CO2-SPICER

CZECH–NORWEGIAN PROJECT TO PREPARE A CO_2 STORAGE PILOT IN A CARBONATE RESERVOIR

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Programme Kappa
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Outline

- Introduction – motivation and current status
- CO2-SPICER project overview
- Site geology and available data
- Project goals
- Work to date
- Expected outcomes

Importance of CCS for the Czech economy

- Decarbonisation solution for process emissions in industry
- Prevention of „carbon leakage“
- Delivery of low-emission („blue“) hydrogen to support hydrogen economy
- Negative emissions through BECCS and/or DACSS
- Peak-load power from NG

Industrial sector	CO_2 emission (t / year)
Iron and steel	5 564 686
Refinery	4 089 807
Cement plants	2 997 169
Pulp and paper mill, millwork	1 116 245
Chemical plants	1 109 317
Lime works	1 071 379
Glass factory	285 022
Cooking plant	119 847
Total all sectors	**16 353 472**

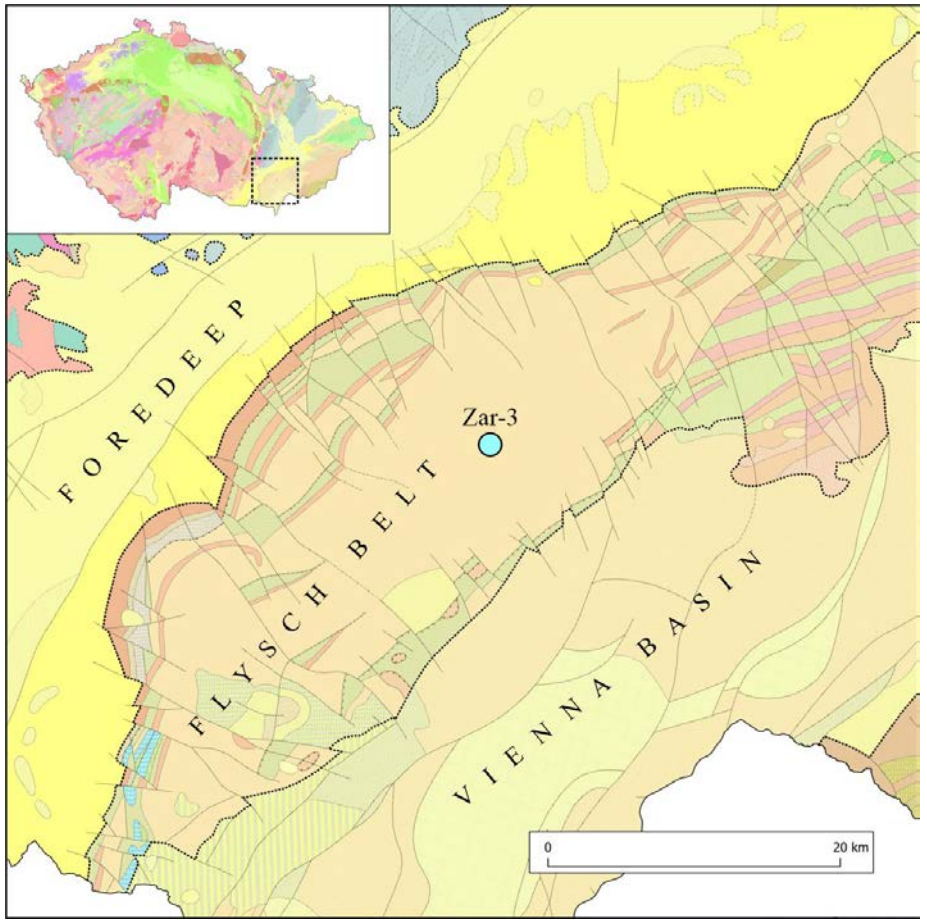
Overview of CO_2 emissions in industrial sectors in the Czech Republic (data from the year 2018).
Source: https://portal.cenia.cz/irz/unikyPrenosy.jsp

Current status of CO_2 storage in the Czech Republic

- Storage of captured CO_2 in geological formations has only been developed on **research level**
- **TRL** for CO_2 geological storage is between 4 (technology validated in lab) and 5 (technology validated in relevant environment)
- An important step towards the deployment of the technology is to prepare and **realise a CO_2 storage pilot project** in the country
- Value of a pilot project – demonstrate the technology at small scale, safely and efficiently to gain **practical experience**, win **stakeholder support** and avoid **public resistance**

Preparation of CO2-SPICER

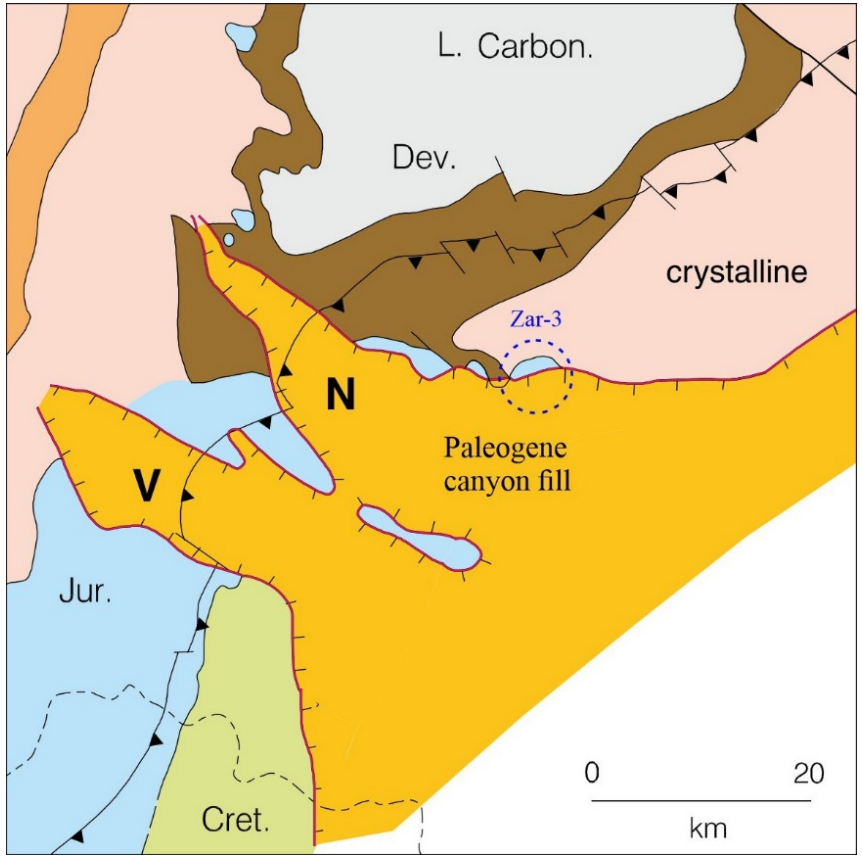
- A dialogue with MND (the leading Czech oil and gas E&P company) opened up the opportunity to consider active hydrocarbon fields as storage candidates
- The **Zar-3 field**, a depleting oil and gas field in south-eastern Czechia was identified as the most promising candidate for a CO_2 storage pilot



Position of Zar-3 site on geological map of the Czech Republic. Source: CGS ArcGIS server map services (http://www.geology.cz/extranet/mapy/mapy-online/esri).

CO2-SPICER project

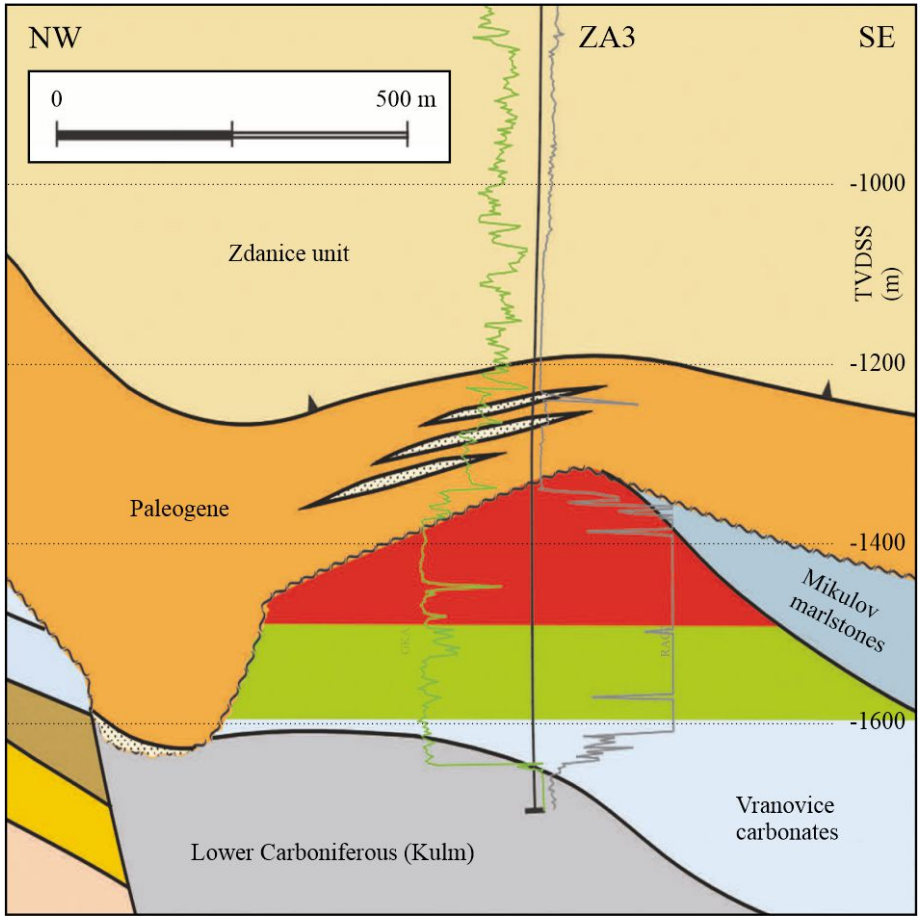
- Main objective - prepare implementation of a CO_2 geological storage pilot at Zar-3
- The first CO_2 storage project in C&E Europe, targeting an onshore hydrocarbon field situated in carbonates
- Zar-3 is situated on the NE slope of the Nesvacilka depression, the northern one of two incised canyons within the SE slopes of the Bohemian Massif



Pre-Neogene subcrop map showing the Nesvacilka (N) and Vranovice (V) paleovalleys. Picha et al. (2006).

Zar-3 site – basic parameters

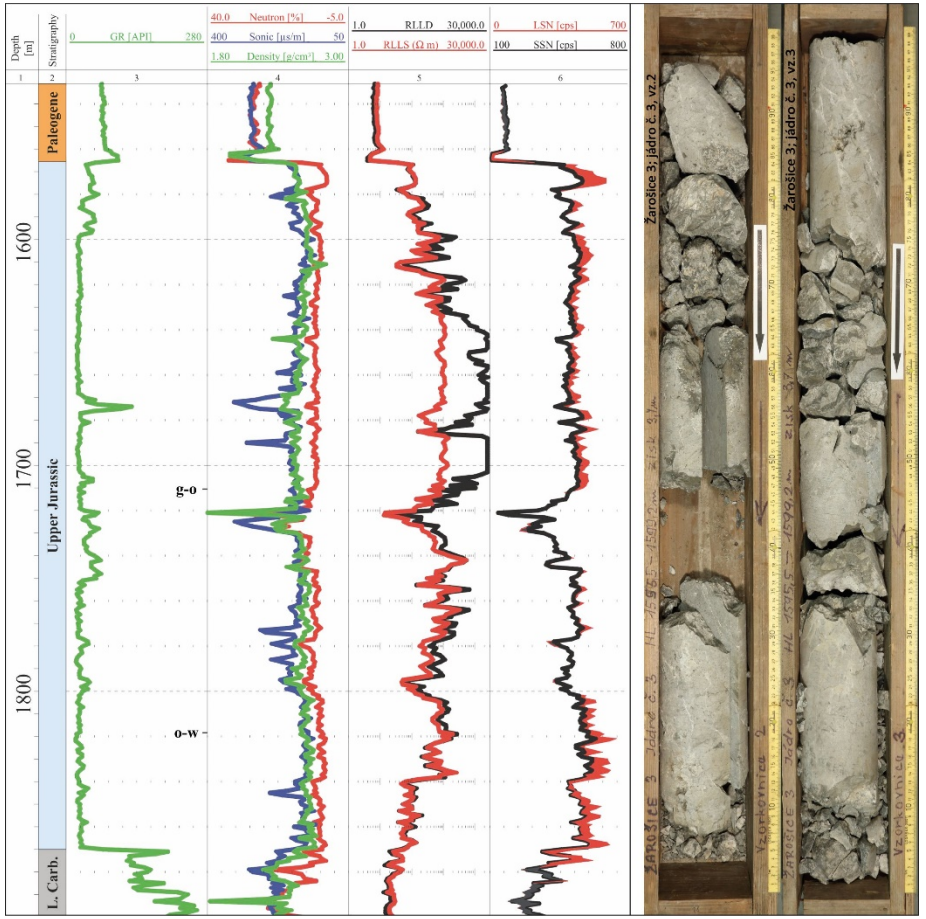
- Oil field with a gas cap and an active aquifer
- Discovery: 2001
- Reservoir: Jurassic Vranovice carbonates
- Depth: 1560 – 1820 m TVD
- Lithology: Dolomites with some limestones and sandstones



Schematic geological cross-section of NW – SE direction through the Zar-3 structure. Kostelnicek et al. (2006).

Zar-3 site – basic parameters

- Reservoir porosity: 2 – 20 %
- Permeability: 190 – 630 mD
- Seal: combination of the Paleogene side valley fill and the Jurassic Mikulov marls
- OOIP = 1.2 MMCM, GIIP = 100 MMCM (gas cap) + 77 MMCM (solution gas)



Well-logs of the reservoir (on the left, Kostelnicek et al. (2006)) and core samples from the upper part of the reservoir (on the right, photos from MND core repository).

Data available

- 3D seismic data covering the whole structure and surroundings
- Well logs (SP, resistivity, GR, sonic density logs) from 20 wells
- Well core samples, geological data
- Pressure, temperature, reservoir fluid properties data
- Production data

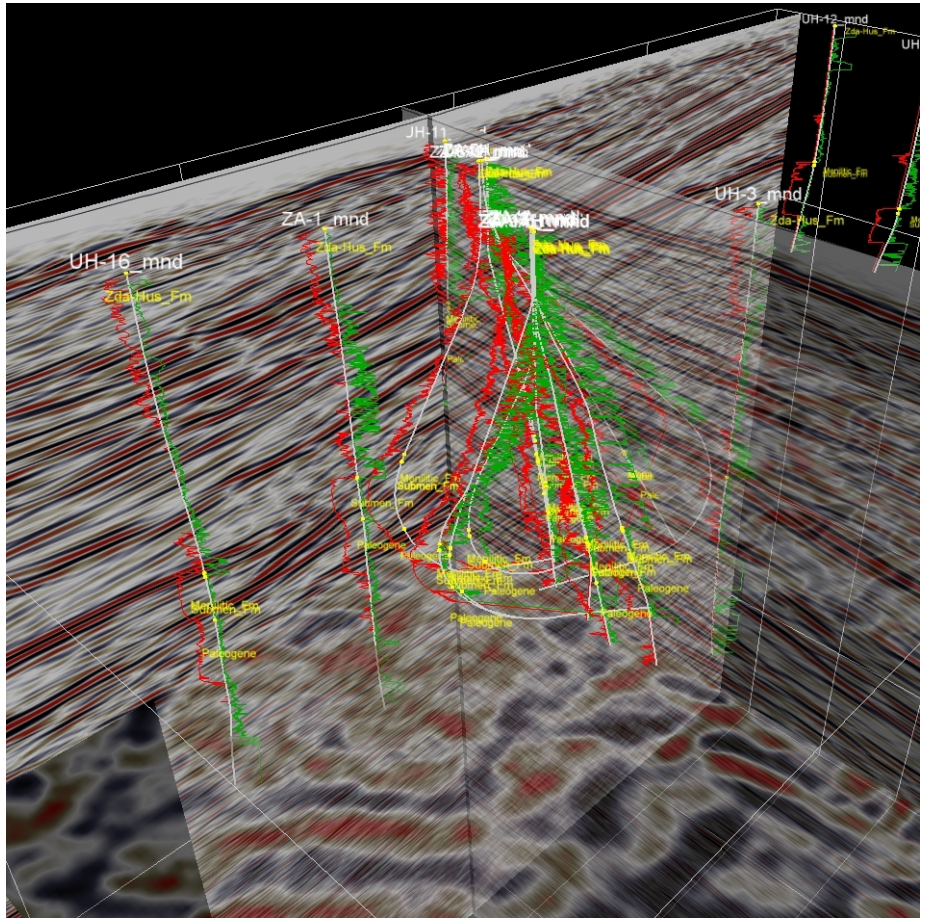


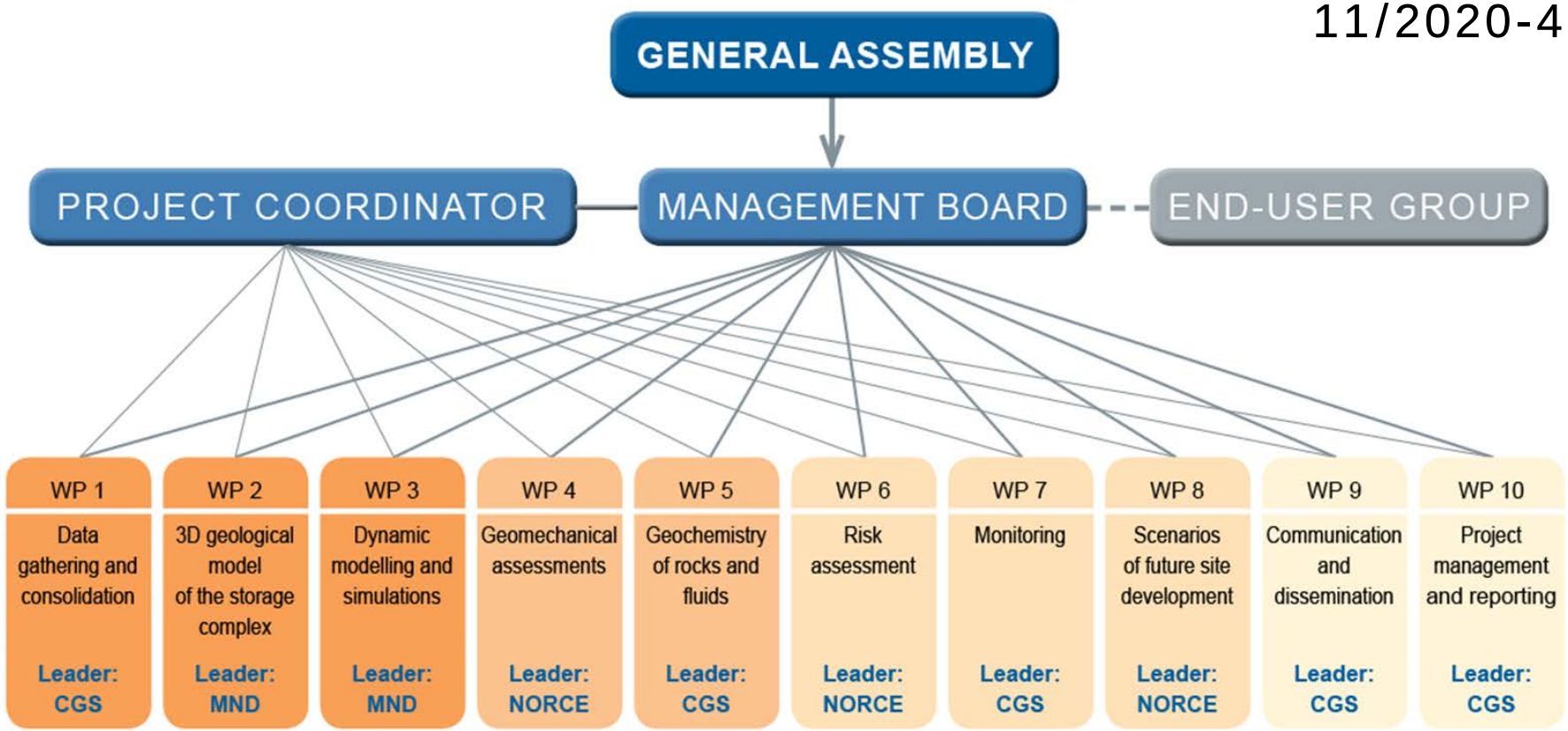
Illustration of data available from the Zar-3 field area – 3D seismics, wells with well logs and stratigraphy. (data courtesy MND a.s.)

CO2-SPICER project goals

- Construct of a 3D geological model of the storage complex
- Evaluate geomechanical and geochemical properties of the storage complex
- Perform dynamic modelling and simulation of CO_2 injection in the reservoir using various scenarios
- Assess risks related to CO_2 storage on the pilot site
- Prepare a site monitoring plan
- Evaluate scenarios for future site development, including design of CO_2 injection facilities

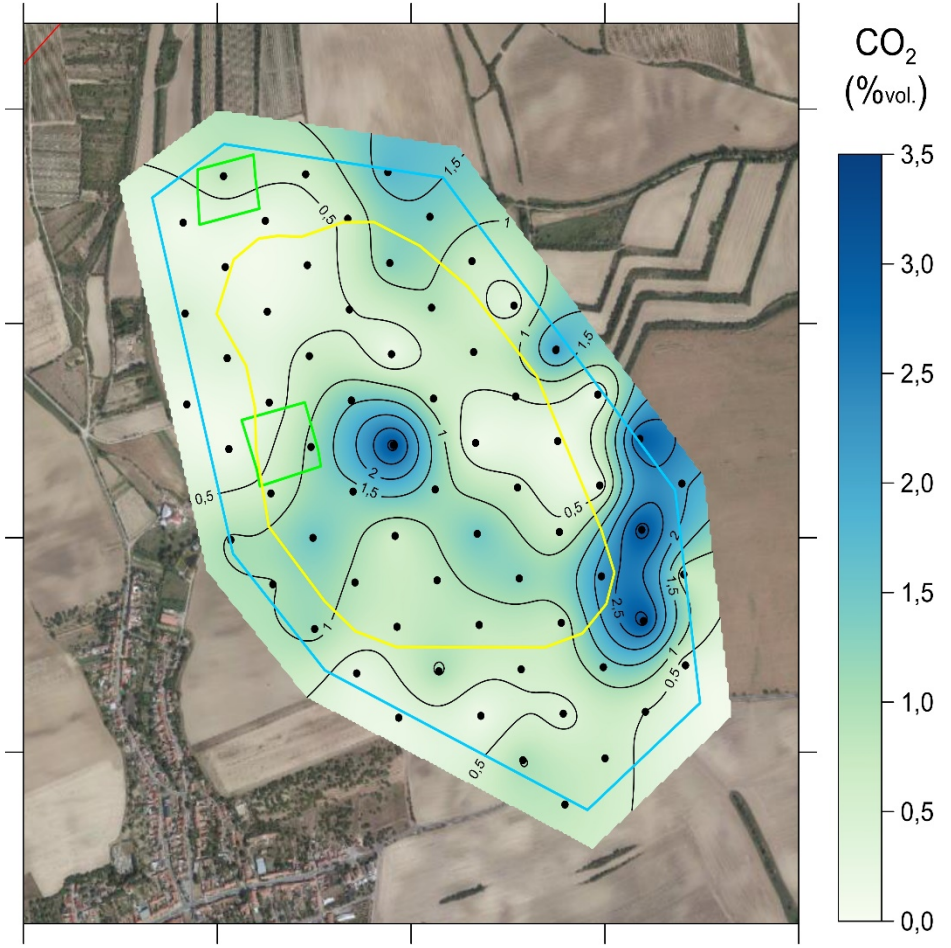
Project structure and planned work

Project duration
11/2020-4/2024



Work to date

- Collection of data and their preparation for geological interpretation and 3D modelling
- Applicability matrix of monitoring methods
- First stage of baseline monitoring of soil gases (CO_2, CH_4) and shallow groundwater
- Site selection of passive seismic monitoring array



Example of preliminary results of atmogeochemical baseline monitoring – map of CO_2 content in soil gas in the Zar-3 field area

Expected outcomes

- 3D geological model of the storage complex
- Results of CO_2 injection simulations for various injection scenarios → optimised scenarios for future development
- Risk assessment report & Site monitoring plan
- Project results will be prepared to enable their immediate application in practice by the industry partner MND → submission of storage permit application
- Parallel industrial efforts ongoing to prepare a full-chain CCS pilot project involving a suitable industrial source of captured CO_2 in combination with the Zar-3 field

Acknowledgement

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https://co2-spicer.geology.cz

PROJECT PARTNERS

CZECH GEOLOGICAL SURVEY

COORDINATOR

MND

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