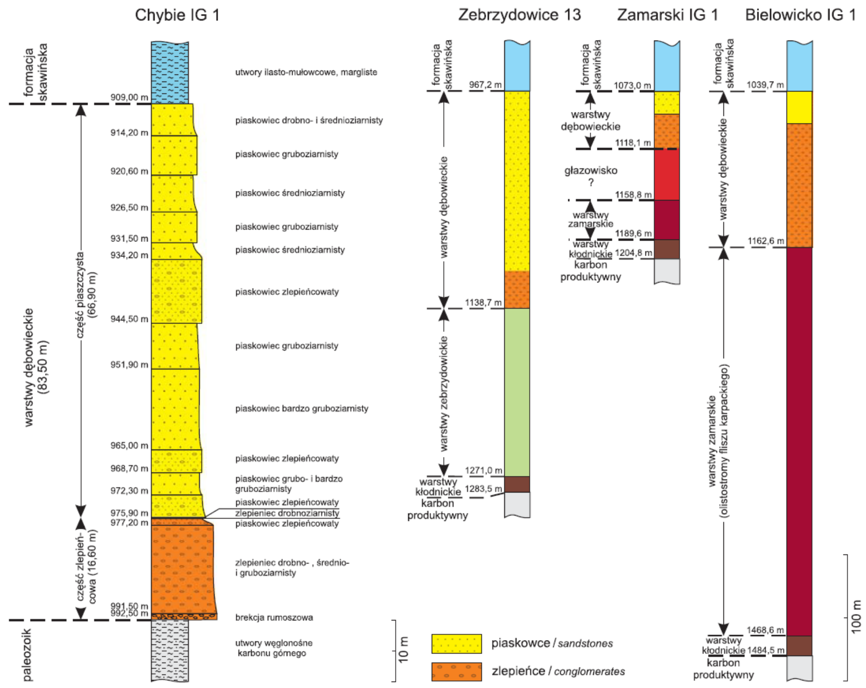
In the area of the Upper Silesian Coal Basin (USCB) the Dębowiec beds (lower Miocene sandstones) were chosen as prospective formation for the purposes of CO2 storage in deep saline aquifers.

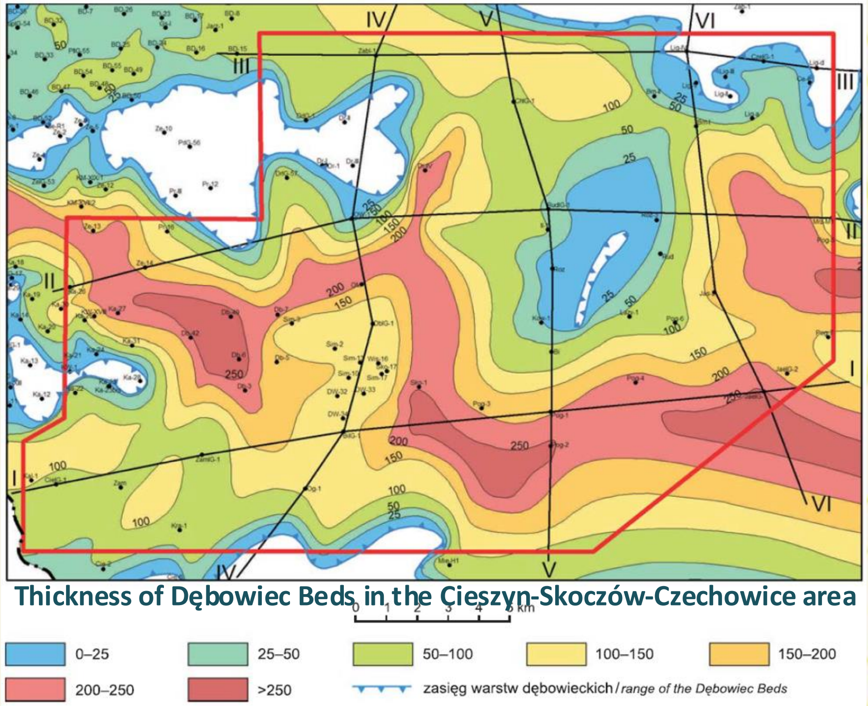
The coverage of the study area with wells penetrating Miocene and its basement is relatively dense, but only for a few wells cores were preserved. Virtually in all deep boreholes well logging data are available, but only for the few the interpretation of lithology and petrophysical parameters was conducted, because the area was explored rather in order to assess hard coal resources in the Upper Carboniferous than, for example, to determine the properties of the Miocene caprock.
Results of petrophysical and petrological analyses of core samples were available in the most of the wells.
In the vertical profile of the Dębowiec layers gradation is observed, from the thickest in the bottom part (boulders, coarse-grained conglomerates) to fine in the roof (fine-grained sandstones).

The thickness of the Dębowiec Beds is variable and is usually in the range from 50 to 200-250 m.

In the case of the sandstone and conglomerate formations of Dębowiec beds the average effective porosity is only slightly higher than 10% (the minimum for geological storage) and average permeability of about 40 mD; similar properties are characteristic for Zamarskie beds (of a small thickness) occurring locally underneath.

Profiles of Dębowiec Beds and Miocene strata basement





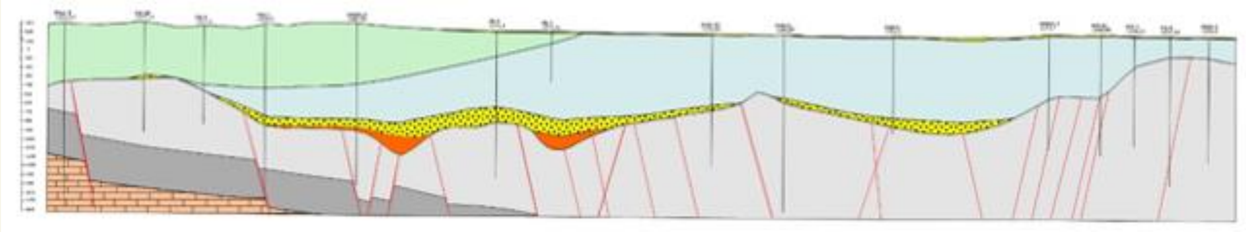
Thickness of Dębowiec Beds in the Cieszyn-Skoczów-Czechowice area

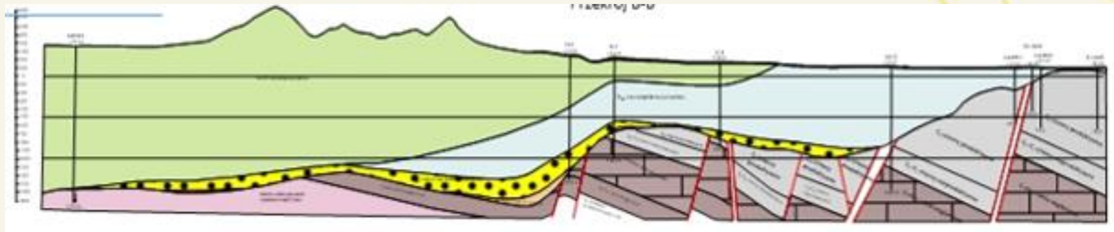
1. CONSTRUCTION OF GEOLOGICAL GRID

Upper Silesian Coal Basin (Skoczów DSA)

Fault modeling

Faults occurs only in deep layers underlying the reservoir –
faults does not continue in the layers of reservoir nor above the reservoir.

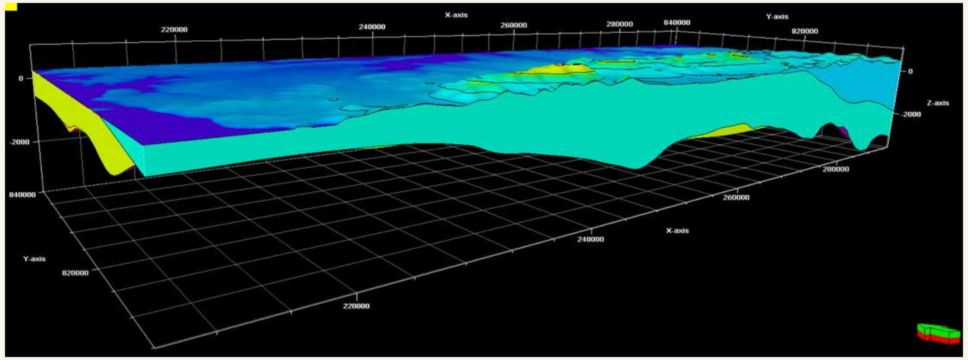




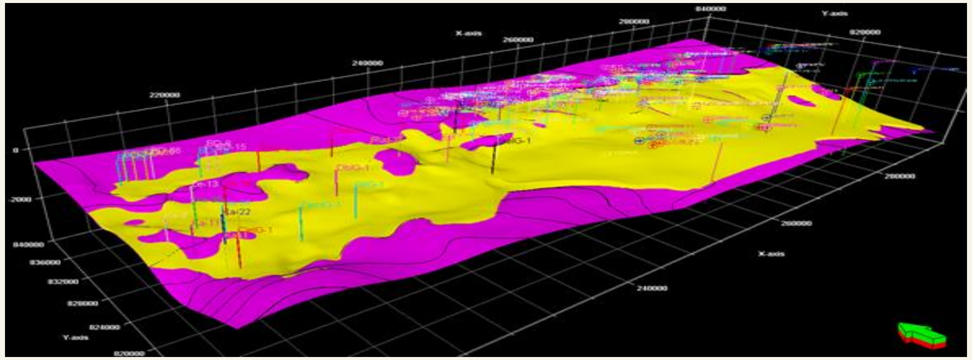
Structural framework of geological model

Upper Silesian Coal Basin (Skoczów DSA)

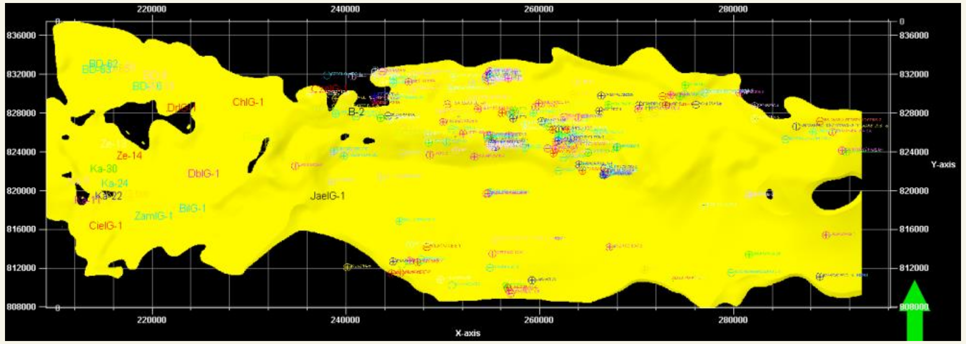
Geological models of the storage complex zone consists of reservoir, caprock and structural elements.
The developed static model includes the top and base of the reservoir, the top of the seal and other horizons in the overburden of potential reservoir for CO2 storage in the area of the maximum range of the Dębowiec layers.



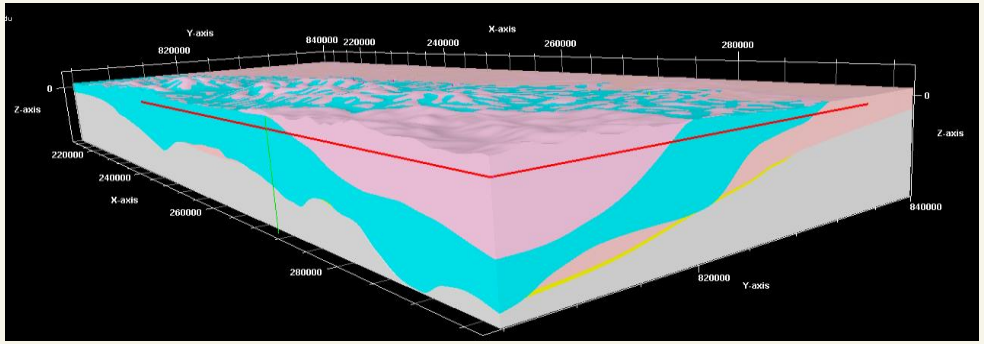
Model of the overburden of the reservoir layers



Geological grid of the Dębowiec layers



Geological grid of the Dębowiec layers



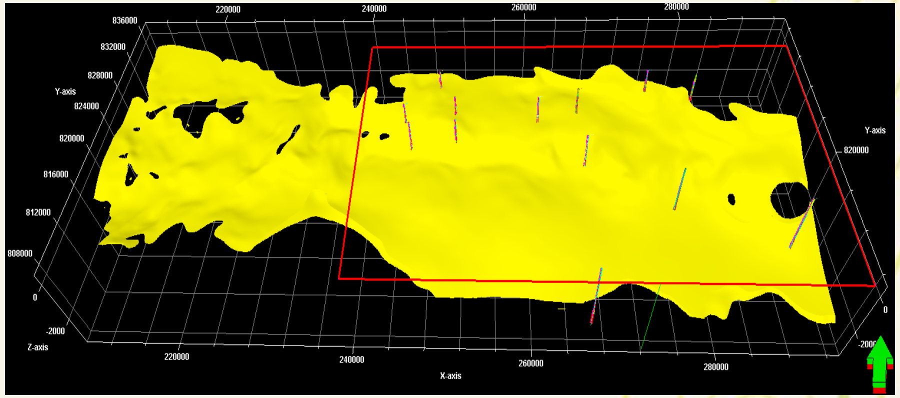
Geological grid of the overburden and underburden of the Dębowiec layers

Petrophysical modelling

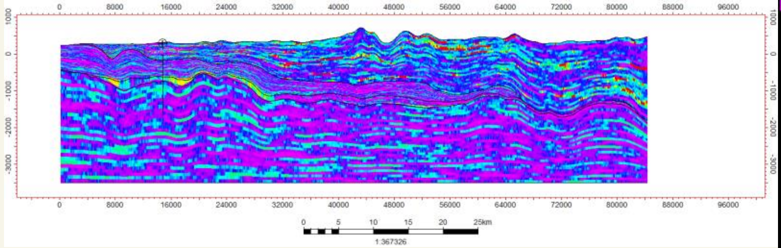
Upper Silesian Coal Basin (Skoczów DSA)

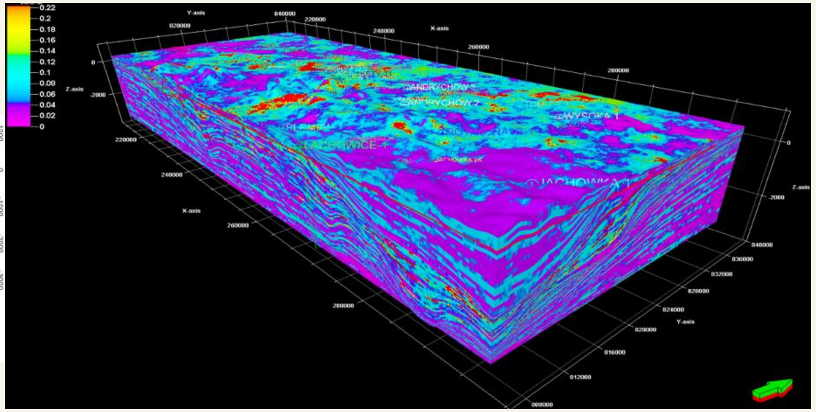
There were observed lack of permeability data in log files for east part of model (available only porosity and VShale data).

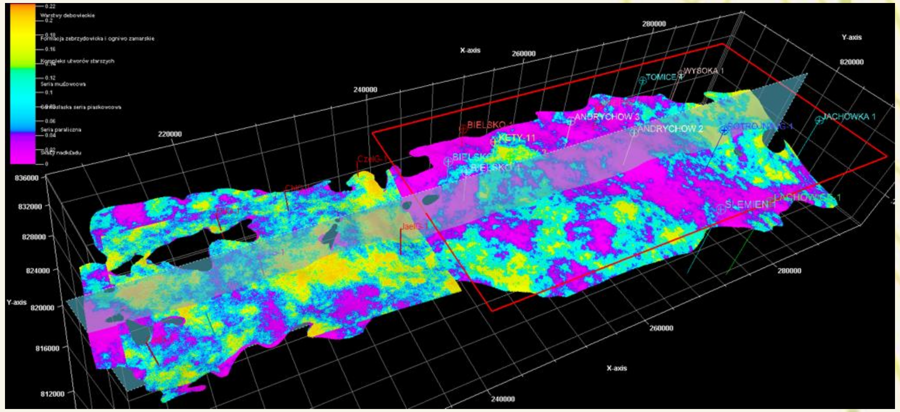
14 additional LAS format log files with porosity and shale content (Vshale) data were loaded into the model in order to upscaling and petrophysical modelling.



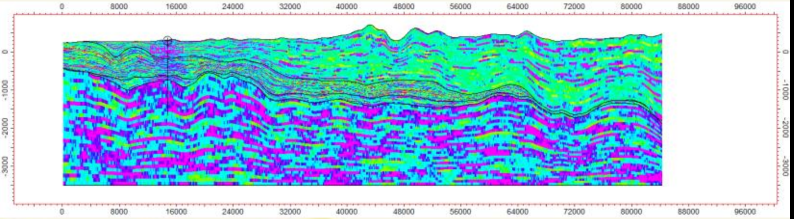
Porosity distribution (SGS)

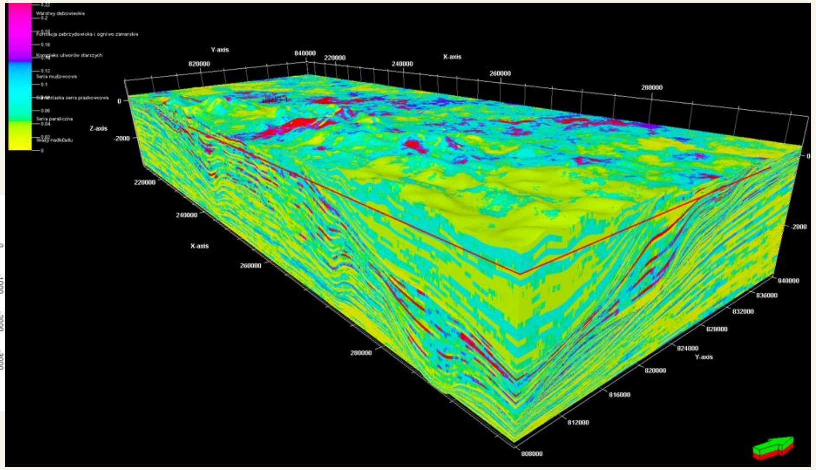


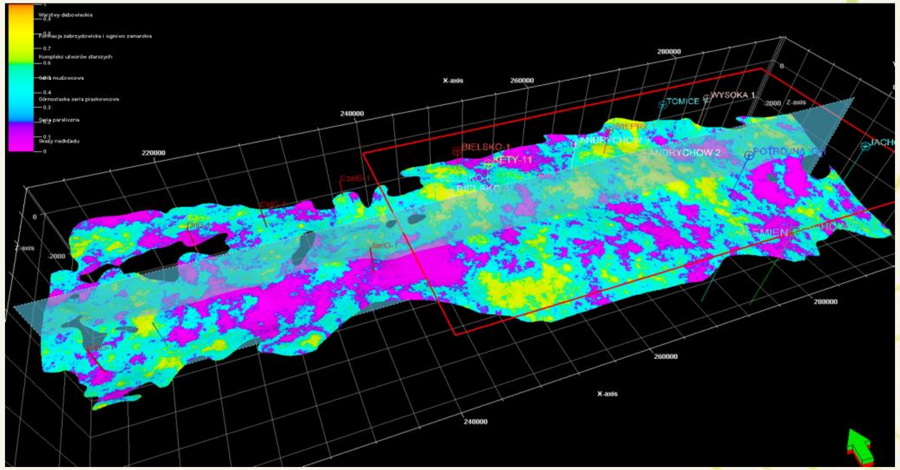




Shale content (Vshale) distribution (SGS)







Final results/Next works

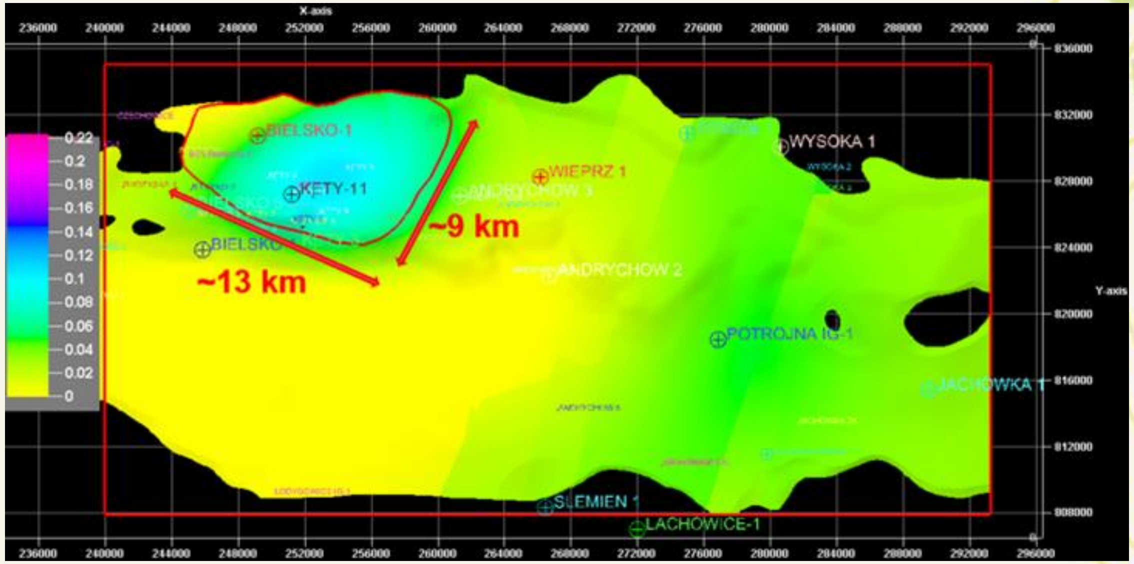
Upper Silesian Coal Basin (Skoczów DSA)

Permeability modelling for the EAST part of the model
As a result of permeability modelling, an area with permeability from ~10 mD to ~80 mD was identified in the area of wells: KĘTY-11 and BIELSKO-1.

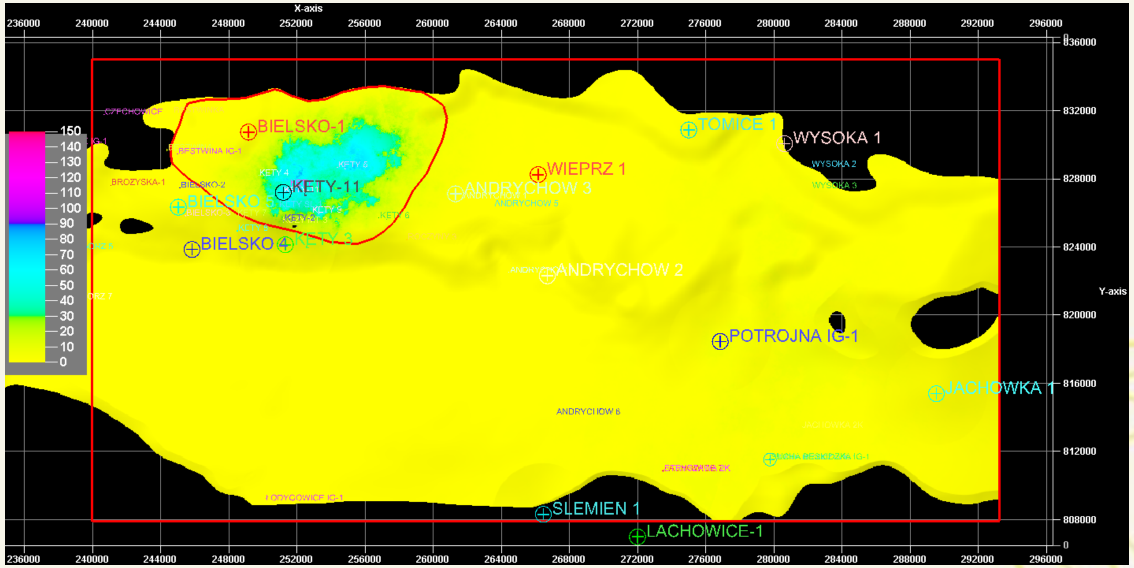
Final results:
The output of this task for the model of Skoczów DSA are the following properties: porosity, VShale (shale volume) and permeability.

Next works:
The range and distribution of petrophysical parameters of the reservoir were analyzed in the area of the maximum range of Miocene deposits in Dębowiec layers. An additional area named "Kęty" with the highest potential for CO_2 storage was identified. The selected area of approximately 115 km2 will be analyzed in detail for storage of carbon dioxide within the framework of Task 2.8., including e.g. estimating the static CO_2 storage capacity in saline aquifers of selected area applying the volumetric equation.

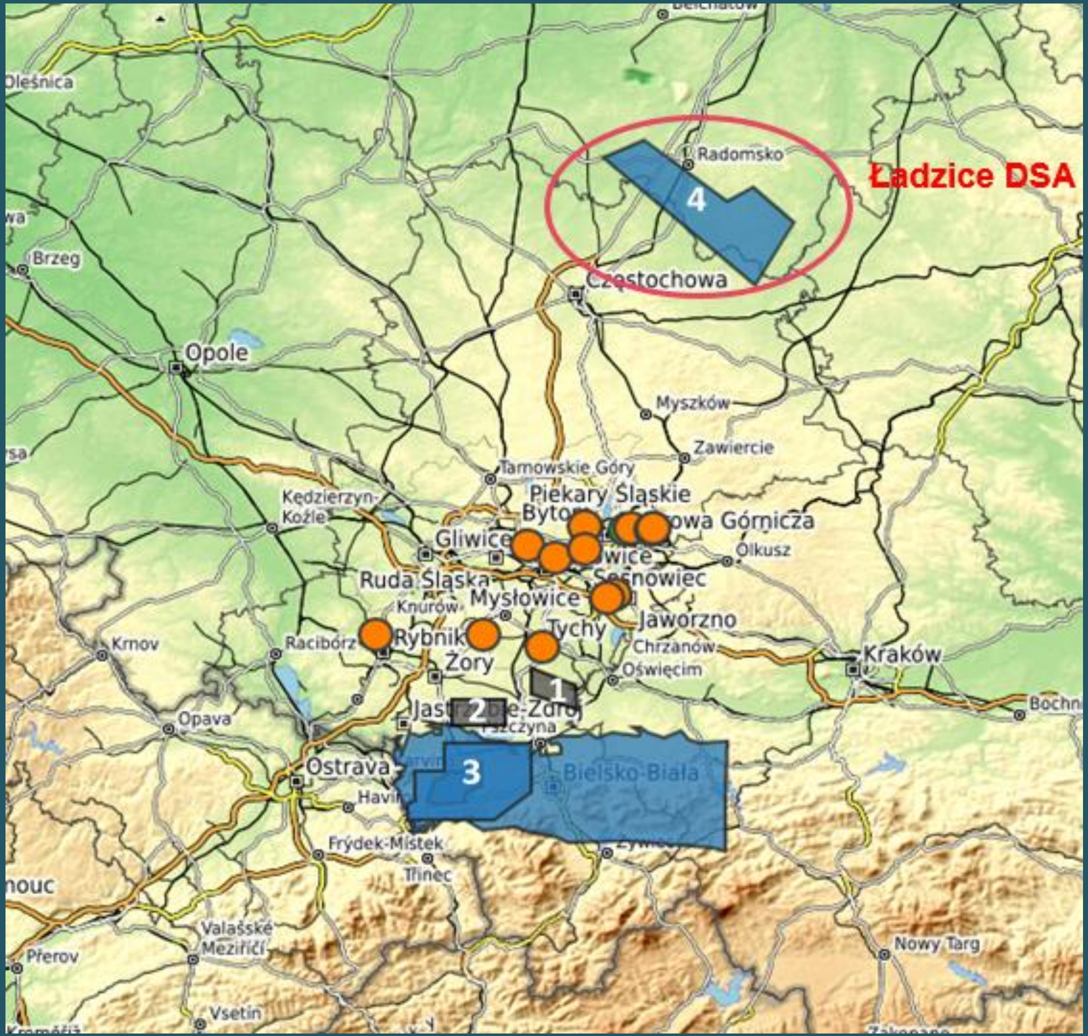
Porosity model



Permeability distribution (based on porosity model)



Jurassic Czestochowa District (Ładzice DSA)

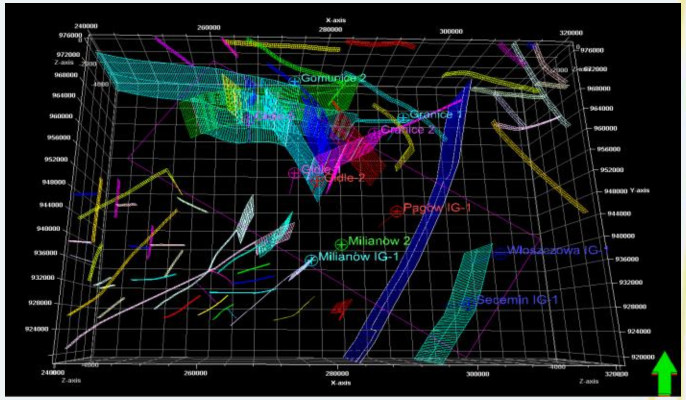


CONSTRUCTION OF GEOLOGICAL GRID

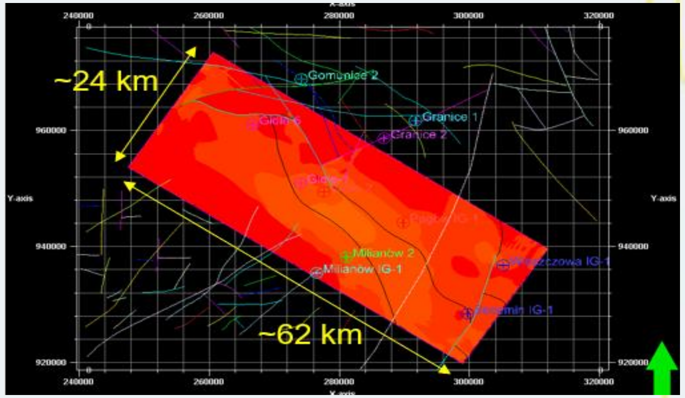
Jurassic Czestochowa District (Ładzice DSA)

- Fault model was built based on the results obtained from WP2 Geo-characterization including geological maps, cross-sections and other data.
- Location of part of faults are confirmed but part of faults are only hypothetical (supposed) but we implemented it for the purposes of uncertainty and risk analysis.
- Location, range and grid orientation were assumed. The dimensions of the model are as follows: the length is about 62 km and the width is about 24 km.

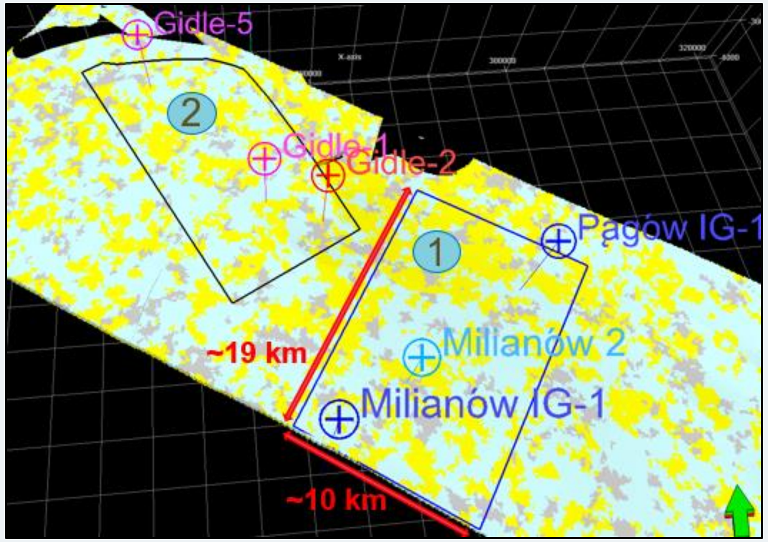
- Two potential areas have been identified,
- Selected only the area No. 1 (10 km x 19 km),
- Model of the storage complex zone (structural model, facies model),
- Petrophysical modelling (porosity, permeability).



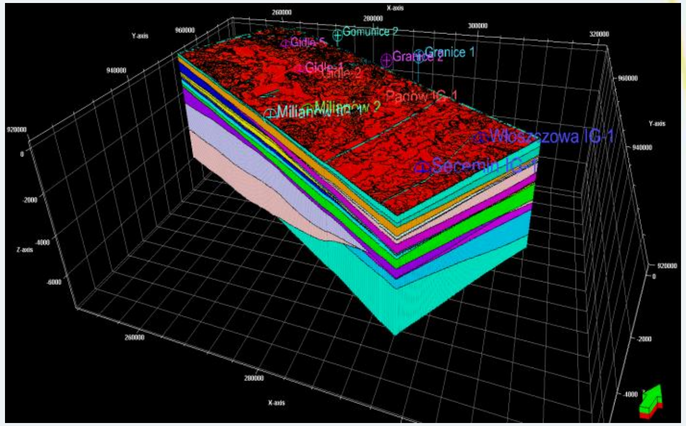
Fault and fracture model



Location, range and grid orientation of the model



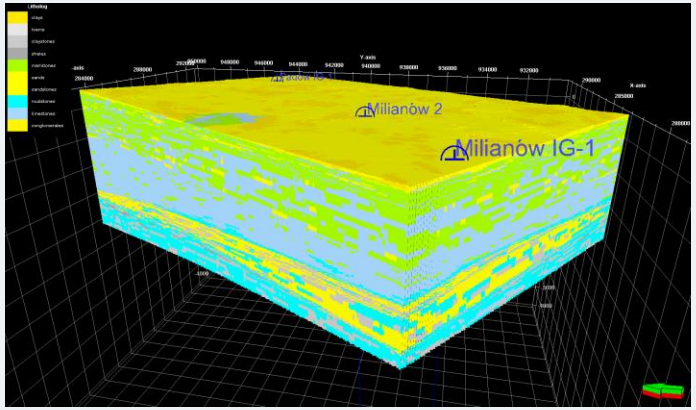
Two potential storage areas indicated based on analysis of data availability

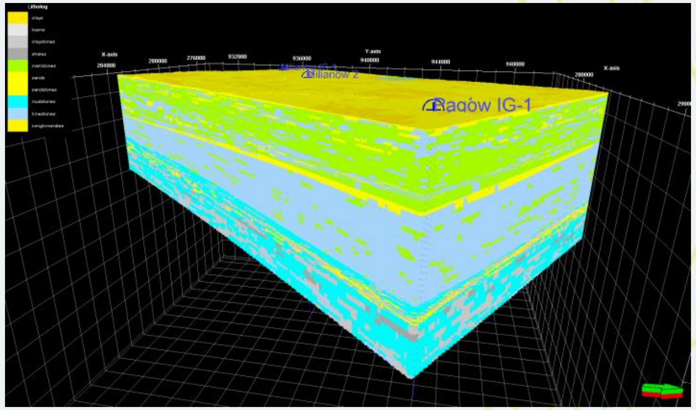


The model of reservoir layers
with the overburden and underburden of the reservoir

PROPERTY MODELLING

Jurassic Czestochowa District (Ładzice DSA)



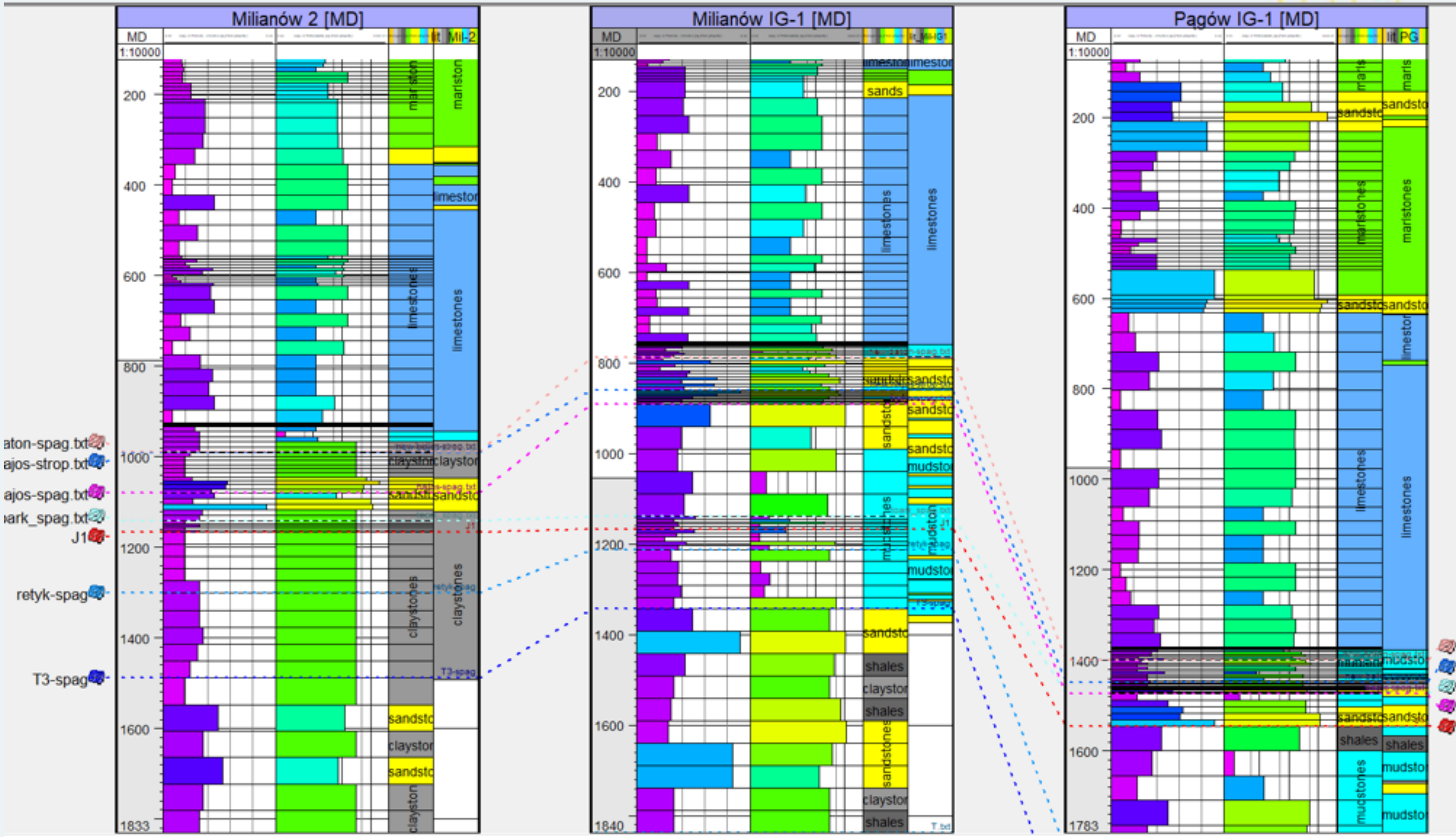


- Facies model of the storage complex for selected area (reservoir and overburden with sealing layers)

- Petrophysical modelling (porosity, permeability) for the overburden and the reservoir layer

- Thickness of the reservoir layer: ~ 50 m (Lower Jurassic and the Lower Middle Jurassic - J1/J2 sandstones);
- porosity from 7.69 to 22.1%;
- permeability from 16 to 1478 mD.
- High values of permeability of **reservoir** are observed in two wells:
- Pągów IG-1 (837 mD, 1478 mD),
- Milianów IG-1 (931mD, 1230mD, 1320mD)

- Thickness of the sealing layer: ~30 m (claystones, mudstones)

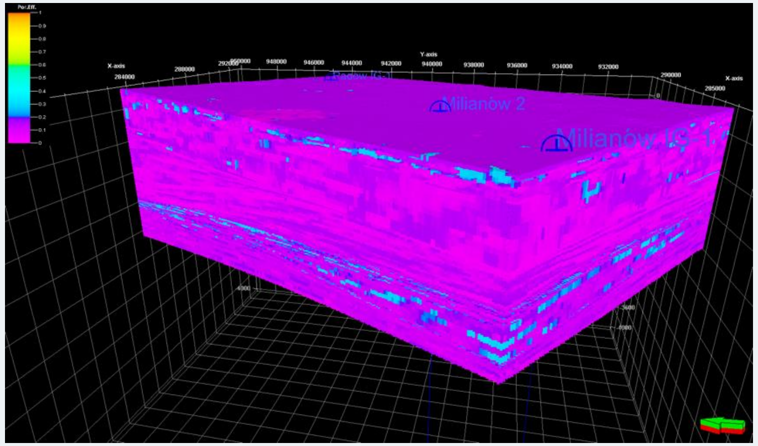


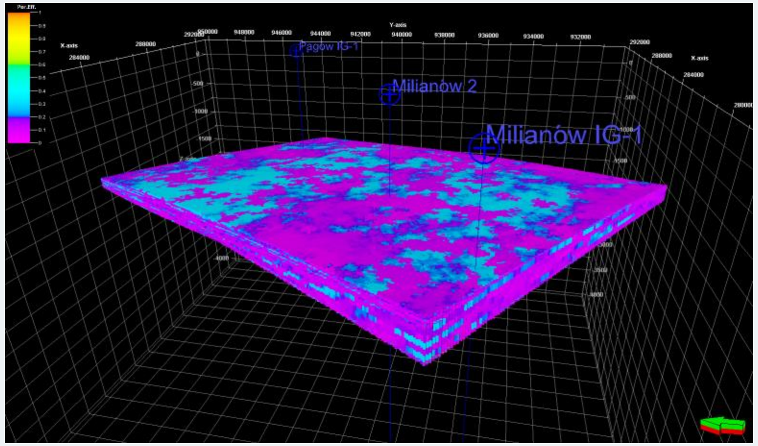
Petrophysical modelling

Jurassic Czestochowa District (Ładzice DSA)

In the case of Ładzice DSA there were observed lack of VShale (shale volume) data in log files (available only porosity and permeability). The created facies model was used as conditioning for the petrophysical model.
Modelling of porosity and permeability was performed using Sequential Gaussian Simulation (SGS) algorithm separately for individual sequences using the control procedure of the previously developed lithological model (petrophysical properties linked to lithofacies).

Porosity model

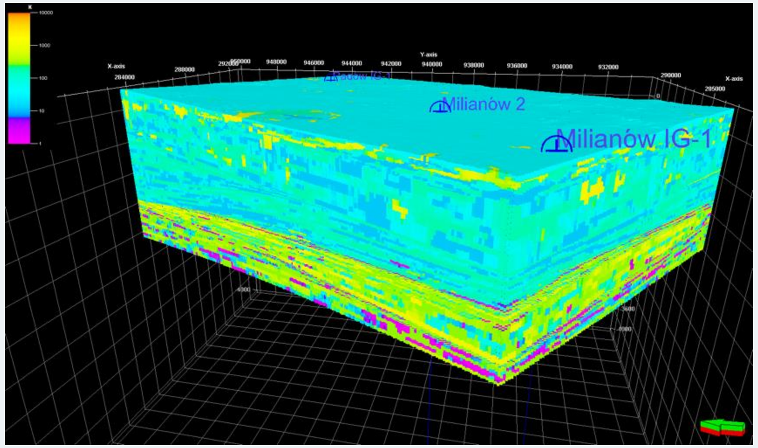


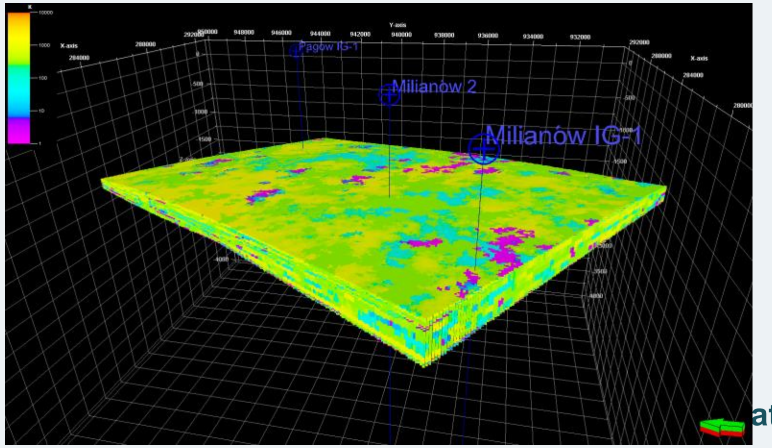


The results of petrophysical modeling of **the reservoir layer with the overburden.**

The results of petrophysical modeling of the **reservoir layer**.

Permeability model





The output of this task for the model of Ładzice DSA are the following properties: facies, porosity and permeability.

CONSIDERING THE GEOLOGICAL UNCERTAINTIES

Jurassic Czestochowa District (Ładzice DSA)

The uncertainty study, including the risk analysis of modeling structural surfaces as well as comprehensive uncertainty analysis of facies and petrophysical properties, **was performed only for the Ładzice DSA in Jurassic Czestochowa District.**

Comprehensive uncertainty analysis

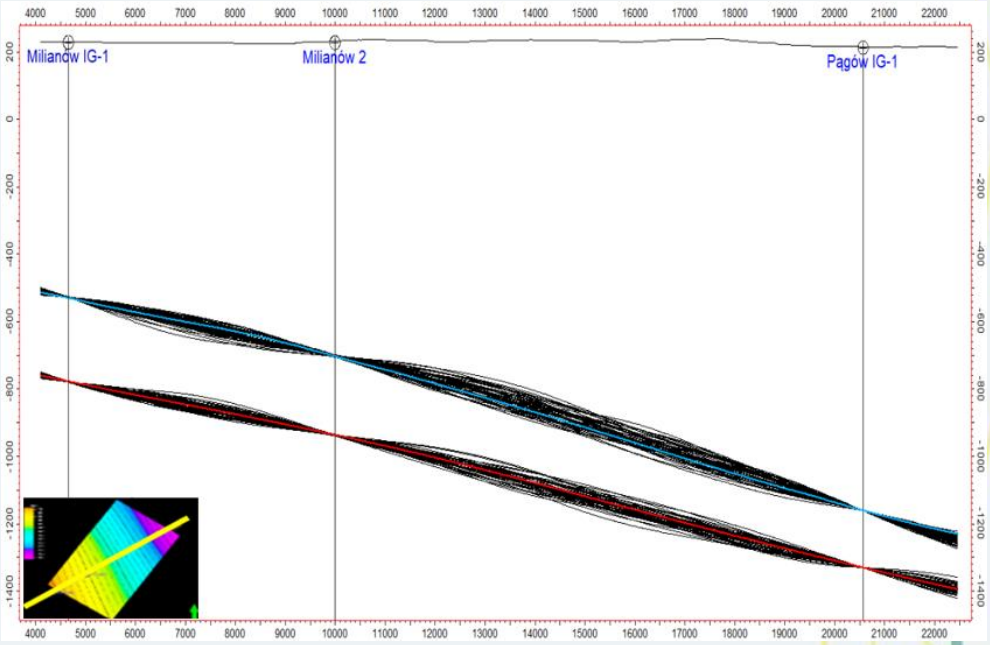
In this analysis, all elements subject to uncertainty simultaneously to each other are randomly selected according to their distribution. Thanks to this, the values of P10, P50 and P90 percentiles can be presented in the final histogram.

A comprehensive risk analysis of the previously mentioned parameters indicates that the median (P50) value is the most probable pore capacity of 5640 million rm3. The P90 value, i.e. the optimistic value in this case, can be considered 5810 million m3, and the pessimistic value 5483 million m3.

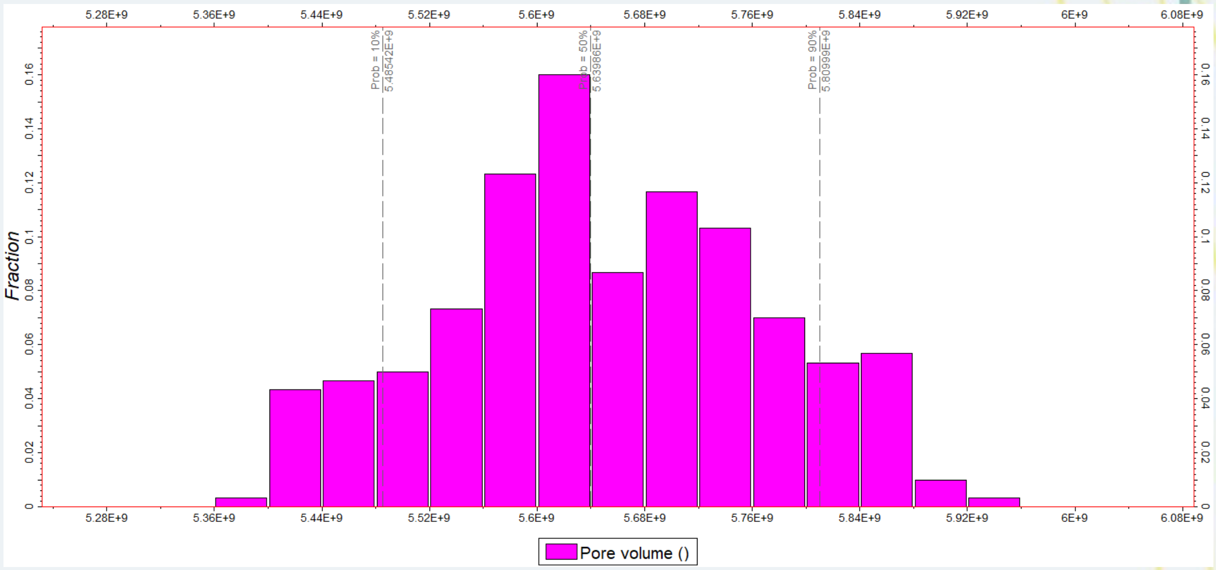
Knowing the values of P10, P50 and P90, it is possible to indicate the stochastic models that are closest to the values corresponding to the low, mid and high case pore volumes.

Probability	Case name	Simulation number ($LOOP)	Pore volume [*10^6 rm3]
P10	END_82	50	5483
P50	END_271	239	5640
P90	END_118	86	5810

Surfaces of the Lower Jurassic floor (red line) and Middle Jurassic top (blue line) and 50 stochastic variants (black lines) on cross-section



Summary histogram of comprehensive uncertainty analysis with marked P10, P50, P90 percentiles (Pore volume – 300 scenarios)



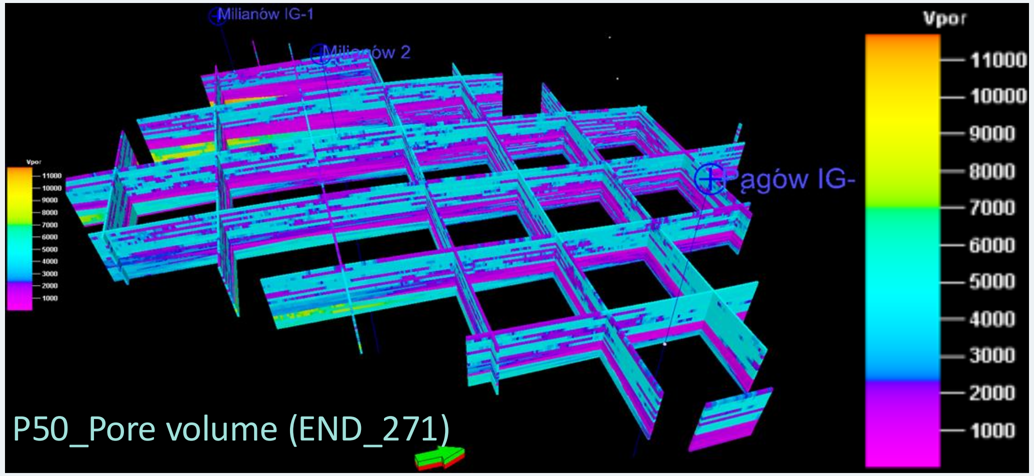
CONSIDERING THE GEOLOGICAL UNCERTAINTIES

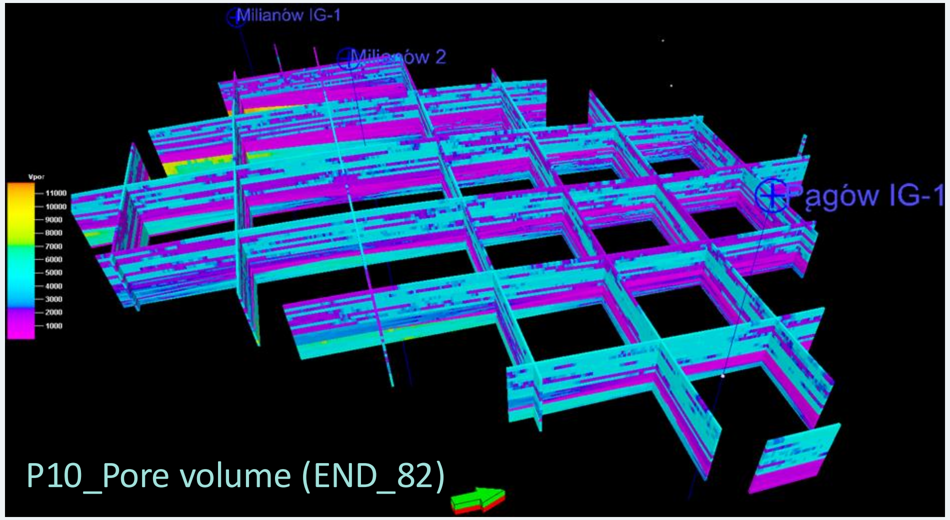
Jurassic Czestochowa District (Ładzice DSA)

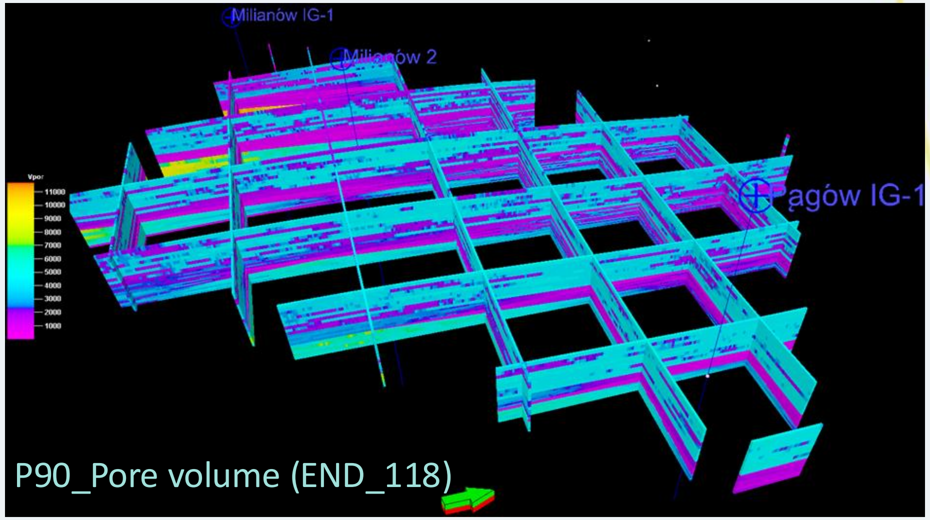
- **Comprehensive uncertainty analysis**

The models corresponding to P10, P50, P90:

Workflow results for uncertainty assessments (facies and petrophysical properties) to determine the pore volumes using *Uncertainty and optimization* module (Petrel).





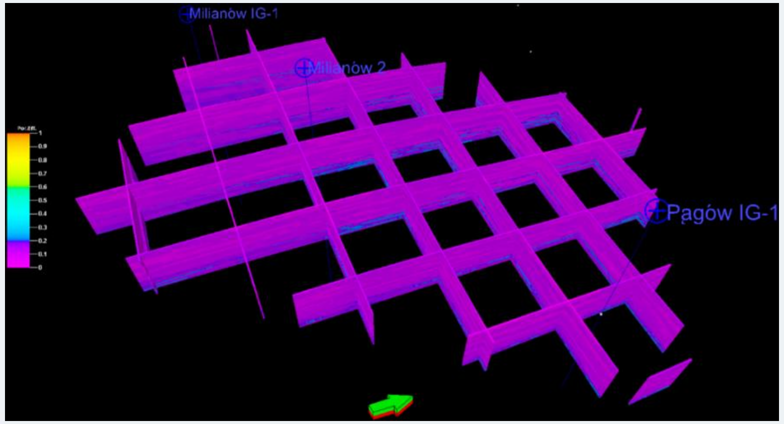


CONSIDERING THE GEOLOGICAL UNCERTAINTIES

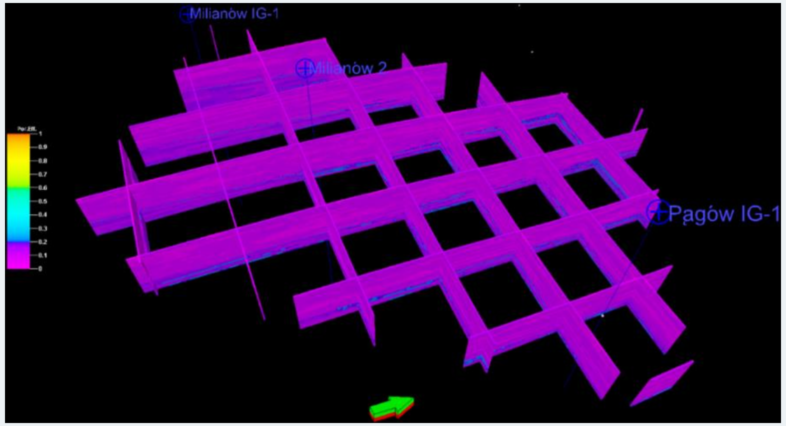
Jurassic Czestochowa District (Ładzice DSA)

- **Comprehensive uncertainty analysis**

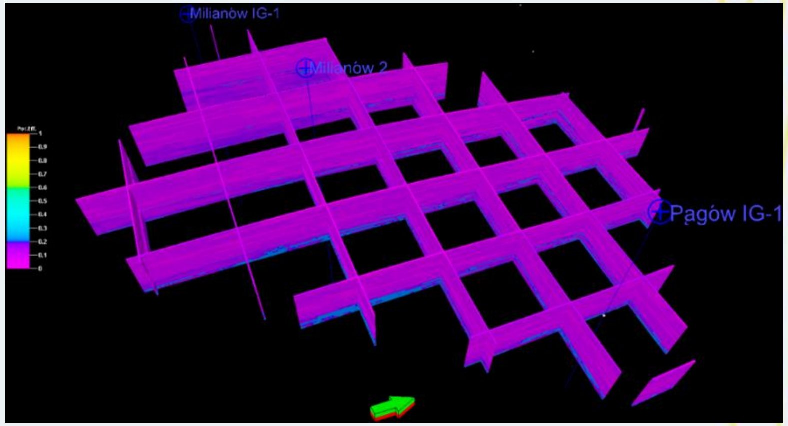
The stochastic realizations of the porosity and permeability models closest to the P10, P50, P90 percentiles of the pore volume model are shown in figures.



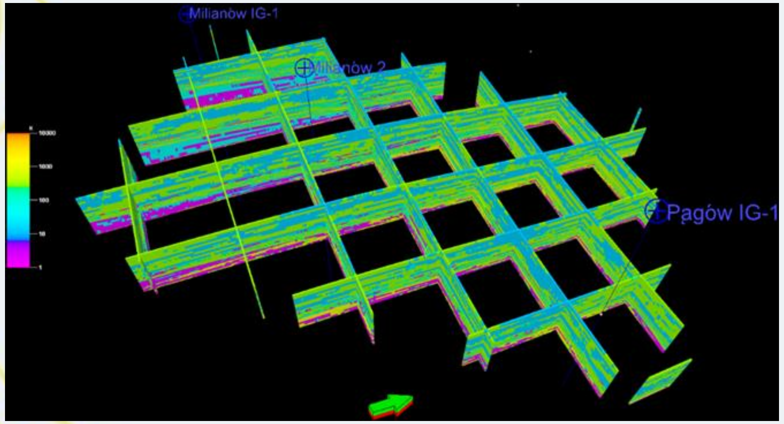
Stochastic realization of porosity closest to P10 model of pore volume



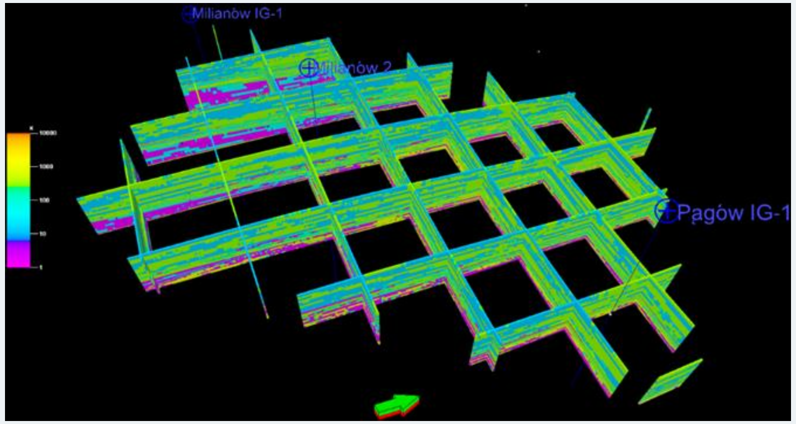
Stochastic realization of porosity closest to P50 model of pore volume



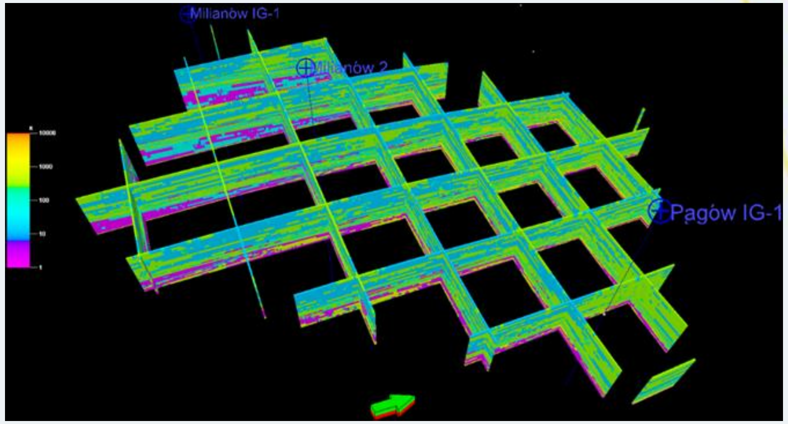
Stochastic realization of porosity closest to P90 model of pore volume



Stochastic realization of permeability closest to P10 model of pore vol.



Stochastic realization of permeability closest to P50 model of pore vol.



Stochastic realization of permeability closest to P90 model of pore vol.

Task 3.2. Dynamic modelling and optimization

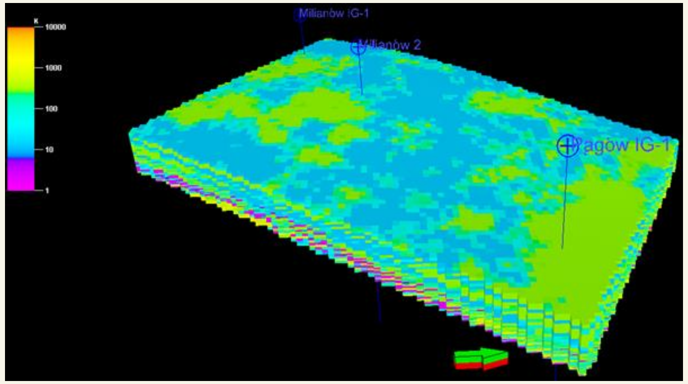
Jurassic Czestochowa District (Ładzice DSA)

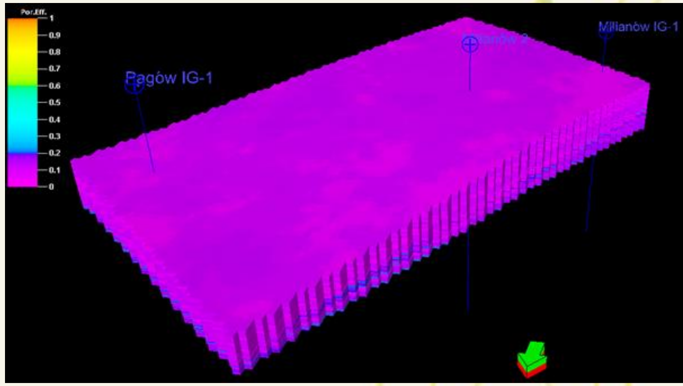
This step of the work covers storage capacity assessment by simulation, based on well locations and flow rate optimization. The optimization should maximize the potential capacity by taking into account the uncertainties in properties of geological model.

The preliminary location of injection wells was selected manually based on properties of geological model, flow properties, pressure perturbation and operational constraints. Based on preliminary visual and statistical analysis, the following injection wells: IN-1A, IN-5A, IN-6 can be assumed as the pilot-scale injection wells with injection rate ~300 kt/year.

The primary objective of task 3.2 is to define the location for a pilot-scale injection well.

Well	Flow rate [sm³/day]	Flow rate [kt/year]	Injection time [years]	Gas injection volume [Mt]	Max. BHP [bar]
IN-1A	439 761	300	10	3	165
IN-5A	439 761	300	10	3	165
IN-6	439 761	300	10	3	165





Stochastic realization of permeability and porosity closest to P50 model of pore volume
- upscaled model with surface dimensions of 200 × 200 m (173,200 cells)

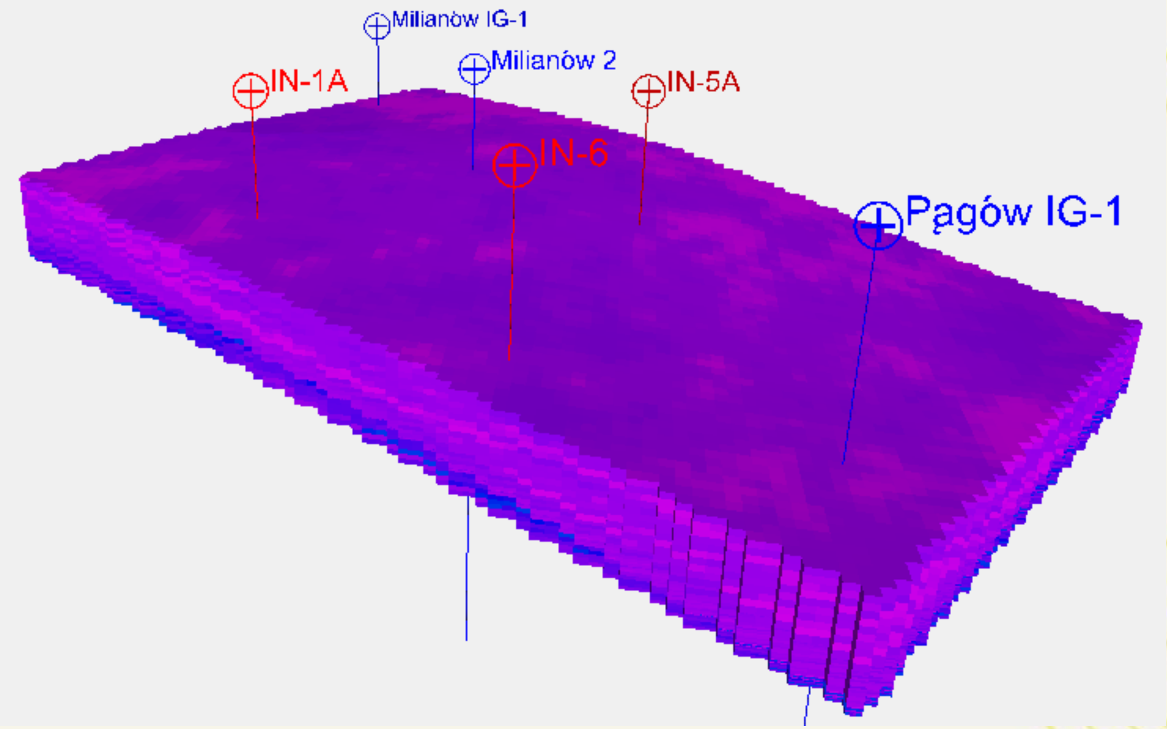


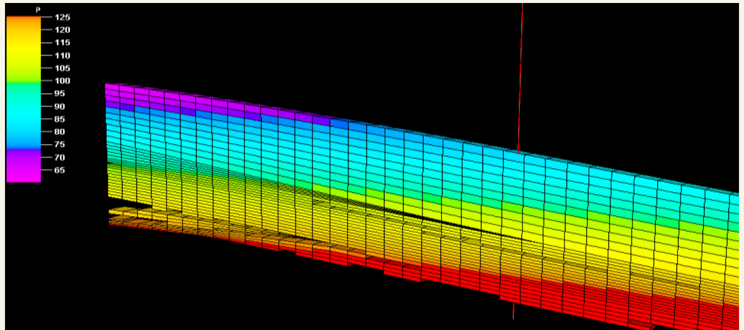
Fig. Three potential locations for a pilot-scale injection well in the model

Task 3.2. Dynamic modelling and optimization

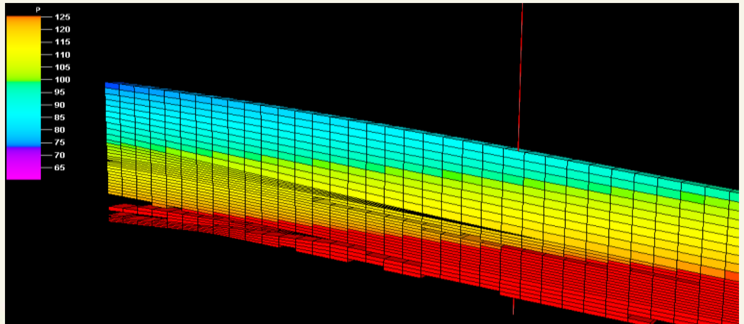
Jurassic Czestochowa District (Ładzice DSA) - Poland

- **Analysis of flow rates**

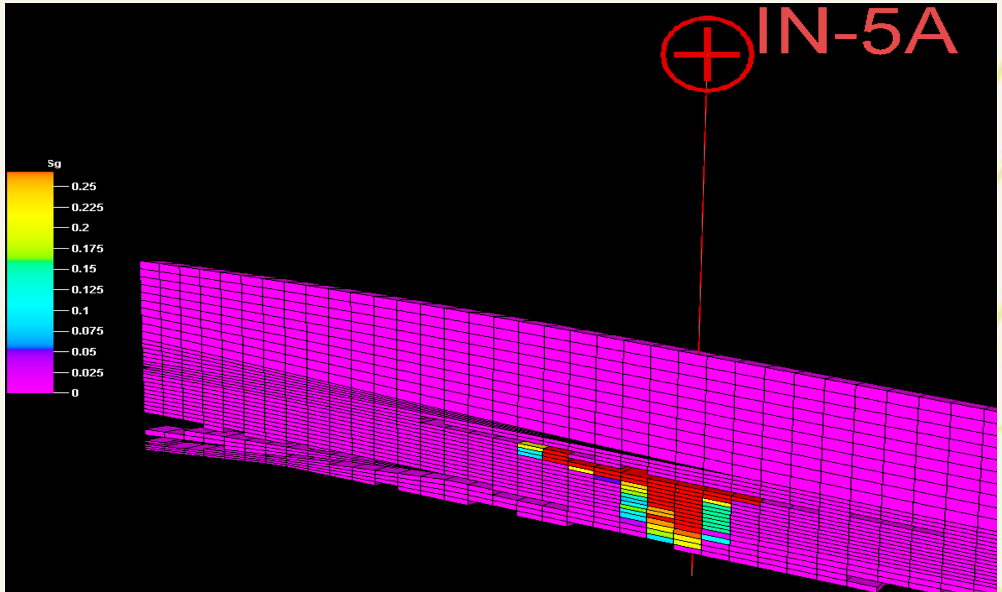
Preliminary location of three injection wells were selected based on properties of geological model and the results of preliminary numerical simulations. An increase in average pressure in the injection zone to acceptable values was observed. It was stated that based on preliminary analysis, three analyzed injection wells with a CO_2 injection rate approximately 300 kt/year for 10 years can be considered as the pilot-scale injection wells.



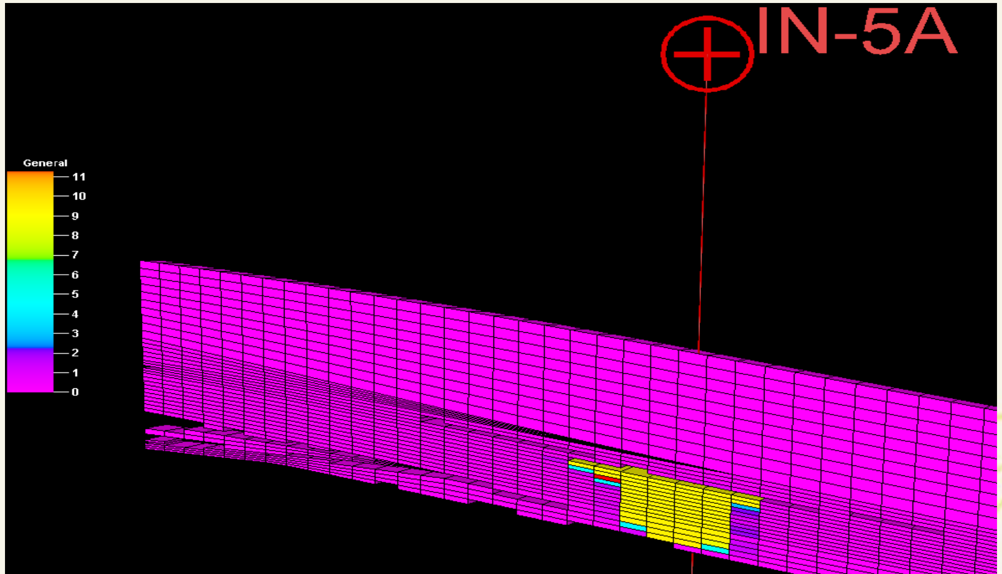
IN-5A: Pressure before the injection



Well IN-5A: Pressure after the injection



Well IN-5A: Distribution of free CO2 saturation



Well IN-5A: Distribution of CO2 dissolved in res. water

(RSWCO2-molar fraction)

Task 3.2 - Assessment of the storage capacity by simulations

Jurassic Czestochowa District (Ładzice DSA)

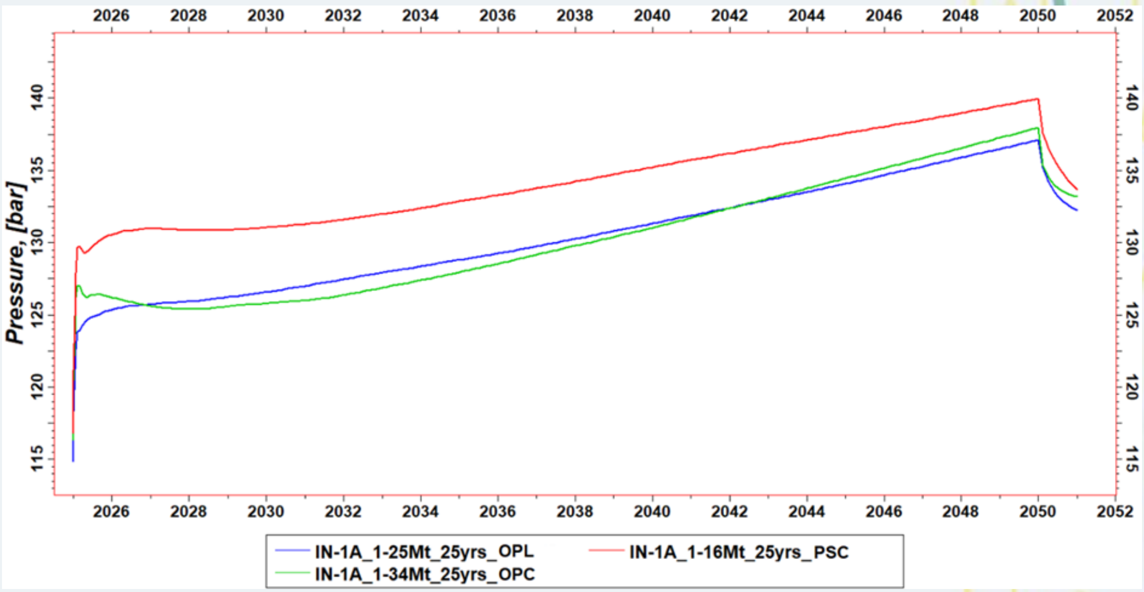
Optimization of well location based on analysis of flow responses to the CO2 injection (plume migration & pressure perturbation)

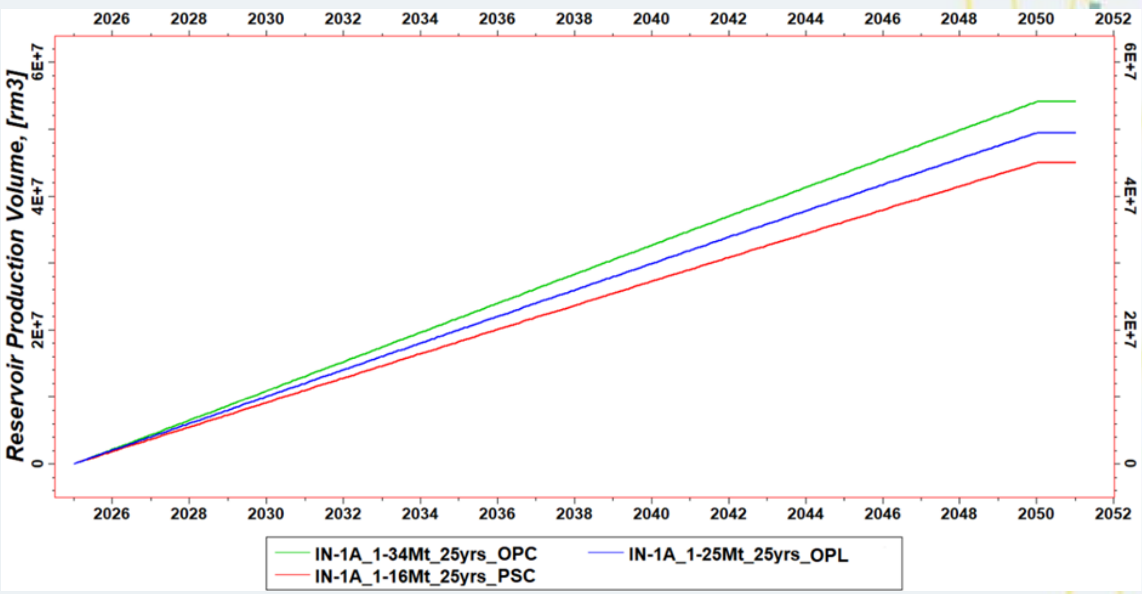
- **maximise the CO2 injection rate taking into account the max increase of pressure;**

Based on the fluid flow simulations, the output value of the CO_2 amount possible to be injected was estimated. The maximum value of flow rate for injection well IN-1A amounts to 1.25 Mt/year which give the maximum potential CO_2 storage capacity about 31.25 Mt within 25 years in optimal scenario of the geological model. In the case of the IN-5 and IN-6 wells, much lower values of injection rates and, consequently, low values of maximum potential storage capacity were observed.

Well name/ Model	Max. flow rate [Mt/yr]	Max. potential capacity [Mt] (injection time = 25 years)	Scenario	Remarks
IN-1A	1.16	29.00	pessimistic	Max. overpressure in the top of reservoir layer = 20%
	1.25	31.25	optimal	
	1.34	33.50	optimistic	

Results of simulations for CO_2 injection period of 25 years





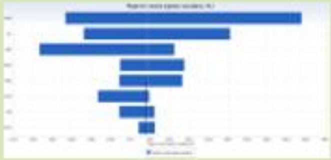
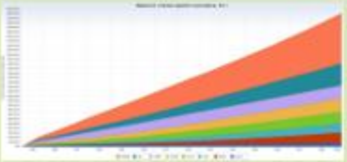
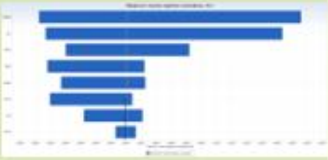
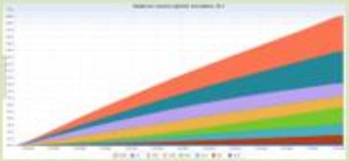
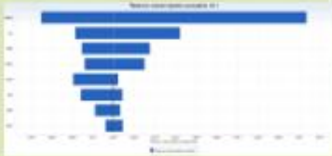
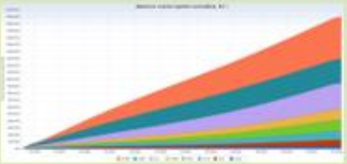
Task 3.2 - Assessment of the storage capacity by simulations

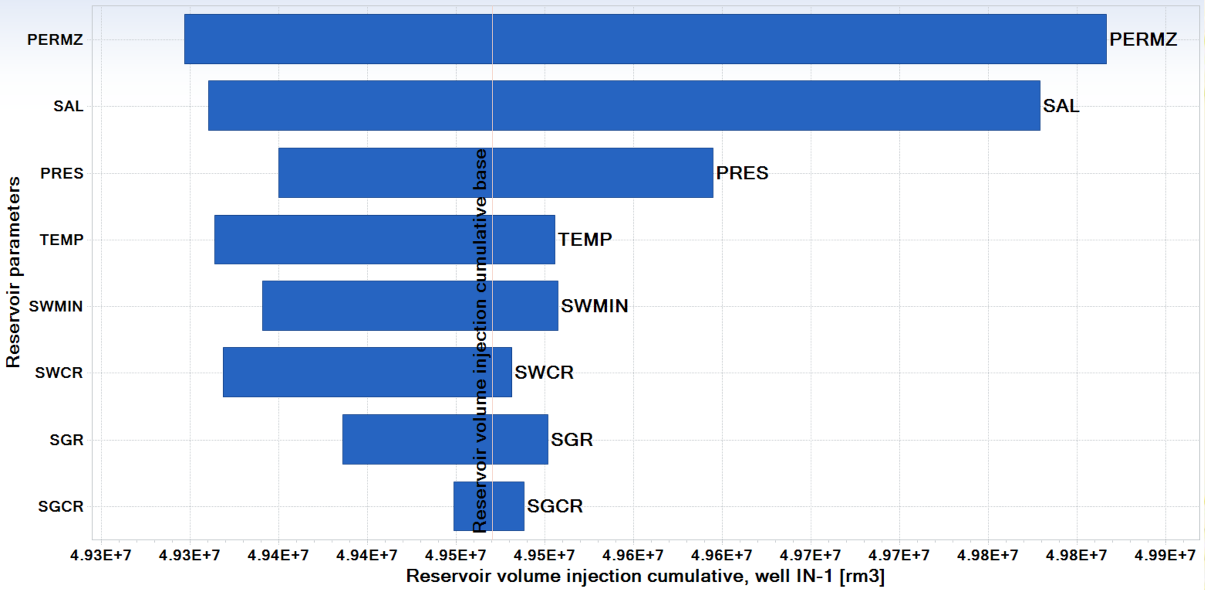
Jurassic Czestochowa District (Ładzice DSA) - Poland

- **Uncertainty analysis - Methodology**

Based on the fluid flow simulations, the output value of the CO2 amount possible to be injected was estimated. In the next stage, following the Uncertainty Analysis procedure in Petrel, analysis of 8 parameters affecting volumetric values was carried out.

The results were presented in the form of a tornado charts. In this way, it was determined to what degree the individual uncertainty elements affect the CO2 amount possible to be injected. Uncertainty analysis was prepared for pessimistic, optimal and optimistic scenarios of the model with the estimated cumulative reservoir injection volume for injection well IN-1A.

Max. flow rate, Mt/yr	Tornado chart showing the effects of individual uncertainty parameters on CO_2 volume	Cumulative tornado chart showing the effects of individual uncertainty parameters on CO_2 volume	Simulation results: max. potential capacity, Mt	Uncertainty analysis: range of potential capacity, Mt
1.16			29.02	28.84 - 29.27
1.25			31.27	31.18 - 31.49
1.34			33.52	33.30 - 34.09

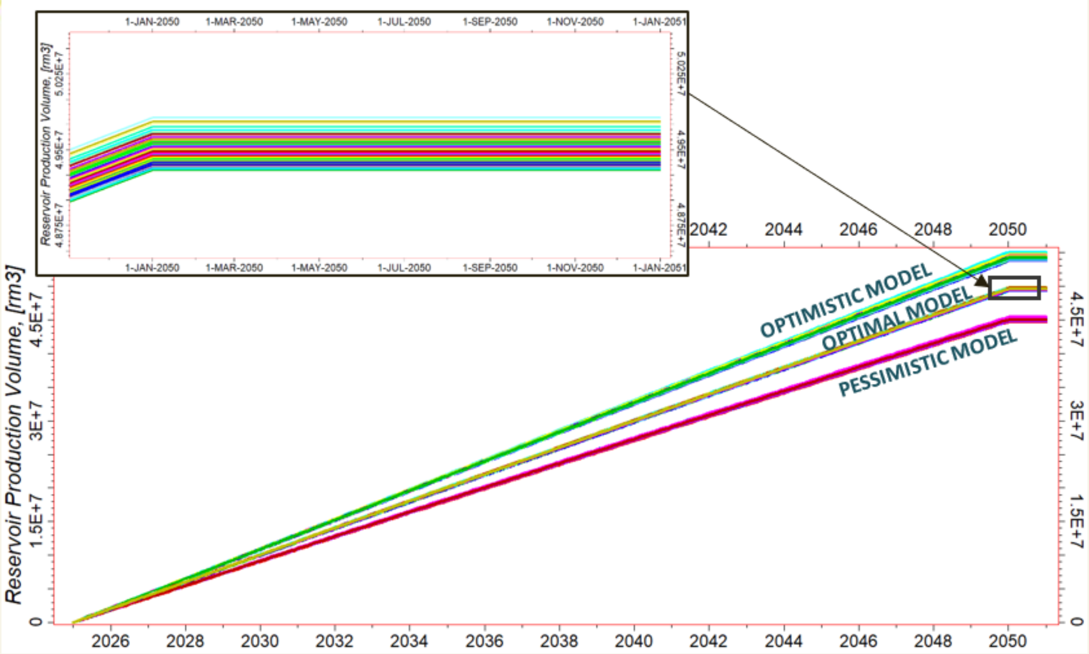


Task 3.2 - Assessment of the storage capacity by simulations

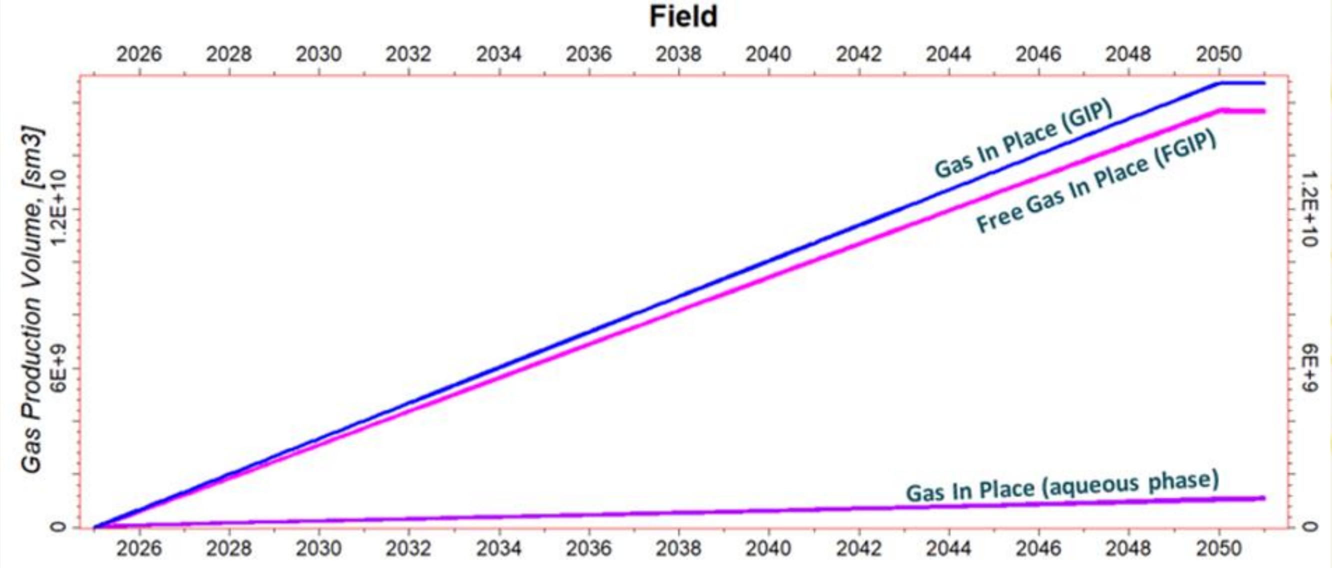
Jurassic Czestochowa District (Ładzice DSA) - Poland

- **Cumulative reservoir injection volume**

Uncertainty analysis was prepared for pessimistic, optimal and optimistic scenarios of the model with the estimated cumulative reservoir injection volume for injection well IN-1A.



Cumulative reservoir injection volume with detailed results of sensitivity analysis for optimal model



Cumulative reservoir injection volume for optimal model: Gas in place(GIP), Free gas in place (FGIP) and Gas in place (aqueous phase)

Cumulative reservoir injection volume (GIP) for optimal model is shown in Figure, along with an indication of what part of this capacity is free CO_2 (FGIP) and carbon dioxide dissolved in the formation water (Gas In Place in aqueous phase).

Next works

Jurassic Czestochowa District (Ładzice DSA) - Poland

Task 3.3. CO2 fate on the long-term

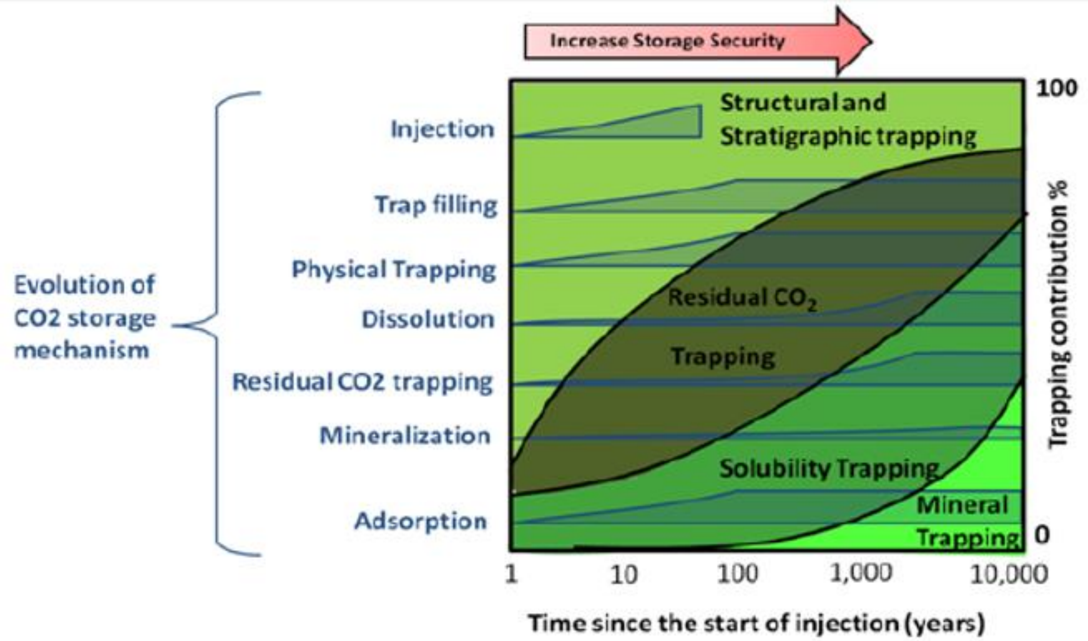
This task aims to simulate the CO2 fate on the long term (1,000 years) in the storage complex (reservoir and caprock).

This task also aims at assessing the extension of the CO2 plume over time in the storage complex.

Using the reservoir model of task 3.1 and the injection location proposed in that task (3.2), it will be evaluated the behaviour of CO2 into the reservoir during injection and after the injection operation, including different trapping mechanisms.

Future work will involve flow simulations, including:

- Model will be checked with the pilot-scale cumulative target injection of 100 kt of CO2 with simulation of the CO2 fate on the long term (1,000 years)
- Numerical simulation of CO2 injection period will be followed by 1,000 years of continued modeling of the CO2 plume migration within the reservoir to check the potential interaction with existing wells or faults.



Upper Silesia, Poland

Summary and conclusions

Two possible storage places have been identified in the region in deep saline aquifers (DSA):

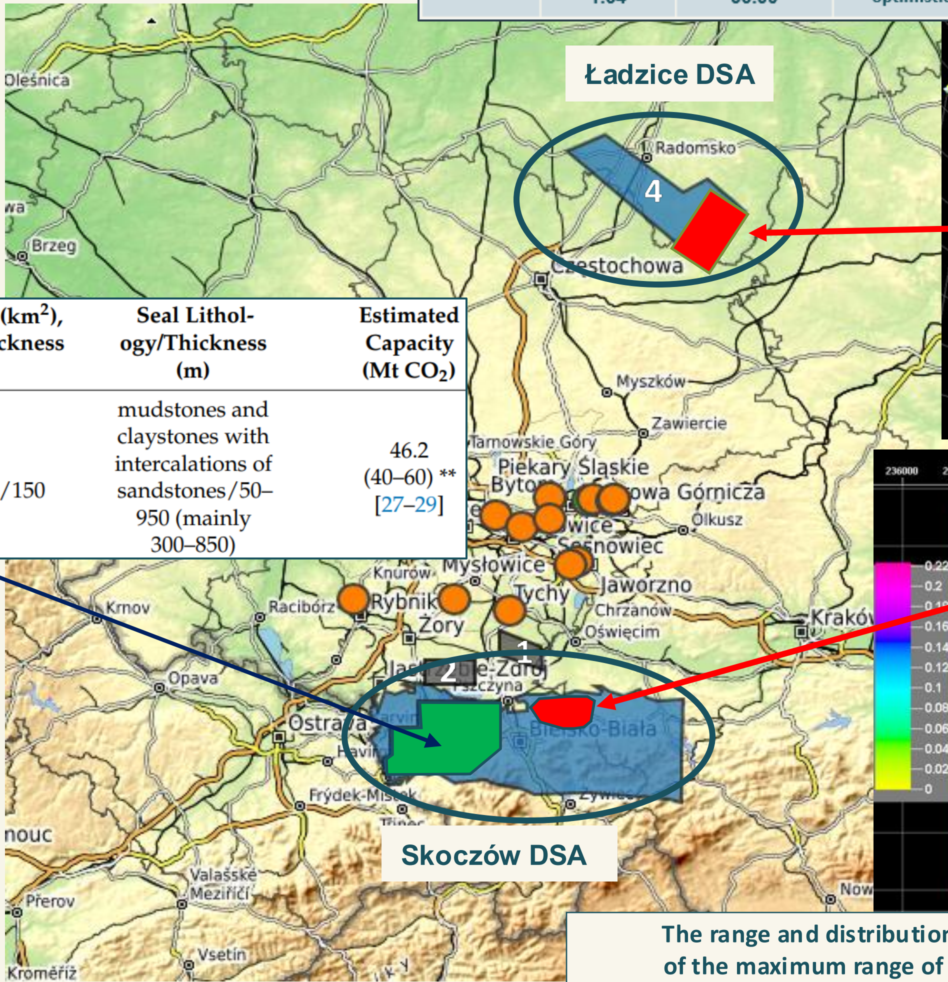
- **Skoczów DSA - Upper Silesian Coal Basin,**
- **Ładzice DSA - Jurassic Czestochowa District**

Task 3.2 - Assessment of the storage capacity by simulations

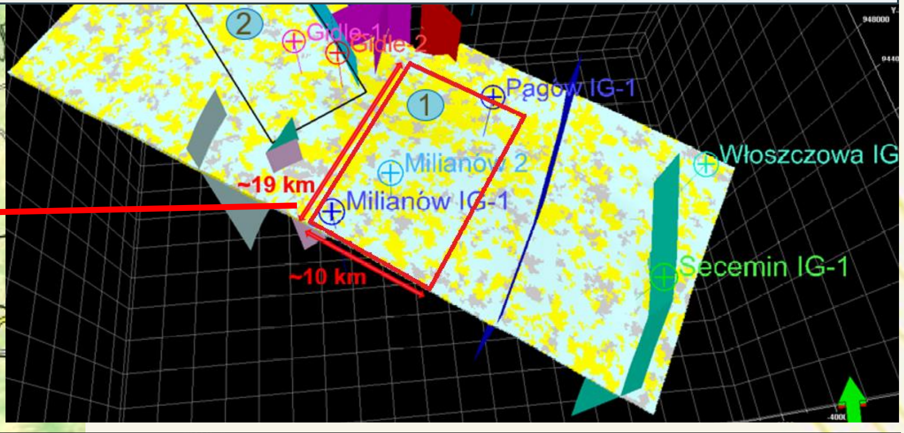
Results of simulations for CO_2 injection period of 25 years

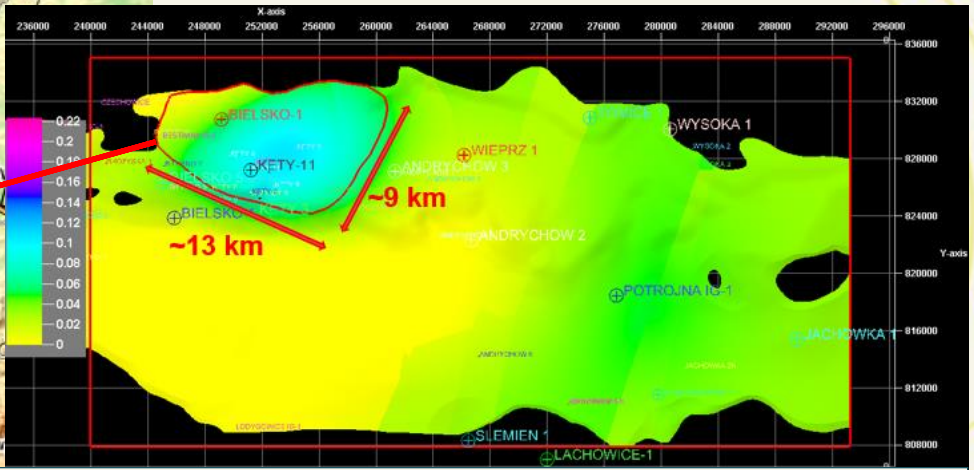
Well name/ Model	Max. flow rate [Mt/yr]	Max. potential capacity [Mt] (injection time = 25 years)	Scenario	Remarks
IN-1A	1.16	29.00	pessimistic	Max. overpressure in the top of reservoir layer = 20%
	1.25	31.25	optimal	
	1.34	33.50	optimistic	

Cumulative reservoir injection volume with detailed results of sensitivity analysis for optimal model



Storage Site ID, Storage Type/Unit	Strat. Formation/Lithology	Unit Area (km^2), Depth/Thickness (m)	Seal Lithology/Thickness (m)	Estimated Capacity (Mt CO_2)
SU#01 Cieszyn-Skoczów-Czechowice, DSA/USCB	Dębowiec Beds/Miocene macroclastic molasse composed of four lithofacies: olistostromes, boulders, conglomerates and sandstones	371, 750–1300/150	mudstones and claystones with intercalations of sandstones/50–950 (mainly 300–850)	46.2 (40–60) ** [27–29]





The range and distribution of petrophysical parameters of the reservoir were analyzed in the area of the maximum range of Miocene deposits in Dębowiec layers. An additional area named “Kęty” with the highest potential for CO2 storage was identified. The selected area of approximately 115 km2 is being analyzed in detail for storage of carbon dioxide within the framework of tasks 2.8 including e.g., estimation of static CO2 storage capacity in saline aquifers of selected area applying the volumetric equation.

Thank you for listening

Tomasz Urych

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Webinar 3 - Upper Silesia, Poland: Activities, results, challenges

Legal conditions for the use of the technology in Poland

24/10/24 | 14:00 - 15:00 | Online | Time shown is CEST

Krzysztof Stańczyk, Tomasz Urych and Aleksandra Koteras - Central Mining Institute (GIG-PIB)

The PilotSTRATEGY project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101022664

Presentation schema

- Geographic situation with potential emitters
- CCUS scenarios
- Social acceptance and community engagement in CCS technology development
- Geo-characterisation - storage potential of Upper Silesia
- Dynamic modelling and optimization of storage capacity
- Legal conditions for the use of the technology in Poland

EU regulations

- ✓ ***Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide*** and amending Council Directive 85/337/EEC, Euratom , Directives 2000/60/EC, 2001/80/ of the European Parliament and of the Council EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006 (“ ***CCS Directive*** ”),
- ✓ ***Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a greenhouse gas emission allowance trading scheme in the Union*** and amending Council Directive 96/61/EC (the " ***ETS Directive*** ").

EU regulations

CCS Directive:

- ✓ "Carbon dioxide capture and geological storage (CCS) is a bridge technology that will contribute to mitigating climate change"
- ✓ while eliminating as much as possible the risk of negative impact of this technology on the natural environment and human health.
  - The CCS Directive obliged Member States, among others, to: to introduce the requirement to obtain a permit for the identification of CO_2 storage sites and its storage, as well as to submit applications for these permits submitted by interested entities to the European Commission.
  - Security of storage also after completion, including monitoring after the end of CO_2 injection and, after confirming long-term stability, transfer of responsibility to the appropriate state authority

Source: CCS Directive, ETS Directive, M. Maciak, G. Pokrzywka, Nowa Energia 3(89)/2023

EU regulations

ECJ Directive:

- ✓ The ETS system is intended to be, as it were, an economic "driving mechanism" for CCS. The higher the price of CO_2 emission allowances, the more profitable it becomes for obligated entities to incur very high expenditure on the implementation of CCS technology.
- ✓ Ultimately, this will stimulate the capture and storage of CO_2 instead of emitting it into the atmosphere

Source: CCS Directive, ETS Directive, M. Maciak, G. Pokrzywka, Nowa Energia 3(89)/2023

National regulations

Implementation of the CCS Directive:

- ✓ by way of an amendment to the Act of September 27, 2013 amending the provisions of the Act of June 9, 2011 - ***Geological and Mining Law (" PGG ")*** and
- ✓ of April 10, 1997 – ***Energy Law (" pe ") .***

Effect:

- ✓ ***Lack of comprehensive regulation in one legal act - the legislator did not choose the form of a special act, which makes it necessary to change various legal acts,***
- ✓ ***CCS solely for the purpose of carrying out a carbon capture and storage demonstration project*** (Article 1(3) of the IAG)
- ✓ ***no exemption from the full licensing obligation for small CCS installations with a total storage of less than 100 kilotons of CO2 - the Directive provides for such a possibility.***

Source: CCS Directive

National regulations – amendment

ACT of June 16, 2023 amending the Geological and Mining Law and certain other acts [1]

Article 1. The Act of June 9, 2011 - Geological and Mining Law (Journal of Laws of 2023, items 633 and 1688) is amended as follows:

- ✓ ***in art. 1: a) in section 1 point 5 is replaced by the following: "5) underground storage of carbon dioxide** ~~for the purpose of carrying out a demonstration project of carbon capture and storage.~~*
- ✓ ***paragraph 4: Conditions for carrying out and controlling activities involving the transmission of carbon dioxide for underground storage** ~~in order to carry out a demonstration project,~~ **specified in the Act of April 10, 1997 - Energy Law (Journal of Laws of 2022, item 1385, as amended 2).";***

Art. 23, section 1 point 4 is replaced by the following:

- ✓ ***"4) underground storage of carbon dioxide in a total amount equal to or greater than 100 kilotons requires obtaining the opinion of the European Commission." - unlocking the option of pilot CO_2 storage.***

Source: CCS Directive, ETS Directive, M. Miak , G. Pokrzywka, Nowa Energia 3(89)/2023

National regulations – amendment

ACT of June 16, 2023 amending the Geological and Mining Law and certain other acts [1]

Art. 6 section 1 point 2b

- ✓ ***intensification of hydrocarbon extraction - methods of supporting the extraction of hydrocarbons from a deposit aimed at increasing the degree of intended use of the deposit's resources;***

Article 21 section 3 section is added. 3a reads as follows:"3a.

- ✓ ***Activities related to the extraction of hydrocarbons from deposits, carried out on the basis of a license for the extraction of hydrocarbons from deposits or an investment decision, may be carried out in connection with underground storage of carbon dioxide.***

National regulations – amendment

Art. 127a. [Rules for locating underground carbon dioxide storage sites]
section 4. The minister responsible for environmental affairs, in consultation with the minister responsible for climate matters, shall determine, by way of a regulation, the areas in which the location of the underground carbon dioxide storage complex is permitted, including in the form of a list of geographical coordinates, taking into account the geological and natural conditions and the characteristics of the complex. underground storage of carbon dioxide, guided by the need to ensure public safety, as well as protect the health and life of people and the environment.

Dziennik Ustaw

Dz.U.2014.1272 | Akt obowiązujący
Wersja od: 23 września 2014 r.

ROZPORZĄDZENIE
MINISTRA ŚRODOWISKA (1)
z dnia 3 września 2014 r.
w sprawie obszarów, na których dopuszcza się lokalizowanie kompleksu podziemnego składowania dwutlenku węgla (2)

Na podstawie art. 127a ust. 4 ustawy z dnia 9 czerwca 2011 r. - Prawo geologiczne i górnicze (Dz. U. z 2014 r. poz. 613, ze zm.) zarządza się, co następuje:
§ 1. Obszary, na których dopuszcza się lokalizowanie kompleksu podziemnego składowania dwutlenku węgla, są określone w załączniku do rozporządzenia.

§ 2. Rozporządzenie wchodzi w życie po upływie 14 dni od dnia ogłoszenia.

ANNEX: AREAS WHERE CARBON DIOXIDE UNDERGROUND STORAGE COMPLEXES ARE ALLOWED
Cambrian reservoir in the exclusive economic zone of the Republic of Poland: Exploited hydrocarbon deposits with their surroundings

Summary

- ✓ It is necessary to complete actions regarding legal regulations, especially in the area of transport and storage.
- ✓ Storage is **still limited** to the Cambrian Reservoir in the exclusive economic zone of the Republic of Poland, in depleted hydrocarbon deposits with the surroundings, which significantly limits the development of technology in Poland.
- ✓ Work on amending this implementing act is ongoing, but the new regions designated for storage are not yet known.

PilotSTRATEGY

Acknowledgements

The PilotSTRATEGY project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101022664