Enabling Positive Tipping Points towards clean-energy transitions in Coal and Carbon Intensive Regions

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D5.2. Seeking opportunities to enable positive tipping points in the coal mining region.

Case Study Upper Silesia, Poland

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Preface

TIPPING+ will provide an empirical in-depth social science understanding of fundamental changes in sociodemographic, geographical, psychological, cultural, political, and economic patterns which give rise to Social-Ecological Tipping Points (SETPs), both positive and negative in relation to socio-energy regional systems. Such empirical and theoretical insights will shed new light on the interdependencies between changes in regional socio-cultural structures and the technological, regulatory and investment-related requirements for embracing (or failing to embrace) low-carbon, clean-energy and competitive development pathways in selected coal and carbon-intensive case study regions (CCIRs). The overall goal is to understand why and under which conditions a given social-ecological regional system heavily dependent on coal and carbon-intensive activities may flip into a low-carbon, clean energy development trajectory – or on the contrary may fall into an opposite trajectory with all its negative implications. Towards this goal, main focus of TIPPING+ is the participatory co-production of knowledge on the driving forces and deliberate tipping interventions leading to the emergence of positive tipping points toward clean energy transitions in European CCIRs.

Who We Are

	Participant Name	Short Name	Country	Logo
1	Global Climate Forum e.V.	GCF	DE	
2	Delft University of Technology	TUD	NL	
3	CIRPA - Università Degli Studi di Roma La Sapienza	UR	IT	
4	Institute for Advanced Sustainability Studies e.V.	IASS	DE	
5	Paris School of Economics	EEP PSE	FR	
6	Nordland Research Institute	NRI	NO	
7	Universitaet Graz	UG	AT	
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10	Westport Consulting	WPC	BA	
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12	Institute for Structural Research	IBS	PL	
13	Aalborg Universitet	AAU	DK	
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15	Eco-union	Eco-union	ES	
	International Partners			
16	University of Greenland	Ilisimatusarfik	GL	
17	Innolab Space Canada – Center of Urban Transitions	Innolab Space	CA	

Executive Summary

Attempts to implement a successful energy transition in carbon-intensive regions require a shift in the overall development trajectory and fundamental changes in economic and social structure. In this case study, we examine the development of the region of Upper Silesia, Poland, and analyse the geographic, cultural, political, and economic trends that have shaped stakeholders' narratives on the hard coal mining transition in the country between 1990 and 2020. Following (Roberts, 2017) we define the term *narratives* as the explanatory patterns that integrate various observations, facts, experiences, and understanding of the socio-economic system. Institutions representing similar narratives provide arguments that may either slow down or facilitate changes to the incumbent system. Understanding these narratives is crucial in designing public policies that support the transition process.

The aim of this case study is to identify factors that lead to a change in the narrative around hard coal in Poland and further social acceptance of the planned coal phase-out date. We use Upper Silesia as an example as it is the largest coal mining region in the European Union, and refer to the concept of tipping points in our work. In this paper, we aim to answer two research questions:

1) What narratives are promoted by the main energy transition stakeholders in Upper Silesia?
2) Are the observed changes a tipping point for the energy transition in Poland?

We use the following methods to provide our answers:

- analyses of statistical data,
- reviews of national, regional, and local strategic documents,
- analyses of the political discourse on hard coal,
- interviews with key stakeholders of the transformation process.

We take a closer look at the mainstream and alternative narratives in Upper Silesia. The mainstream narrative outlines the views represented by stakeholders directly affected in the energy transition: coal and mining-related companies and their employees, trade unions, and municipalities that are heavily dependent on coal. This narrative can be divided into three strands which either emphasize the role of coal in terms of Poland's national energy security, address local labour market struggles, or highlight the ensuing income losses likely to affect coal-dependent municipalities. These viewpoints partially overlap, but all indicate the importance of coal in energy and the regional socio-economic system.

While most stakeholders have (partially) accepted the general need for a coal phase-out, two alternative narratives seem to have emerged regarding the future of Upper Silesia. Both emphasize the need to maintain the region's industrial economic profile. On the one hand there is the on-stream narrative, which supports the mainstream argument for a gradual and slow transition while maintaining hard coal exploitation and usage in the gasification process and carbo-chemical installations. On the other, there are off-stream stakeholders who advocate for a swifter abandonment of coal mining, instead favouring the creation of national supply chains for industries that support the energy transition and a circular economy.

Our work demonstrates how mainstream narratives, and thus general attitudes towards the transition, have shifted. This was not a sudden change, but a slow and gradual process

shaped by the internal dynamics of stakeholder interactions and external events. The transition pathway will result from the individual interpretation of what constitutes a just transition among decisive stakeholders, the influence of alternative narratives, and incrementally taken tipping interventions.

Case study results show a window of opportunity to change the incumbent energy system development pathway. However, at this stage, it is difficult to say whether the socio-economic structure shift determines the tipping point establishment in the transition process in Upper Silesia. In terms of the tipping point concept, the three following lessons are to be learned from other coal regions.

First, the coal phase-out process in Upper Silesia resembles a model already seen in another historic European industrial region, the Ruhr Valley, where discussions resembled a tug-of-war between opposing 'industrial' and 'green' narratives. In the case of Poland, both alternative narratives exist and often run across deep political divisions. The debate on mining tends to intensify at the breakthrough points in industry development.

Second, despite the economic diversification of Upper Silesia, it is not possible to judge whether the agreed coal phase-out path will be permanent and irreversible. Specific events should be interpreted as tipping interventions or triggers. Moreover, the transition trajectory in Poland has resulted from a conglomerate of micro-decisions taken in an attempt to adapt to the requirements of global and European climate policy, rather than being a policy-deliberated path of energy transition or grassroots initiatives. Thus, credible conclusions about achieving a tipping point should be formulated ex-post, not as an assessment of current or anticipated changes.

Third, due to the interactions between narratives and public policy, ensuring the irreversibility of change is a political challenge. Geopolitical uncertainty and the time-consuming nature of a comprehensive reconstruction of socio-economic structures make it challenging to undertake radical changes. This leads to a conflict in terms of the understanding of the terms 'climate justice' and 'just transition.' Thus, the final development and pace of the energy transition will result from the interpretation of several dimensions of justice by decision-makers, formed by various narratives and the goals that policymakers want to achieve.

Upper Silesia – main results

- **Mining is a declining industry in the regional labour market**. Since 1990, mining employment in Poland has decreased by 300,000, and more than 40 mines have been closed. In 2020, there were 74,500 miners in Upper Silesia (3% of the region's people of working age). The region's economic structure was more diversified and the labour market outlook for the future transition was much better than in the 1990s and early 2000s. Meanwhile, mining-related industries provided almost 51,000 jobs, especially in manufacturing and construction. Socio-economic trends foster changes in the economic structure of Upper Silesia. An increase in professional activity, lower unemployment rates, and a relatively high level of education improve regional economic resiliency and will help replace the declining coal industry with more modern production and services.
- **Although coal is losing its indispensable status, it is still crucial in Poland's energy mix**. Over the years, the discourse around coal has been negative and the political significance of the topic has waned. Moreover, small institutional shifts such as empowering regions as policymakers (2007), establishing the Ministry of Climate

(2017), and negotiating the coal mine closure schedule until 2049 (2020), have all contributed to weakening the *industry's* narrative. Since the Russian aggression on Ukraine, coal seems to have returned in good graces as a secure, domestically produced energy source. Still, the discourse on energy independence indicates energy security as a diversified technologies mix (nuclear, renewable) rather than a high national reliance on coal, especially in household heating.

- **The coal exit pathway in Poland remains slow but stable.** The projected share of coal in energy production and use is systematically decreasing. More than 40% of currently employed miners will retire by 2030. Shortages of workers in other industries will accompany the surplus of miners, and considering current employment and demographic forecasts, unemployment should not be an issue. The crucial points to address along with the coal phase-out are:
  - replacing coal with other energy sources during the coal exit process,
  - providing stable and well-paid jobs in coal regions (not only Upper Silesia) which will replace mining and mining-related jobs and ensure the dignity of former mining or mining-related workers,
  - avoiding fuelling negative attitudes towards energy and climate policies.

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1. Introduction

Both the development of alternative energy sources and technologies, and a substantial reduction in the use of fossil fuels are required for a successful large-scale decarbonisation. Therefore, the energy transition becomes a disruptive process aimed at the phase-out of specific technologies (Rogge & Johnstone, 2017) and a shift in policies, consumer habits, scientific knowledge, cultural categories, and financial flows (Turnheim & Geels, 2013). Theoretical studies of technological transitions identify the destabilisation of incumbent systems equally as crucial as developing new ones to replace them (Roberts, 2017). As a result, decarbonisation affects carbon-intensive industries and imposes multidimensional changes in the entire economic ecosystem.

The path that results in a fundamental change in the economic structure can be analysed following the concept of tipping points. According to Milkoreit et al. (2018), a tipping point can be understood as a critical threshold crossed when a small quantitative change results in fundamental, non-linear qualitative changes in the configuration and dynamics of a given system. When trying to identify potential or actual positive tipping points in the socio-ecological system of reference, Tàbara et al. (2022a), argue that three key moments need to be considered: (1) the building of transformative conditions and capacities for systemic and appropriate, deliberate change, (2) a tipping event, precipitating the system towards a desirable trajectory or basin of attraction, and (3) qualitative, irreversible, and structural effects derived from such transformation.

The system shift may pose opportunities for some stakeholders while proving to be a challenge for others, particularly those highly dependent on the existing regime. Stakeholder attitudes towards the transition are expressed through narratives defined as "explanatory schemes integrating different observations, facts, experiences, and understandings of a socio-technical regime" (Roberts, 2017). Moreover, actors presenting similar storylines can influence the pace and course of the transition as they carry agential power and transformative capacities. A shift in narrative may therefore indicate the emergence of a window of opportunity to introduce a system-wide change.

In this case study, we seek to explain the context and dominant narrations of the coal mining transformation pathway in Upper Silesia. We examine socio-economic trends since the beginning of the coal transformation in the early 1990s. We strive to address the relationships between structural change in the regional economy and the development of transition narratives. Our aim is to identify the factors that lead to change in the narrative around hard coal in Poland and the social acceptance of the planned coal phase-out date. We answer two research questions:

1) What narratives are promoted by the main energy transition stakeholders in Upper Silesia?
2) Are the observed changes a tipping point for the energy transition in Poland?

The case study is structured as follows. Section 2 explains the process of identifying stakeholder groups. Our goal was to recognise attitudes towards regional structural change and indicate potentially converging interests in the transition. In Section 3, we seek to explain the economic and socio-political context of the coal mining transformation in Upper Silesia. We examine population and labour market trends, as well as the political and cultural environment of the coal phase-out since its start in the early 1990s. Thus, we

characterise the mega-trends accompanying mainstream narratives that supported the incumbent technology. We also strive to identify potential narrative shifts and interventions that lead to systemic change. Section 4 analyses the mainstream and alternative narratives, presenting their main arguments and indicating which stakeholders represent particular storylines. Section 5 presents our conclusion on potential tipping points in the regional development pathway.

2. Research methods and tools applied

We followed two stages to identify the relationships between regional structural change and the development of transition narratives. First, we analysed quantitative data to evaluate the economic, political, and cultural trends from publicly available datasets. We also systematically reviewed 54 local development strategies from those municipalities in Upper Silesia where mining activities were carried out (as of October 2020). We focused on the role of coal mining, particularly enterprise, as well as the scale of mining activities in past, present and future regional development trajectory. Additionally, we examined the provisions of national and regional strategic documents, e.g. the "National Energy Policy until 2040" and the "Territorial Just Transition Plan for the Silesian Voivodeship", enacted during the second quarter of 2021.

Second, we conducted a participant observation study via a series of seven consultation seminars in each subregion devoted to the Territorial Just Transition Plan draft, totalling 449 participants. This helped us identify stakeholders as well as map their positions and power relations within the discussion on the coal phase-out process. At the same time, we conducted a dozen in-depth individual interviews with various stakeholders (labour market institutions, trade unions, economic self-governments, miners, NGOs, and representatives from mining municipalities, regional authorities, and business environment institutions). Our sample was purposive as we wanted to achieve a span that would take into account all types of stakeholders, especially those playing active roles in the debate. Then, we put particular emphasis on labour market offices – technocratic institutions with a broad perspective on the short- and long-term transition effects on regional and local economies (total sample on Silesian mining area). Our research process coincided with the most critical strategic policy decisions regarding the development of the Upper Silesian region and the future of the Polish energy sector (Figure 1).

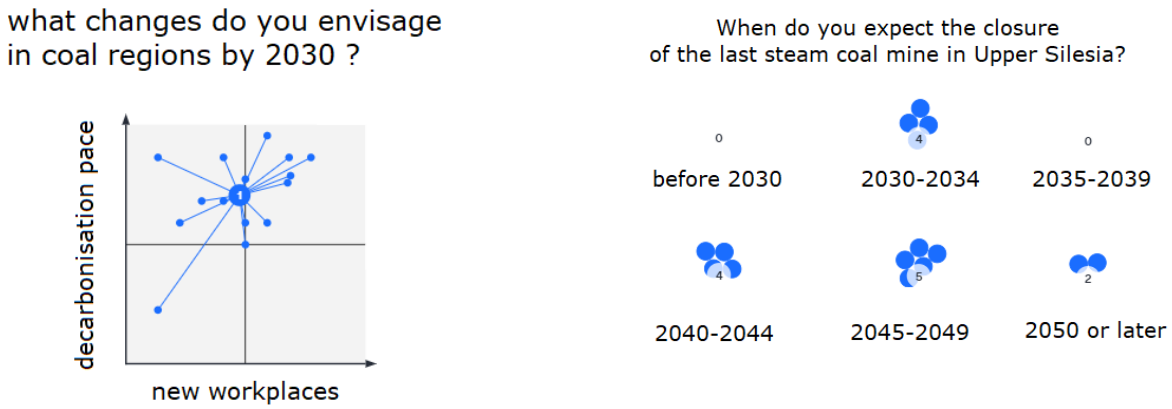
Figure 1. Research process and public policy background

Source: Own elaboration

This procedure facilitated the reconstruction of stakeholder group narratives and views on future regional development projections beyond coal. Thanks to this, we were able to confront and verify the results of strategic documents with official positions from the institutions engaged in the discussion based on both public and private statements.

In April 2021 (23.04.2021), we conducted a dedicated co-creation project workshop devoted to regional labour market challenges in the context of decarbonisation, with the active engagement of 35 public, private, and NGO sector representatives. The online workshop served to discuss the main challenges for regional development trajectories in the context of the so-called social agreement (signed 28.05.2021), present the first project results in terms of predicted employment pathways, and consider other essential research dilemmas from the perspective of the region (Figure 2).

Figure 2. Examples of knowledge co-production during the workshop



Note: First question: (1) What changes do you expect in coal regions until 2030? (2) When do you expect the closure of the last steam coal mine in Upper Silesia?

Source: Workshop exercises using menti.com

To sum up, our engagement in the Territorial Just Transition Plan (TJTP) covered three roles: active participant (invited to closed workshops devoted to the JTF plan; as well as reviewers of the TJTP project plan), observer (during workshops dedicated to regional stakeholders) and knowledge contributor (researcher, interviewer, workshop organiser, and discussion moderator).

We supplemented the qualitative feedback collected in 2020 and 2021 with documents and other publications devoted to energy policy narrations (Biedenkopf, 2021; Krzywda et al., 2021; Mrozowska et al., 2021; Nowakowska et al., 2021) published during the data collection period. Our additional qualitative sources included transcripts of meetings of the Just Transition Governmental Subcommittee on the plans and policy programmes regarding the regional consequences of a coal phase-out. Other sources used were podcasts and interviews with impactful regional stakeholders. Our analysis included the mutual reading of transcripts of interviews with a focus on such categories as 'decarbonisation,' 'coal phase-out,' 'social agreement,' and 'tipping point', with particular attention being paid to the norms and values understood behind just transition, as well as specific actions that would have to be performed.

Reflecting on the case, we identified several methodological limitations in our approach.

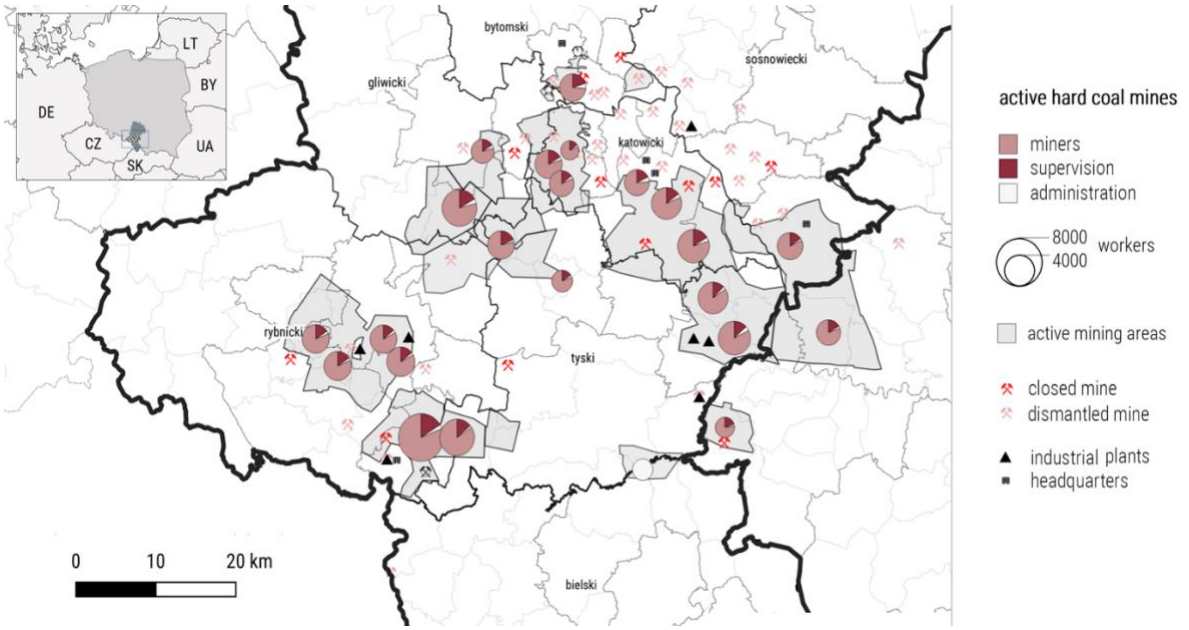
Firstly, the fact that it was conducted during the COVID-19 pandemic between 2020 – 2021. We did not include further implications regarding the consequences of Russia's invasion of Ukraine, which provided additional arguments for both the transformation's supporters and opponents. Based on our initial observations, the war in Ukraine put energy security at the centre of Polish policy. However, until the case study submission, regional and sectoral development pathways agreed upon by the government and miners' organizations were the same as before. Secondly, we placed a particular emphasis on specific institutions (e.g. labour offices – which we found underrepresented in coal transition studies), so our view shows slight bias towards labour market and economic issues. We tried to balance the case with evidence from existing documents and insights from other stakeholder groups through several iterations.

3. The landscape behind the transition narratives in Upper Silesia

3.1 Population and labour market

Upper Silesia is Poland's most urbanised and second most populous region. It covers an area of 12,333 km^2 (nearly 4% of the country's territory) and is inhabited by 4.5 million people (almost 12% of the Polish population)[1]. Most of its inhabitants (76.5%) live in cities, and the region has the highest population density in the country (364 people per km^2 in 2020, compared to the national average of 123). The capital is the Katowice conurbation, which developed around mining and other traditional industry branches. Upper Silesia concentrates 90% of domestic hard coal extraction and the vast majority (89%) of total employment in coal mining (Map 1), so phasing out coal production in the region is a core component of the decarbonisation process in Poland.

Map 1. The spatial distribution of mining employees in Upper Silesia



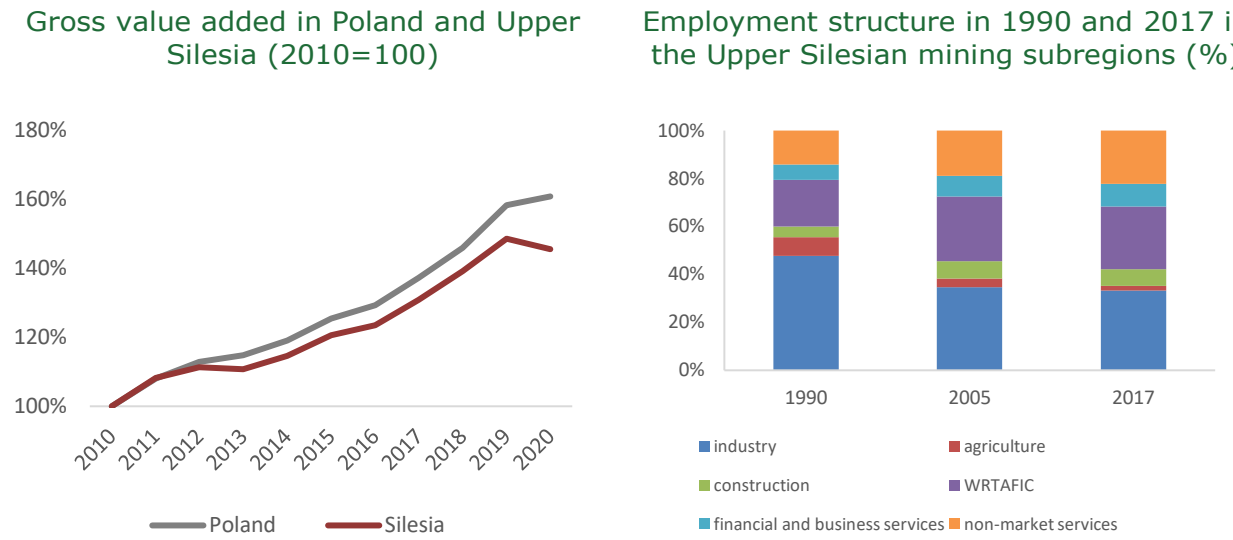
Source: Own elaboration based on official data obtained from mining companies (Sokołowski et al., 2022)

Upper Silesia is among the country's most developed regions, ranking fourth in terms of GDP per capita (2019). The region has a solid industrial economic base, with 41% of value-added generated by industry and construction. Its share in domestic exports is also the largest (14.5%), due to its crucial role in supplying the automotive sector. The most developed regional industries are manufacturing (metallurgy, automotive, engineering, chemical, building materials, and textile), mining, and energy production. Nevertheless, the share of the region's added value is decreasing. The GVA growth rate in the region is lower than the national average. Over the last decade (between 2010 and 2020), it has increased

[1] The present regional boundaries were established in 1999.

by 45.5%, being second from last among the country's 16 voivodships and over 15 pp. lower than the national average (60.9%) (Figure 3) – an indicator that Upper Silesia has been gradually losing its strong economic position for some time now.

Figure 3. Gross value added (left graph) and employment structure changes (right graph) during the transition in Upper Silesia



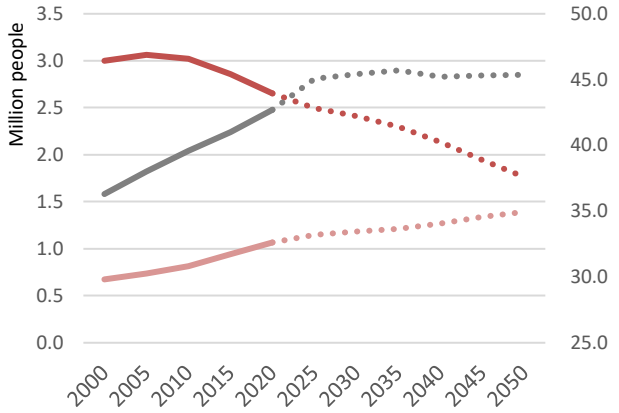
Source: Own elaboration based on Statistics Poland (left) and ERD Eurostat (right)

The industrial heritage of Upper Silesia and the need to intensify the region's economic transition have given rise to a series of economic, environmental, and social challenges. The region's population is constantly decreasing (by 5.6% from 2000 to 2020), and according to forecasts, it will fall by over 18% (i.e. by more than 811,000 people) by 2050 compared to 2020 (Figure 4a). This value, analysed in absolute terms, is the highest among Poland's regions (Urząd Marszałkowski Województwa Śląskiego, 2022). These adverse demographic trends result from migration and an ageing population. Upper Silesia is a region where a negative natural increment is maintained, and the median age is rising constantly; it is expected to increase from 42.7 in 2020 to 45.5 in 2050.

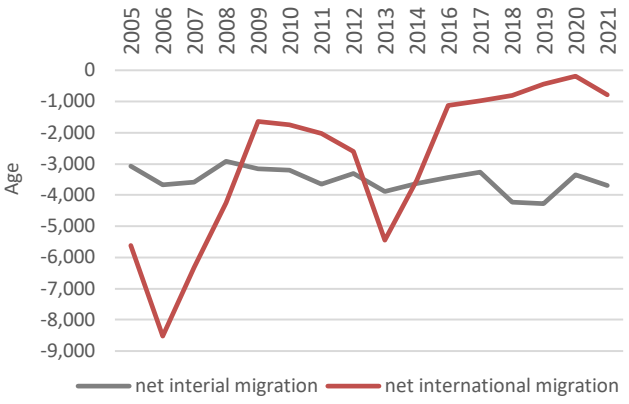
Migratory outflow compounds the population decline. The cumulative net migration of people of working-age (this group constitutes the vast majority of migrants) who decided to migrate abroad for permanent residence amounted to over 45,000 between 2005 and 2020 (Figures 4b and c). However, this negative migration balance has started decreasing as of 2013, and the balance has been positive for people of pre-working age since 2016. There is also a strong tendency to move from urban areas and settle in rural ones (Figure 4d); however, this pace of suburbanisation is less intense than in other large Polish urban areas. This may be the result of a greater distance to urban areas, or may be affected by overall settlement attractiveness (Krzysztofik et al., 2017). Over the past 15 years (since 2005), the population living in rural areas has increased by almost 56,000 people. Preventing depopulation and limiting urban sprawl are key factors to consider in this area in the future.

Figure 4. The demographic situation in Upper Silesia

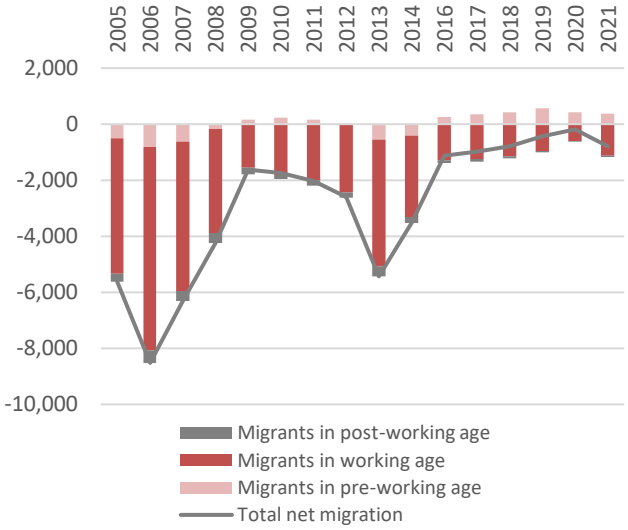
a) Population forecast until 2050



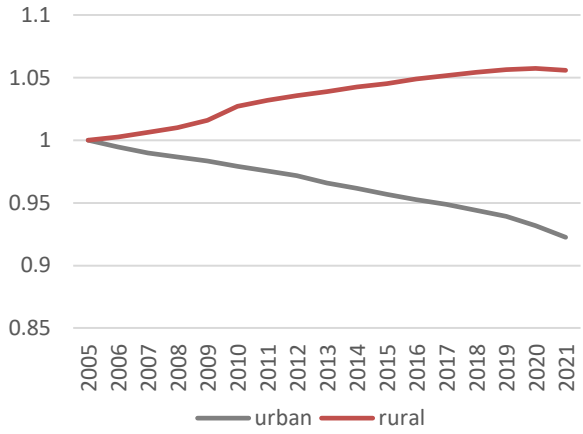
b) Net migration



c) Net international migration



d) Changes in populations living in urban and rural areas

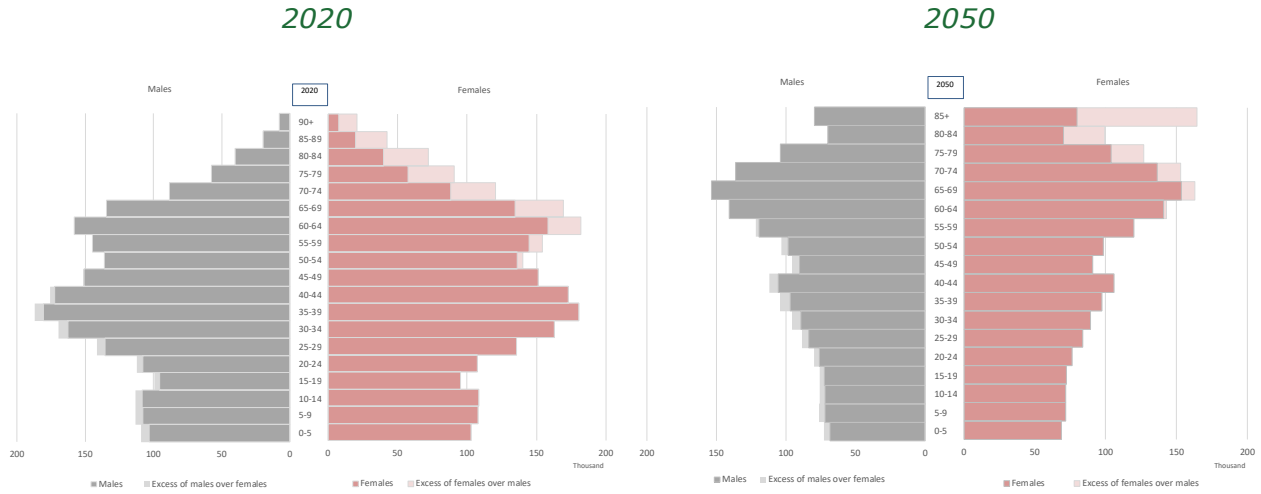


Source: Own calculation based on data from Statistics Poland

The outflow of human capital, especially of mobile people (in terms of age and competences), is an unfavourable issue that has been observed in the region for a long time. Moreover, it is only compensated to a certain extent by an influx of workers from Eastern Europe and Asia. The changes in population structure (that is, an increasing share of people of post-productive age coupled with a diminishing share of people of pre-productive age, see Figure 5) pose a challenge for transforming the structure of the economy and maintaining growth dynamics, in particular for the development of modern areas of production and services. On the other hand, the age structure of the region's population requires access to social services and care for dependent persons. As the median age increases, the organisation of social assistance to support families in their care of dependent persons becomes a social policy goal – not only to ensure a decent standard of living, but also to increase residents' social and professional activity. Moreover, such demand also creates drivers for deploying new services that have not been intensively

developed, such as lifelong learning, a richer cultural and tourist offer, and rehabilitation services, as well as improving public transport and urban accessibility.

Figure 5. Population pyramid in Upper Silesia



Source: Own calculation based on data from Statistics Poland

The development of new branches and a shift in regional economic structure are natural consequences and critical elements for a successful transition. These changes will affect the composition of industries and will shape the labour market. With a domination of large employers such as industrial plants; particularly in the mining, energy and steel sectors, the labour market has built a certain specificity for the transition process. In 2021, the number of entities operating in Upper Silesia accounted for 11.5% of all Polish enterprises.

Compared to other regions, the Upper Silesian labour market model is strongly based on employment in medium and large enterprises. However, an increase in the number of economic entities, which amounted to 15% in the last decade, resulted almost exclusively from a growing number of micro entrepreneurships (17%)[2]. And even though the region's level of entrepreneurship is consistently lower than the national average, the relative number of entities in Upper Silesia is increasing. Such a trend is positive in light of the anticipated changes since many companies that will be transformed are significant regional employers. Job creation in entities that are highly adaptable to changing economic circumstances is desirable at this time, especially if these changes go hand-in-hand with at least the same working conditions (in terms of wages, type of employment, etc.).

3.2 Socio-political landscape

Upper Silesia possesses a robust regional identity, with a distinct culture and even its own language. Compared to the rest of Poland, there are five factors that determine the region's values and cultural functions: cultural distinctiveness, working ethos, egalitarian approach, high level of religiosity, and solid familial relationships (Błaszczak-Wacławik et al., 1990). There are many historical and ethnographic works on rich and lively Silesian traditions,

[2] Meanwhile, the total number of small (10-49), medium (50-249) and large (250 or more employees) companies decreased by over 4.9 thousand (almost 19%).

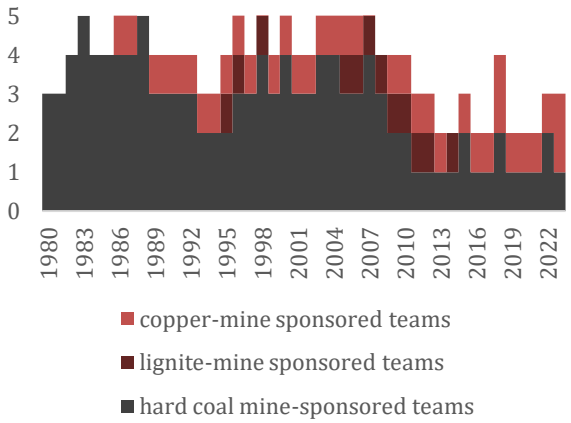
celebrations, and cuisine (e.g. Wódz et al., 2011). Heavy industry, especially coal mining and the metallurgic sector, were always at the heart of inhabitants' regional identity. Upper Silesia's urban landscape, spotted with mines, shafts, and trains, was a common feature of many Polish movies, sports club names, classic literary works, and popular paintings.

Through the years, the central role played by coal mining in Silesian identity has slowly been diminishing. Socialist rule positioned Upper Silesia and its strategic reserves of 'black gold' as a bedrock of the Polish state (Kuchler & Bridge, 2018). Children in the 1970s and 1980s were educated in line with this mainstream narrative – not only in the region, but nationwide (Figure 6). Even during the challenging transformation period, the occupational prestige of being a miner increased from 68 points in 1991 to 77 in 2008 (Domanski et al., 2010). And mining traditions remain important, to some extent (e.g. the celebration of St. Barbara's day, mining orchestras, or football club sponsorships, etc. See Figure 7). Coal mining is still a source of decent and stable work with a 50-year retirement threshold (or 25 years of work experience, with at least 15 underground), which is a major asset of this profession, even when we consider all dangers and health problems it entails. However, due to harsh working conditions and remuneration adjustments, earnings in the mining industry are not as competitive as they were in the past.

Figure 6. Children wearing hats resembling miner's uniforms during a school lesson

Source: Private domestic archives (photo from the 1980s, not taken in Upper Silesia)

Figure 7. Football teams with mining association playing in Poland's top professional football league



Source: Own elaboration based on Polska-Pilka and Wikipedia

Despite the lessening social role of the industry, mining-related trade unions remain strong in Upper Silesia. In fact, coal mining is the most unionized sector in Poland. During many years of permanent negotiations, mining trade unions obtained exceptional occupation privileges, smartly playing their narrative cards in their discussions with the government; including on energy security, and considering their robust potential for causing 'social unrest' and the possibility of strikes – something no ruling party wanted to face (Zientara, 2009). In 2020, mining trade unions used existing institutional channels and their symbolic power to successfully negotiate an agreement on a coal phase-out until 2049 with the ruling government (Box 1). This dialogue was triggered by mounting pressure to diminish the share of coal in the country's energy mix, a goal reflected in the assumptions of the Energy Policy of Poland. Given the adoption of such a policy course, trade unions sought to guarantee a long horizon and structured approach to the phase-out to avoid the rapid

closures of mines and subsequent severe pressure on labour markets and local economies. The agreement enforced a long-term phase-out which was considered as a very moderate pathway, even in the opinion of mining institution representatives (Malec, 2022). Moreover, even though the most powerful trade union (NSZZ Solidarność) is associated with the ruling Law and Justice party, trade union members heavily criticized the ruling camp for their climate and energy policy shift (Kubin, 2021). The harshest critique was directed at Polish Prime Minister Mateusz Morawiecki, who was elected from the Silesian constituency, and, according to the opinion of trade unions, chose to ignore Silesian coal mining as he established a pan-European climate and energy policy course.

Box 1. Agreement between mining trade unions and the government regarding a hard coal phase-out

In May 2021, the government signed a so-called social agreement with mining trade unions. The agreement outlines a plan to close down the sector in the next 30 years and transform the region, and establishes:

- financing mechanism for existing state-led hard coal mining companies,
- set of industrial investments in the area of Silesia (including IGCC technologies, CO_2 sequestration, low-carbon coal fuel, methanol gasification, hydrogen production from coking gas, coal-to-SNG installations),
- Silesian Transformation Fund – establishing a dedicated fund from the state budget to finance various investments in post-mining areas,
- mine closure schedule scenario until 2049 for state-led companies: PGG, TWD, and LW Bogdanka
- employment guarantees for employees (Frankowski et al., 2021),
- mining severance packages

The most major aspects of the social agreement were included in the Energy Policy of Poland. According to the social agreement, two coal mines (Wujek and Pokój) were to be merged with existing ones, which occurred in 2021. The closure of another mine, Bolesław Śmiały in Mikołów, is planned for 2028, giving the region a seven-year perspective to prepare for this.

Despite the enduring, strongly influential role of mining trade unions in Polish politics, hard coal is becoming less important in state policy. Over the past two decades, coal was rarely mentioned in parliamentary debates[3] and remained an issue for local MPs rather than ministers or even the secretary of state (Figures 8 and 10). The most important government representative responsible for mining is the undersecretary of state. This is in stark contrast to a Polish government under socialist rule, when there was a role for a minister who was solely responsible for coal mining. During the transformation period, the discourse on coal was filled with negative sentiment attributed to anxiety and trouble (law, colliery, condition, concern, situation, problem, etc.), with many words emphasizing the industry's economic aspects (e.g. restructuring; Figure 9). Since 2020, the discourse around hard coal has evolved, with more positive sentiments (change, work, activity, etc.), which can be attributed to the elements of a just transition. This narrative change was accompanied by an emphasis on the positive aspects of a coal phase-out; the main arguments being:

1) an investment impulse to redirect the economies of mining sub-regions onto a path of green, smart and digital growth;
2) the reclamation and revitalization of brownfields;
3) improving air quality and living conditions.

[3] Inspired by the German study on coal discourse in the parliament (Müller-Hansen et al., 2021), we did a similar analysis for Poland.

This narrative emerged as a consequence of social dialogue and the inclusion of a broad group of stakeholders, including those who had been underrepresented or ignored in the past: NGOs, external experts, and local communities. This narrative shift, clearly visible in political discussions, should be treated as a tipping event. However, Russia's invasion of Ukraine in 2022 and the resulting embargo on fossil fuels from Russia had now shifted the main focus of discussions onto acquiring much needed supplies of imported coal for domestic heating ahead of an advancing winter season. This was now at the issue topping the list of current political challenges.

Figure 8. Sentiments regarding hard coal in parliamentary discourse

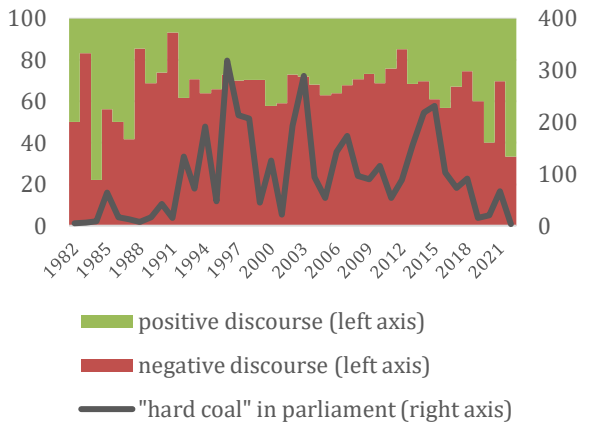
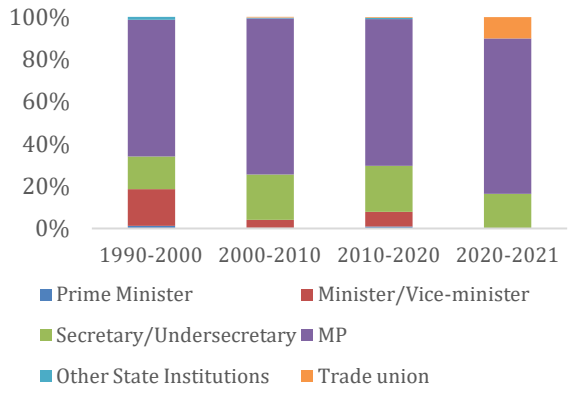


Figure 9. 100 most popular words in Polish parliamentary discourse around hard coal

Source: Own elaboration based on Polish Parliamentary Corpus and (Riegel et al., 2015)

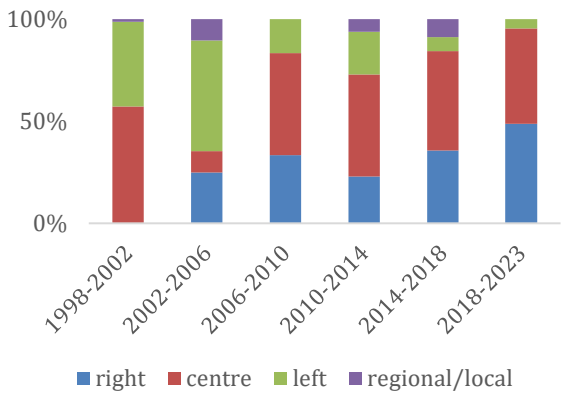
Upper Silesia is a traditional Polish swinging state. Formally located at the intersection of three historical regions, its inhabitants are similarly divided between right/left political views and liberal/conservative values (Trembaczowski, 2021). However, the closer they live to a mine, the stronger their attitudes towards more traditional values and regional identity (Map 2 and 3). During regional elections in the 2010s, the Movement of Silesian Autonomy (which was established in Rybnik 30 years ago) received three seats in the regional parliament (Baranyai & Lux, 2014). Such a result enabled them to join the ruling centre-liberal coalition, influence cultural policy, and develop investments seen as strategically important in terms of regional identity (e.g. The Silesian Museum). In 2022, the regional authority was represented by the right-wing Law and Justice marshal, as one of the candidates from the centre party (.Nowoczesna) decided to take the position of vice-marshal and awarded one deciding vote to this party (Figure 11).

Figure 10. Agency and position of people speaking about hard coal in Polish parliament



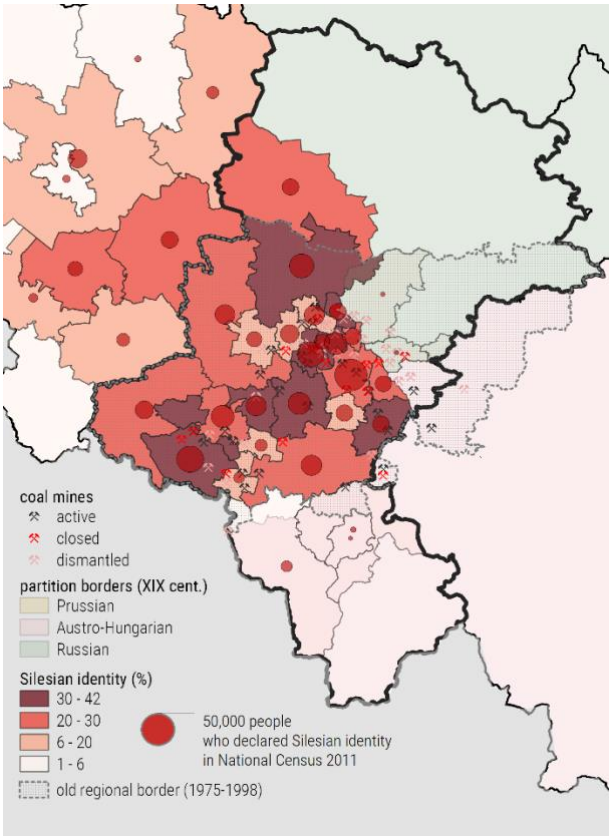
Source: Own elaboration based on data from the Polish Parliamentary Corpus.

Figure 11. Seats in regional parliament broken into political views



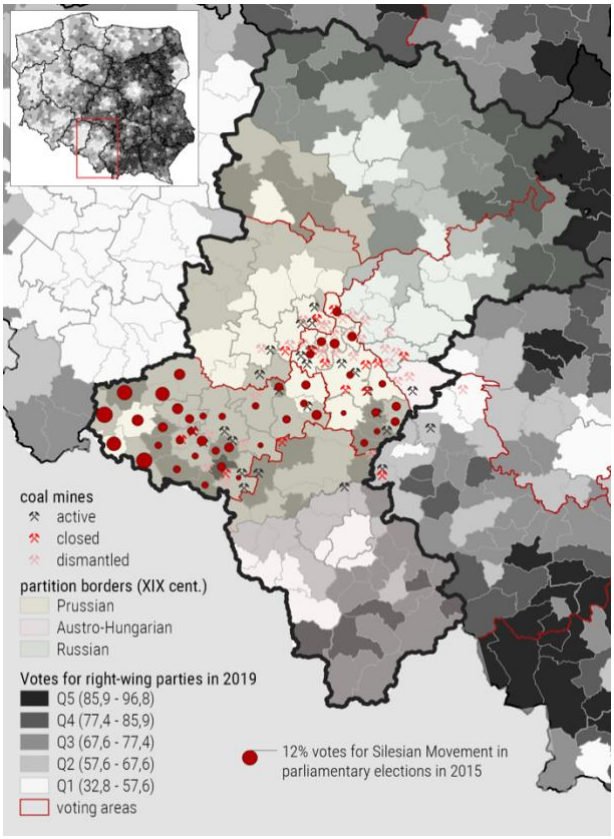
Source: Own elaboration based on National Electoral Results.

Map 2. Declaration of Silesian identity in National Census 2011



Source: Own elaboration based on Statistics Poland

Map 3. Right-wing parties' electoral results in Silesia in 2019



Source: Own elaboration based on National Electoral Results 2019. Right-wing: Law and Justice, Konfederacja, PSL.

Although the votes of miners and their families do not guarantee an election win, right-wing party leaders use populist arguments to their advantage and capitalize on general mining community bias and inclinations. Before every election, prominent Law and Justice party leaders visit mining towns and criticize energy and climate policies. Polish President Andrzej Duda said during his campaign that he "won't let anyone murder Polish mining" (Żuk & Szulecki, 2020) and mentioned that "Polish supplies will last for another 200 years" (Brauers & Oei, 2020). Even liberally oriented party leaders such as Donald Tusk celebrated St Barbara's day, promising to preserve "energy independence." This shows that politicians, regardless of their political affiliation, place a high value in the symbolic voting power of Polish miners and hold them to a higher esteem than other occupational groups. Paradoxically, despite making fierce declarations to the contrary, the right-wing Law and Justice government ended up decreasing the importance of coal mining, adopted the first Polish Energy Policy, declared coal phase-out dates for domestic heating, and negotiated the agreement on a final coal phase-out in 2049.

Many Silesian politicians have proposed transformative solutions at a European level, with Polish MEPs – such as Jan Olbrycht (MEP and author of metropolitan investments) or Jerzy Buzek (former PM responsible for mining reforms in 1998 – 2002) – having contributed to the EU's regional and urban policy. Jerzy Buzek happens to be a politician from Gliwice, a city that underwent a successful transformation from heavy industry to IT and modern services. He was one of the architects of the Territorial Just Transition Plan idea for coal and carbon-intensive regions. In 2019, he also lobbied for metallurgic coal as a strategic EU resource (with the support of the Law and Justice party), showing that in some cases, Poland's largest opposing political factions are capable of putting economic rationale first and voting together.

3.3 Coal mining restructuring experiences

Upper Silesia is a region concentrated on hard coal production (both collieries and mining-related industries) and remains the EU's largest hard coal basin. Three out of every four hard coal mining employees in the EU work in Poland (Alves Dias et al., 2018). At the end of 2020, 80,000 people worked in hard coal mining in Poland, with the vast majority (89%) operating in seven mining subregions in Upper Silesia. Most employees in the mining sector work in mines (94%), with the remaining 6% in industrial plants and administration. 77% of the sector's employees are blue-collar workers[4], 17% were engineering and technical supervision staff, and 6% were administrative employees (Frankowski et al., 2020). As the decarbonization process will directly affect workplaces in coal mines, coal companies, miners, and mining trade unions are crucial stakeholders in the transition process.

From the early 1990s until the end of 2020, an intensive transition of the hard coal mining sector has occurred in Upper Silesia, driven by natural and economic factors (depletion of deposits and unprofitable exploitation; Jonek-Kowalska, 2015). Over 300,000 miners were dismissed during the transformation (a decrease of around 80% in comparison to total employment in 1990), more than 40 active coal mines (out of 70 in 1990) were closed, and total coal output fell by over 90 million tonnes since 1990 (a decrease of over 60% compared to 1990) (Sokołowski et al., 2022). The coal mining transformation aimed to raise the

[4] People directly working on extraction underground and on the surface in coal processing plants.

productivity and profitability of the remaining mines. As of 2022, the hard coal mining industry was never fully commercialized and remains under state control. Moreover, Silesian hard coal is responsible for generating almost 40% of the nation's electricity. As a result, the state remains the main actor in transforming hard coal mining in Poland.

When observed since the early 1990s, the mining transformation process can be divided into several stages. Most activities were conducted under successive government restructuring programs for hard coal mining, supported and financed by budgetary resources. Despite a multitude of programs and actions, the main restructuring objectives remained the same; to create a viable, economically efficient industry capable of competing in an open market on a lasting basis (Appendix 2). The following sub-objectives supplemented the main goal and were considered to be the most important:

- reduction in production costs, outsourcing, and restrictions on side-by-side activities not directly linked to production,
- adapting volume and production capacities to the declining demand for coal,
- rationalization (reduction) of employment, reduction of labour costs, and increase in labour productivity.

The restructuring process was accompanied by social tension, expressed by mining trade unions through protests, strikes and the occupation of mining company headquarters. Social unrest was high during discussions about programming documents and legislation, especially when these interfered with pay issues, mining privileges, or involved mine closures. During this period, the main narratives on the mining transformation were created and consolidated.

We distinguished four milestones for transition narrative creation during the 30 years of the market economy in Poland. First, we treat the decision to form mining conglomerates in 1993 as the point of commencement of the country's mining sector transformation. As the transition of the mining sector started in 1990, this brief period of mining companies' autonomous operation proved unsuccessful (Kosmalski, 2003), showing that coal companies were incapable of adjusting to the market economy setting without a coordinated industry-wide policy. In 1993, the mines formed conglomerates and reduced their production capacity, employment, and non-productive assets (Blaschke and Gawlik, 1999; Ürge-Vorsatz 2006; Korski et al., 2016). Up to 2000, restructuring processes were conducted within these conglomerates (Jonek Kowalska, 2015; Brauers and Oei, 2020).

Second, the rapid closure of the coal basin in the Wałbrzych region (Lower Silesia) contributed to the narrative of collapsing local economies. The decision to close the coal mines in the Wałbrzych region was made in 1991. Four coal mines were closed and over 10,000 people lost their jobs between 1994 and 1996. The process lacked a labour market transition strategy, leading to substantial socio-economic hardship (Lesiw-Głowacka et al., 2021). The unemployment rate increased from about 11% in 1990[5] to 17% in 1996. The aftermath seen in Wałbrzych proved that the transformation of mining regions required a well-structured labour market strategy that considered the needs of dismissed workers and a structural policy for the affected area's economic diversification.

Third, the most intense employment decline in the mining industry in Upper Silesia occurred at the turn of the 1990s and 2000s and contributed to the creation of a labour market narrative. Between 1998 and 2002, employment in hard coal mining decreased by over

[5] Own calculation based on (Statistical Office in Wałbrzych, 1998), and (Zakrzewska-Półtorak, 2010)

100,000 people. Unlike in the Wałbrzych region, large-scale safety nets were implemented following consultations with mining trade unions. Between 1998 and 2002, approx. 67,000 workers benefited from labour market support.

The employment reduction was supported by mitigation measures such as early retirement and welfare allowances. The authors of the program introduced in 1998 offered voluntary departure not only to miners whose jobs were in direct threat of liquidation, but to a broader group of industry employees, with voluntary resignations being supported by strong financial incentives. This social package was dedicated to all underground mine workers, with some of its minor elements encompassing non-underground workers (Szpor and Ziółkowska, 2014). The policy contained four types of instruments: 1) early retirement, 2) redundancy payment in the form of a 'golden handshake,' 3) welfare allowance paid monthly during the period of retraining and job seeking, but for no longer than two years, and 4) fully funded retraining courses to improve employability outside of the mining sector. These mitigation measures were insufficient to maintain a high level of economic activity for the workers who left the mining industry.

The main failures of this initial coal transition stage were: a lack of targeted active labour market policies (Szpor and Ziółkowska, 2014), insufficient public intervention aimed at urban regeneration and economic recovery in the most affected cities (Krzysztofik et al., 2021), and the misrecognition of socio-cultural determinants in mining communities (Faliszek et al., 2001). Between 2014 – 2016, there was a so-called 'small restructuring' when the largest company was transformed into a national enterprise (Polish Mining Group). Several less profitable mines were closed without particularly impacting the regional labour market; a result of the company's adopted employment reduction rules. Employees from the closed mines were transferred to active plants, remained in the liquidated mines to carry out work on the closure, or used protective instruments in the form of early retirement and, to a lesser extent, redundancy payments.

Fourth, Poland's accession to the EU in 2004 changed the institutional context for coal mining in terms of market regulations and state aid rules (Hayo, 2004; Skoczkowski et al., 2020). The EU's energy and climate policy now became the main driver for the energy transition and decarbonization process in Poland. Policy targets implemented the obligation to reduce greenhouse gas emissions, develop renewable sources, and improve energy efficiency. The targets were set by EU leaders in 2007 and enacted in legislation in 2009. The policy set out quantitative paths for the decarbonization of national energy systems. Since the mid-2010s, this was supported by a bottom-up narrative for better air quality and to stop using coal as a household energy resource furthered by e.g. ecological movements and citizens who claimed the right to clean air (Frankowski, 2020). Highlighting these environmental issues also sparked a discussion around clean coal combustion technology as an alternative pathway for developing the mining and energy industry. The clean coal technologies narrative focused on the possibility of maintaining coal production, enhancing innovation, and reducing emissions when generating electricity.

4. Narratives

4.1 Mainstream narratives

Mainstream narratives in Silesia outline the views of different stakeholder groups directly affected by the energy transition: coal and mining-related companies and their employees, trade unions, and municipalities heavily dependent on coal. Matters related to energy security also reflect the government's position. The mainstream narrative can be divided into three strands that partially overlap but maintain the importance of coal in energy and the regional socio-economic system.

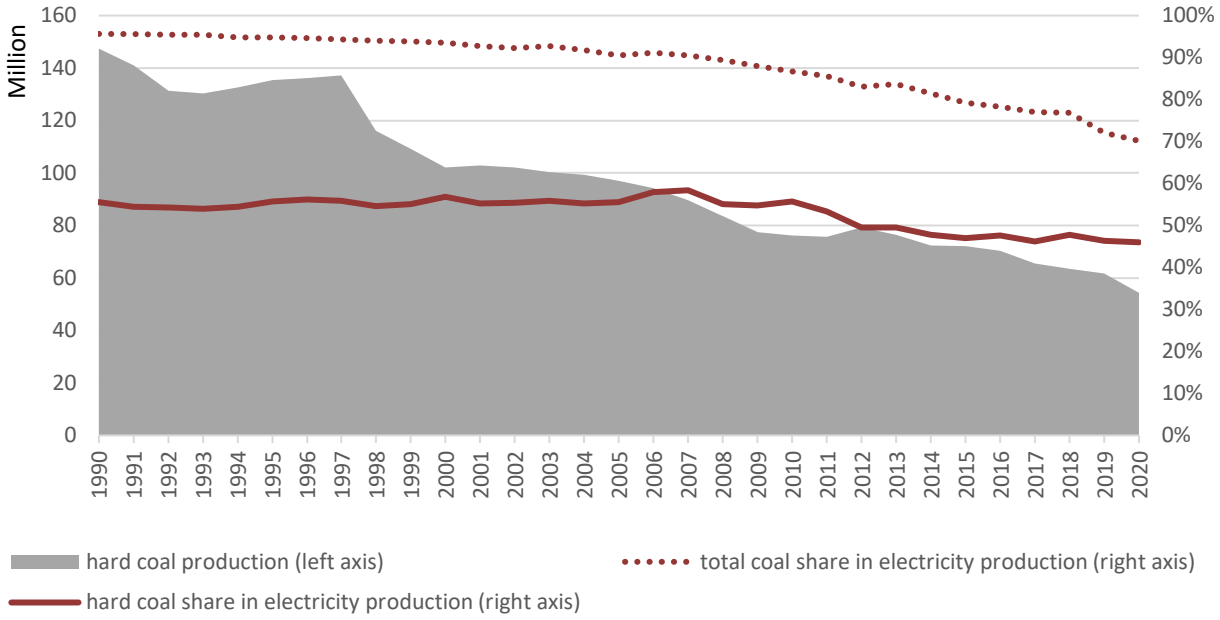
On-stream energy security narrative

The first mainstream narrative highlights the importance of coal in national energy security. Its core argument is based on the large share of coal in electricity production in Poland. Domestically extracted coal guaranteed energy security (self-sufficiency) and independence (also geopolitically). Although final consumption of coal in Poland decreased by over 46% between 1991 and 2020 (Eurostat), the country remained highly dependent on domestically produced fuel. Coal-fired power plants constitute a major share of the energy mix, accounting for about 70% of electricity and heat production (Figure 12). Besides coal, no other significant fossil fuels are produced in Poland and used in the energy sector.

The strength of this narrative is reflected in the fact that in almost all coal mining industry restructuring programs in Poland from the 1990s onwards, one of the recurring and overarching goals was to cover the nation’s demand for coal with domestic production (see Appendix 5). The role of coal as a guarantee of energy security changed along with the gradual decrease in the share of this carrier in the energy mix. Along with the development of new technologies, coal-fired power plants are seen as a buffer for variable production from renewable sources and a guarantee of the stable and uninterrupted operation of the energy system. Coal is perceived as the backbone of energy generation in Poland and a fuel which secures national energy supplies (Kuchler & Bridge, 2018). The war in Ukraine only served to strengthen this narrative by justifying the need to postpone the transition. Nevertheless, due to current market instability, the long investment cycle enabling the increase of coal production, and the assumed long-term horizon for the coal phase-out, the main direction of the transformation seems undisturbed so far.

This narrative is represented by coal and mining-related companies, trade unions, and sectoral business environment institutions – incumbent stakeholders in the region. As decarbonization will affect companies concentrated in the region, the transition is also described as a significant threat to the interests of local entrepreneurs. Due to the pressure of energy and climate policy goals, mining-related companies are forced to reduce production, change their business model, or reorient their production towards exports. A focal point of this narrative is that the rationale for the transition is being imposed on the sector by external actors.

Figure 12. Hard coal output and share of coal in electricity production in Poland



Source: Own calculation based on data from the Industrial Development Agency, Katowice.

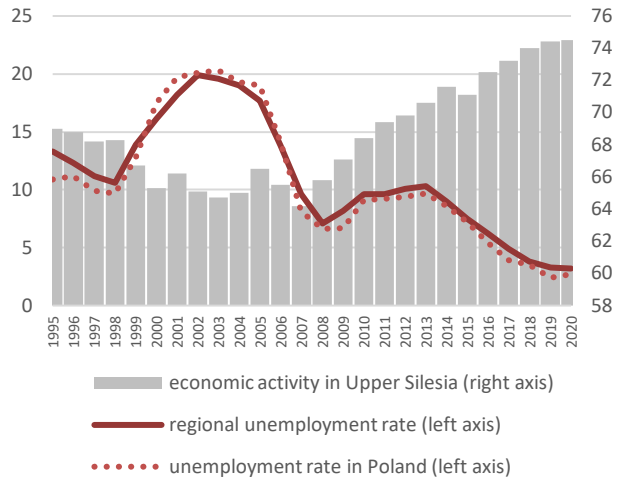
On-stream labour market narrative

The second narrative focuses on direct and indirect job losses and potential labour market destabilization due to surges in unemployment, which will result in income declines and welfare losses. In this context, the historical experience of the rapid closure of coal mining and other heavy industries in Poland forms the attitude and expectations toward future phase-out attempts (Sokołowski et al., 2022). Work in the coal mining industry is perceived as rigid but stable by members of mining communities, offering high wages and social benefits such as additional remuneration and the right to an early retirement.

Coal mining jobs tend to pay well – significantly more than local alternatives in agriculture or low-skilled services – and typically more than similar occupations in the construction and manufacturing sectors (Ruppert Bulmer et al., 2021), which makes them an attractive option to have in the labour market. Therefore, when assessing the future transition pathway as a disruption of the region's economic stability, energy system, and socio-cultural basis, stakeholders (mainly trade unions) opt for safety net implementation and industrial investments that secure alternative jobs in the region.

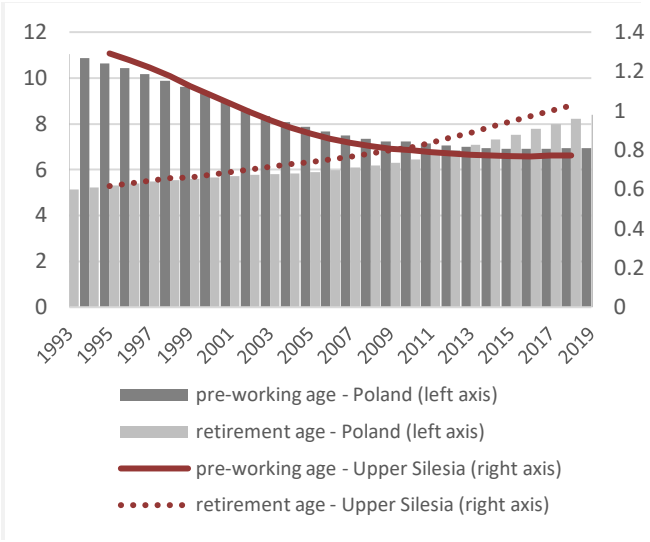
In Silesia, the labour market narrative emerged in the mid-1990s after intensive reduction of employment in the mining industry and the rapid transition implemented in the Wałbrzych region. In the 1990s and 2000s, workers who lost their coal mining jobs had few labour prospects as sectors that offered similar jobs (e.g. manufacturing, construction) were also struggling. Moreover, labour supply and the number of job seekers were increasing constantly, especially among people with relatively low educational attainment (Figure 13). However, since the late 2000s, these conditions have changed as other industrial sectors have rebounded, and the overall growth in labour supply has slowed due to demographic changes (Sokołowski et al., 2022).

Figure 13. Economic activity and unemployment rates in Upper Silesia (%)



Source: Own calculation based on data from Statistics Poland

Figure 14. Labour supply changes in Upper Silesia and Poland (millions of people)



Source: Own calculation based on data from Statistics Poland and ERD Eurostat

Labour supply has constantly been decreasing since the 1990s, both in Poland and in Upper Silesia. At the beginning of the coal sector transformation, more young people were entering the industry than older people retiring from it (Figure 14). Mine closures and the reduction of jobs in the mining industry placed additional pressure on the labour market. Since 2013 (2010 in the Silesia region), the number of people of retirement age has surpassed the number of pre-working age inhabitants. Thus, in the coming years, reductions in employment in the mining sector will release the additional number of workers needed to stabilize the regional economy rather than create a structural labour mismatch that cannot be managed efficiently (Sokołowski et al., 2022). Considering these issues and the minor consequences of 'small coal mine restructuring' between 2014 – 2016 and the safety net system, we can carefully say that this narrative is becoming less potent than it was.

Labour market issues are raised in particular by stakeholders related to the mining industry: trade unions, coal companies, the mining chamber of industry and commerce, representatives of mining municipalities affected by the transformation, and some local media. Also, labour market institutions are engaged in activities to support employees during mine closures. The positions of regional stakeholders are also influenced by past events, as Upper Silesia has been under a coal transition of varying intensity since the beginning of the 1990s. These experiences still resonate in Upper Silesia and have served as a background for transition narratives and affect public discussion about the pace of the coal phase-out.

Similar to energy security, the goal to maintain stable jobs in the coal mining industry was reflected in the government's policy towards the sector. Optimizing employment structure, social protection for dismissed employees, and mitigating the adverse socio-economic effects of the transition were the basis for introducing safety nets. As a result, mining workers gained social protection, which distinguished this professional group from other workers affected by the transformation. This inequality was noticed during the preparation

of the region's just transition territorial plan in 2022, which called for the implementation of special programs and interventions that would support employees from mining-related companies as well. The benefits and costs of a coal phase-out are discussed within the framework of fairness, focusing mainly on mitigating the negative economic and social consequences of structural changes in the energy system, as well as ensuring those impacted by the energy transition have a say in ensuing decision-making processes (Cha, 2020).

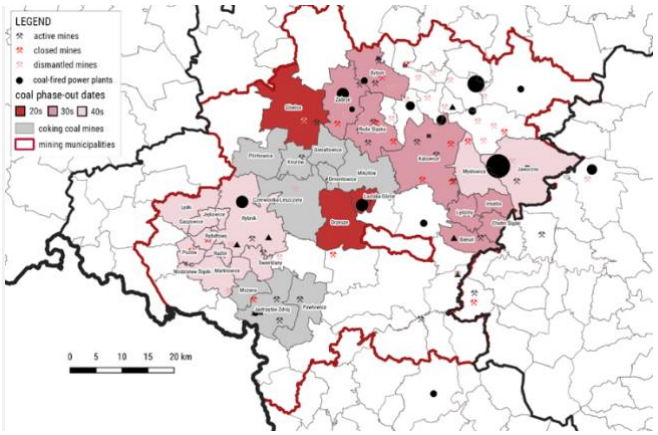
On-stream local economy collapse narrative

The third narrative addresses income loss and the issue of struggling local economies in coal-dependent municipalities. In addition to jobs, coal mine investments bring economic stimulus and tax revenue to coal districts and municipalities. The creation of coal mining jobs spurs labour demand within coal supply chains and other local sectors, as coal workers spend their wages on local goods and services, generating taxable transactions that can contribute to government coffers (Ruppert Bulmer et al., 2021). These arguments are raised mainly by local authorities and sectoral business environment institutions, who warn of the spillover effects of mining job losses, a decline in municipal revenues, and the accumulation of structural mismatches in local markets. This issue is crucial for municipalities where mining has been the backbone of local economies for years, if not decades. This problem becomes even more substantial in peripheral areas with limited access to infrastructure that would facilitate the development of alternative economic activities.

Since the transformation will affect coal-dependent communities, the region’s most vulnerable municipalities have been diagnosed. The areas ‘undergoing transformation’ face economic, social, spatial, and environmental threats due to the coal phase-out. This includes communities where hard coal mining activities are carried out, where many inhabitants still work in the mining industry, or where mining activities have ended (mines closed or in liquidation) but policy intervention is required to rebuild the local socio-economic structures. The above criteria are met in 64 communes (out of 167) located mainly in the central and western parts of the region (Map 4).

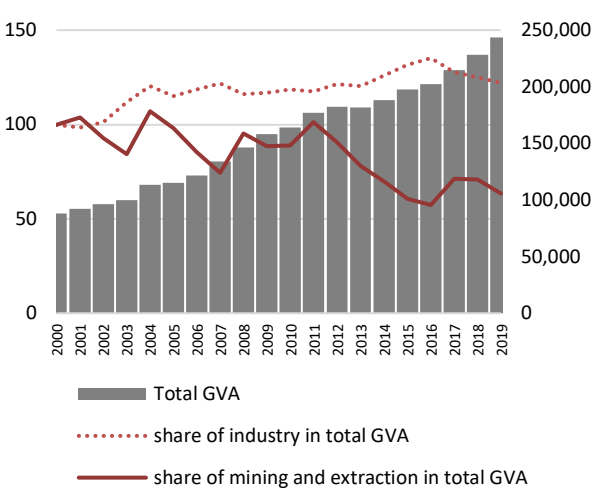
In the past, coal mine closures generated persistent economic, social, and environmental challenges in some mining communities in Silesia. Deteriorating conditions and quality of life of the region's inhabitants, degraded post-industrial areas, and the relatively low pace of their reclamation remain pending challenges that require capital-intensive solutions. Mainstream narratives on the transition pathway have translated these issues into calls for special consideration and support for coal-dependent regions in the EU structural and just transition funds. The current attitude can be described as conservative concerning the pace of climate policy implementation, expecting substantial support for mitigating the social consequences of the transition and avoiding rapid transformation.

Map 4. Municipalities undergoing coal transition



Source: Own calculation based on regional Strategy "Silesia 2030"

Figure 15. Share of industry and coal mining in the regional GVA



Source: Own calculation based on data from Statistics Poland and ERD Eurostat

Unlike other mainstream narratives, support for local economies did not resonate with the government's sector restructuring programs. The first declarations regarding the restructuring of the region appeared at the turn of the 1990s and 2000s (see Appendix 5). However, macroeconomic trends show that Upper Silesia, which was highly dependent on coal in the 1990s, has been diversifying its economic structure and has become less reliant on coal mining since the mid-2000s (Figure 15). Investments carried out with the support of structural funds were one of the main drivers behind this regional development. Nevertheless, the 'local economy collapse narrative' still carries weight among some small mining communities where many people are indirectly connected with the mining sector, and the mine is a significant taxpayer.

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The mainstream narratives in Upper Silesia were formed in the early stages of the transition, during a period with a completely different market, and institutional and technological setting. Moreover, all mainstream narratives have been embedded in the experience of rapid mining closure, not supported by a comprehensive regional development strategy. As our case study shows, labour market conditions for a coal phase-out and demographic megatrends have changed markedly since the late 2000s. Therefore, the current labour market outlook for future transition is much better than it was in the 1990s and early 2000s. As the economic position of Upper Silesia deteriorates, a reduction in coal production should be balanced by growth in other sectors and industries. Obtaining favourable social and stakeholder attitudes that support the transformation are essential for its success. These narratives are analysed in the next section.

4.2 Alternative narratives

Along with the pressure of energy and climate policy, the narrative that coal is Poland's 'black gold' is not the future regional development scenario any longer. And while most stakeholders have accepted a general need for decarbonization (with phase-out scheduling and energy carriers being the main points of contention), there are two alternative narratives about the future of Upper Silesia. Both emphasize the need to maintain the region's industrial economic profile. The first on-stream narrative supports the mainstream statement arguing for a gradual and slow transition, maintaining hard coal exploitation and usage in the gasification process and carbo-chemical installations. In the other, off-stream stakeholders advocate a swifter abandonment of coal mining in favour of creating national supply chains for industries that support the energy transition and a circular economy (Krzywda et al., 2021; Kubin, 2021).

The clean coal technologies (CCT) on-stream narrative ("Industrial Silesia")

The clean coal technologies narrative emerged in the mid-2000s. It encourages the public sector to support, research, develop and demonstrate that coal technologies are available for large-scale commercial deployment. It focuses on coal gasification technology (the chemical processing of coal to obtain gas and liquid products) and low-emission energy technologies. The main argument for the development of CCT is the technical, scientific and economic potential that is present in both mining and the region. This narrative aims to shape the image of coal as a modern, innovative, environmentally friendly and socially acceptable fossil fuel. It supports other mainstream narratives and maintains the crucial role of coal in the energy system and the regional economy.

The development of clean coal technologies is mainly supported by different regional stakeholders with a long history of cooperating with coal companies, such as mining-related research institutions, government authorities[6] and trade unions. These stakeholders have access to political power (especially the Ministry of State Assets), finance (through state research grants) and information sources (the media). The narrative propagated by heavy industry has a potentially strong impact on innovation and knowledge creation, with a relatively weak economic contribution to the regional economy in terms of job creation (especially in the short run) and the diversification of regional economic structures. The narrative also utilizes arguments about energy security and economic patriotism; that it is imperative that Poland relies on its own national resources and stands against the implementation of foreign technologies (Russian gas, German gas boilers, Danish wind turbines etc.). This goes hand in hand with the mainstream energy security narrative. CCT stakeholders are generally supportive of using nuclear energy as a backup source, but do not believe in its fast implementation.

[6] e.g. the Industrial Development Agency; CCT were also indicated in the Polish Energy Policy as one of the investment priorities.

'Green' off-stream narrative ("Green Silesia")

Narratives that support the energy transition often point to the multifaceted aspects of the process, highlighting health and living condition improvement as core transition benefits. This view focuses on mitigating the problem of air pollution, mining damage in urban areas, and mining waste deposits. While responding directly to the need for improved quality of life in the region, this narrative derives from the concept of sustainability, joint responsibility for climate change, and intergenerational justice.

This narrative also points out that there would be increased investments and innovations in the public and private sectors due to the deployment of green technology. The main drivers for such growth are the availability of clean technologies and the fact that their implementation will lead to cost reduction and improved effectiveness. New business models and growing demand for environmentally friendly solutions ensure the creation of potential jobs and new supply chains in the transition region. This can then lead to accelerated economic diversification, growth, and regional development.

The green narratives are supported by interdisciplinary research institutions, most green NGOs, the mainstream media, local civil society, business entities, the regional administration and authorities, the European Commission, and international bodies (e.g. the World Bank). These institutions are often located outside the region and may include members of central government or opposition parties who attempt to push this narration further. This narrative has a potentially strong impact on the regional economy in both the short and long term. The construction, manufacturing and energy sectors have the highest potential to replace lost mining jobs. Moreover, according to the regional specialization plans, business services (ICT, BPO/SSC), logistics, medicine, tourism and land remediation have the highest potential to diversify the economic structure of the region.

Box 2. Smog alerts – an example of bottom-up transformative capacity

According to the European Environmental Agency, 14 towns on a list of the most-polluted urban areas in Europe are located in Upper Silesia. And it was this immoderately high number of days with critically elevated air pollution levels during the winter heating season that resulted in a bottom-up reaction. Despite weak citizen engagement in environmental issues, "Smog Alerts" began sprouting in every major Polish city as formal and non-formal organizations focused on monitoring air quality, educational campaigns, and local advocacy (Frankowski, 2020). Active social movements focused on preserving air quality can be found in Rybnik, Katowice, Ustroń and Bielsko-Biała. Especially Rybnik has become an epicentre of air quality-motivated activities. Local smog alerts launched aggressive campaigns, which prompted the president of the city to promote state-led Clean Air Programmes and vow to penalize households that did not respect antismog laws, which, since 2022, banned the use of old furnaces (that did not meet EU emission standards). Moreover, the city also supports innovations e.g. cohousing for elderly citizens who are living alone (to protect them from energy poverty) and citizenship debates about energy costs.

Thanks to these actions, Rybnik and towns in the surrounding area have become leaders in terms of household solid fuel stove replacements (Map 5). Interestingly enough, strong opposition to coal stove substitution remained in these communities. Older people, especially former miners, still prefer using coal for cultural reasons, often acquiring it straight from a colliery. According to Irma Allens' work, "embodying its dirty work has long been a primary route for attaining domestic masculinity, securing its patriarchal authority and integrity and acceptably expressing its familial love and care" (Allen, 2021). However, the activities of smog alerts and local municipalities led to more radical coal phase-out dates in the residential sector, as the regional government in Upper Silesia declared to terminate coal use in households by 2029. This example shows how a bottom-up transformative force was able to generate a tipping intervention in this particular niche – a domestic energy transition. Nevertheless, the success of the transition was very limited in 2022 as coal sources were replaced by gas in most cases (Figure 16).

Map 5. Percentage of households that participated in the Clean Air Programme

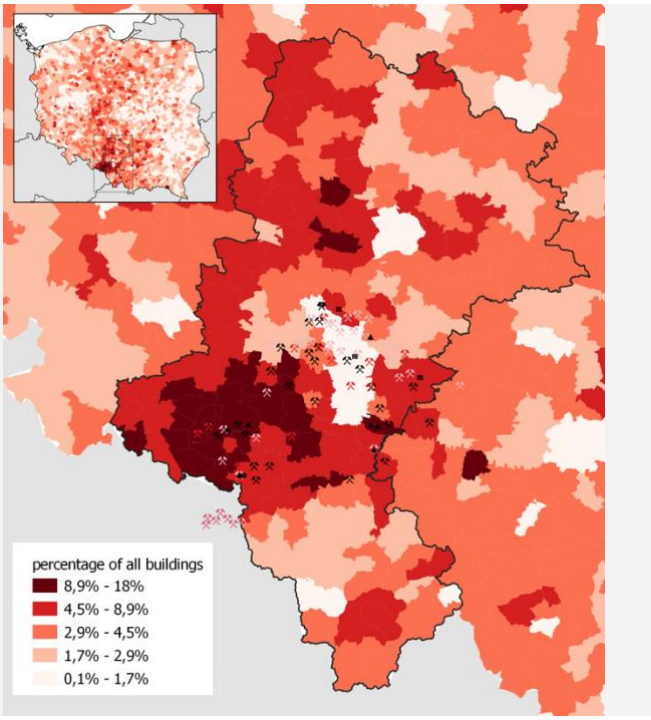
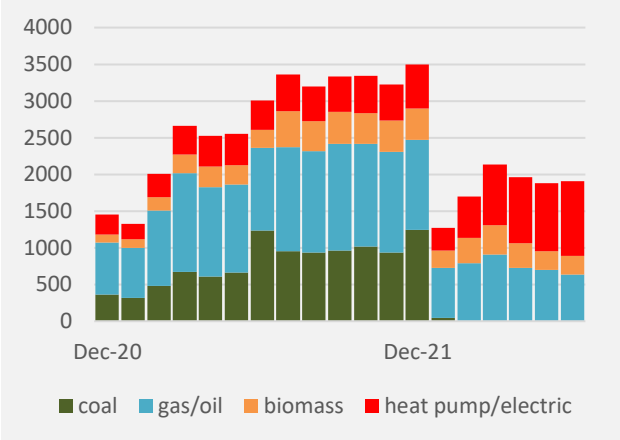


Figure 16. Coal stove replacement in Upper Silesia



Source: Own elaboration based on Clean Air Programme statistics (2021 – 2022)

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One of the main premises of the industrial narrative relies on the willingness to use the knowledge and competencies that are already accumulated in the region. This potential can be used to strengthen the region's competitive position, justified by its high concentration of production companies operating in heavy industry sectors and enterprises cooperating within market chains. The transformation is therefore seen as the further development of the industry towards modern industrial technologies. Opposingly, the green narrative emphasizes the need to improve living conditions in the region. Stakeholders promoting this approach appreciate the regional industrial competences, but their main focus lies in the need to create favourable conditions for modern services and sustainable industrial development in line with environmental and climate policy obligations. The common point for both approaches is the need for economic diversification and raising regional resilience to economic turbulence.

Table 1. Alternative narratives about Upper Silesia

Narrative	Industrial Silesia	Green Silesia
postulate	to extend the lifetime of heavy industry, especially coal technologies (IGCC, CCS, coal to SNG)	to diversify the economic base into more modern and service-oriented activities
expected coal exit	2049 or even later	2030s / early 2040s

rationale	accumulated technical know-how, energy security, economic patriotism	improved health and living conditions, deployment of green technologies, intergenerational justice
main actors	unions, mining-related institutions, industry research institutes	regional authorities, business institutions, research institutions, NGOs, European Commission
The vision of the region	The industrial heart of Poland	A European hub of modern services and industries

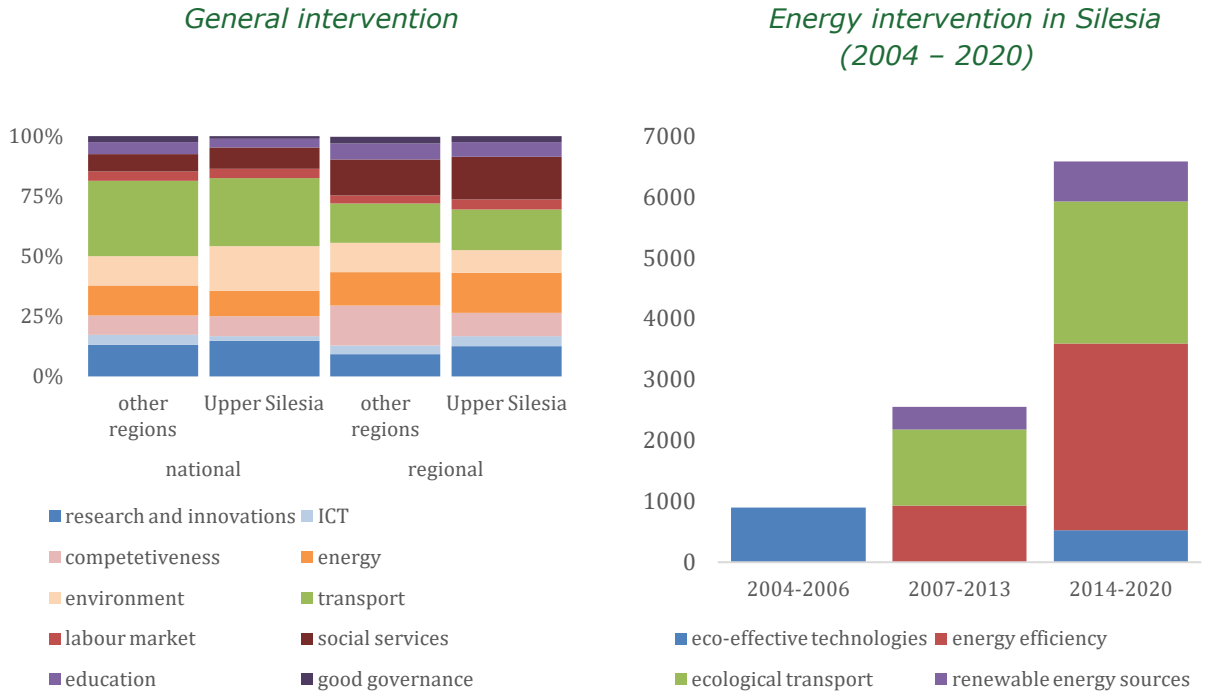
Source: Own elaboration

4.3 Key policy interventions supporting regional development in Upper Silesia

Since 1989, many policy interventions have stimulated transformation processes in Upper Silesia. Prior to Poland's accession to the EU, the primary interventions came from limited state funds, pre-accession funds (e.g. PHARE, ISPA), and development assistance (e.g. World Bank grants). After joining the EU, the dominant financial resources to support regional development came from the European Funds – Cohesion Fund (CF), the European Regional Development Fund (ERDF), and European Social Fund (ESF). EU funds provided a substantial investment boost and promoted good governance, long-term strategic thinking, stakeholder partnerships and multi-level cooperation (Dąbrowski, 2013). Since 2007, regional authorities have possessed operational programmes to conduct partly independent regional policy. As many other recent works elaborated on sectoral policies (Śniegocki et al., 2022; Bulmer et al., 2021), we limited our analysis of policy interventions to EU-funded programmes for two reasons – they remained the most essential resources to strategically implement regional and local policies, and were the best reported. For the purposes of the Tipping+ project, we prepared a dedicated EU project database (including three EU perspectives 2004 – 2006; 2007 – 2013; 2014 – 2020), which enabled us to compare financial flows, intervention category (including energy transition support), and type of beneficiary for the selected area to observe trends and choices across this period (Figure 17).

The distribution of public intervention schemes in Upper Silesia was similar to that of other regions in Poland. During the last 18 years, most funds were allocated to transport (26%), environment (16%), and research and innovations (14%). More state-led funds in Upper Silesia were spent on the environment (+7 p.p.), research and innovations (+2 p.p.) and social services (+2 p.p.), with a lesser share on ICT and transport. Regional authorities invested more in social services, transportation and R&D&I, and less in SMEs and the environment. The largest investment in Upper Silesia financed using EU funds was the A1 Motorway, which connects the region with the Polish coastline.

Figure 17. Distribution of financial support from EU Funds in Upper Silesia



Source: Own elaboration based on EU project reporting (SRP 2004–2006, KSI SIMIK 2007–2013, EU project database 2014–2020) by the ministries responsible for regional development.

We observed various trends in energy interventions over these periods.

- 2004 – 2006: The main focus of energy interventions was to decrease the harmful environmental impacts of the industry. Upper Silesian entities received almost 13% of funding from all of the EU's programmes. Large state-led companies implemented the most expensive projects, including electrostatic precipitators, desulphurisation, and closed water circuits in coal-based power plants, and the construction of metallurgic plants and foundries. Also, the largest Polish coal mining company (Kompania Węglowa) received money for averting from the desalination of the Vistula River by the Piast coal mine.
- 2007 – 2013: Upper Silesia received far fewer general funds for energy interventions (approx. 5%), as the most significant projects were located in northern Poland (i.e. the LNG terminal). Nearly 80% of renewable energy installation projects subsidised by EU funds concerned large wind farms (60%) and biogas and biomass plants (Chodkowska-Miszczuk et al., 2016), which could not be implemented in the region because it was highly urbanised. The most extensive EU-funded intervention in Upper Silesia concerned a biomass boiler in the Jaworzno coal-fired power plant and the implementation of more ecological urban transport.
- 2014 – 2020: In this period, the European Commission earmarked at least 10% of the entire ERDF in Poland's funds for clean energy. Almost 11% of total funds allocated to energy intervention were spent in Upper Silesia. During this period, we observed a number of investments in energy efficiency in buildings and companies, district heating networks, modern ecological public transport, and prosumer PV support. Climate protection and air quality served as rationale for these activities. However, the largest

project during this period was a loan for JSW KOKS (a state-led coking coal producer) to develop a coking gas-led station in Zabrze.

Over the years, energy spending has gradually shifted from EU sources. Most recently, the Polish government and Upper Silesia's regional authorities have invested more money in diverse energy interventions. Also, the motive for these moves changed too. Soon after Poland's accession, the main goal of funding energy projects was to increase competitiveness. Then, investments were financed due to energy security and sustainability. Finally, due to pressure from enforced EU regulations – especially the Europe 2020 Strategy – the Polish government and regional authorities adopted energy efficiency interventions under clean energy and climate policy rationale. And despite the fact that large state-led companies, including coal-fired power plants and mining companies, remained the significant beneficiaries of these funds, they will probably benefit from the Just Transition Fund in specific interventions.

The EU's funding highly contributed to the region's economic transformation, especially after a series of mine closures. And even though there was a lack of safety nets and social or retraining projects for miners and workers from mining-related sectors – as these were instead funded directly from the state budget – local authorities spent EU funds on protecting their cultural heritage (Rybnik, Zabrze, Świętochłowice, Katowice), preparing mining-dependant areas for economic development (Zabrze, Jaworzno), or on adapting mining objects to other functions, e.g. academic (Sosnowiec) or recreational (Figure 18). Funding also came from private resources, such as in the case of a spectacular adaptation of a post-mining region into a shopping mall (Baca-Pogorzelska & Jodłowski, 2016). Some cities also financed the urban renewal of historic mining estates (e.g. Ruda Śląska, Figure 19), improving their aesthetics, energy efficiency, and overall living conditions, and contributing to alleviating energy poverty (Sokołowski et al., 2021).

Figure 18. Bicycle paths in the area of a former mining waste dump in Bieruń

Source: (Gawor & Marcisz, 2018)

Figure 19. Renovated mining estate buildings in Ruda Śląska

Source: Fieldwork materials

Regional policy interventions are scarcely controversial. To some extent, regional policy is seen as technocratic rather than a source of potential political conflict. Political disputes focus on the funds available, EU-level prohibition, or particular investments connected with regional identity. In 2020, all parties in the regional parliament approved a new Silesian Regional Development Strategy ("Green Silesia 2030"), which set the directions for further

interventions (e.g. a regional operational programme). In general, institutions responsible for regional policy choose to adapt a 'transformative' narrative in opposition to state and industry actors who try to compete with this channel, proposing sectoral policy tools, investments, and funding sources.

5. Concluding discussion

Nationwide decarbonisation will particularly affect Poland's coal and carbon-intensive regions. In this case study, we explored the narratives that accompany the coal phase-out in the country's largest mining region, Upper Silesia. We identified different stakeholder groups, their concerns with and arguments for the decarbonisation process, and addressed the relationships between structural changes in the regional economy and these transition narratives.

Is Upper Silesia at a tipping point in its transition pathway? The case study reveals the circumstances that may create a window of opportunity for a permanent change in the energy system. It should be noted that mainstream narratives have changed since 2019 – negative arguments warning of a collapsing industry and threats to energy security and regional development are now balanced with vital pro-transformative arguments such as creating opportunities to develop innovative industries and services, or improving air quality and living conditions. Both mainstream and alternative narratives also have other points in common. The narratives find consensus on further development pathways based on the region's existing competitive advantages. The transformation is therefore seen as an opportunity to comprehensively carry out major processes that would inevitably take place sooner or later due to increasingly difficult coal extraction conditions and the mining industry's economic situation . There is also a general agreement to preserve the region's coalmining heritage and respect its history. This narrative shift occurs in the parliamentary discourse and the regional debate and is further supplemented by progressive development activities.

Gaining trade union approval of a concrete mine closure program was a major tipping intervention on the transition pathway. Even if the schedule is still being debated and could either accelerate or delay the transition, this is undoubtedly the first agreement constituting the complete cessation of steam coal mining in Upper Silesia. The gradual phasing-out of coal production has also been incorporated into regional development strategies ("Green Silesia 2030") and has become the focal point of the Territorial Just Transition Plan. These changes are constantly reinforced by the vital role of the European Union as a leading actor mainstreaming energy and climate policies.

A socio-ecological tipping point is defined as a "discontinuity moment in which suddenly a given system of reference qualitatively, fundamentally and irreversibly changes its structure and future dynamics" (Tàbara et al., 2018). However, we cannot determine that at this transition stage, the changes observed in the case study fulfil all these requirements.

First, we must keep in mind that changes in mainstream narratives, and thus in attitudes towards the transition, are not a sudden process but rather a slow and gradual change shaped by the internal dynamics of stakeholder interactions and external events. Our case study precisely indicates how a shift in the mainstream narrative may be observed. The geopolitical turnabout caused by Russia's invasion of Ukraine bolstered the arguments of the energy security narrative. However, energy transition advocates have taken over the narrative for maintaining a high share of coal in the energy mix. The main argument points to severe dependence on fossil fuels, which must be secured due to the declining production of domestic mining or the incompatibility of Polish coal resources with household needs. Thus, most stakeholders perceive increasing the share of renewable sources and nuclear energy uptake as the right way to maintain energy security. However, it seems that the

current situation can, on the one hand, slow down the coal exit process in electricity production but accelerate the coal exit in households on the other.

Second, as Maier et al. observed, many economic processes are reversible, and policy interventions may pose tipping events that trigger or accelerate the system towards a desired pathway (Maier et al., 2020). It is hard to define what should be considered as 'irreversible'. Regarding the coal exit, irreversible actions should be attributed to material efforts (such as closing down all coal mines), not only discursive changes (such as policy declarations – even social agreement). Although we recognise many current actions and trends that enable and accelerate the diversification of the regional economy, we agree with the insights from the German study (Mey & Lilliestam, 2022) that the approach to a coal phase-out in Central Europe is the result of incremental, long-term changes. Thus, using the framework of tipping points (applying irreversible criteria) may be problematic and only observable in retrospect (Mey & Lilliestam, 2022). To some extent, a problem of scale seems to be complicated. Finding a coal region wholly dependent on one industry is challenging as regional systems are multifaceted and complex. Such dependency is usually a characteristic of towns and selected communities, which can suffer from sudden and ill prepared coal exit strategies. We also agree with the suggestion that the socio-economic tipping points should be considered as "looser, metaphorical scenarios for regeneration" (Geels, 2022). We discuss two aspects: the irreversibility and radical character of tipping points, which in our opinion, are challenging to translate into positive regional development pathways.

Third, ensuring the irreversibility of changes is also a political challenge. Upper Silesia is a specific region as it concentrates almost all hard coal mining companies in Poland. Because of this, regional changes directly affect the national energy system, and regional decisions take on a national importance. The coal phase-out will cause a decline in the region's political power, and regional actors will lose the ability to influence national energy and industrial policy. Therefore, the coal phase-out and energy transition processes carry with them the capacity to transform the regional political economy (Steckel & Jakob, 2022) and, in the case of Poland, could lead to undermining the widespread doctrine that Silesia is Poland's industrial and energy heartland. Moreover, replacing coal in the energy mix will increase the role of the country's coastal regions, where large-scale nuclear and offshore investments are planned. Considering the above, it is also crucial to recognise and appreciate the historic role of Upper Silesia as a major contributor to current welfare and provide fully inclusive and transparent procedures during the transformation process.

We must remember that narratives which emphasize 'the power of coal' can also be used for political purposes. Such a message is targeted mainly at active miners whose political views seem diverse and pragmatic, as well as at a large group of mining retirees left bitter by closing mines and their sentiment for the industry's strong position. This coal-supporting narrative could be played in political games to win election votes. Meanwhile, this influence will likely weaken over time due to cultural and social changes. Overcoming the cultural dominance of coal, diminishing its role in the labour market and hence the symbolic role of mining, and moving towards a brand-new vision for regional development would also contribute to tipping point achievement.

It should be noted that such a policy highlights the dilemma of justice. The time-consuming nature of a comprehensive reconstruction of social and economic structures must compete with the need for urgent radical changes which are necessary for climate protection. This discrepancy brings about another 'radical' aspect of the socio-ecological tipping points. To what extent can coal exit policy be just in terms of temporal dimension? How much time do we need to prepare the process and deliver a positive tipping point (complete coal mine

closures)? Does Upper Silesia have the right to postpone the transition process and expect the phase-out to proceed in a similar fashion to what took place in the Ruhr Valley in the past? These questions reflect the dilemma that is born when climate justice meets just transition discourse, and there are no straightforward answers. In this case, the individual interpretation of justice among decisive stakeholders – and their take on industry and green narratives as well as incrementally taken tipping interventions – will be what decides on the final shape of the transition pathway.

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Appendix 1: Online workshops organised during TJTP consultations

Date	Main topic	Participants	Who	Organiser	IBS role
11.09.2020	JT challenges: competitiveness	~30	invited experts: business chambers, business support institutions, labour offices, energy and mining companies, local communities, government	regional authorities	invited, active participant
17.09.2020	JT challenges: labour market	~30	invited experts: business chamber, companies, think tanks, labour offices, energy companies, NGOs, government		
24.09.2020	Katowice, in-person	~100	municipalities, NGOs, European Commission	WWF	passive observatory
22.10.2020	JT challenges: gliwicki subregion	50	metallurgy plant representatives, local business associations, research institutes, municipalities, trade unions, European Commission	regional authorities	
27.11.2020	JT challenges: bytomski subregion	37	local communities, president of Bytom, green organisations, European Commission, labour offices, SRK		
5.11.2020	JT challenges: katowicki subregion	67	EC, local municipalities, business chamber, trade unions, metropolitan association		
10.11.2020	JT challenges: sosnowiecki subregion	75	local municipalities, local business support organisations, EC, green organisations, an energy company, trade unions, vocational training centre		
12.11.2020	JT challenges: rybnicki subregion	50	municipalities, green NGOs, research institutes, miners, students, ministry		
17.11.2020	JT challenges: bielski subregion	40	coal mine HRs, local municipality associations, trade unions (Solidarność)		
19.11.2020	JT challenges: tyski subregion	50	energy companies, research institutes, trade unions, EC, municipalities, government, business institutions (special economic zone), companies		
23.04.2021	labour market transitions	35	research institutes, universities, trade unions, NGOs, labour offices, government, business representatives	IBS	organiser and moderator

Appendix 2: The list of individual in-depth interviews

Date	Organisation	Type	Subregion	Narration
1.09.2020	Regional Authority	online	katowicki	transformative
7.09.2020	President of the mining city	telephone	rybnicki	transformative vs local economy collapse
7.09.2020	Local business support institution	telephone	katowicki	transformative
9.09.2020	Social policy NGO	online	katowicki	transformative
14.09.2020	Educational centre coordinator	telephone	sosnowiecki	transformative
17.09.2020	Miner	in-person	sosnowiecki	transformative
23.09.2020	Business chamber	in-person	rybnicki	labour / local economy collapse
23.09.2020	Secretary of a mining community	telephone	sosnowiecki	local economy collapse
24.09.2020	Director of Regional Labour Office	in person	katowicki	transformative
31.05.2020	Trade union representative	telephone	katowicki	labour / local economy collapse
1.06.2021	Left-wing political party	in person	Warsaw	labour / transformative
2.06.2021	Government representative	online	Warsaw	energy security
2.06.2021	Civic Platform representative	online	Warsaw	transformative
30.06.2021	Mining-related research institute	telephone	katowicki	transformative

Appendix 3: Additional, dedicated set of telephone interviews – labour market office

Date	Organisation	Subregion	Narration
16.12.2020	Bielsko-Biała	bielski	hard to say
17.12.2020	Jaworzno	sosnowiecki	transformative
17.12.2020	Rybnik	rybnicki	transformative
17.12.2020	Ruda Śląska	katowicki	local economy collapse
18.12.2020	Gliwice	gliwicki	transformative
18.12.2020	Tychy	tyski	transformative
18.12.2020	Bytom	bytomski	transformative
18.12.2020	Pszczyna	tyski	transformative
21.12.2020	Łaziska Górne	tyski	local economy collapse
12.01.2021	Wodzisław Śląski	rybnicki	transformative
12.01.2021	Jastrzębie-Zdrój	rybnicki	transformative
14.01.2021	Zabrze	gliwicki	transformative
14.01.2021	Piekary Śląskie	bytomski	transformative
15.01.2021	Mysłowice	katowicki	hard to say
15.01.2021	Katowice	katowicki	transformative
20.01.2021	Żory	rybnicki	transformative

Appendix 4: Trends and indicators for sustainable transformations

Observed in:	Name of the narrative or other factors	Trends observed in the narrative (qualitative description)	Key Stakeholders representing the narratives	Indicator(s) that helps describe the trend (way to measure)
Mainstream narratives	Energy security narrative	Domestically extracted coal guaranteed energy security. Along with the development of new technologies, coal-fired power plants are seen as a buffer for variable production from renewable sources and a guarantee of the stable operation of the energy system.	• coal and mining-related companies, • trade unions, • sectoral business environment institutions	• share of coal in electricity production; • coal production output; • import dependency
	Labour market narrative	Transition poses a threat of potential labour market destabilisation (direct and indirect job losses)	• trade unions • local government • labour market authorities	• level of economic activity; • unemployment rates; • labour supply; • education level; • social protection level
	Local economy collapse narrative	The transition will unequally affect local communities. Mining-dependent municipalities will suffer severe structural crises.	local authorities (mainly coal-dependent municipalities) sectoral business environment institutions	• regional GDP dynamics; • share of mining in regional GVA; • entrepreneurship level • new industries (sectors) and enterprises; • population
On-stream narrative	The clean coal technologies narrative	Clean coal technologies allow to maintain coal production and fulfil environmental requirements	• mining-related research institutions, • government authorities • trade unions	• sectoral R&D investments
Off-stream narrative	'Green' narrative	Transition is an opportunity for the Upper Silesia region to revitalize its economy. The region may benefit from innovative and	• interdisciplinary research institutions, • NGOs, • mainstream media,	• new industries (sectors) and enterprises (green jobs creation) • presence and importance of

		profitable activities and better living conditions.	• local civil society, • regional administration and authorities, • European Commission and other international bodies	low carbon sectors; • investment level • air pollution

Appendix 5: Policies of coal transition

Duration	Government programs for hard coal transition	Main objective	The provisions related to transition narratives		
			Energy security	Labour market	Regional economy
1990-1992	Proposal towards restructuring programs for coal and lignite, gas, electricity, heating and the liquid fuel industry	Creation of independent, viable, market-based undertakings, exempted from direct control and not constituting State ownership	Absent	Absent	Absent
1993	Restructuring of hard coal mining in Poland. Implementation of the first stage within the State's financial capacity.	Restraining the bankruptcy of coal companies and creating conditions for profitability.	Adjusting coal production to demand (reducing overproduction of coal)	Employment reductions and increasing labour productivity in mines Mitigating the social impact of restructuring Introduction of a social protection package (early retirement and social benefits)	Absent
1994-1995	Restructuring of hard coal mining - Program for Stage II implementation in 1994-1995.	Achieving profitability of coal mines Debt reduction Increasing labour productivity and wages Mitigating the social impact of job losses	Conclusion of long-term contracts by coal companies with major industrial coal users (mainly power plants)		The mining industry restructuring program should be linked to regional restructuring programs in upper Silesia and the Walbrzych region.

1996-2000	Hard coal mining - State and sectoral policy for 1996-2000. Program of adjusting the hard coal mining industry to the market economy and global competitiveness	Improving the economic efficiency of hard coal mining Maintaining the social security of miners	Adjusting coal production to demand Establishing strategic state coal stocks (finally not implemented)	Absent	Absent
1998-2002	The reform of the hard coal mining industry in Poland in 1998-2002. Revision of the government program on the reform of the hard coal mining industry in Poland in 1998-2002	Enabling economic efficiency and maintaining the competitiveness of hard coal mining companies in the domestic market	Meeting the domestic demand for hard coal and "economically justified" exports by 2010 Maintaining the requirements of environmental protection and competitiveness in the conditions set by the European Union, and with the openness of the market for all energy carriers, respecting the principle of mutual benefits.	The program and the reform implementation should consider the social aspect to minimize its negative impact on society.	Industrial reconversion in the mining municipalities will be carried out to boost their economic development. The reform of hard coal mining must address the long-term regional impact of this process.
2003-2006	Hard coal mining restruct uring program for the years 2003-2006, with an application of anti-crisis laws and launch of privatization of certain mines, corrected on January 28, 2003	Achieving profitability, reducing overdue liabilities of the sector, and ensuring regular payments, including environmental changes.	Absent	Absent	Programs will be implemented to mitigate the effects of employment reduction in Silesia and Lesser Poland.

2004-2007	Hard coal mining restructuring in 2004-2006 and a strategy for 2007-2010 Plan for access to hard coal resources in 2004-2006 and the procedure for mine closures in 2004-2007.	Achieving stable profitability, economic efficiency and competitiveness in the single European market. Adapting production capacity to the domestic market demand and economically viable sales in the single European market and exports. Privatization of mining companies.	Maintaining domestic energy security and contributing to the energy security of the European Union. Obtaining a satisfactory level of financial liquidity and creditworthiness to ensure the stable operation and development of mining enterprises;	Employment reduction with the use of protective and adaptive-activating instruments; Introduction of modern management methods and optimization of organizational structures in the coal companies; Pursuing a sound employment policy	Absent
2007-2015	The strategy of hard coal mining in Poland in the years 2007-2015 Act on the functioning of hard coal mining in 2008-2015 Program of hard coal mining activity in Poland in the years 2007-2015 (2011; revised and updated Strategy of 2007).	Rational and effective management of coal deposits located on the territory of the Republic of Poland so that these resources serve the next generations	Adjusting production capacity to the market demand for coal Ensuring stable supplies of required quality coal to domestic and foreign recipients	Ensuring stable and economically safe jobs in hard coal mines and rational management of labour resources.	Developing modern technologies in the hard coal mining sector and providing the foundations for technological and scientific expansion, particularly in the Silesia and Małopolska regions. Revitalization and reclamation of land devastated and degraded by industrial activities Development of industrial property, infrastructure, housing, and technical and social infrastructure facilities for new investments.

2018-2030	Program for hard coal mining in Poland (accepted in 2018, revised in 2019)	Creating favourable conditions for the development of a profitable, effective and modern hard coal mining sector	Meeting the domestic demand for hard coal and ensuring the necessary hard coal supplies to the domestic market, Supporting the transition of the Polish economy to a low-emission economy by improving the quality of produced coal and developing the production of qualified low-emission fuels. Diversification of the use of hard coal	Increase of employee's competencies and qualifications, allowing adaptation to the challenges of the changing environment	Absent
	Program for the hard coal mining in Poland revised in 2022	The fair transition of the hard coal mining sector with gradual liquidation of the power coal mining industry based on public support mechanisms	Adjusting production to the domestic demand for hard coal and guaranteeing the necessary hard coal supplies to the domestic market during the transition Diversification of the use of hard coal – developing clean coal technologies	Mitigating the negative socio-economic effects of transition. Increasing employee's competencies and knowledge, respecting safety nets in the process of energy transition	