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National Assessment of Carbon Management Potential in CEE Regions in Transition: Case of Poland

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Fundacja Warszawski Instytut Studiów Ekonomicznych i Europejskich - WiseEuropa

ul. Nowogrodzka 38/17, 00-691 Warszawa

NIP: 113-286-48-09, REGON: 146626611

KRS: 0000457991

Contact details: Krzysztof.fal@wise-europa.eu

Authors

Krzysztof Fal

Maciej Giers

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List of abbreviations

ETC	Et cetera
EPG	Energy Policy Group
CM	Carbon Management
CCS	Carbon Capture and Storage
NZIA	Net Zero Industry Act
CO2	Carbon dioxide
EU ETS	European Emission Trading System
Mt	Mega tonnes

1. Summary Overview

Recently, the Polish ambition in terms of deployment of carbon management technologies increased. It is partially due to the regulatory obligations imposed on the largest energy company in Poland through the Net Zero Industry Act. The push from other hard-to-abate industries which are seeking for strategies to align their business strategies with the long-term climate targets, and avoid additional, extensive costs related to EU ETS system also put additional pressure. The project of CCUS.pl in 2024 the complex assessment of potential for the CCS technology has been conducted providing the public administration with the tools to prepare the data-driven strategies.

The Ministry of Climate and Environment has started working on the long-term strategy, engaging also the representative of industries, academia and third sector. Despite all of these, the final strategy as well as proposal for the comprehensive regulations for the CCS market in Poland have not been published yet, potentially jeopardizing the implementation of such projects.

The aim of this paper is to briefly present key opportunities and political barriers jeopardizing the development of the CM market in Poland, also in the just transition regions. We hope to contribute to the works and discussions on the future framework for these technologies, as in our opinion they remain crucial for ensuring the more sustainable economic development of Poland.

2. Policy Context

2.1. Policy Context

Given that industry accounts for approximately one quarter of Poland's Gross Domestic Product (GDP)[1][2], industrial decarbonisation has become a key policy priority in recent years. While partial emissions reductions can be achieved through electrification[3], decarbonisation of hard-to-abate sectors (e.g. cement, steel, chemicals) requires additional technological pathways, including carbon capture, utilisation and storage (CCS). Furthermore, achieving climate neutrality by 2050 will likely require the deployment of negative emissions technologies, further reinforcing the role of CO_2 capture solutions.

In terms of policy development, several initiatives aimed at establishing a CCS framework have been undertaken in Poland. Notably, the 2020 agreement between the government and the coal mining sector in Silesia explicitly recognised CCS as a potential tool supporting

[1] GUS (2026), The social-economic situation in Poland, table 2 & 3

[2] Giers M. & Rubaszek M.(2024), *Społeczno-ekonomiczne korzyści z wdrożenia CCUS w Polsce*, WiseEuropa 2024

[3] Dusiło M. (2024), *Gdzie zacząć transformację przemysłu?,* Forum Energii, p. 8

the region's transition. However, the agreement has been criticised for its limited alignment with EU climate targets and insufficient level of ambition.

A key milestone was the 2023 amendment to the Geological and Mining Law[4], which significantly expanded the regulatory framework for CCS. The main changes included:

(i) extending the scope of CCS activities beyond demonstration projects,
(ii) introducing hybrid concessions enabling combined hydrocarbon production and CO_2 storage, and
(iii) reducing regulatory barriers in the exploration phase. These changes marked a shift from a pilot-based approach towards enabling commercial CCS deployment.

During the past year, the Ministry of Climate and Environment has released the project of the regulation determining the possible storage areas in Poland[5]. This has been the long-awaited piece of legislation, which can somehow give the momentum to the CCS in Poland.

Despite these improvements, stakeholders from industry, academia and third sector[6] continue to highlight the absence of a comprehensive CCS strategy, including clear rules for the development and operation of CO_2 transport and storage infrastructure. This gap limits investment certainty and delays project development.

More recently (2025–2026), the Ministry has initiated further steps towards developing a national CCS framework, including public consultations on the identification of potential CO_2 storage sites and the establishment of a dedicated working group involving representatives of industry and academia. These efforts indicate a gradual move towards a more structured policy approach, although a fully integrated CCS strategy has yet to be adopted.

[4] Act of 16 June 2023 amending the Geological and Mining Law and certain other acts (Journal of Laws 2023, item 2029)

[5] Draft amendment to the Minister of Climate and Environment Regulation of 3 September 2014 on areas where locating a CO_2 underground storage complex is permitted – The Ministry of Climate and Environment legislative work list item 1274

[6] WiseEuropa (2025), Position on the draft Polish Development Strategy by 2035 (*Konsultacje projektu Strategii Rozwoju Polski do 2035 r.*), WiseEuropa https://wise-europa.eu/wp-content/uploads/2025/11/WiseEuropa_Formularz_uwag_SRP2035.pdf

2.2. Government Bottlenecks

The development of a CCS framework is currently constrained by four key government-related bottlenecks.

Firstly, CCS competes with other decarbonisation technologies for limited public funding, while lacking a sufficiently robust business model. In particular, the absence of long-term revenue certainty mechanisms (e.g. contracts for difference or stable carbon price signals) significantly undermine the bankability of CCS projects, especially in the transport and storage segments, which require high upfront capital expenditure.

Secondly, the regulatory framework remains fragmented and underdeveloped. While recent amendments to the Geological and Mining Law have improved the legal basis for CO_2 storage, key issues remain insufficiently addressed, including long-term liability for storage sites, integration with the EU ETS, and rules governing cross-border CO_2 transport. This legal uncertainty continues to delay investment decisions.

Thirdly, CCS development is hindered by a systemic coordination problem related to infrastructure. CCS requires simultaneous development of capture, transport, and storage components, which creates a “chicken-and-egg” dilemma. Without clear government-led planning and risk-sharing mechanisms, private actors are unlikely to commit to large-scale infrastructure investments.

Finally, limited administrative and social capacity constitutes an additional barrier. Public authorities are still building technical expertise necessary to design and implement CCS-specific regulation, which may affect the efficiency and predictability of permitting processes. At the same time, low public awareness and trust, combined with NIMBY (not in my backyard) dynamics, continue to constrain social acceptance of CO_2 storage projects.

2.3. Enabling Factors

Adoption of the NZIA has put the CCS higher in political agenda due to binding targets for storage capacities in Poland. Orlen, the largest energy and O&G company in Poland, has included the CCS perspective in its long-term strategy by 2035, planning to reach capacity of 4 mt/a within this timeframe[7]. Also the project of Holcim in Kujawy, the most advanced CCS project in Poland, clearly shows the momentum for CCS in Poland. The Kujawy project aims at ensuring the capture rate of 1MtCO2/a of emissions bringing the net-zero cement to Polish market.

[7]Orlen, Strategy by 2035: Energy of tomorrow starts today; access: https://www.orlen.pl/content/dam/internet/orlen/pl/pl/o-firmie/strategia-2035/dokumenty/Strategia%20ORLEN%202035.pdf

Secondly, appointment of the working group in the Ministry of Climate and Environment also can be considered as the potential enabler of CCS, in particular in terms of preparation & adoption of the market-oriented, well designed strategy for this technology in Poland. Despite time challenges being faced by this group, the members of the working group have already provided Ministry with the assistance in terms of CCS potential or identification of the regulatory bottlenecks in Polish regulatory frameworks.

In terms of other CM options, the direct air capture demonstration project will be deployed in Kielce (Świętokrzyskie) to capture carbon dioxide directly from air. This project, being implemented in the cooperation of Katowice municipality and Oraquel S.A. is the pioneer project in Poland and will allow for capturing up to 500 tonnes of CO2[8].

3. Potential for Development

3.1. Carbon Emission Sources - Sectoral Analysis

In Poland, the most relevant candidates for carbon management (CM) are large point sources in the power sector, cement, steel, chemicals and refining/fuels. In the WiseEuropa modelling[9], CO_2 capture rises from 2 $MtCO_2$/year in 2030 to 22 Mt in 2035, 55 Mt in 2040, 64 Mt in 2045 and 69 Mt in 2050. By sector, the largest capture volumes are projected in the energy sector (around 32–36 $MtCO_2$/year from 2040 onward), followed by industry (16 Mt in 2040, 21 Mt in 2045, 26 Mt in 2050) and the fuel sector (around 7 $MtCO_2$/year from 2040). The report also identifies specific high-potential installations, including cement plants, steelworks, ammonia production, hydrogen production, refineries and selected coal- and gas-fired units such as Kozienice, Jaworzno, Opole and Turów.

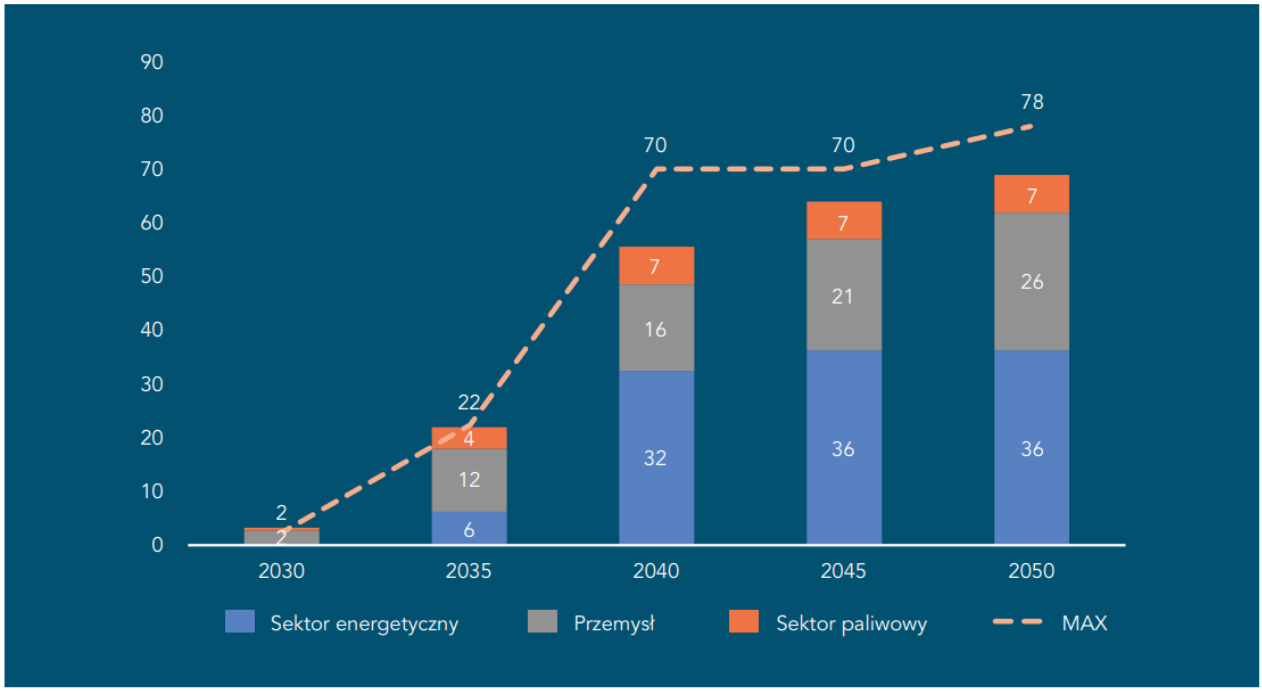
From a sectoral perspective, the strongest no-regret CM case appears in cement, where process emissions are difficult to eliminate through electrification alone. WiseEuropa explicitly indicates cement as a priority area for rapid CCS deployment, and cites international evidence that CCS could reduce annual cement-sector emissions by about 61% over the long term. A second priority is chemicals, especially ammonia and hydrogen, where capture can both lower direct emissions and support a low-emissions hydrogen market. Steel is another feasible sector, particularly where blast-furnace routes remain in operation. In contrast, CM in the power sector is feasible at scale in the model, but its role is more politically contingent because it depends on whether Poland chooses to retain coal- and gas-based generation with CCS in the transition mix.

[8] https://www.kielce.eu/pl/aktualnosci/przy-ul-olszewskiego-bedzie-zamontowana-pilotazowa-instalacja-do-pochlaniania-co2-z-powietrza.html

[9] Giers M. & Rubaszek M.(2024), *Społeczno-ekonomiczne korzyści z wdrożenia CCUS w Polsce*, WiseEuropa 2024, p. 7

The report suggests a phased integration strategy. In the 2030s, Poland should prioritize industrial clusters with concentrated emissions, especially cement, refining, chemicals and selected power assets located near future transport corridors. In parallel, the country should use depleted hydrocarbon fields as the initial storage base, because the model shows onshore storage in exhausted hydrocarbon deposits as the backbone of early deployment; only later do saline formations become more important. By 2050, domestic storage could reach about 70 $MtCO_2$/year, with an additional 8 Mt potentially exported to Norway through a pipeline, although the report treats this as an optimistic assumption.

Wykres 2. Miejsca wychwytu dwutlenku węgla w podziale na sektory (Mt/a CO_2)



Source: WiseEuropa report[10]

[10] Giers M. & Rubaszek M. (2024), *Społeczno-ekonomiczne korzyści* (…), p. 8

4. CM Deployment in Transition Regions: Economic & Social Impacts

Economy wide, the impact of CCS was assessed during the exercise conducted by WiseEuropa[11]. Overall impact on Gross Domestic Product by 2050 is generally positive, and this technology will contribute up to 2,8% to economic development of Poland. Deployment of the CCS-value chain should also positively impact the consumption (increase by 0,2) which historically has been one of the key drivers of economic development and improvement of the welfare of Polish citizens, as well as will lower pression on the inflation in this period (by 2%). In terms of employment, the model suggests the positive impact of CCS on the employment rate (increase by 1,8%) as well as on salaries (almost 5%). Regarding the timeline, the most positive "added value" of CCS deployment are expected between 2040 and 2045 in most of these indicators.

Unfortunately, the model has not broken down this data on regions what makes it difficult to present the numeric data for just transition regions. However, the report tried to estimate and break down this general data to assess how the deployment of CCS will impact key industries. By identifying the key CCS-feasible sectors in the just transition regions can help us to assess the potential of CCS in these regions . Also, limitations of the CCS impact on these regions need to be taken into account – this technology could not be best fit for installing in every industries, what is limiting its impact on the economic indicators in these regions .

Below, basing on the data of Polish Statistic Office, we gathered "CCS-feasible" sectors in the Just transition regions:

- Upper Silesia[12]: energy productions, coal mining and to some extent minerals & chemistry industries;
- Lower Silesia[13]: domination of automotive industry & electric devices' production, but to lower extent the production of metallic products, rubber and plastic products;
- Łódzkie[14]: food production, rubber and plastic products, metallic & non-metallic production

As the just transition regions also parts of the Greater and Lesser Poland are listed, however there is much lower availability of the statistical data regarding the industrial production in these areas.

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[11] *Ibidem.*, p. 11

[12] Statistical Office in Katowice (2026), *Socio-economic landscape in Śląskie in January 2026* (Sytuacja społeczno-gospodarcza województwa śląskiego w styczniu 2026), https://katowice.stat.gov.pl/opracowania-biezace/komunikaty-i-biuletyny/inne-opracowania/sytuacja-spoleczno-gospodarcza-wojewodztwa-slaskiego-w-styczniu-2026-r-,2,172.html?contrast=default

[13] Statistical Office in Wrocław (2024), Report on the socio-economic situation of Dolnośląskie Voivodship 2024, p. 146

[14] Statistical Office in Łódź (2024), Report on the socio-economic situation of Łódzkie Voivodship 2024, p. 172

Nevertheless, even this “generic” view on the industries in the JT regions can help to estimate the impact of deployment of CCS. According to the analysis of WiseEuropa[15], the minerals industry is unquestionably the biggest beneficiary of the deployment of CCS , with the added value of almost 30% (in comparison to the business-as-usual scenario) in the perspective of 2050. The other industries (chemistry, raw material, coal & energy) are placed somewhere in between almost 9% (raw materials) and 4,1% (chemistry). It needs to be however noted that the model developed by WiseEuropa covered implementation of CCS to some of the coal-fired power plants, which is currently highly unlikely. Also, it is worth noting the ongoing project of *Net Zero Poland*[16] – conducted by Silesian School of Technology, Princton University, Institute of Energy – National Research Institute and Carbon-Free Europe, where the aim of the model is to prepare the scenarios for reaching by Poland carbon neutrality by 2050.

Regarding other CM technologies, abovementioned example of city of Katowice shows that these technologies can be also used to serve the public health of the inhabitants of Polish cities, however this potential has not been thoroughly assessed yet in Poland.

5. Public Perception and Stakeholder Engagement

According to survey, a total of 68% of Poles have heard of carbon management technologies[17]. Acceptance varies by age: respondents aged 50–59 (57%) and 60+ (58%) show the highest acceptance, while the youngest group records the lowest acceptance rate (46%) and the highest indifference (41% vs. 23% for 50–59 and 26% for 60+)[18]. Diving deeper in the results of the survey show that the support varies depending on the specific technologies. Whereas the CCU & CCS is acceptable for more than half of respondent (respectively 65% and 58%) the acceptance for direct air captures falls to 50%[19]. Regionally, Podlaskie shows the lowest acceptance (44.8%) and the highest indifference (41.4%), while Łódzkie (63.2%) and Lubuskie (62.5%) record the most positive attitudes[20].

[15] Giers M. & Rubaszek M. (2024), *Społeczno-ekonomiczne korzyści* (…), p. 13

[16] https://ien.com.pl/baza-wiedzy/aktualnosci/net-zero-poland-droga-do-neutralnosci-klimatycznej-polski-do-2050-roku

[17] Giers M. (2026), National Study on Public Perception on Carbon Management in Poland. WiseEuropa, p.25

[18] *Ibidem.*

[19] *Ibidem.,* p. 25 - 26

[20] *Ibidem.,* p. 38 - 40

Support for CO2 underground storage, WiseEuropa report[21]

Findings for Just Transition regions and the southern voivodeships are specific and limited to the reported patterns. Łódzkie records the highest regional acceptance at 63.2%. Among the four southern voivodeships the study finds no significant overall difference between the south and the rest of the country compared with 2024, but the internal distribution remains consistent: lower support in Opolskie, Śląskie and Podkarpackie, and relatively higher support in Małopolska.

6. Deployment Pathway & Timeline

The Ministry of Climate & Environment is working on the long-term sectoral strategy for CCS. The working group, consisting of the representatives of the crucial industries (steel, cement, O&G), academia and the third sector, in the recent months have contributed to works on document providing the public administration with the experience-driven know how on the functioning of the future market. Moreover, in December 2025 the Ministry has also commissioned the economic analysis in the consultant aimed at assessing the potential of the CCS and providing data-driven insights on how to build the future system in Poland. All these activities have helped Poland to move forward with the strategy, however the final assessment of the strategy should be done once it is officially published

Also in recent strategic documents, the representatives of Council of Ministers have included the CCS in their long term development visions (in such documents as draft National Energy and Climate Plan, or Development Plan by 2035). The latter suggests that by the 2030 it is expected to build at least 8 CCS installations in Poland by 2030 and this number supposes to raise to 15 in 2035[22], however achievement of these goals would require lifting the barriers mentioned earlier in this report.

[21] *Ibidem.*, p. 38

[22] Ministry of Funds and Regional Development, Annex 2 to the Polish Development Strategy by 2035, p. 4

Despite progress, it is still unclear when exactly the regulatory frameworks for CCS in Poland will be established. The lack of detailed regulation on the organization of the market (its architecture, roles of the market participants) as well as support schemes hinder development of the market and makes it hard to predict the timeframe for full scale CCS deployment.

POLICY RECOMMENDATONS:

- Adoption of the comprehensive strategy for CCS development in 2026. These document should set the clear milestones and timeline for implementation of the regulatory and financial framework for the CCS in Poland. All relevant Ministries should continue to work on this document in close cooperation with industry, academia and third sector.
- Put in the fast track the legislation for the CCS. The comprehensive framework, implementing the CCS Directive and the NZIA should release to the public consultations as soon as possible to ensure that the lack of frameworks is not jeopardizing the business plans of the major emitters.
- The public awareness raising campaigns have to be released as soon as possible. The low level of awareness of the CCS and CM options constitutes the major risk for these technologies in the future.
- The local communities and cities should be encourage to follow the Kielce in deployment of the CM option. The de-risking tools for the local authorities and companies should be put in place.

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