The Building momentum for the long-term CCS deployment in the CEE region project is funded by Iceland, Liechtenstein and Norway through the EEA and Norway Grants Fund for Regional Cooperation.

BUILDING MOMENTUM
FOR THE LONG-TERM CCS DEPLOYMENT
IN THE CEE REGION

CCS4CEE - Building momentum for CCS deployment in the CEE region

Michał Wendołowski (Bellona Europa)

14 June 2023

Implemented by: WiseEuropa, BELLONA EUROPA, EPG ENERGY POLICY GROUP, CIVITTA, Institute for European Integration

Supported by: EUROPEUM INSTITUT PRO EVROPSKOU POLITIKU INSTITUTE FOR EUROPEAN POLICY

Co-financed by: NIW

Sfinansowano przez Narodowy Instytut Wolności - Centrum Rozwoju Społeczeństwa Obywatelskiego ze środków Programu Rozwoju Organizacji Obywatelskich na lata 2018 – 2030

PROO

BELLONA EUROPA

Our topics and work areas

Bellona Europa is an independent non-profit organisation that meets environmental and climate challenges head on. We are solutions-oriented and have a comprehensive and cross-sectoral approach to assess the economics, climate impacts and technical feasibility of necessary climate actions. To do this, we work with civil society, academia, governments, institutions, and industries.

Industry
- CCS
- Hydrogen use
- Circularity
- CO_2 infrastructure

Sustainable Finance
- Private/public funding
- Public procurement
- Competitiveness
- Greenwashing

Energy Systems
- Hydrogen production
- Grids (electrification)

Cities and Transport
- Construction
- Waste incinerators
- Fuels

Carbon Accounting
- CDR
- Climate impact of circular economy
- Green claims

About the CCS4CEE project

WP3

Assessment of current state, past experiences and potential of CCS deployment in CEE region

- Analytical reports, focusing on the current state, past experiences and potential for CCS deployment in the target countries.
- Stakeholder engagement events (workshops and seminars)

WP4

Developing policy roadmaps for national CCS deployment and regional cooperation

- Integrated policy roadmap prepared based on inputs delivered by partners
- Stakeholder events focusing on policy roadmaps (workshops and seminars)

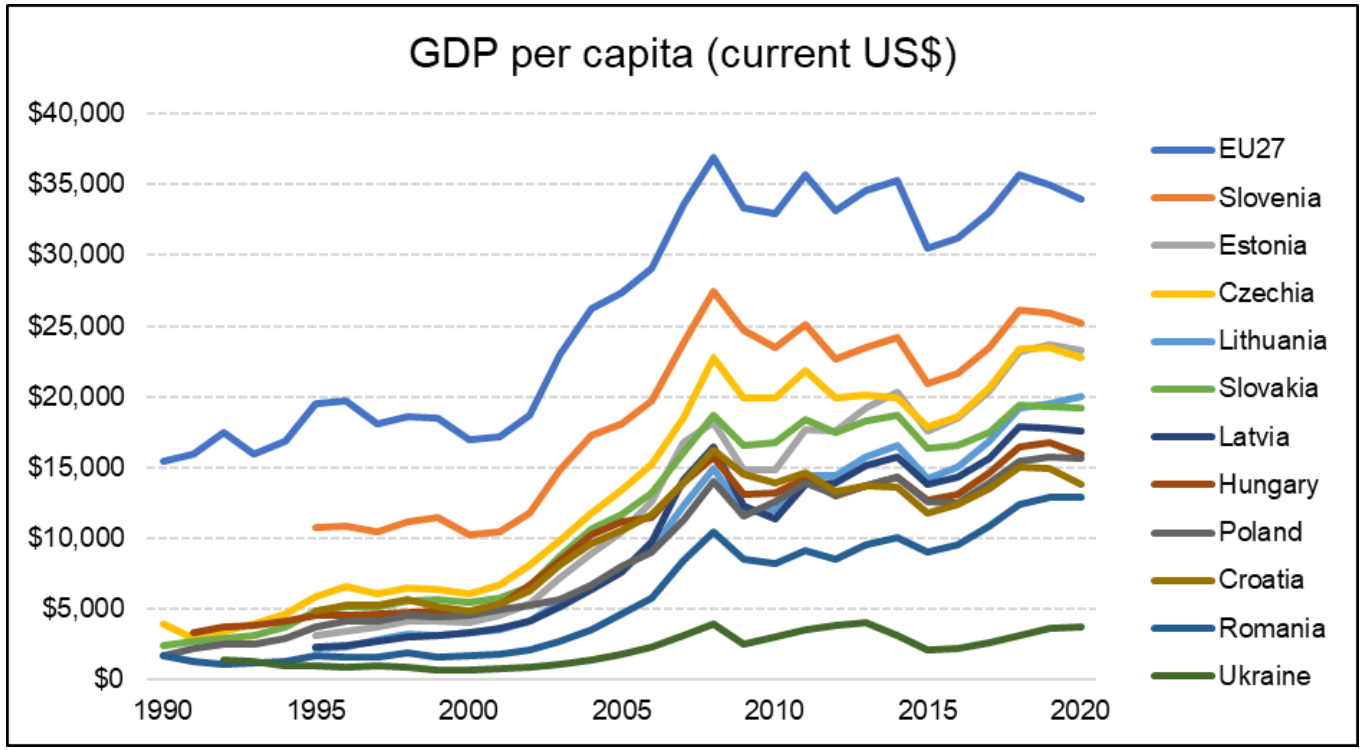
WP5

From roadmaps to implementation: supporting the development of flagship CCS initiative in the CEE region

- Networking and capacity-building for implementing CCS initiatives in target countries
- Setting up a dedicated platform to ensure that the network will last beyond the project duration.

- WiseEuropa (PL) - **Lead partner**
- Bellona - **Expert partner**
- CIVITTA (LV)
- Energy Policy Group (RO)
- Institute for European Integration (CZ)

CEE economy

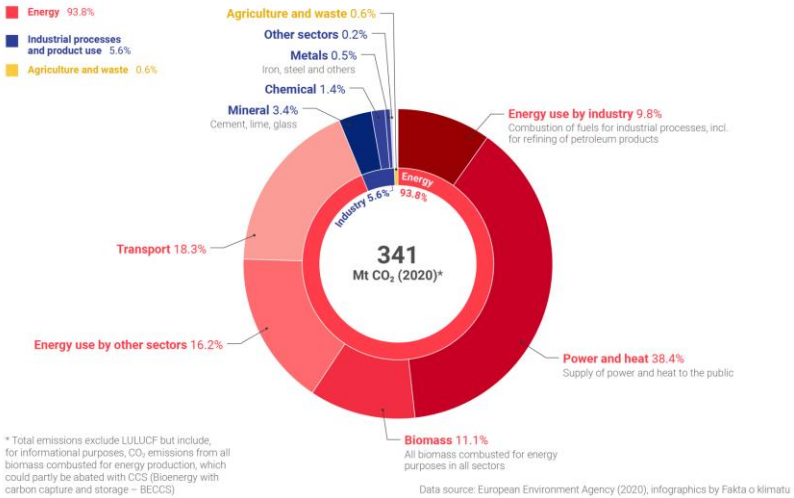


Source: EPG (for the CCS4CEE WP3 summary report, 2021)

- Steady increase in GDP and a shift towards service-based economies in CEE
- GDP in CEE still below EU average
- Industry plays an important role in CEE, more than in western European economies
- Manufacturing is a key sector for CEE economies, particularly production of cement and lime, glass, and metals

Emission profiles of CEE countries vary

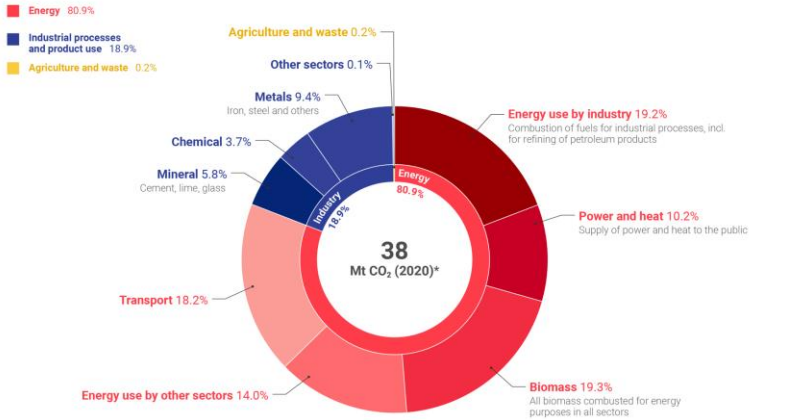
CO_2 EMISSIONS IN POLAND BY SECTORS



* Total emissions exclude LULUCF but include, for informational purposes, CO_2 emissions from all biomass combusted for energy production, which could partly be abated with CCS (Bioenergy with carbon capture and storage – BECCS)

Data source: European Environment Agency (2020), infographics by Fakta o klimatu

CO_2 EMISSIONS IN SLOVAKIA BY SECTORS



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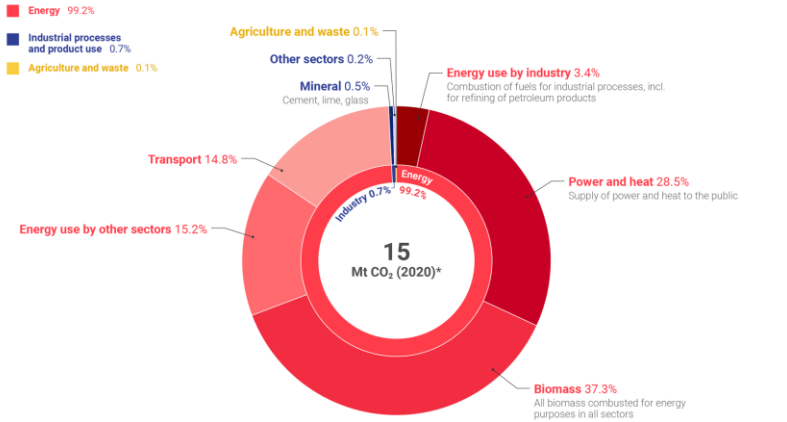
Data source: European Environment Agency (2020), infographics by Fakta o klimatu

CO_2 EMISSIONS IN ESTONIA BY SECTORS



* Total emissions exclude LULUCF but include, for informational purposes, CO_2 emissions from all biomass combusted for energy production, which could partly be abated with CCS (Bioenergy with carbon capture and storage – BECCS)

Data source: European Environment Agency (2020), infographics by Fakta o klimatu

THE BIGGEST EMITTERS IN ESTONIA

EU ETS covered emissions of greenhouse gases in 2021

INSTALLATIONS WITH EMISSIONS (Mt CO_2eq)

- **above 250 000** tonnes of CO_2eq

  Sectors:

  - **Heat and power**
  - **Oil refining**

- **40 000–250 000** tonnes of CO_2eq

  Sectors:

  Heat and power, Oil refining

HOW TO READ MINI CHARTS

250 000 t CO_2eq = ■

1 000 000 t CO_2eq = ■■■■

6.9

Mt CO_2eq

of total emissions
covered by EU ETS

Data source: EU ETS (2021), infographics by Fakta o klimatu

THE BIGGEST EMITTERS IN SLOVAKIA

EU ETS covered emissions of greenhouse gases in 2021

INSTALLATIONS WITH EMISSIONS (Mt CO2eq)

- **higher than 250 000** tons of CO2eq

Sectors:

- Heat and power
- Cement and lime
- Chemicals
- Oil refining
- Metals

- **40 000–250 000** tonnes of CO_2eq

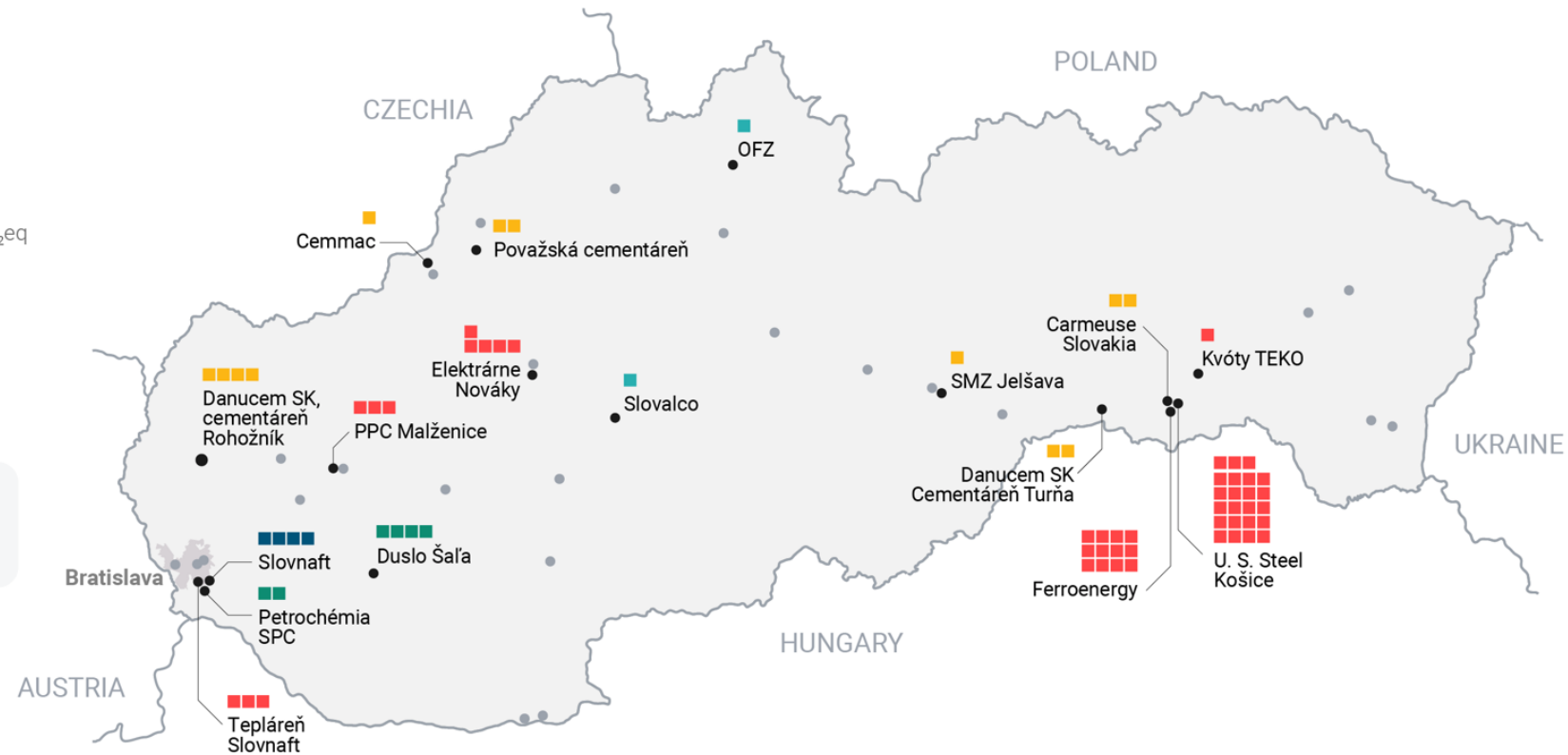
Sectors:

Heat and power, Cement and lime, Oil refining, Iron and steel, Other

HOW TO READ MINI CHARTS

250 000 t CO_2eq =

1 000 000 t CO_2eq =



20.8

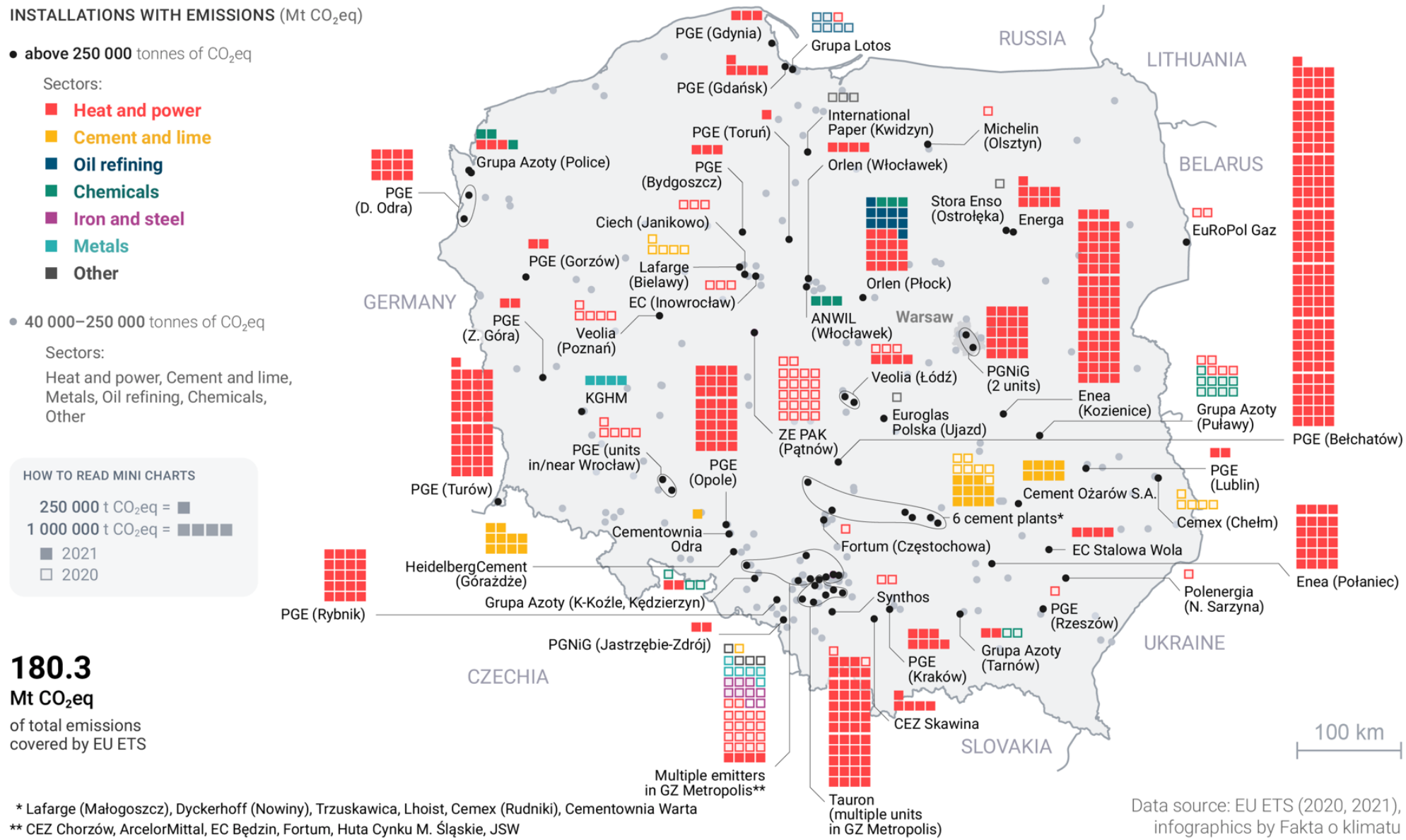
Mt CO_2eq

of total emissions covered by EU ETS

Data source: EU ETS (2021), infographics by Fakta o klimatu

THE BIGGEST EMITTERS IN POLAND

EU ETS covered emissions of greenhouse gases in 2020 and 2021

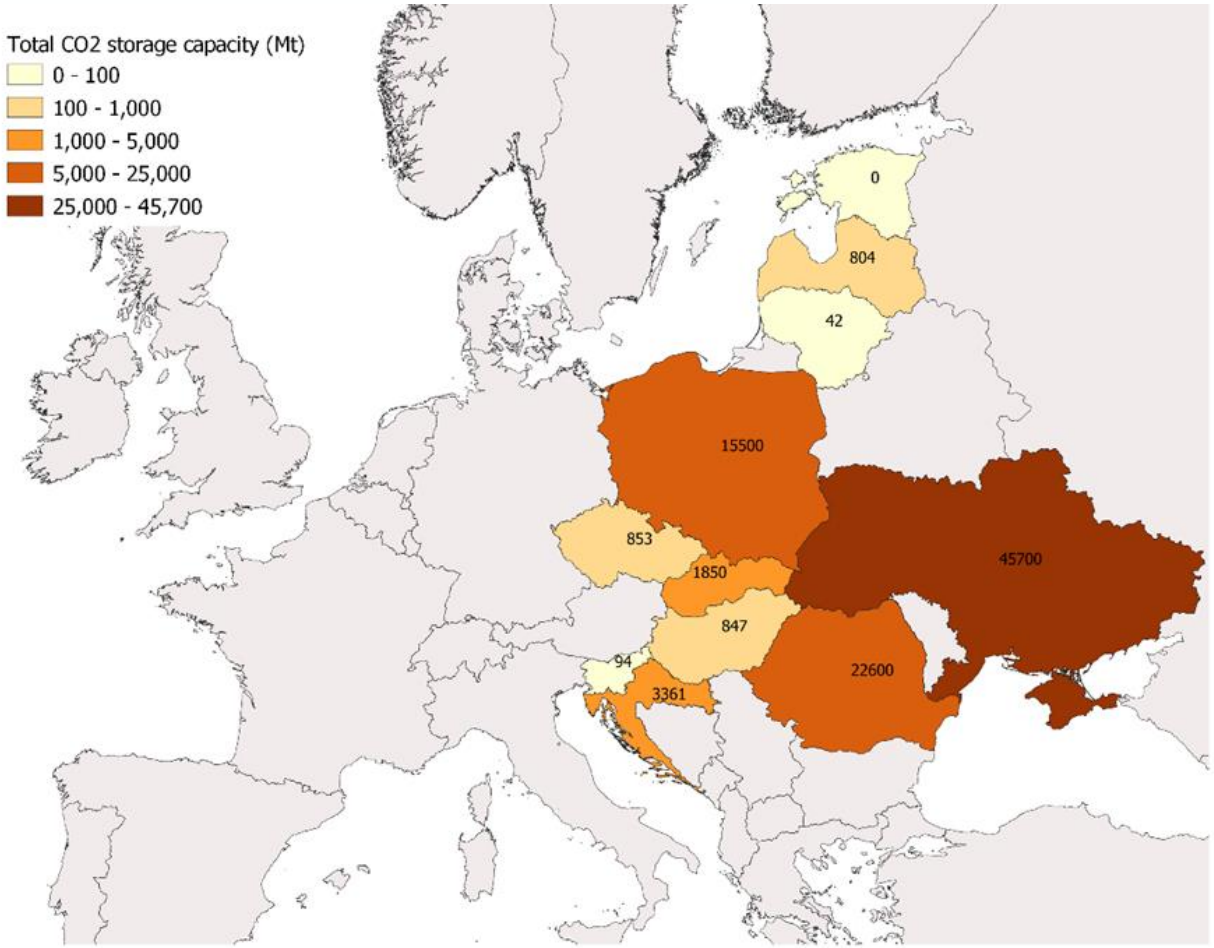


* Lafarge (Małogoszcz), Dyckerhoff (Nowiny), Trzuskawica, Lhoist, Cemex (Rudniki), Cementownia Warta

** CEZ Chorzów, ArcelorMittal, EC Będzin, Fortum, Huta Cynku M. Śląskie, JSW

Data source: EU ETS (2020, 2021), infographics by Fakta o klimatu

CO2 storage potential in CEE (indicative)



- Total storage (indicative): ca. 92 Gt CO2

- For comparison:

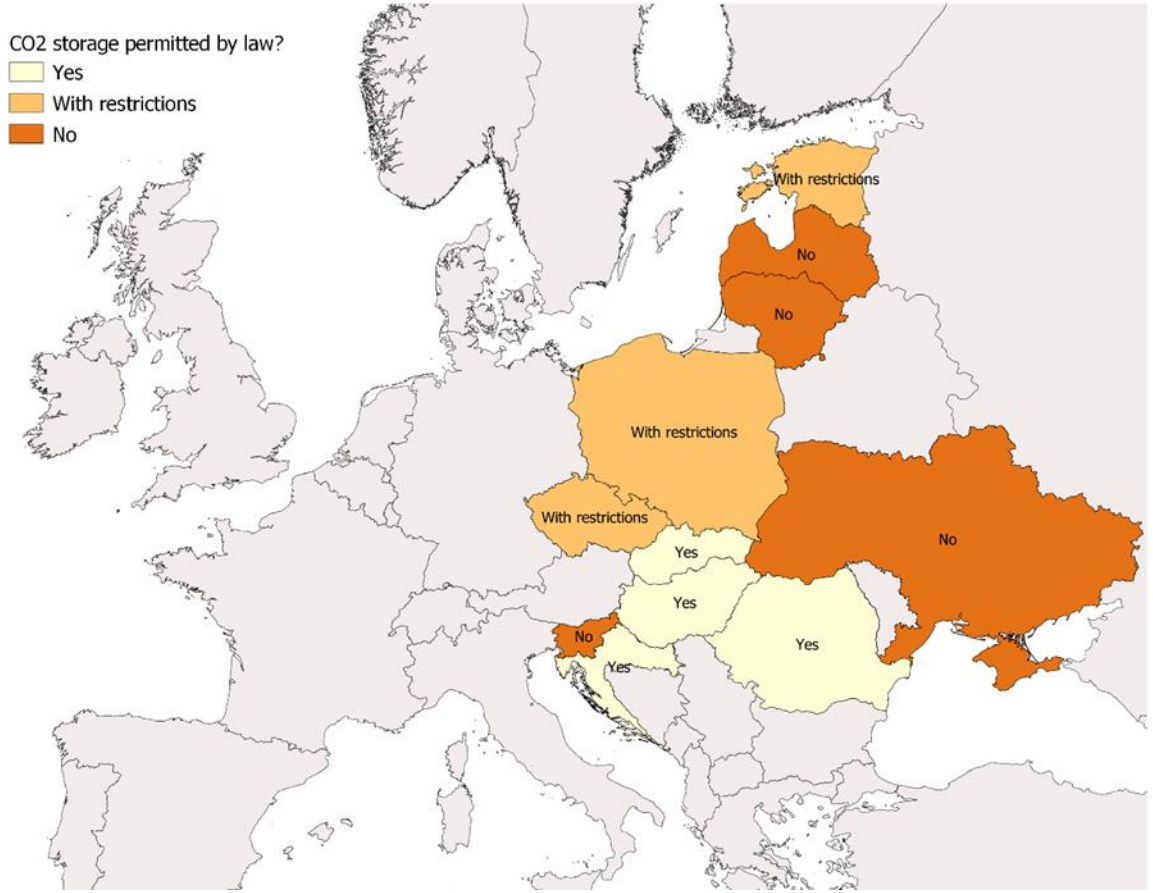
CEE (incl. Ukraine) CO2 emissions in 2019: < 1Gt CO2

Source: Compiled by EPG based on CCS4CEE partners' analysis of CO2 storage research

CCS experience in CEE

- History of academic research
- Experience with international research projects
- Experience with CO2-EOR and -EGR in Hungary, Romania and Croatia
- Experience with CCU
- CCS testing and demonstration projects (abandoned)

CCS-relevant regulations and policies



Source: EPG (for the CCS4CEE WP3 summary report)

- Regulatory environments of partner countries vary, particularly on CO2 storage and transportation
- Ban on storage in some countries (despite including CCS in their long-term strategies)
- Long-term national strategies and plans rarely mention CCS
- High costs and low maturity associated with CCS in government plans
- Perceived as a transition solution only

CEE stakeholders perception

- Stakeholders are cautious about CCS
  - high costs
  - lack of clear government support and financing
  - challenging administrative procedures
  - issues related to risks of CO2 leakage from geological storage, as well as the complexity of the required storage infrastructure
- Preference for CCU (including CO2-EOR) over CCS
- Importance of regional and inter-sectoral cooperation

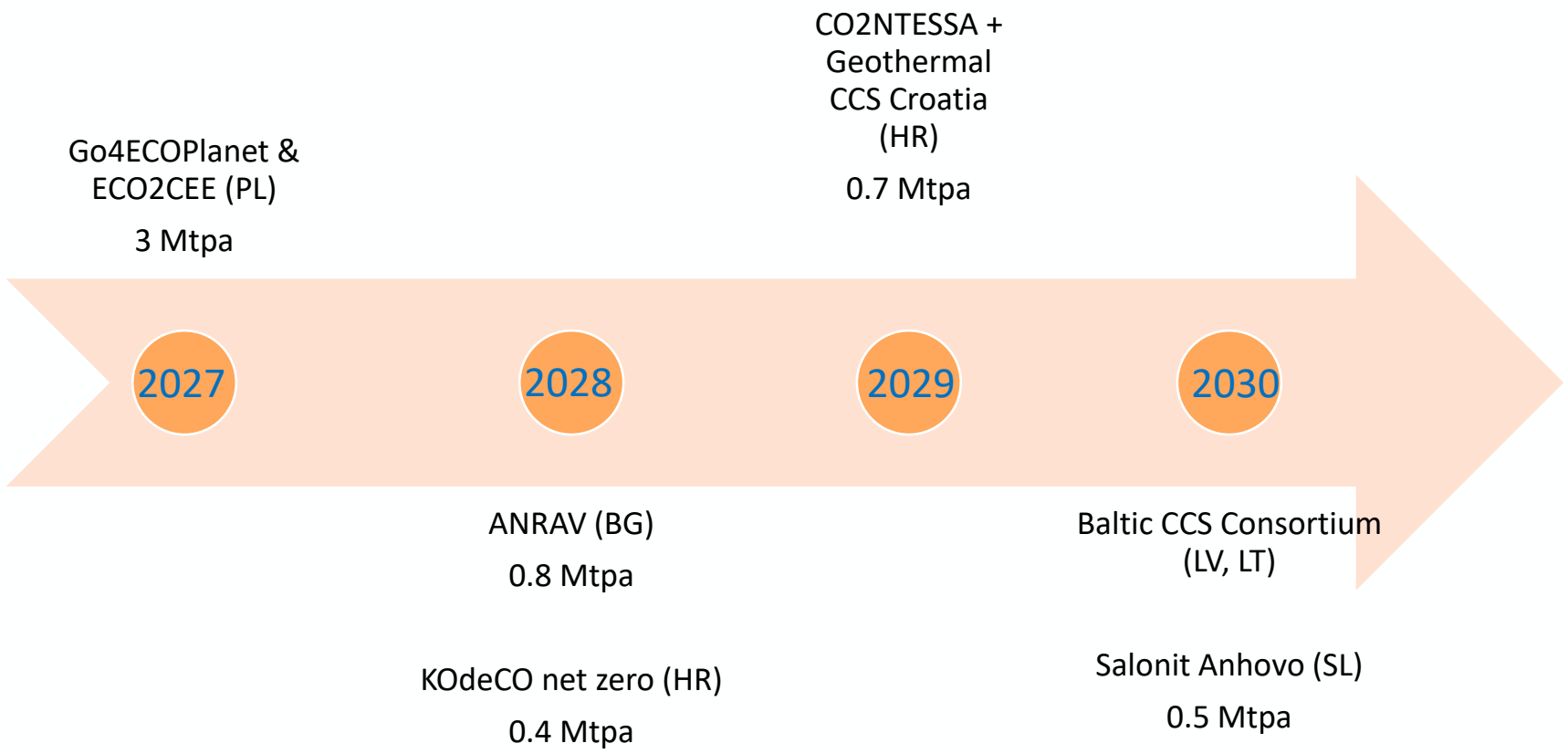
Public support

- lack of knowledge about CCS
- attitudes towards climate action in partner countries are also less favourable than in the rest of EU countries
- history of opposition to other similar projects or even CCS projects

CCS deployment roadmaps for CEE – our key recommendations

- Create national CCS platforms, and join or increase engagement in European and international ones
- Include CCS in national and sectoral decarbonisation strategies
- Allocate public finance to CCS deployment from pilot projects to their industrial scale-up
- Identify industrial clusters, potential transport networks and storage sites to create CCS hubs
- Seek cross-sectoral and regional cooperation opportunities
- Put in place a regulatory framework that removes obstacles and inconsistencies across legislation
- Engage with local communities and other stakeholders to build public support for CCS

CCS projects in CEE timeline – ca. 5 Mtpa of CO2 captured and stored by 2030

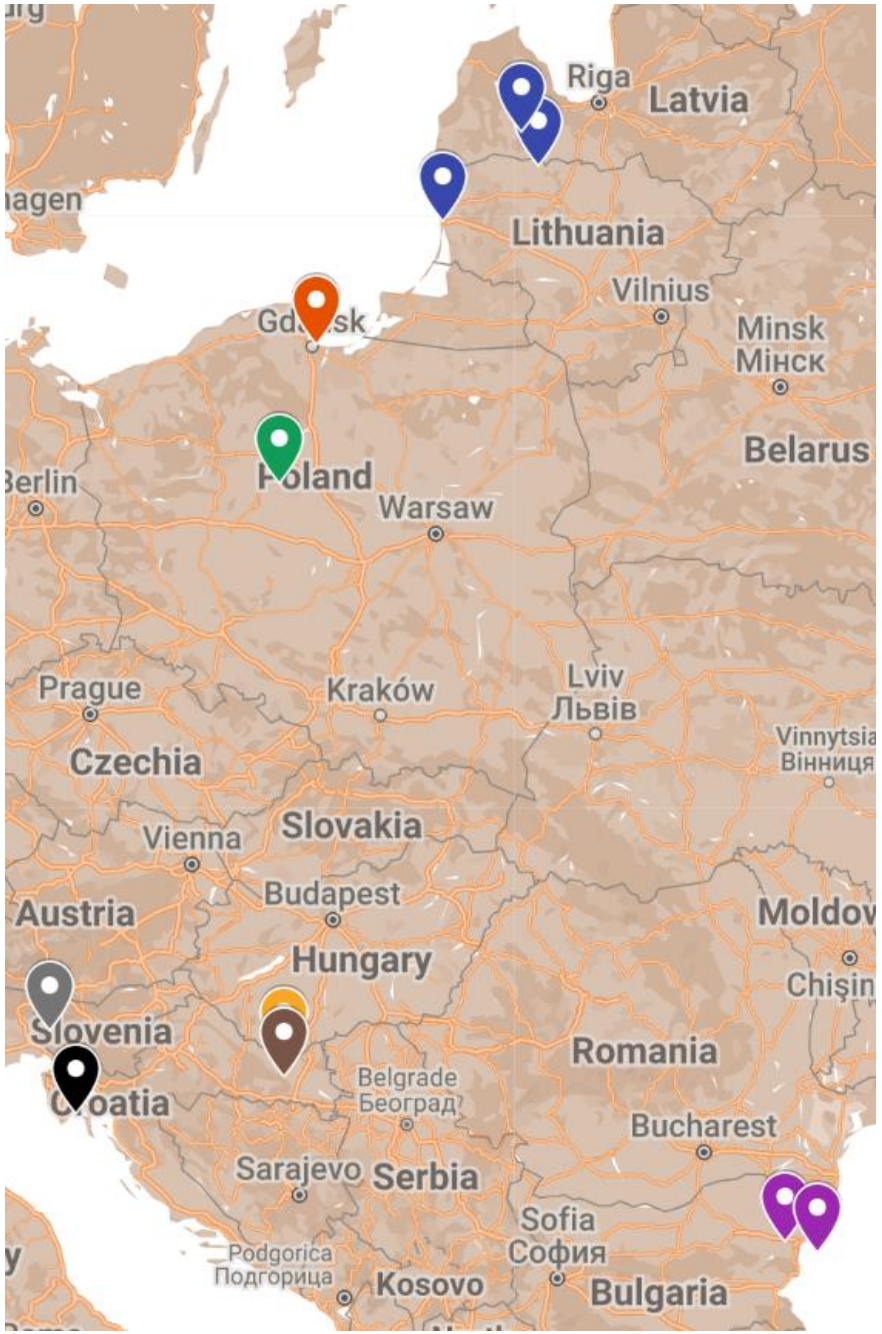


Go4ECOPlanet
Capture: Cryocap tech at cement plant in Poland
Transport: ECO2CEE
Storage: North Sea, onshore Poland from 2030
Companies: Lafarge, Air Liquide
Operational: 2027
Status: FEED documentation, environmental decision, construction permit
Volume: 1.2 Mtpa
EU support: Innovation Fund in 2022

ECO2CEE
Capture: Go4ECOPlanet; refinery in PL, possibly other emitters
Transport: part of ECO2CEE (rail->Port of Gdańsk->ship)
Storage: North Sea, possibly Baltic Sea
Companies: Air Liquide, PKN Orlen, Lafarge Polska
Operational: 2027
Status: feasibility study (railway transport) ongoing
Volume: 3 Mt (2027) -> 9 Mt (2030+)
EU support: PCI (planned application for CEF)

Salonit Anhovo CCS project
Capture: at cement plant in Slovenia
Transport: not specified
Storage: not specified
Companies: Salonit Anhovo
Operational: 2030
Status: not specified
Volume: 0.5 Mtpa

KOdeCO net zero
Capture: end-of-pipe adsorption at cement plant in Croatia
Transport: shipping
Storage: Mediterranean Sea
Companies: Holcim
Operational: 2028
Status: not specified
Volume: 0.367 Mtpa
EU support: Selected for Just Transition Fund; applied for Innovation Fund in 2023

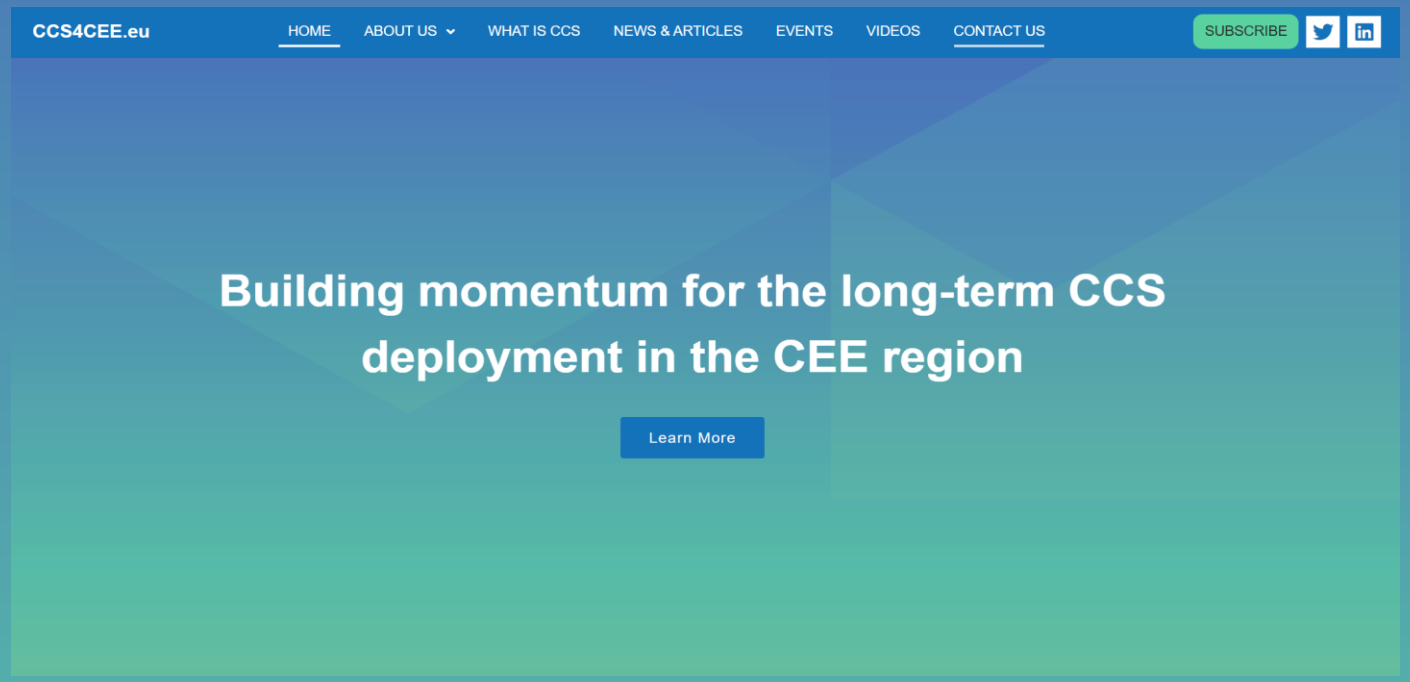


More projects are being prepared but not yet announced

Baltic CCS Consortium
Type: Full CCS value chain
Capture: oxyfuel kiln at cement plants (in LT and LV)
Transport: rail -> CO2 terminal -> ship
Storage: North Sea/Baltic (looking for partners)
Companies: KN, Akmenes Cementas, Schwenk, Mitsui, Larvik Shipping
Operational: 2030
Status: project concept / before permitting
Volume: 32 Mt captured (over lifetime), 20 Mt net reduction (over lifetime)
EU support: PCI candidate

CO2NTESSA + Geothermal CCS Croatia
Capture: oxyfuel tech at cement plant in Croatia
Transport: pipeline
Storage: onshore saline aquifer, combined with geothermal or in exploited gas fields
Companies: Nexe, Croatian Hydrocarboin Agency, INA, Plinacro, Heidelberg Materials*
Operational: 2029
Status: project documentation in progress
Volume: >0.7 Mtpa (capture); >25 kt (1st stage) -> possibly 100 Mt of total storage capacity
EU support: connected to a PCI candidate; applied for Innovation Fund in 2023
**HM cement plant in Beremend (Hungary)*

ANRAV
Type: Full CCS value chain
Capture: amine+oxyfuel capture at cement plant (in BG)
Transport: onshore+offshore pipelines
Storage: depleted gas fields in the Black Sea
Companes: Devnya Cement (H.Materials); Petroceltic
Operational: 2028
Status: feasibility study completed
Volume: 0.8 Mtpa (Ph. 1) to 5 Mtpa (Ph. 2-3)
EU support Innovation Fund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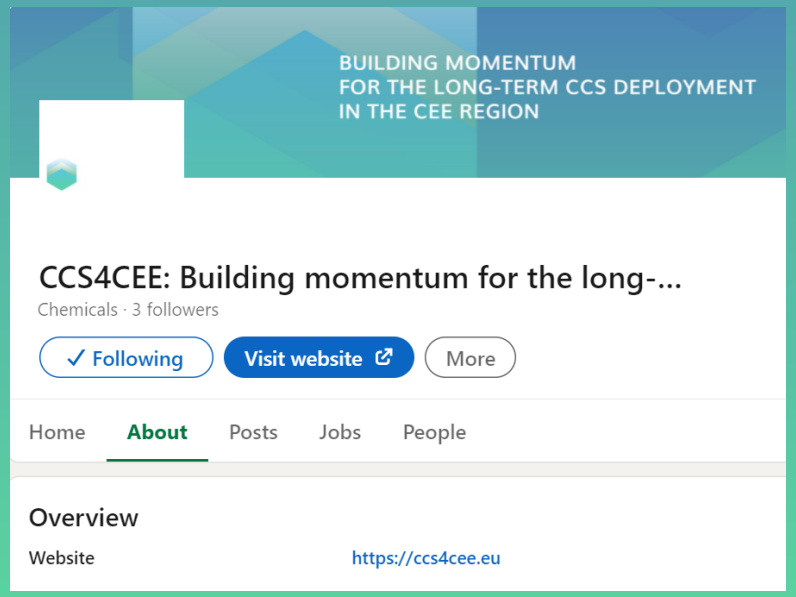
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Thank you!

Contact details:

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michal@bellona.org

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Results of the CCS4CEE project

Opportunities and barriers to the development of CCS technology in Poland and how to overcome them?

Krzysztof Kobyłka (WiseEuropa)

14 June 2023

Implemented by: WiseEuropa, BELLONA EUROPA, EPG ENERGY POLICY GROUP, CIVITTA, Institute for European Integration
Supported by: EUROPEUM INSTITUT PRO EVROPSKOU POLITIKU INSTITUTE FOR EUROPEAN POLICY
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PROO

WiseEuropa – who we are?

MACROECONOMICS AND ECONOMIC POLICY

ENERGY AND CLIMATE

EUROPEAN POLICIES AND SUSTAINABLE FINANCE

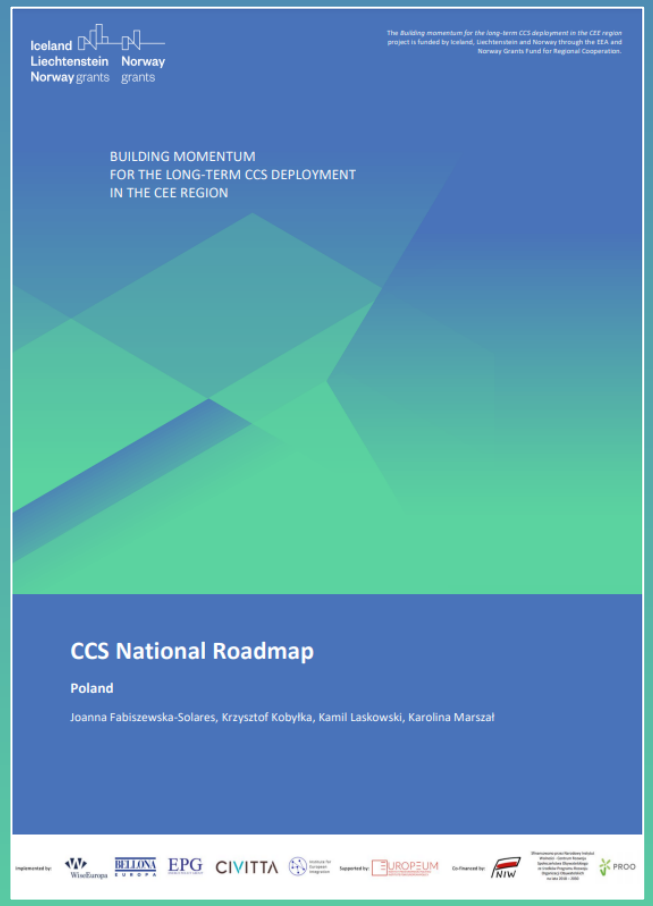
SUSTAINABLE TRANSPORT

15+
Analysts and experts

10+
Fellows

2021

2022



2023

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Iceland Liechtenstein Norway grants

BUILDING MOMENTUM
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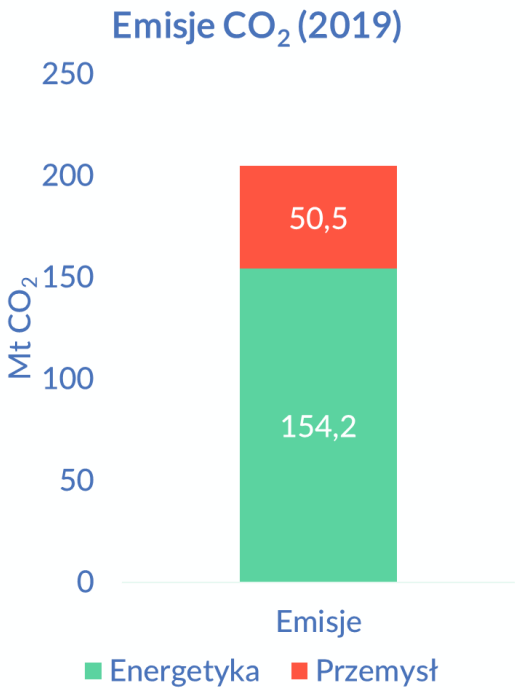
Determinants and barriers to the deployment of CCS technology in Poland

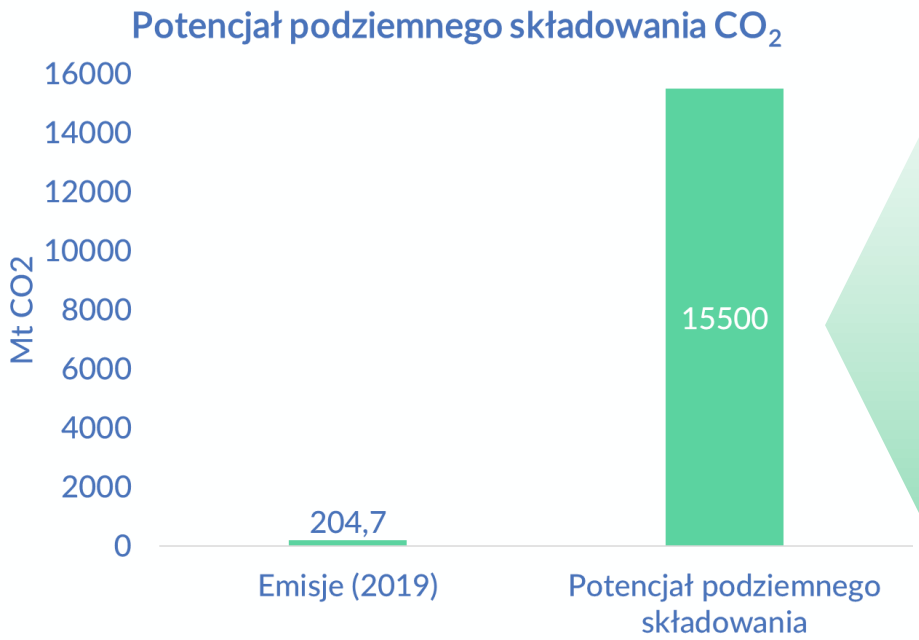
Implemented by: WiseEuropa, Bellona Europa, EPG Energy Policy Group, Civitta, Institute for European Integration

Supported by: Europeum Institut pro evropskou politiku / Institute for European Policy

Co-financed by: NIW, Organizacji Obywatelskich na lata 2018 – 2030, PROO

Determinants of CCS technology deployment in Poland





Źródło: Europejska Agencja Środowiska i Polski Instytut Geologiczny

Extensive experience (pilot projects and R&D)

Robust research facilities (including research infrastructure)

Vast majority of identified geological potential located onshore

Barriers to the development of CCS technology in Poland

Stakeholder perspective

- Excessive financial requirements for potential CCS project developers
- Limited possibilities of obtaining financing
- Regulatory barriers (lack of a permit for onshore CO2 storage, inflated standards, ambiguity on ETS emissions accounting...)
- Public acceptance

Administrative costs of onshore CO2 storage in Poland

Financial security

+

Security of funds

=

Even several hundred milion PLN

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How to overcome barriers – Polish roadmap

Implemented by: WiseEuropa, BELLONA EUROPA, EPG ENERGY POLICY GROUP, CIVITTA, Institute for European Integration
Supported by: EUROPEUM INSTITUT PRO EVROPSKOU POLITIKU INSTITUTE FOR EUROPEAN POLICY
Co-financed by: NIW, Organizacji Obywatelskich na lata 2018 – 2030, PROO

Thematic areas

1) Transition from the research and development phase, pilot and demonstration phase to the commercial phase

2) Legal and institutional environment

3) Stakeholder engagement, cooperation and dissemination of know-how

4) Public acceptance of CCS

Timeframe:

- **Short-term measures – by 2025**
- **Medium-term measures – by 2030**
- **Long-term measures – by 2040**

Transition from the research and development phase, pilot and demonstration phase to the commercial phase

Steps to be taken by 2025

- Assessment of 'CCS readiness' of Polish power and industrial plants
- Update of geological storage potential in Poland
- Focusing on already available technologies rather than waiting for the best solutions

Steps to be taken by 2030

- Conducting feasibility studies of CCS installations for power and industrial plants
- In the pilot and demonstration phase, CO2 should be transported by conventional means of transport
- Implementation of different parts of the CCS value chain by separate entities, but in a coordinated manner

Steps to be taken by 2040

- In-depth assessment of the most efficient method of CO2 transport in the long term, taking into account geographical differences
- Burdening the state or a consortium of multiple companies with the cost of building a pipeline network
- Location of new emitting energy and industrial plants near CO2 storage sites
- Ensure that the development of CCS technology is consistent with the development of the hydrogen economy

Legal and institutional environment

Steps to be taken by 2025

- Permit for exploration and prospecting of onshore CO2 underground storage complexes and onshore CO2 storage
- Ensuring that CO2 exports from Poland to the North Sea are legal under international law
- Reduced financial burden (less financial security required, deduction of all captured and permanently stored emissions in the EU ETS)
- Develop a long-term, national strategy for decarbonisation of individual sectors (especially industrial and district heating) including CCS
- Raising the issue of the disbursement of CO2 emissions trading funds under the EU ETS

Steps to be taken by 2030

- Adoption of ISO standards on CCS

Steps to be taken by 2040

- Implementation of CCS technologies in the context of just transition process

Stakeholder engagement, cooperation and dissemination of know-how

Steps to be taken by 2025

- Awareness of regulatory barriers and challenges related to public acceptance of CCS technology
- Build links between suppliers of CCS technologies (research institutes, private companies) with their potential customers, i.e. emitters in the energy and industrial sectors
- Forming international consortia with more experienced foreign CCS players
- Identify CCS hubs and clusters

Steps to be taken by 2030

- Implementation of CCS hubs and clusters

Steps to be taken by 2040

- Sector coupling for CO2 - linking CO2 capture plants to producers of goods where CO2 is used in production
- International (regional) investment in CO2 transport networks, benefiting from economies of scale

Public acceptance of CCS

Steps to be taken by 2025

- Updated assessment of public support for CCS technology
- Involvement of local authorities in the promotion of CCS investments
- Creation of information centres, websites, portals with a Q&A section

Steps to be taken by 2030

- Success of the first pilot and demonstration CCS plants (primarily in terms of safety)
- Raising awareness of climate change and its risks and highlighting CCS as a solution to the problem
- Organisation of excursions to already existing underground CO2 storage sites in Poland (Borzęcin, Kaniów) or underground gas storage facilities

Steps to be taken by 2040

- Education and dialogue on storage safety (fears of CO2 leakage)
- "Story" of CCS in the local economic context - highlighting the impact of CCS installations in saving the local/regional industrial base and making it more competitive
- Regulations and standards should be strictly respected by investors and state authorities

Our impact

What do we do to have an impact?

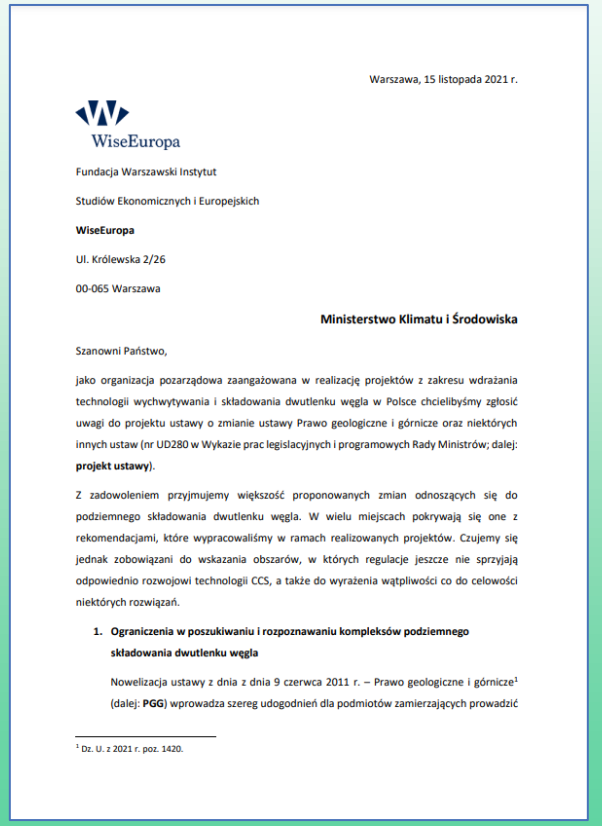
1. Official involvement of project partners in the **law-making process**

2. Consultations/bilateral meetings with representatives of ministries

3. Engagement of project partners or project stakeholders in facilitating national, regional and transnational initiatives to support the CO2 capture

4. Letters of intent from representatives of different target groups, expressing the intent or need of developing future transnational/national pilot projects focusing on CO2 capture

Key Performance Indicators



Warszawa, 15 listopada 2021 r.

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Ministerstwo Klimatu i Środowiska

Szanowni Państwo,

jako organizacja pozarządowa zaangażowana w realizację projektów z zakresu wdrażania technologii wychwytywania i składowania dwutlenku węgla w Polsce chcielibyśmy zgłosić uwagi do projektu ustawy o zmianie ustawy Prawo geologiczne i górnicze oraz niektórych innych ustaw (nr UD280 w Wykazie prac legislacyjnych i programowych Rady Ministrów; dalej: **projekt ustawy**).

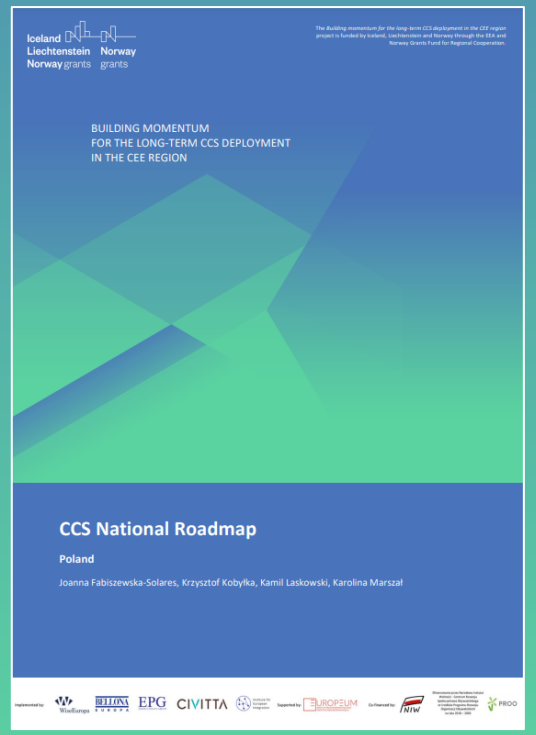
Z zadowoleniem przyjmujemy większość proponowanych zmian odnoszących się do podziemnego składowania dwutlenku węgla. W wielu miejscach pokrywają się one z rekomendacjami, które wypracowaliśmy w ramach realizowanych projektów. Czujemy się jednak zobowiązani do wskazania obszarów, w których regulacje jeszcze nie sprzyjają odpowiednio rozwojowi technologii CCS, a także do wyrażenia wątpliwości co do celowości niektórych rozwiązań.

1. **Ograniczenia w poszukiwaniu i rozpoznawaniu kompleksów podziemnego składowania dwutlenku węgla**

   Nowelizacja ustawy z dnia z dnia 9 czerwca 2011 r. – Prawo geologiczne i górnicze[1] (dalej: **PGG**) wprowadza szereg udogodnień dla podmiotów zamierzających prowadzić

[1] Dz. U. z 2021 r. poz. 1420.

https://ccs4cee.eu/

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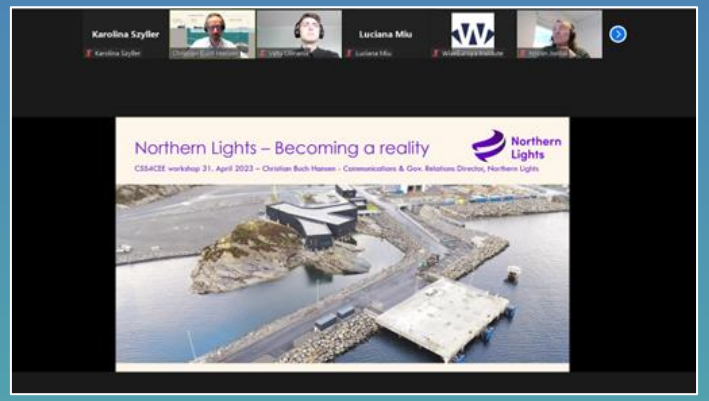
IN THE CEE REGION
Second annual regional conference in Vilnius
DATE 24 November 2022, 15:30-17:30 EET
PLACE Vilnius Greentech Forum
In-person and online event


Karolina Szyfler
Luciana Miu
Northern Lights – Becoming a reality
Northern Lights


Iceland Liechtenstein Norway grants
BUILDING MOMENTUM
FOR THE LONG-TERM CCS DEPLOYMENT
IN THE CEE REGION
Summary of CCS4CEE project
Poland


Iceland Liechtenstein Norway grants
THE PATH TO NET-ZERO:
ACCELERATING CCS
IN CENTRAL AND EASTERN EUROPE
CONFERENCE
DATE 6 June 2023, 8:30 – 16:00 CEST
PLACE Residence Palace Brussels
Implemented by:
Supported by: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BUILDING MOMENTUM
FOR THE LONG-TERM CCS DEPLOYMENT
IN THE CEE REGION

Thank you for attention

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