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*Analysis of Territorial Just Energy Transition Plans*  
*Analiza planów terytorialnej sprawiedliwej transformacji*  
*energetycznej*

Autor:

Kierunek studiów:

Opiekun pracy:

*Marta Kubińska*

*Energetyka Odnawialna i Zarządzanie Energią*

*dr inż. Janusz Zyśk*

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## **Abstract**

To fight the climate crisis, the European Union sets increasingly ambitious climate goals and has made a commitment to achieving climate neutrality by 2050. As the energy sector is responsible for the major part of CO<sub>2</sub> emissions, its decarbonisation will be fundamental to achieving them. Phasing-out coal is a complex process, which has broad social and economic consequences, thus it is essential that it is thoroughly planned, in a just and inclusive way, respecting the needs and rights of all people involved, which is called "just transition". This thesis focuses on the transformation process in three coal regions in selected countries: Poland, Slovakia and the Czech Republic, presents an analysis of their Just Transition Plans and carries out their assessment on the basis of the developed criteria.

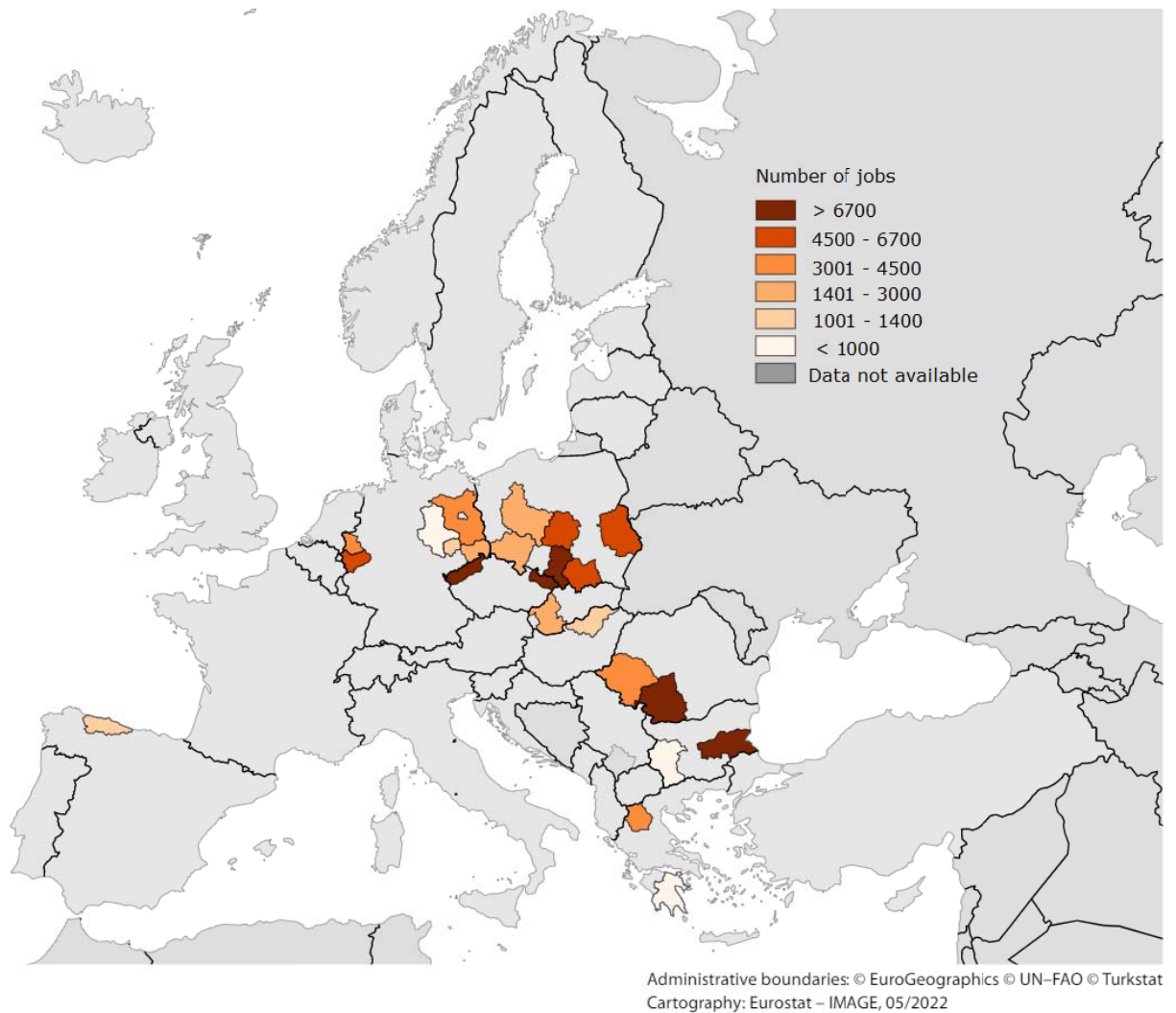
## **Streszczenie**

Walcząc z kryzysem klimatycznym, Unia Europejska wyznacza coraz ambitniejsze cele klimatyczne, takie jak zobowiązanie do osiągnięcia neutralności klimatycznej do 2050 roku. Jako że sektor energetyczny odpowiada za znaczną część emisji CO<sub>2</sub>, jego dekarbonizacja będzie miała fundamentalne znaczenie w ich osiągnięciu. Odejście od węgla to złożony proces, który ma szerokie konsekwencje społeczne i gospodarcze, dlatego ważne jest, aby był szczegółowo zaplanowany, z poszanowaniem potrzeb i praw wszystkich zaangażowanych osób, co nazywane jest „sprawiedliwą transformacją”. Praca ta skupia się na procesie transformacji w trzech regionach węglowych w wybranych państwach: Polsce, Słowacji i Czechach, przedstawia analizę opracowanych przez nie Planów Sprawiedliwej Transformacji i przeprowadza ich ocenę na podstawie opracowanych kryteriów.

# 1. Introduction

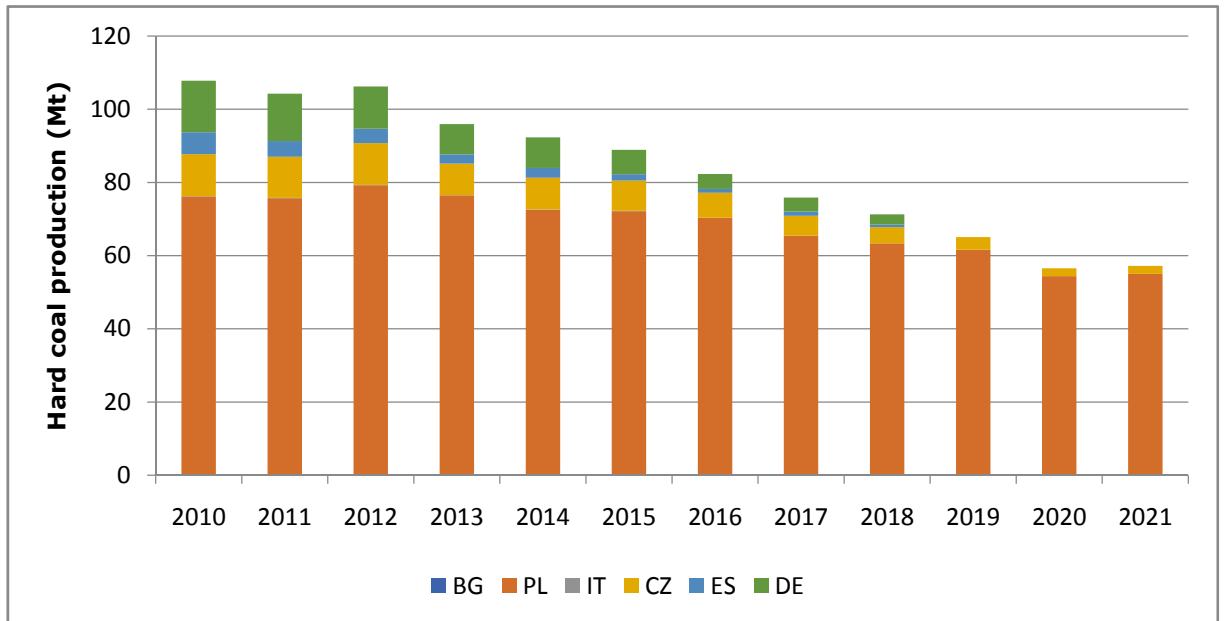
With the European Green Deal, the EU Commission proposed a new target to reduce the greenhouse gas emissions by at least 55% by 2030, as compared to 1990 levels and to achieve a climate-neutral European Union by 2050 [1]. Proposed strategy is also in line with the Paris Agreement's target to keep the global temperature increase to well below 2°C and pursue efforts to keep it to 1.5°C. It aims to make EU's economy sustainable and resource-efficient, minimize external energy dependency, reduce energy poverty and protect the health and well-being of citizens. Those goals cannot be achieved with current policies therefore they must be revised and improved, plus it has to be ensured that all EU actions and programs contribute to the climate neutrality objective. Regions and sectors which will be most affected during climate transition are those that are dependent on fossil fuels (especially hard coal, brown coal, peat and oil shale) or carbon-intensive processes. One of these sectors is the energy sector, as the production and use of energy is responsible for more than 75% of the EU's greenhouse gas emissions.

Taking into account current sector size and, what is strictly connected, the amount of people employed, coal activities are likely to have the biggest impact among all fossil fuels. Coal is identified in 19 EU countries and presently there are 58 operating coal mines in eight countries, i.e. Bulgaria, Czechia, Germany, Greece, Hungary, Poland, Romania and Slovakia [2]. Altogether, in 2021 they produced 332 million tons of hard coal and brown coal, the biggest producers are Germany (126 Mt) and Poland (107 Mt). The coal regions are defined as NUTS-2 regions of the EU with over 100 jobs in coal sector [3]. As **Figure 1.1** shows the largest number of people are employed in the regions: Śląskie (Poland), which accounts for nearly 50% of jobs, Sud-Vest Oltenia (Romania), Yugoiztochen (Bulgaria), Severozápad and Moravskoslezsko (Czechia). Overall, the coal sector employs nearly 340 000 people in direct and indirect jobs across Europe and it was estimated that up to 112 000 jobs may be lost by 2030 [4]. Furthermore, job losses are also expected in coal-related sectors and should be taken into account when considering the negative effects of transformation.



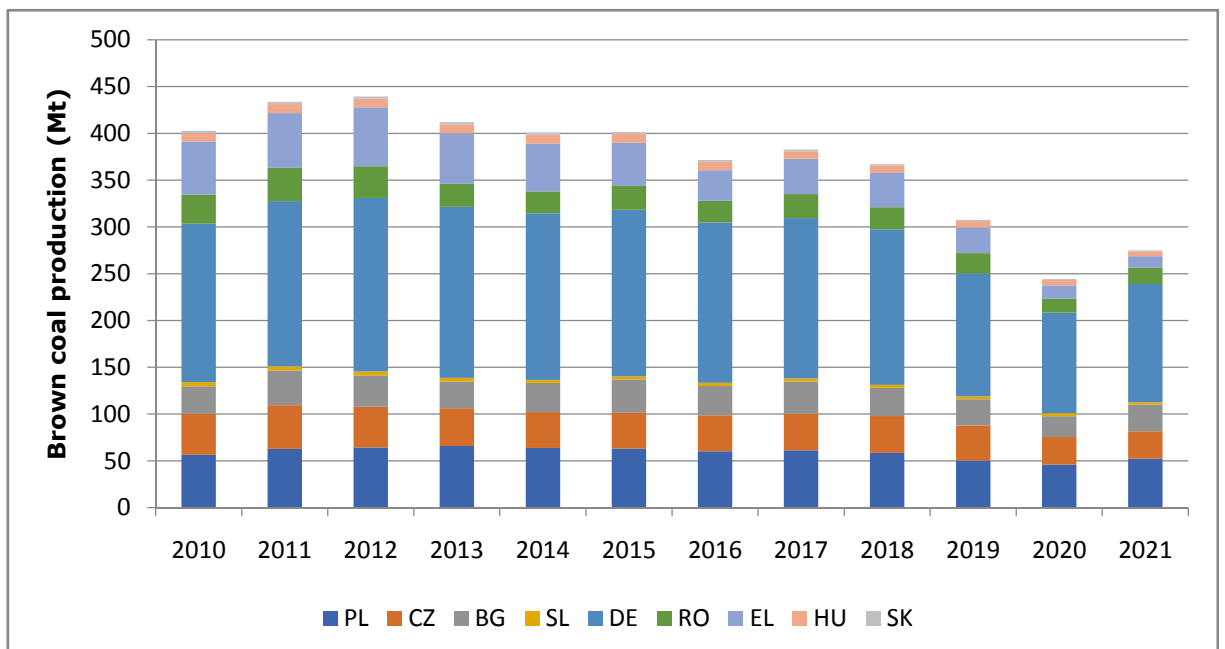
**Figure 1.1.** Number of jobs in coal sector across EU (2018) [4]

In the past decade there has been a decrease in hard coal production by almost 47%, as well as the number of Member States producing it (**Figure 1.2**). Currently hard coal is mined only in two countries: Poland, which accounted for 96% of total EU production and Czechia. Due to major decrease in production, import dependency has increased and was consistently above 50% in 2010s [5]. The largest supplier of hard coal to the EU is Russia, which in 2020 was responsible for 56% of imports, followed by the United States with 17% and Australia with 15%.



**Figure 1.2.** Hard coal production by Member States in years 2010-2021 [6]

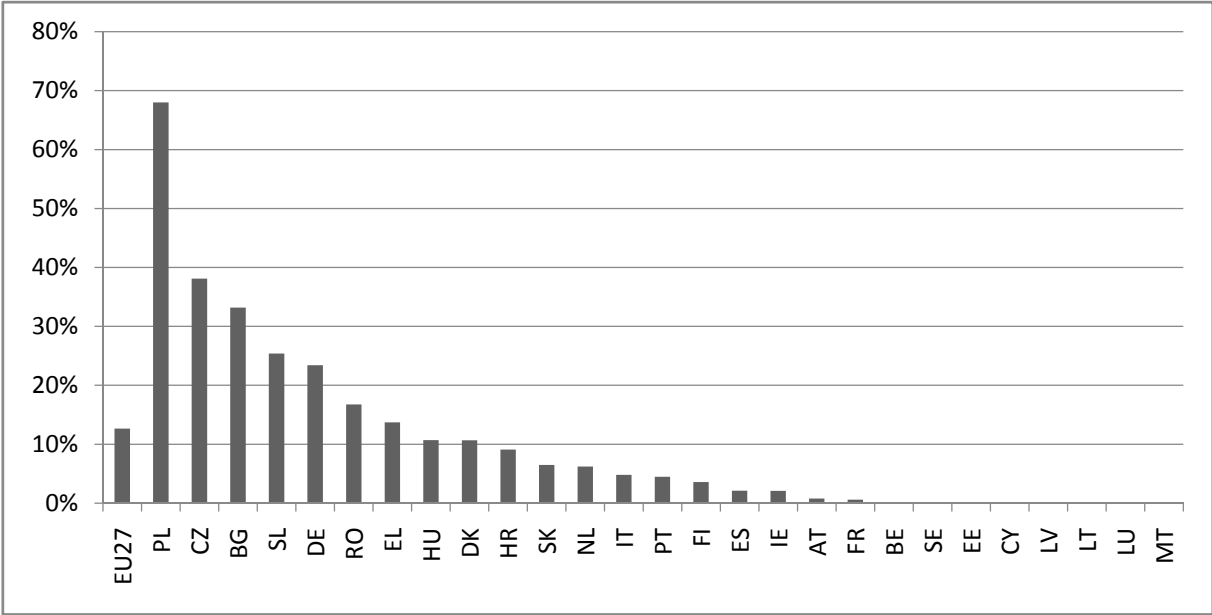
Similarly to hard coal, the continuous decrease can be noticed in the case of brown coal, in years 2010-2021 its production dropped by almost 32% (**Figure 1.3**). Brown coal is produced in nine EU's countries, 46% of the production comes from Germany.



**Figure 1.3.** Brown coal production by Member States in years 2010-2021 [6]

Formerly, solid fossil fuels were one of the main fuels used to electricity production, however since the 1990s there has been gradual decrease in their

use and now they account only for approximately 12% in general electricity production (Eurostat, 2020). As shown in **Figure 1.4** the importance of coal in electricity production varies significantly across the EU. While eight countries make no use of coal in power generation, in others coal use is much higher than the EU average. For instance, Poland generates 68% of power from coal, followed by Czechia with 38% and Bulgaria with 33%.



**Figure 1.4.** Share of electricity generation from fossil fuels in total electricity generation by Member States in 2020 [7]

Phasing-out fossil fuels is a long-term trend that began decades ago and all the actions that are being taken now are continuation of it. Therefore, some of the EU countries already have no coal in their energy mix, some will be able to eliminate coal in the coming years in a relatively easy manner, while others, with continued high dependency on fossil fuels, still will need them for decades to go. Many Member States have already announced their plans to phase out coal, the time for implementation of them significantly varies among countries.

While the transition creates new opportunities for innovation, investment and jobs, it threatens several other branches which currently depend either directly or indirectly on carbon-based processes. Thus, it is required to guarantee that transformation towards a neutral economy is implemented in a just and inclusive way, respecting the needs and rights of all people involved. Mechanism of transition will differ in regions and Member States, as not all of them start at

the same point, will face similar obstacles on their way and have the same capacity to respond. Regions, which presently heavily rely on fossil fuels for energy production and industries with a high intensity of greenhouse gases emissions are usually less advanced and may not have sufficient financial resources. Such a situation will significantly diversify the speed transition in the EU and will deepen the disparities between regions, which contradicts the cohesion policy. In order to deliver on its commitment to "leave no one behind" the European Commission has set up the Just Transition Mechanism, with the objective to provide support for regions, industries and workers which will be most affected. It includes the Just Transition Fund (JTF), established to mitigate the negative effects of climate transition on employment and to finance diversification and modernization of the local economy [8]. The JTF should support actions which are in line with EU's ecological standards and priorities and do not significant harm to the environmental objectives, i.e. do not contribute to adverse impact on the current climate, increase of greenhouse gas and pollutant emissions, do not lead to inefficient use of materials or natural resources and increase in waste generation [9]. The funds cover all Member States, but it will be distributed in dependence of transition impact. Moreover, in order to ensure effective use of the JTF finances countries which fail to make a commitment to the implementation of the objective of achieving a climate-neutral Union by 2050 will get limited access to national allocations (to 50%).

The Regulation on the JTF outlines the types of activities that can be financed from it, which can be divided into two main groups, one concentrating on supporting the economy and the other one on protecting citizens. As for the first group the main focus lies on creating a neutral, circular economy with the significant role of local, small and medium-size enterprises (SMEs), as well as activities aimed at increasing resources efficiency and energy efficiency. Citizens are most vulnerable to the climate transition, as it is directly connected to job losses and the necessity to change profession, therefore they should be provided with support during the process of searching for a new job and adaptation to new employment opportunities.

Essential part of the process of distributing JTF resources are the territorial just transition plans (JTTPs), covering one of more affected territories. Member



States are required to prepare documents, which will outline the expected transition process, all types of impacts, what operations are envisaged, and how the process will ensure participation, monitoring and evaluation. It is necessary to justify that those particular regions are the most affected, based on economic and social impacts resulting from the transition, especially regarding job losses. The TJTPs are meant to be prepared and implemented in close cooperation with relevant partners, such as: local and regional authorities, economic and social partners, citizens representatives, non-governmental organizations and research organizations.

## **2. Aim and scope of the thesis**

This thesis focuses on just transition process in three EU countries - Poland, Czechia and Slovakia, on the example of, respectively, Western Małopolska, Karlovy Vary and Upper Nitra regions. It provides an overview of challenges and possible solutions in those regions and compares their experiences and perspectives in order to assesses if transition to a zero-carbon economy is carried out in a sustainable manner, taking into account the needs of all affected, leaving no one behind.

The main objective is to evaluate the quality of the Territorial Just Transition Plan of Western Małopolska, in comparison to other regions undergoing transformation. The Plan is to be assessed in terms of social, environmental and ecological issues, labor market and tourism, sustainable development and shift of regional energy production to renewable sources, as well as plans for economic diversification, stakeholders' involvement and participation of the general public during the preparation and implementation processes. As a result, it will be possible to identify the weaknesses of the plan and further improve its quality.

The research question the thesis intends to answer is "How principles of effective TJTP are being achieved in the case of Western Małopolska and what can be improved?"

The first step to do so is to describe the current energy situation in Poland, as well as Slovakia and Czechia, and compare it with these two countries. This will help to understand the level of carbon dependency, define development opportunities and identify factors that might hamper transformation.

Then, based on an overall assessment of the transition process in considered regions, define strengths and weaknesses, opportunities and threats of the plan for Western Małopolska (SWOT analysis).

### **3. Description of methodology**

This thesis is based on a broad literature review, such as, among others, EU publications, statistical data, publications of environment-oriented organizations or mining associations, as well as reports and articles gathered on platforms dedicated to just transition and coal regions. In order to obtain a good understanding of the analyzed issue, care was taken to ensure that the reviewed literature presented various viewpoints on the subject. The information available on the websites of the relevant ministries and national companies was used for the individual country analysis.

To define a comprehensive set of principles of effective TJTPs, the available literature on this topic was analyzed, considering different perspectives. Firstly, in order to ensure compliance with the formal requirements and with the EU objectives, the criteria included in the "Commission Staff Working Document on the territorial just transition plans" were taken into account [10]. This document specifies the elements that the plans must consist of, along with references to related regulations. Furthermore, it lists types of activities to be supported from the JTF, together with requirements for them, as well as excluded investments, which are mainly those involving any continued use of fossil fuels. Another document considered was the WWF toolkit, based on existing guidance and policies, as well as practical experience gained by the organization from working on transformational processes [11]. It defines ten principles for efficient TJTPs, and also provides examples of poor practices. Moreover, it underlines the importance of social dialogue and the participation of the general public, as well as the transparency of work on the plan. It also refers to the guidance by the Europe Beyond Coal campaign, in which the principles characterizing the open and inclusive process have been precisely defined [12]. Additionally, as EURACOAL emphasizes, the mining and energy sector cannot be excluded from creating transformation plans, since as directly related entities they can provide valuable insights and solutions [13]. Taking into account recommendations, principles and requirements specified in the above-mentioned documents, a set of evaluation criteria was developed, balancing climate objectives, economic development and needs of affected societies.

## **4. Examples of successful transition processes**

The energy transition is not a new movement, however it gained momentum after climate goals set by Paris Agreement and now required actions are much more urgent. From the EU's countries, which previously based their electricity production on coal, four have already phased it completely out: Belgium (2016), Austria and Sweden (2020), Portugal (2021) [14]. All EU countries have already started to consider phase out coal plans, but with different implementation timelines. However, many are planning to do so in following years and already have adopted concrete phase out programs. The transformation will affect every country and mutual benefits can be drawn from cooperative actions. Platform for Coal Regions in Transition was launched by European Commissions to support these regions in a way toward neutral economy. This platform creates a space for stakeholders to exchange experiences, cooperate with each other, promote good practices, develop support materials and to provide technical assistance on projects development [3]. Regular meetings are organized to discuss recent updates, new opportunities and to share knowledge, which significantly helps to accelerate the transformation.

It is not possible to create one general plan of transformation, as every country has own strengths and weaknesses and different resources. However, analysis of successful transition processes will help to gain information about positive and negative impacts of implemented measures and identify success factors and challenges. In the following part two case studies are discussed.

### **The Ruhr region, Germany**

The Ruhr region is the largest urban area of Germany, comprising four counties and 11 large cities, with an area of 4,435 km<sup>2</sup> inhabited by 5.2 million people. It has gained its importance because of hard coal, steel and iron production, in the 50s and 60s these sectors provided employment for majority of Ruhr's population [15]. In the face of alternative energy sources emerging and international competition, the demand for hard coal began to decline, mines began to close, unemployment rose, and the region was hit by a huge crisis. It was essential to take steps to restructure the economy. Transition process can

be divided into two phases: the first from 1960 to the mid-1980s and the second from the mid-1980s to the present [16]. Firstly, focus was set on preserving coal industries, denying the need for reforms and innovations. The main motivations were the economic reasons. While governments provided financial support for economic diversification and to mitigate the negative impact of job losses, there were also significant investment in coal companies. This had only a short-term effect and delayed the transformation. In the second phase different approach was used, with much greater involvement of stakeholders and support for innovations and new technologies [17]. Moreover, attention has started to be paid to the environmental issues, with the objective to reduce GHG emissions, and region's industrial heritage was acknowledged. Amount of people employed in mining industry decreased from 90% of total region's workforce in 1960 to 3% in 2001, however it did not have negative impact on unemployment rate in the region as many new jobs were created, mainly in service sector [18]. Every affected worker was treated individually and offered with possibilities of new employment, assistance in job seeking process, required trainings, early retirement plan or financial support. To keep post-mining areas active and, at the same time, preserve coal culture and heritage many initiatives were created using existing infrastructure and industrial assets, from environmental-focus activities to sociocultural projects [19]. Zollverein is a perfect example of successful repurposing, a former coal mine, now UNESCO World Heritage Site, coal industry museum and a lively culture place, visited by 1.5 million tourists every year.

Transition of Ruhr's region was a long process, not without shortcomings and fails, but eventually the goal was achieved and hard coal mining was phased out completely by 2018. From region dominated by industry it became knowledge-based economy, with dynamically developing new technologies, attractive jobs opportunities and prosperous society. It needs to be noted that without generous financial investments over these decades from German government, as well as EU, such a transformation would not be possible. Other strengths were also taking an advantage from existing regional assets, wide support for people, their active participation and collaboration between communities and governments, which helped develop comprehensive solutions. However, transition process could have been more inclusive, as main help

focused on mine's workers and people working in indirectly connected industries were left out. It also cannot be called "just", as there were a lot of disparities between regions and many people experienced unemployment and poverty, especially unskilled workers, foreigners, immigrants and young people [16]. Moreover, it would have been more reasonable to accept the inevitability of change earlier, as delaying it will only increase the final cost and focus more on technologies, not industry, to boost the economic potential.

### **Genk, the Limburg region, Belgium**

Genk, once a small village, became one of the most important industrial towns in the region after in 1901 coal was discovered and mining sites started operating. The new work opportunities attracted many people from all over Belgium, along with foreigners, resulting in rapid population growth. The coal industry was the main activity of the region for many years. The decision of closing the first mine in the '60s met with opposition from mining society and resulted in strikes, in which two people was killed by police. After this tragedy, the government has made a commitment to create new workplace for every workers affected by mines' closing [20]. Therefore, it became necessary to find different sources of revenue and new job opportunities. In the first phase the top-down approach was used and the economy was monopolized by car industry [21]. As a result, after the car manufacturer decided to shut down its facility, another major transformation was required. It was the time of bottom-up approach, focusing on sustainability and economic diversification. Possibilities of reuse of existing infrastructure and preventing coal heritage were started to be discussed [22]. However, in the beginning former mining facilities were not seen as an asset, but as something to eliminate, and were left abandoned for many years. Despite this, they later became the main driver of transformation and now Genk is an example of redevelopment of mining infrastructure. In order to minimize the competition each mining site was planned with different leading theme. One of the projects is Thor Park, former coal mine Waterschei, transformed into technology park and hotspot for smart and sustainable innovations, hosting high-tech companies, research centers and knowledge intensive institutes [23]. To support redevelopment government provides

subsidies and tax incentives for companies and academic institutions to move to the region.

Despite the fact that last coal mine in Genk was closed more than three decades ago, transition process to knowledge and smart manufacturing economy is ongoing until now. While unemployment rate is below national average, one of the challenges region is still facing is re-employment of former workers of automotive industry. As economic diversification was crucial part of the successful transition, Genk's example shows that economy based on few, large industries is not resilient to rapid changes and breakdowns. Moreover, the ongoing initiatives are mostly financed from external sources, what makes them vulnerable to changes in policy frameworks, therefore it is important to include, where possible, private funding. Limburg's transformation proves that deliberate actions on the re-use of existing mining resources and combining them with innovative solutions can benefit the region's development, as well as protect the mining heritage.

## **5. Social, environmental and technological challenges of transformation**

Transition toward neutral economy is a complex process that requires cooperation of many entities, taking into account various factors, opinions and demands of different stakeholders. Plans of action will vary among particular regions, reflecting the different starting points and challenges awaiting on a way. It is essential to properly identify those challenges and find a method to overcome them, guided by justice and fairness.

The major element of the transformation is the conversion of the energy sector and a complete phase out of fossil fuels, mainly coal. However, in coal regions it is the backbone of the economy and has advantages that make it tough to replace - it is convenient, easily available and affordable [13]. Moreover, during the transformation process, coal should be used in the cleanest possible way and it requires a large investment outlay. The constantly increasing prices for CO<sub>2</sub> allowances put a heavy burden on coal companies and negatively affect their investment opportunities, be it the diversification of activities (switching to other fuels) or ecological solutions, such as CO<sub>2</sub> capture. Renewable energy sources are expected to play a major role in transforming regions, but they are not well developed - if at all - and will require massive investments. The objective to achieve climate neutrality will have an impact not only on the energy sector, but will also force changes in the transport, construction and others carbon intensive industries sectors. It is necessary to assess the role of transforming and declining sectors, their importance and what impact it will have on the entire economy in the region. It is crucial whether the transformation will involve SMEs, as they have less responsiveness and fewer resources and will need more support. Coal regions, however, are often monopolized by large enterprises, so in many cases a big challenge will be to diversify the economy and create conditions for the development of smaller companies.

The main social challenge will be to avoid deteriorating the quality of life of the inhabitants of coal regions. The transformation will affect not only people directly related to the coal industry, but indirectly all people living in the region. Every effort should be made to prevent economic stagnation, marginalization and



depopulation. The most pressing problem will be to ensure continuity of employment and do not lead to increased unemployment. It is needed to estimate how many jobs will be lost or affected during the transformation or closure of industries and assess how this will influence the overall unemployment rate in the region. Skilled workers will be needed in newly created enterprises - to avoid the influx of labor from outside the region, it is necessary to create an opportunity to adapt the skills of former coal employers. Considering the generally low level of education in coal regions, an important aspect will be the improvement of the quality of education, the development of higher education and other educational opportunities. The development of education should be done with regular communication between educational institutions and companies on current and future skills required so that new opportunities meet the market needs. The measures taken are to involve all people needed support, ensure equal opportunities and not exacerbate exclusion, which means that the needs of the more vulnerable groups must be recognized and addressed. To be fully successful, the transformation process has to be accepted and supported by the communities concerned and they should be involved in its implementation. In many cases this will be a big challenge as people are not eager to transition, do not understand its necessity and only see it as a threat to their stability and prosperity.

Years of mining and industrial activities in the transforming regions have a major impact on the environment, causing severe soil, air and water pollution, as well as changes to the landscape. This significantly reduces the attractiveness of the region and its value for both residents and investors. Therefore, in the first stage of transformation, care should be taken to revitalize the environment and remove the effects of previous activities in these regions. This will be essential to create decent living conditions and prevent depopulation, as well as to attract investors to establish new activities in former coal regions. In addition to the need for revitalization, brownfield sites present a challenge to find reuse for them, which, ideally, will allow to use of existing potential, preserve the mining culture and positively influence the region's economy.

## **6. Principles of effective Territorial Just Transition Plans**

The effective TJTPs should:

1. Include plan for sustainable transformation of energy system.

Prolonged use of fossil fuels is in contradiction to the EU's climate objectives and Member States should aim to phase out coal by 2030 and fossil gas by 2035 [24]. Therefore, any investment regarding the production, processing, transport, distribution, storage or combustion of fossil fuels, as well as decommissioning or construction of nuclear power stations cannot be supported from the JTF [8]. Along with the deterioration of the environment, use of fossil fuels lead to escalation of energy poverty and deepens social inequalities. Due to constantly rising CO<sub>2</sub> prices, the cost of heat and power generated from fossil fuels will increase simultaneously, causing higher energy prices for customers. Based on experience from regions ongoing transition, trying to prevent change by supporting falling industries is only a short-term solution, which delay the transformation and increase the overall cost of it. Therefore, TJTPs including continued use or new investments in fossil fuels should not be accepted. Together with reducing fossil fuels, the share of RES should be increased.

2. Strive for climate neutrality in line with EU targets for 2030 and 2050.

EU has set a goal to completely eliminate greenhouse gas emissions by 2050, therefore measures taken should be ambitious enough to contribute to that objective. In the industry sector the biggest polluters are the iron, steel, cement and chemicals industries and refineries, which altogether account for almost 70% of total industrial emissions in the EU [25]. While setting higher carbon prices motivates investments in transformation, it is not a long-time solution, as it deteriorates competitiveness and worsens the situation of fossil fuels-dependent regions. There are several technologies, that can lead industries toward carbon neutrality by reducing emissions of current processes (improving energy efficiency, employing carbon capture and storage), replacing fossil fuels by electrification, biomass, low-carbon hydrogen or by developing new production pathways (process intensification and circular economy).

### 3. Do not harm environment and include revitalization projects.

During the transition it is crucial to make effort to compensate for the damage caused by phasing out industries. The JTF can support "investments in regeneration and decontamination of brownfield sites, land restoration and including, where necessary, green infrastructure and repurposing projects, taking into account the 'polluter pays' principle" [8]. This principle states that polluters have to take responsibility and bear the costs for any damage caused to the environment by their actions, including preventing and controlling measures [26]. This approach incentivizes polluters to make an effort to minimize impact on the environment and clearly identifies responsible entities. However, the principle is not always applied, which shifts the cost of pollution to taxpayers or EU budget. Therefore, it should be analyzed whether institutions that have benefited from coal mining and fossil fuels energy production will actively participate in the restructuring process, and the cost of it is not meant to be financed from external sources. Moreover, all new investments should be in line with the "do no significant harm" principle and promote the pursuit of a circular economy, increase in energy efficiency and reduce energy use.

### 4. Provide broad support for people losing jobs

Transition toward neutral economy will have strong impact on people working in phasing out sectors. Coal companies are often main employers in less developed regions, which otherwise would face a problem of high unemployment. Moreover they offers well-paid jobs with higher salaries than average in region [13]. A truly just transition should result in the maintenance or even improvement of the current standard of living. Therefore, jobs created must be characterized by fair working conditions, meaning appropriate salaries, reasonable working hours, social protection and healthy work environment. Social impact will not only be associated with job losses but also with a need for upskilling and reskilling workers, who will be necessary part of ongoing transformation. Ideally, people losing their jobs should be offered with employment opportunities in newly created work places, however this requires broad support for them to acquire new skills and be actively included in the labor market. Transition will affect not only people directly employed in fossil fuels

sectors, but also a lot of employees indirectly connected to this industry, such as suppliers of equipment, services and materials. Attention should be paid to develop new jobs for them as well.

#### 5. Address the issues of various vulnerable groups.

Climate changes do not affect all people in equal way, vulnerability to climate risk is higher on regions with poverty, and it is increased by inequality and marginalization connected to social status, gender or ethnicity [27]. Similarly in the case of the energy transformation these regions will be more at risk and it will have wide impact on people's everyday lives, through affecting cost of energy production and electricity prices, transport and even cost of the food production. Among the most vulnerable groups are: unemployed people, those with below-average income, young and elderly citizens, single parents and people employed in energy-intensive industries [28]. It needs to be ensured that they are not left out from energy transition discussion. Those people, economically and socially disadvantaged, would be opposite to the transition if they have to carry the cost of it, as most of them believe they do not have capacity to respond, plus governments and big companies are truly responsible and obliged to find solutions. Their concerns need to be addressed, as public's resistance can significantly delay the transition.

#### 6. Provide a path for economic diversification.

Presently, coal regions are often dominated by a few large enterprises, which are the main employers and the driving force of the economy. The main disadvantage of such a market structure is low flexibility, as large companies react slower to changing market conditions. One of the reasons is the wide scale of activities, which does not allow for quick changes in the scope of services provided or production processes. As a result of the transformation, coal regions should strive for development of economic diversification. The core of a diversified economy will be SMEs, which are currently not very well developed in coal regions. Therefore, projects related to the creation and development of SMEs should be supported at every stage, from education and motivation of residents to start their own business, through support in entering the market to wide funding dedicated for them. They are often in a worse position on the

market, resulting from low competitiveness and the level of innovation [29]. Moreover, they encounter barriers that slow down their development, such as insufficient equity and difficulties in obtaining external financing, limited resources in terms of access to sales markets or new technologies, bureaucratic difficulties as well as problems with finding qualified employees. SMEs are characterized by low innovativeness, therefore TJTPs should include projects aimed at supporting research and development activities. An important aspect will be the improvement of cooperation between enterprises and scientific institutions and the creation of educational programs in order to improve the competencies of employees.

7. Ensure that creating process is transparent, open and inclusive.

The preparation and implementation of territorial just transition plans need to be carried out with involvement of the public and of all stakeholders: local and regional authorities, economic and social partners, citizens representatives, non-governmental organizations and research organizations. Mining and energy sectors should also be included, as they can provide valuable contribution and offer solutions. All stakeholders should have easy access to information and can actively participate in every step of the planning process. Information on planned activities should be easily available and communicated to the public on a regular basis, so they can provide feedback, and if necessary, propose changes. Social dialogue cannot be neglected.

The introduced above principles are presented in the **Table 1**, together with the detailed criteria defined for each of them, which will be used to assess the effectiveness of TJTPs.

**Table 1.** Principles of effective TJTPs

1. Include plan for sustainable transformation of energy system	
1.1.	Is the plan for phasing out fossil fuels ambitious enough and does not lead to prolonged use of them?
1.2.	Are investments planned to increase renewable energy in the region, along with specific projects proposed?
2. Strive for climate neutrality in line with EU targets for 2030 and 2050	
2.1.	Do the Plans make a commitment to at least a 55% GHG emissions reduction by 2030?
2.2.	Do the Plans contain measures to scale down carbon-intensive industries or to transition them to a climate neutral economy?
2.3.	Will the regions contribute to the achievement of the national climate targets through other measures as well (e.g. transport, energy efficiency)?
3. Do not harm environment and include revitalization projects	
3.1.	Do the Plans include measures to remediate the environment?
3.2.	Do they take into account the polluter pays principle?
3.3.	Do the Plans promote circular economy, energy efficiency increase, energy use reduction?
4. Provide broad support for people losing jobs	
4.1.	Will support be extended to people not directly related to the mining industry?
4.2.	Are changes in the skills profiles demanded identified and plans for upskilling/reskilling of employers included? in transforming sectors and new
4.3.	Will jobseekers be provided with any needed assistance?
4.4.	Do the Plans recognize the need for creating good quality jobs?

5. Address the issues of various vulnerable groups	
5.1.	Do the Plans address problems affecting the deterioration of the quality of life?
5.2.	Do the Plans identify most vulnerable groups and address their needs (lowest income group, socially excluded)?
5.3.	Do the Plans address issues related to the migration of young people and depopulation risk?
5.4.	Do the Plans include dedicated support for long-unemployed people?
6. Provide a path for economic diversification	
6.1.	Do the Plans recognize the importance of SMEs and provide support for their development?
6.2.	Do the Plans promote sustainable industries?
6.3.	Do the Plans include unjustified support for large enterprises?
7. Creating process is transparent, open and inclusive	
7.1.	Are working groups diversified?
7.2.	Have mining companies been included in discussions?
7.3.	Have open meetings and discussion panels been organized?

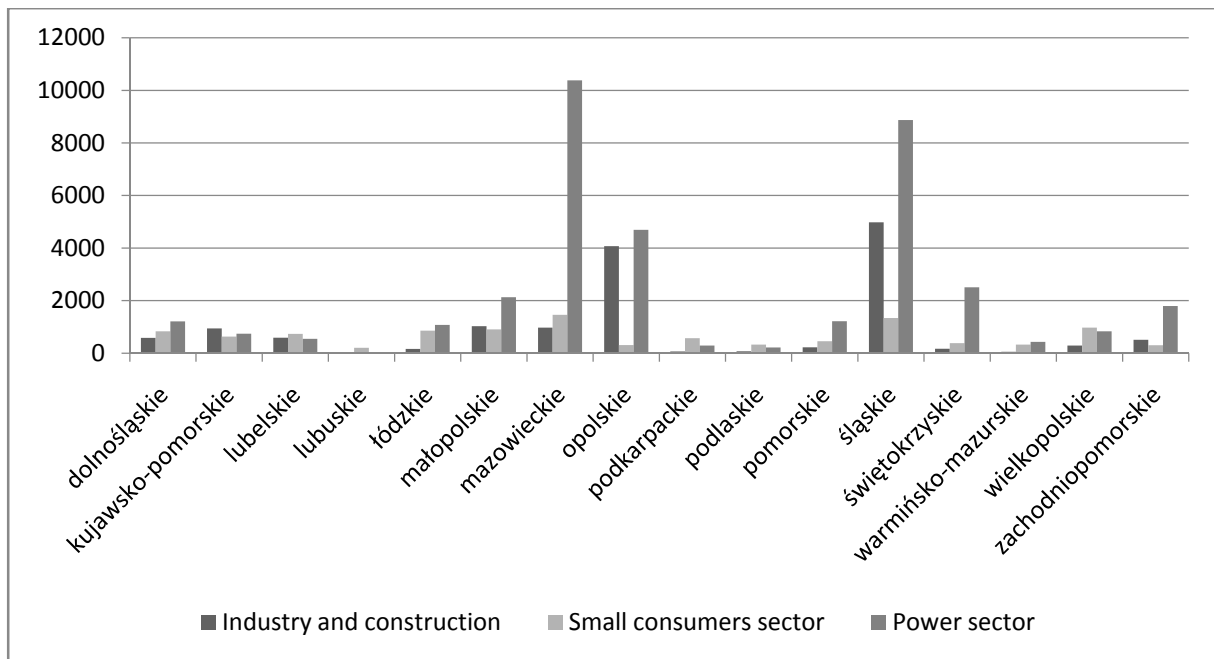
## **7. Just Transition in chosen EU countries: country analysis**

### **7.1. Poland**

#### **7.1.1. Introduction**

Poland is the biggest hard coal producer in the EU. Coal deposits are located in three basins, however, presently it is extracted from underground mines in two of them: Upper Silesian and Lublin Coal Basins. Mining in the Lower Silesian Coal Basin was terminated in 2000. As of end of 2020 there were 163 proven hard coal deposits, 49 of which were in production. 80% of documented hard coal resources are located in the Upper Silesian Coal Basin and, except for one, all active mines are placed here [30]. For several years, hard coal production has been on a downward trend, yet in 2021 a slight increase in production - about 1% - was registered compared to 2020 [31]. According to Central Statistical Office, the consumption of hard coal in 2020 was equal to 62,404 million tones, which is less than in previous years [32]. As coal is the main fuel used for electricity production, 59% of it was used by power sector. The industry and construction sector accounts for 24% and retail sector, including households and agriculture, for 17%. Consumption of coal varies significantly between voivodeships, in dependence of population and industry size, and it was the highest in Mazowieckie, Śląskie and Opolskie voivodeship (**Figure 7.1**). The high coal demand results in fact, that despite significant resources and own production, Poland is also a coal importer. In 2020 the hard coal trade balance was negative and amounted to -8,182 million tones [33]. It is mostly caused by factors such as the location of the demand, the availability of the raw material with the given properties and its price.





**Figure 7.1.** Hard coal consumption in 2020 (in thousand tonnes) [32]

Poland's energy reliance on fossil fuels is much higher than in other EU countries. Currently, coal is essential for the country's energy security, it allows to cover the demand mainly from domestic sources, thus ensuring a high degree of energy independence. While the EU aims to phase out coal completely by 2030, the Polish energy policy states that in 2030, the share of coal in electricity generation will not exceed 56%, with the perspective to eliminate it by 2049 [34]. Initially, natural gas is planned to play a crucial role in the energy transformation, with a later transition to RES and implementation of nuclear energy by 2033. Moreover, there is a high social dependence on coal in mining areas. The coal sector employs over 76,000 people directly and, together with indirect jobs, it is estimated that 96-120,000 jobs are related to coal activities, which far exceeds employment in other EU countries [35]. As a result, people are opposed to the transition.

In order to establish solutions to protect employees of the coal industry, and at the same time to maintain energy security and enable the transformation of coal areas, the Social Agreement was signed between the Polish government, representatives of mining companies and coal mining trade unions [36]. It contains financing support for mining companies, including subsidies to the costs of capacity reduction, as well as regarding mines' shutdown, and indexation

of wages. However, the implementation of these measures will depend on EU funds. Issues related to employment are also addressed, such as ensuring continuity of employment (allocation of workers, reskilling) and additional social benefits for people losing jobs (severance payments). Moreover, the dates for termination of exploitation in particular mines were set, they were spread over many years in order to avoid a sudden drop in regions' economies. All of them are to be closed by 2049.

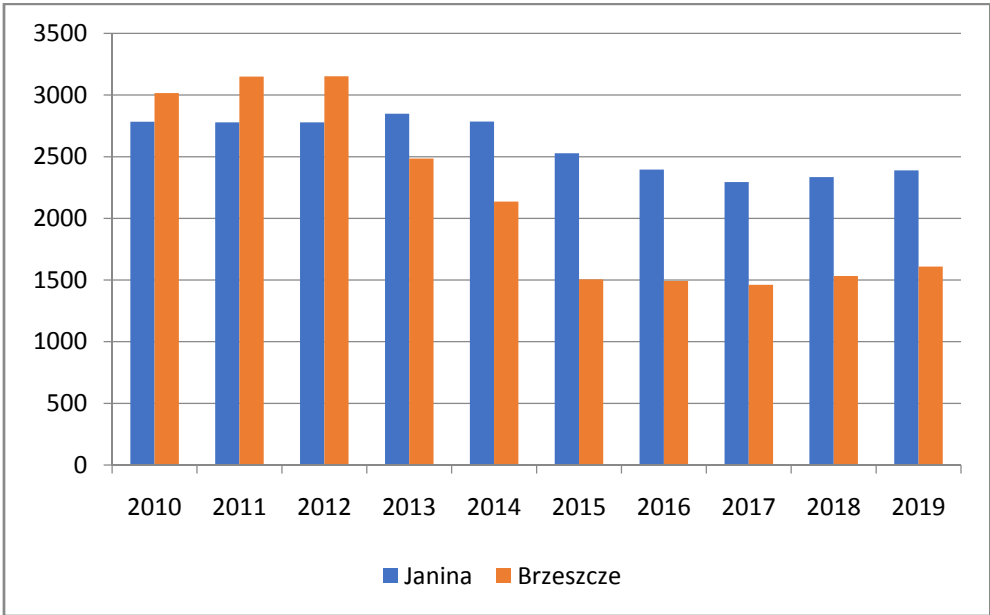
The coal sector is an important part of the country's economy, so its transformation will be a great challenge, requiring the cooperation of many stakeholders and significant investments. Under the Just Transition Mechanism, Poland is to be allocated the highest amount of funds, representing 20% of the total resources [37]. Apart from a national Just Transition Plan, there are six plans under development for each coal region in the country: Upper Silesia, Eastern Wielkopolska, Walbrzych sub-region, łódzkie, Lubelskie and Western Małopolska. The Ministry of Climate and Environment is responsible for the transition process in Poland, in cooperation with the Ministry of Development Funds and Regional Policy on regional level and consulting company PwC. Diverse working groups have been established for each region, consisting representatives of government administration, regional authorities, trade unions, non-governmental organizations and scientific institutions.

### **7.1.2. The Western Małopolska region**

Western Małopolska is located within the Upper Silesian Coal Basin, which has essentially shaped the economy in this region. It covers the Oświęcimski Subregion, which includes 4 counties: Oświęcimski, Chrzanowski, Olkuski and Wadowicki. The region with an area of 2040 km<sup>2</sup> is inhabited by almost 550,000 people, which results in a relatively high population density. The economy is based on heavy industry, coal mining, electricity production and manufacturing industry, dominated by large companies employing many people. GDP at the region is rather low compared to the other coal regions. The unemployment rate is 5.9%, slightly above the national level [38]. Location enclosed Silesia region, good transport and communication network, along with shared industrial activities, created the economic connection of both regions. As a result, a great

number of the region's inhabitants are employed in Silesia, even up to 50% in some parts. Thus, the processes taking place in Silesia due to transformation will also have an impact on the situation in the Western Małopolska.

The coal transformation of the Western Małopolska began in the 1990s and as a result coal mine Siersza was closed, together with some mine shafts in Brzeszcze and Libiąż. Negative social, environmental and economic effects of it are still observed. There are currently two mining plants operating in the region: Brzeszcze and Janina (located in Libiąż), both owned by the company TAURON Wydobycie S.A. In 2020, around 3 million tons of coal were extracted from both of them [30]. Employment in the coal sector has been declining in the last decade, in the case of Brzeszcze mining plant it was a decrease by almost 50% (**Figure 7.2**). In 2019 there were about 4000 people working in both mining plants. Thus, the region's economic dependence on coal is not significant. The percentage of workers with the lowest qualifications is gradually decreasing and the majority have secondary education, moreover the share of people with higher education has increased [39]. It will have a positive impact on the transformation process, as a higher level of employee education enables industry improvement or makes it easier to find a new job. Another favorable aspect is the fact that the most employees are in the 30-39 age group.



**Figure 7.2.** Employment in coal mining plants Janina and Brzeszcze in years 2010-2019 [40]

The region has a relatively high investment potential, however there is a lack of attractive investment locations for industrial or municipal activities. There are many small areas, which have different owners and required merging, areas with unregulated ownership status with an undetermined status as regards post-industrial pollution. Another problem is also the insufficient communication network.

The TJTP project for Western Małopolska was adopted in December 2021 and after being updated in March 2022, it was submitted for an assessment by the regional director of environmental protection and the voivodeship sanitary inspector [41]. Then, it was presented for public consultations. As the Plan states the main objective of the planned activities is to mitigate the social, economic and environmental effects of the transformation to a climate-neutral economy, currently and in the following years [42]. In addition to the actions necessary to be taken immediately, the region is to be prepared for the negative effects of the transition that may appear in the future. Specific goals are defined as: inhabitants' professional and social activity, a stable and diverse low-carbon economy and improved condition of the environment. To prevent social exclusion and depopulation it is crucial to take measures to maintain professional activity in former coal regions, provide people with adequate assistance in re-entering the labor market and create new job opportunities. In order to diversify the economy, special support will be provided to people starting business activity and SMEs, as well as former coal enterprises changing their business profile. Innovative and sustainable investments will be prioritized, based on circular economy, energy efficiency and low-emission industrial processes. As air pollution is one of the main problems in the region, the development of alternative heat and energy sources will have a significant impact on improving the quality of life of the inhabitants. Projects related to the modernization of heating systems, thermal modernization and replacement of heat sources in households are to be implemented, together with activities aimed at increasing energy production with renewable energy and the development of low-emission transport. Former coal mine sites are to be redeveloped according to the needs of local communities. As a result, the region is to become attractive, both for residents and investors, to prevent depopulation and economic stagnation.

### **7.1.3. Analysis of the just transition process in Western Małopolska**

Present plans to phase-out fossil fuels in Małopolska are not in line with the EU's climate policy. Coal production is projected to drop in 2030 to 2.2 million tons per year, which, compared to 2020, is a decrease of about 27%. It will lead to reducing the number of people employed to around 3000, which is almost quarter less than currently. According to the Social Agreement, coal mines Brzeszcze and Janina are planned to be shut down in 2040 and 2049, respectively [36]. Additionally, closure of mines in Silesia will also have a negative impact on the situation in the region as many people are employed there. Moreover, in many cases they are supposed to be closed earlier. Piast-Ziemowit mine, employing the largest number of people from Małopolska is to be closed in years 2035-2037. Given that coal demand may decline more than now is anticipated, these dates may change. However, the current plans are far behind compared to other EU countries and even other regions of Poland. This may adversely affect the possibility of receiving funding from the JTF, which in turn will force the region to intensify its efforts in transformation.

Very poor air quality is one of the main problems in Małopolska - together with Silesia and bordering areas of Slovakia and the Czech Republic they are one of the most polluted areas of the EU. Pollutions level for PM<sub>10</sub> and PM<sub>2.5</sub>, as well as for the benzo(a)pyrene are systematically exceeded. Air pollution significantly affects the quality of life and reduces the attractiveness of the region. Activities aimed at improving air quality have been carried out for years, mainly by replacing substandard coal boilers. Subsidies from public funds for coal-fired boilers were canceled and all existing boilers are planned to be replaced by 2029. Ecological heating sources are promoted, a complete transition to RES in public utility buildings is planned by 2025. Moreover, there are many initiatives, both regional and national, focused on the development of renewable energy sources, increasing energy efficiency and thermo-modernization in private households. Along with improving air quality, it will also significantly reduce the demand for coal, as it is now the main energy source used in households, which further accelerates the transformation.

The biggest emitters of pollutants in the region are power plants. There are two power plants in Western Małopolska: Heat and Power Plant in Andrychów and Tauron Siersza Power Plant in Trzebinia. Plant in Andrychów ended use of hard coal in 2019, presently the source of energy is natural gas and further investments are needed in order to fully decarbonize it. Two coal-fired units at the Siersza Power Plant were closed in 2020 and the closure of the two remaining currently working units is scheduled after 2025. No new investments in coal-fired units are planned. Moreover, there are many heavy industry companies which negatively affect the environment. The largest CO<sub>2</sub> emitters among them are chemical production company Synthos and ZGH Bolesław producing zinc and derivative products. However, both of these companies, among many others in the region, plan to make investments to move towards climate neutrality by 2030. Additional measures are planned in transport sector: building an integrated, zero-emission public transport system, with promoting alternative transport. While decommissioning of Siersza power plant, together with elimination of coal in the municipal and housing sector, will result in a significant reduction in CO<sub>2</sub> emissions, the overall emission reduction plans for Western Małopolska are not ambitious enough. Greenhouse gas emissions are planned to be reduced by 40% by 2030, which is inconsistent with the current EU targets, as they have been tightened. Thus, the region should aim at larger reductions as well.

The Plan contains actions aimed at revitalizing the environment and removing the negative effects of mining activities in order to give post-industrial areas and facilities new social, economic and natural functions. It also includes plans to solve problems with access to drinking water resulting from stopping the coal exploitation. However, there is no information on the origin of the pollutants and the entities responsible for their creation. It is therefore assumed that these activities will be financed entirely from external sources, which is inconsistent with PPP. Moreover, due to the planned relatively long period of operation of the mines in the region, the Plan does not contain information on the revitalization of the areas after their closure or plans for the redevelopment.

The transformation of the region will result in job losses not only directly in mining, but also in mining-related sectors (trade, services, construction,

transport), power plants and companies based on coal individual heating (coal depots, sale points, transport services). Mining-related jobs account for 12% of employment in the region. Also, the requirement to transform production processes to reduce environmental impact will lead to automation of many of them or even closure of some departments, which will result in additional job reductions. Existing companies will face many difficulties, for instance issues in regards to re-branching, the need to find new sales markets or to retrain employees with low educational level are expected. In order to determine the directions of creating new jobs, an analysis of the demand for skills was carried out. As a result, it was concluded the number of people looking for a job is lower than the number of offers in the following industries: construction, transport, logistics and production. These sectors correspond to the preferences of miners who, according to surveys conducted in mining plants, indicate them as the most attractive alternative to current employment. Due to this fact, in many cases it will not be necessary to completely re-brand the former coal workers, as job opportunities will be adapted to their current skills and abilities. This, in turn, may also change their attitudes towards transformation to more positive.

Jobseekers are to be offered a wide range of support in terms of career advice, assistance in the job search process and opportunities to acquire new skills through training, courses or internships. Moreover, people who want to start their own business will be supported, both in terms of training and the possibility of obtaining funding. All investments aimed at creating new jobs in mining municipalities will be prioritized and provided with broad support.

Another problem of the region are unfavorable demographic trends related to migration, mostly among young people, negative birthrate and aging of the society. The number of people of working age decreases every year and, according to forecasts, this tendency is to continue in the coming years. Moreover, this is also intensified by location between two large agglomerations (Kraków and Silesia), with competitive living and employment conditions. In order to prevent depopulation, along with creating profitable job opportunities, activities are planned to raise the overall quality of life. Together with extensive efforts to improve the environment condition, it will also include maintaining local cultural identity, revitalizing former mining sites, workplace housing estates and

developing public spaces, as well as improving health care. An important issue will also be the construction of an integrated, sustainable and emission-free transport system, as well as the development of infrastructure for pedestrian and bicycle traffic.

Needs of vulnerable groups to the transition are not comprehensively discussed, focus is set mostly on employees from the mining, mining-related and emission industries. Additionally, training and qualification courses as well as advisory support are planned for unemployed people living in one household with people leaving work in these industries. The Plan does not mention the possibility of early retirement or benefits for elderly people, as well as support for dealing with social problems that may be caused by unemployment.

Presently, large workplaces dominate in the region and there are relatively few SMEs, thus it will be important to support development of them. It is planned to create technology parks, economic activity zones, acceleration programs and business incubators. The Plan states that start-ups should be focused on sustainable, low-carbon and circular economy. Education on responsible resource management and recycling will be promoted and projects related to these activities will be financed. Due to the necessity to terminate the activities of many enterprises, currently related, directly or not, with the coal sector, these companies will be looking for opportunities to rebrand. It is important that the change of the business profile proceeds with the best possible use of the currently possessed resources, knowledge and skills. One of the possibilities will be created by major development in renewable energy technologies and for instance companies from the coal-fired boiler industry can switch to the production and installation of heat pumps and energy storage. Moreover, new SMEs are to be created in relation to increased tourist attractiveness of the region, based on the sustainable use of local potential, landscape parks and Natura 2000 sites.

In order to develop a comprehensive and inclusive plan, a special team involving a wide group of stakeholders was created. It consists of representatives of selected municipalities and poviats, relevant ministries involved in works on the JTF, universities and research institutes, trade unions, business entities, relevant companies and development agencies, and other institutions and unions



(e.g. WWF, Polish Smog Alert). A series of meetings were organized where stakeholders presented their expectations, shared their ideas, comments and objections. After the draft of the Plan was created, it was assessed, remarks were collected and then re-discussed. In addition, Małopolska has been supported by experts from the Platform for Coal Regions in Transition.

The Plan recognizes the need for public participation and acceptance in the transformation process, thus the possibility for all citizens to submit comments was also created, however there is no information how their views were incorporated in the final version. Due to currently rather low awareness among inhabitants, several activities are planned to increase it. This will include school activities for young people on climate neutrality, sustainable consumption and the circular economy as well as improving the competence of local administration to prepare for participation in the energy transition.

## **7.2. Czechia**

### **7.2.1. Introduction**

Czechia, in the Policy Statement of the Government, has announced it will phase out coal by 2033, accelerating the transformation compared to the previously proposed date of 2038 [43]. Presently, the country is the third largest producer of brown coal in the EU, and, together with Poland, the only hard coal producers. Moreover, Czechia is in second place in the EU in terms of energy dependence on fossil fuels and accounted for 38% of electricity generation from fossil fuels in total electricity generation [7]. Despite this, significant decline in coal mining has been seen and production of hard coal and brown coal decreased by 80% and 37%, respectively, over the past decade. There are three coal regions: Karlovy Vary and Usti (brown coal) in the north-west of the country and Moravian-Silesian (hard coal) in the east, with nine operating coal mines. Hard coal mining is expected to end in years 2023-2024 and the brown coal mining between years 2025-2030 [44]. Currently, the economy in these regions is based on coal mining, heat and electricity production and heavy industry (metallurgy, chemical industry), which is also reflected in the employment structure. They are

one of the slowest developing regions in the country, with a high percentage of people at the risk of poverty, small number of SMEs, higher unemployment than the national average, unfavorable demographic trends and a significantly polluted environment. In 2020, the coal and energy industries employed a total of 21,600 people, and almost twice as many - 19,000 - in indirect jobs.

Under the Just Transition Mechanism, Czechia is to be allocated 8.5% of total resources, which is the fourth highest amount [37]. All three coal regions are to be covered by the support and available funds have been already allocated among them based on following indicators: population, GDP, unemployment rate, the size of the area affected by mining activities and number of employees at R&D. The highest amount, 46%, is to be allocated to Moravian-Silesian region, 39% to Usti region and 15% to Karlovy Vary region [45]. The Czech Government ensures it will be effectively used for the transformation and modernization and will bring the greatest benefits for citizens and SMEs. Coal in the energy sector is to be replaced by a mix of nuclear energy and decentralized renewable sources, especially photovoltaic, with natural gas playing a crucial role in the transformation process. In opposition to domestic coal, natural gas, as well as fuel for nuclear power plants are imported from abroad. This results in a greater focus on renewable energy sources, for instance, in order to become more independent from Russian gas, subsidies for gas condensing boilers have been cancelled and replaced with support for the installation of heat pumps [46]. However, in the recent NECP a target for the share of energy from renewable sources in gross final energy consumption was set to 22% in 2030, which is below the level recommended by the Commission and general EU plans [47]. Moreover, while the EU aims to phase out coal completely by 2030, NECP states it would still account for almost 30% of total primary energy sources.

The Ministry of Regional Development is responsible for the transition process in Czechia, with technical support from Frankfurt School of Finance & Management, in cooperation with Czech Technical University in Prague and Cambridge Econometrics and Trinomics. TJTPs are developed within the Transformation Platform, which is administered by the RE:START department of the responsible ministry. The Transformation Platform was set up to ensure that the planning process will be transparent and to allow the participation of all

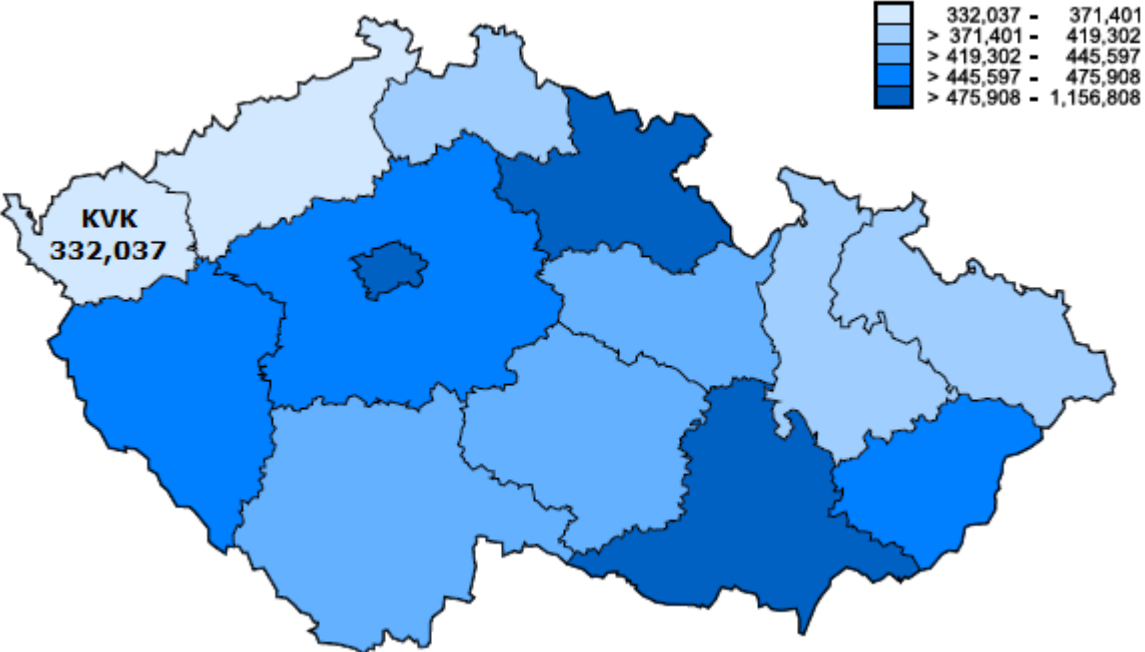
interested parties. It consists of a wide range of stakeholders, including representatives of local and regional authorities, coal industries, trade unions, relevant ministries, renewable energy associations and NGOs [48]. Between October 2020 and February 2022 eight meetings of the working group took place, allowing them to voice their expectations, share ideas, provide comments and opinions and monitor the development process over time. Detailed plans of these meetings, presentation materials and other information are available online for all interested.

### **7.2.2. Karlovy Vary region**

Karlovy Vary (KVK) region, located in the western part of Czechia, with an area of 3314 km<sup>2</sup> and inhabited by around 300,000 people, is the second smallest region in the country in terms of population and area. It consists of three districts: Cheb, Karlovy Vary and Sokolov. There are three types of natural resources: brown coal, kaolin and mineral waters, which together have shaped the region's economy. Brown coal has been mined since the nineteenth century, however presently the production of coal in the KVK region accounts for only a small part of the total production in Czechia. Coal mining resulted in the development of the energy sector, and currently there are two power plants operating: Tisová/Březová and Vřesová. After closing Medard mine in June 2021, there is only one mine operating left - Jiří mine. It produces around 3 million tons of brown coal annually, 50% of which is sold to domestic and foreign customers, and the rest is used for the energy needs of the region [49]. Coal mining and electricity production are monopolized by private company Sokolovské uhelné. While it is the smallest coal company in the country, at the same time it is the largest enterprise in the region. The company provides employment to almost 2500 people and indirectly affects the existence of several thousand other jobs in supplier and partner entities.

Apart from heavy industry, the presence of mineral waters influenced the development of the spa industry, as well as the food industry, especially the production of beverages. Another important activity in the region is the mining of kaolin, which, together with production of glass and porcelain, is equal to coal mining in terms of production size and the number of employees.

Presently, the region is struggling with a variety of problems. Many years of mining industry caused significant environmental pollution and, especially since brown coal is mined using the opencast method, major changes in the landscape. The region's economy, based on heavy industry, becomes uncompetitive, also compared to other coal regions. GDP per capita is the lowest among all of them (**Figure 7.3**). The unemployment rate in 2021 amounted to 5.7%, it was the highest value in the country, significantly exceeding the national average (2.8%) [50]. Moreover, the decline in coal and power generation from coal will result in even greater problems with employment in the following years. Most people have a low level of education, average earnings are lower than in other regions of the country. Society is aging, which is further worsened by migration, especially among young, well educated, people. In addition, the unfavorable trends are also intensified by the close vicinity of Bavaria - a rich and attractive region.



**Figure 7.3.** Gross domestic product per capita (CZK). 2020 [51]

The Plan was prepared in close cooperation with the region's authorities and consulted with the Transition Committee and the Transformation Platform. The current version (5.1) was released in September 2021 [52]. The vision of the region's transformation has been formulated as: "The Karlovy Vary region is

a prosperous and welcoming place, offering broad opportunities. Natural resources as well as cultural and historical heritage are our assets and potential".

The three priorities of the plan are: society, the economy and the environment. The activities carried out aim to reverse negative demographic trends by, among others, improving the overall quality of life, developing the education system at all levels, including higher education institutions, and creating satisfying job opportunities. The support will cover disadvantaged social groups, socially or digitally excluded. The emphasis will be placed on innovation and all planned activities are to be based on climate objectives. The traditional industry is to be restructured and its potential and efficiency will be increased, and additionally the development of new economic activities will be supported. An important aspect will be maintaining the region's position on the energy market, which requires the transformation of the energy sector into a sustainable and climate-friendly one. The environment is to be restructured and post-industrial areas transformed for new investments.

### **7.2.3. Analysis of the transition process in Karlovy Vary**

According to the national plans for phasing out fossil fuels, the Jiří mine operating in the region is to be closed by 2033. Termination of brown coal extraction will also lead to the decommissioning or transformation of power plants currently powered by this fuel. However, the Plan does not contain detailed information on this subject, so it can be assumed that no specific measures are planned at the moment. Only the necessity to find a new energy source is marked, the goal is to increase the share of renewable energy sources, and the region's potential is recognized in wind energy, photovoltaic and biomass. The interventions are to be targeted at all energy producers and consumers, and will include private, industry and urban investments, together with electro mobility and alternative forms of transport. Actions aimed at reducing energy demand, such as thermal modernization of residential buildings, are also to be taken. The Plan does not include any timeframe, so it is assumed that previously mentioned activities will take place in an indefinite period of time until 2033. As urgent actions are required, the lack of specific dates may unnecessarily delay the transformation process.

Czechia has made a commitment to become climate neutral, however in the recent NECP a indicative target for a CO<sub>2</sub> emissions reduction was set to 80% compared to 1990 by 2050 [53]. Therefore, additional steps will be needed to accelerate this process and make it possible to fulfill this obligation. The sector responsible for the largest part of emissions is the energy sector and within it, by 2040, an almost 30% decrease in emissions is expected compared to 2020. The decommissioning of power plants operating in the KVK region, together with the development of renewable energy sources and local energy will significantly contribute to the reduction of emissions. However, these are distant future plans, without specific dates. The only investment prepared for the moment is the modernization of the Vřesová power plant, which is planned for 2023 [54]. It will contribute mainly to the reduction of NO<sub>x</sub>, but indirectly, by reducing the demand for coal, also to reducing CO<sub>2</sub> emissions (up to 48,000 tons annually). There are also plans to introduce innovations in the energy sector, such as systems of intelligent solutions for managing energy consumption. Activities aimed at the transition to a circular economy, effective use of natural resources, responsible management and waste recovery will be supported. The second largest emitter sector is transport, additionally is the sector with the highest emissions increase in recent years - 24 % increase since 2005 - and this trend is expected to continue [55]. As the development of transport infrastructure is an important aspect of transformation, special attention should be paid not to increase the negative impact on the environment. Actions are planned to develop public and rail transport, promote electromobility and public transport, and decarbonise the local transport sector and its infrastructure. The aim is to increase the share of vehicles powered by alternative fuels, which is to be achieved by financial support for introducing CNG-powered public transport vehicles and limiting the number of diesel vehicles in urban public transport.

Mining activities, together with heavy industry, have significant impact on the region. According to the Plan, as of April 1, 2021, a total of 1,149 contaminated sites with various degrees of severity and treatment status were registered in KVK, including 65 with an area of over 2000 m<sup>2</sup>. In addition, there are many post-industrial areas, such as the premises of the Libocký Důl Textile Works, the area of the Old Waterworks Karlovy Vary and the area of the railway depot in Sokolov, which are left no longer used, however the effects of their

existence have not been completely removed, and they have not been prepared for re-use. The Plan sets the goal for the revitalization of at least half of the largest brown field sites by 2030 and the removal of all old environmental burdens, mainly originated from the glass and chemical industries. Moreover, there are plans to revitalize the areas that are currently unused or not fully used in order to increase the development opportunities of the cities in the region. The Plan mentions that revitalization is to be carried out in line with the Polluter Pays Principle, but does not specify the responsible entities. In addition, due to the planned relatively long period of operation of the mine, at the moment there are no revitalization plans connected to its closure.

As a result of the transformation many workplaces will be reduced. The Plan states that employees will be retrained for a different position with the same employer or be provided with any support needed in the process of re-entering the labor market. One form of the support is the Outplacement Project, which operates throughout Czechia, it includes career counseling, training in labor law, financial knowledge, and even training in soft skills. Participants can also take part in training courses, the content of which is consulted with regional employers, especially SMEs, and corresponds to their requirements and needs. Another program enabling the improvement of employees' qualifications is Support for vocational training of employees II (POVEZ II), addressed to employers and self-employed persons. The main goal of it is to enable adaptation to the changing situation on the market, so that it does not lead to the necessity of redundancies and increasing the number of unemployed, but only their retraining. Support is to be provided not only to employees directly related to the mining industry, but also to those employed in related industries or energy plants in the region.

One of the main issues with creating new jobs, especially in enterprises requiring higher qualifications, will be the low level of education, as KVK is the region with the second largest percentage of people with primary education in the country. Therefore, one of the goals of the activities is to improve the quality of primary and secondary education, as well as to create the possibility of continuing education at universities directly in the region. Currently, students from KVK have one of the worst results in final exams and in some cases even

the teaching staff is not sufficiently educated. Moreover, educational opportunities are mainly focused on vocational schools, with profiles inconsistent with the new vision of the region and the needs of the labor market, and the possibilities of obtaining higher education are very limited. It is planned to create new fields of study related to the development of new technologies and ecological solutions such as: Industry 4.0, digitization, circular economy, alternative energy sources. In addition, studies in the fields of STEM will be promoted, especially with regard to potential new energy sources in KVK. In order to develop the ceramic and glass industry in the region, it is planned to establish courses also in the field of creative and artistic industries in higher vocational schools in the region and to combine them with the arts faculties of the universities in Plzeň and Ústí nad Labem. Furthermore, opportunities are to be created for "lifelong learning", i.e. continuation of qualification improvement after completion of formal education, through, for example, post-graduate schools, courses and training. In addition, self-learning, through online platforms and other training programs, will be promoted. This would help to be more flexible in the labor market and quickly adapt to changes, which are essential skills in the transforming economy.

Poorly developed academic background also affects the low level of cooperation between companies and research institutions, which leads to low innovation of the activities carried out and low competitiveness of local companies. Therefore, creating a network between them and the participation of all partners in educational activities are to be promoted. It is planned to establish the Karlovy Vary Innovation Center (KIC), which is to be a place of cooperation between business entities, the public sector and research institutions. The next center, which is to be created in order to promote research and innovation is Regional Business Park Sokolov (KBPS), which will be the place of operation of enterprises focusing on new technologies and an ecological approach to business. Placing it in the center of the former mining town Sokolov will help attract investors and prevent economic stagnation, as well as create conditions for the development of education and obtaining qualifications necessary in the new labor market.



According to the Plan, the spa industry is to be one of the main sources of employment after the transformation, it is to be further developed and promoted in order to create new business opportunities and increase the attractiveness of the region. Establishment of the Institute of Spa and Balneology in 2018 allowed to create conditions not only for the development of research in the field of balneology, but also for the development of higher education and increasing the qualifications of residents, which are crucial elements of successful transformation. Another traditional industry that is to be developed is the creative industry, especially the production of glass and ceramics. Activities are planned to create conditions for the development of creativity and creative talents, to found a design park, and to initiate financial programs to support these activities. Moreover, a Regional Office for Culture and Creativity is to be established, the activities of which will focus on promoting creativity in education and supporting newly emerging companies, research and art institutions. Investments are also planned for the renovation and equipment of schools and production centers in order to improve the qualifications of future employees and increase production and export capacities. Furthermore, as the KVK region is the second in the country in terms of the number of people employed in agriculture, the development of this sector will be of great importance. It is planned to increase the cultivation area and support activities aimed at the transition to organic farming.

The KVK region is one of the regions with the highest risk of social exclusion in the country, which is also directly related to digital exclusion. It is associated with less decision-making, less educational, professional or recreational opportunities and a lower economic position. Moreover, these groups are more exposed to the effects of any crises and deterioration of the social or economic situation, which means that the effects of the transformation will also be more severe for them. One of the goals of the plan is to "develop a region that does not exclude anyone", therefore dedicated long-term support programs are to be launched to help solve the problems of excluded groups and prevent them from arising. They will consist of, inter alia, assistance for indebted people, providing better housing conditions and supporting the employment of excluded people, including people with disabilities. Support is also planned for people in a particularly difficult situation in affording education, in order that

everyone has equal opportunities to obtain the necessary qualifications and is not excluded from the labor market in the future. There are also programs planned to support the employment of parents with young children (part-time work, home offices, job sharing, etc.). Additionally, to prevent energy poverty, educational activities are to be conducted dedicated to low-income households on the possibility of reducing energy consumption.

The Plan recognizes the need to differentiate the planned support for employees according to their age, as older people may find it more difficult to adapt to changing situations. Activities are planned to promote self-employment among people over 50, as well as programs developing new skills targeted at this age group.

KVK, like many other coal regions, is struggling with excessive migration, especially among young people. Incentive programs are planned to encourage specialists, especially in scarce professions, such as medical workers, architects and designers, to settle in the region. This is to improve both the demographic and the economic situation. Additionally, activities are planned to improve the quality of life and attractiveness of the region by maintaining public spaces, cultural and sports facilities, and creating new infrastructure for recreation.

SMEs are of great importance in creating new jobs and improving the stability of the economy, however currently in the region this sector is not sufficiently developed and requires significant investments. It is planned to create a support network for people starting a business, both in terms of information, administration and finance. Moreover, in order to increase competitiveness and facilitate market entry, cooperation is to be established between SMEs and larger economic partners and state organizations. Special support will be given to start-ups in sectors supporting transformation, such as RET, energy saving, thermo modernization and new construction, as well as for new enterprises from industries that have not yet existed in the region.

In the early stages of the transformation process Czechia has been criticized for its lack of adequate inclusiveness, transparency and public discussion [56]. TJTPs were to be created with the participation of only selected groups of stakeholders and, while many of them were properly represented, one

of the main problems was insufficient representation of the affected communities. The Transformation Platform, established to work on the plans and ensure participation, consists of only one representative of civil society [57]. Moreover, the allocation of EU funds also raises concerns as it took place behind closed doors, and the greatest share was allocated to large coal and energy companies, which at the same time are the biggest polluters in affected regions.

The Plan's objectives include transparent communication, participation and partnership of all concerned. Nevertheless, the KVK region faced similar problems as the rest of the country. The first public consultations, in which anyone interested could participate, was not organized until June 2021 [58]. The meeting was held online with over 80 participants, including representatives of NGOs, cities and municipalities and, most importantly, people from the general public. Information about the JTM and the JTF were presented, along with the draft transformation plan and its goals. The meeting has created the possibility to ask questions, submit comments and ideas. The Plan has been updated twice since the meeting, but it is not known to what extent the comments were included. The current version of the Plan and all information related to the transformation process can be found on the website of the Regional Permanent Conference of the Karlovy Vary Region (Regionální stálá konference Karlovarského kraje: <https://www.rskkvk.cz>), serving as the main information channel. Educational activities, such as training and seminars, are also planned to share the awareness and involve as many people as possible in the transformation process.

## **7.3. Slovakia**

### **7.3.1. Introduction**

Slovakia, in the environmental policy strategy published in February 2019, committed to completely eliminate coal by 2030 and to stop using it for electricity production by the end of 2023 [14]. Brown coal is extracted from three underground mines, two are located in Upper Nitra region and one in Trnava

region. Total annual production accounts for only around 1% brown coal production in the EU and is used entirely for internal energy purposes. Coal mining is monopolized by private company Hornonitrianské báne Prievidza a.s. (HBP), based in Prievidza. Slovakia generates 6.5% of power from coal in two power plants: Nováky uses domestic coal from the Upper Nitra region and Vojany uses hard coal imported from Ukraine. It was announced that they will be shut down in 2023 and 2025 respectively [59]. Nováky power plant is planned to be transformed into renewable-based and Vojany into a secondary fuel installation, which will enable it to become independent from imported primary energy sources. In order to prevent security of energy supply, the construction of two additional reactors at the Mochovce nuclear power plant was planned and one of them is already operating. Nuclear accounts for a quarter of total energy supply [60]. In the recent NECP a target for the share of energy from renewable sources in gross final energy consumption was set to 19.2% in 2030, what compared to EU's target 32% is considered as unambitious [61]. While Slovakia does not rely on coal for electricity production, Nováky power plant is the country's second largest GHG emitter, therefore its decommissioning will be a significant step in a way toward a neutral economy.

Transition in Slovakia is planned in three regions: Upper Nitra, Banska Bystrica and Kosice, as those regions are most vulnerable.

### **7.3.2. The Upper Nitra region**

The Upper Nitra region is located in western part of Slovakia, in administrative region Trenčín and includes two districts: Partizánske and Prievidza. The population is 184,000 inhabitants. Since the beginning of the 20th century, the region's economy has been based on coal mining, electricity production and heavy industry: chemical industry, rubber production. Two underground mines are located there: Nováky and Handlová, which are responsible for 81% of total brown coal production in Slovakia [62]. Currently, the region's economy is not dependent on mining activities, as other industries have developed there as well, such as automotive industry, building materials production, textile and footwear production and engineering companies. Nevertheless, HBP company is still the main employer in the region, presently

3244 people are employed in jobs directly connected to brown coal mining and almost 600 in indirect jobs [63], [64]. Majority of the employees have a vocational education and only around 8% have a university degree. As many workers are approaching retirement age it was stated that phasing out coal activities will not lead to significant unemployment problems in the region. Unemployment rate is currently 4.5%, which is lower than the national average and it is forecasted to increase to 8-10%. The Upper Nitra region's society is aging, the percentage of people in retirement age is higher than in other regions and it is worsened by migration of the young people.

Development of the Action plan for the transformation of the Upper Nitra Coal Region is coordinated by the Ministry of Investments, Regional Development and Informatization (MIRRI SR) with cooperation of international consulting company PricewaterhouseCoopers (PwC). The latest update was published in December 2021 [65]. The project started with a comprehensive analysis of the current situation in the region, relevant reports, laws and regulations.

The stakeholders, which participated in the creating process are: the Government of the Slovak Republic, individual ministries and managing institutions, local authorities at all levels, local companies and entrepreneurs or potential investors, NGOs and local associations and representatives of educational institutions, health and social services. In order to facilitate the transformation, a working group (Slovensku Pracovná skupina pre implementáciu Akčného plánu transformácie regiónu horná Nitra) has been established to manage the process, it consists of equal representation of the private and public sectors and academic communities.

The vision of the region's transformation has been described as "Upper Nitra as an attractive and self-sufficient region with the development of economic activities in symbiosis with a clean environment, connected with other economic centers in Slovakia and the European Union". As negative migration is one of the main problems of the region, in order to reverse this trend focus needs to be set to creating decent job opportunities, especially for skilled workers with higher education. Moreover, the region aims to become an attractive tourist destination. Only investments which do not harm the environment as well as those which will help in its restructuring are to be supported. The region's transport and

communication infrastructure is to be improved, focusing on environmental-friendly transport (developing public transport, alternative fuels). Furthermore, the region is to become as independent as possible in terms of food production, energy and services.

Four pillars of transformation have been identified: mobility and communications; economy, entrepreneurship and innovation; sustainable environment; quality of life and social infrastructure. For each of them priorities and action plans have been established.

### **7.3.3. Analysis of the transition process in Upper Nitra**

The Upper Nitra region respects commitments made by the Slovak government in regards to phasing out fossil fuels and has made an announcement that coal subsidies for electricity production will be suspended by 2023. Nováky power plant is to be closed in the same year. Therefore, there will be a gradual reduction of brown coal production in the Nováky and Handlová mines, the termination of extraction in individual mining fields and their decommissioning. Previously, the opening of the 12th mining field of the Nováky mine was planned, but the idea was abandoned due to the projected changes in electricity production. Handlová mine is planned to shutdown in the period from January 2022 to December 2024 and Nováky mine from January 2025 to December 2027. As a result, the Upper Nitra region will be completely coal free by 2027, ahead of national coal phase out goals set to 2030.

One of the important issues regarding energy transition is the production and supply of heat. Presently Nováky power plant produces heat for a large part of the region from domestic coal, thus as coal will be phased out it is required to replace it with another heat source. Various solutions have been analyzed in terms of their impact on the economy, environment and employment. It was decided that the heat would be produced based on renewable energy sources (over 50% produced from RES). Of the total installed RES capacity, individual sources are proportionally represented as follows: sustainable biomass 53%, heat pumps 36% and solar 11%. Natural gas is planned to be used as an additional source of heat, however it is assumed to be used only during the winter months, as RES is to be sufficient during the rest of the year. In the next

phase, it is expected that heat consumption will be reduced, the generation of heat from RES will be increased and in 2034 it accounts for 100%, completely phasing out natural gas, which is in line with the EU's objectives.

Slovakia has made a commitment to become climate neutral by 2050, however, as The Low-Carbon Development Strategy shows, with existing measures it is unlikely to happen and further efforts are needed [66]. Additional solutions for different sectors, suggested in the Strategy, were compared with the measures proposed for the Upper Nitra region to assess how the region will contribute to the achievement of national climate neutral goals. As regards the energy sector, decommissioning of the Nováky power plant will have the greatest contribution, as it is the biggest polluter in the region, responsible for emitting 1.5 Mt CO<sub>2</sub> in 2019 [59]. Moreover, measures are planned to increase the energy efficiency of buildings and create environmentally-friendly heat sources. On the subject of industrial processes and product use, the circular economy will be promoted, along with waste heat technologies. Sector, which importance cannot be neglected, is transport, as it accounts for around 20% of total GHG emissions and, unlike most sectors, long-term projections predict an increase in emissions. The improvement of transportation is one of the priorities of the Plan, as it is believed that through improving the accessibility of the region it will help create more job opportunities. Therefore, it is crucial to ensure that it has as little negative impact on the environment as possible. In order to do so, great focus is set on promotion of alternative transport, including integrated public passenger transport, electro mobility, the use of alternative fuels, cycling and pedestrian transport. In order to encourage people to not use individual transport, the development of public transport is needed, to make it more convenient and attractive. The carbon footprint of public transport is to be lowered by electrification and use of alternative fuels.

The Upper Nitra region is heavily polluted, more than 55% of the inhabitants live in areas with significantly deteriorated environmental quality. In addition to coal activities and electricity production, the chemical industry has a noticeable negative impact on the environment in the region. The chemical production company Fortischem is one of the top five producers of particulate matter pollution in the country, causing the air quality deterioration.

Long industrial activity, i.e. coal mining and combustion, as well as heavy industry activities have significant effects the environment in the region, including contamination of soil, air, surface and ground waters. Mining activities also caused landscape's changes, for instance lowering of the surface, cracks and land subsidence, which may have a negative impact on infrastructure, forest and agricultural land. The Mining Law Act (51/1988 Zb. o banskej činnosti) regulates the legal requirements for the environment's revitalization after the termination of mining activities. It also includes requirements for the safe destruction of mining sites, disassembly of equipment and reclamation of waste dumps. Measures to improve the overall condition of the environment in the region are also planned, such as development of sustainable waste management, support for water management (sewage systems, wastewater treatment plants), protection of biodiversity and increasing the number of protected areas.

The HBP is a private company, which presently entirely controls mining activities and benefits from them. It was established in 1996 after transforming form a state-owned company. According to PPP, the HBP should bear the cost for any damage caused to the environment by their actions. However, the Plan states there are multitude difficult to identify environmental impacts, where it is very complicated or practically impossible to determine the source. As a result, external funding is planned to be used, including the EU's funds. The HBP's share in total financing was estimated at less than 20%. This is justified by the fact that due to the decline in production, the company will have lower income and will not have sufficient financial resources, as well as the fact that mining began long before the company was founded. Another company whose activity has had a significant impact on the environment is Slovenské elektrárne, which owns Nováky power plant. However, as with HBP, it will only bear a small part of the total cost of environmental restoration. Therefore, the Plan is considered as not compliant with PPP.

One of the priorities of the plan is creating new permanent jobs: for people who will lose them due to termination of mining activities, as well as for young people who will enter the labor market during the transformation. Former mine workers will need to acquire new skills to adapt to changing situations. Most of them are undereducated, with only work experience in heavy industry.

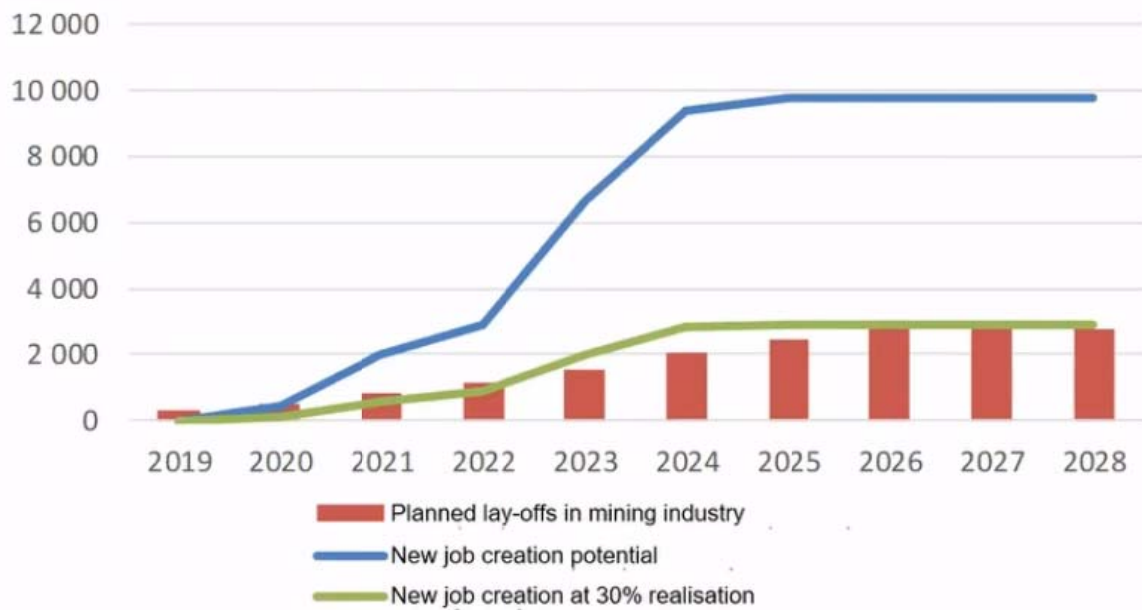


Therefore, it will be necessary to create educational opportunities for them, such as retraining courses.

Along with the development of new investments, the demand for employees with higher education will increase. An important issue in the region, which needs to be further developed, is dual education, i.e. cooperation between employers and schools to prepare graduates to work in new sectors of the transforming economy. As a result, young people acquire a specific set of skills, get better job opportunities and are less likely to migrate.

Supporting SMEs will be an important part in providing new job opportunities. One of the examples is STODOLA project, initiative for young people from secondary schools and universities, with the aim to help them develop their own businesses. More jobs are to be created as the result of development of tourism, however presently Upper Nitra region is not an attractive destination, mostly because of significant environmental degradation due to mining activities, but also poor road and touristic infrastructure. Developing tourism will require major financial resources, from infrastructure's improvement to marketing activities to promote the region. The tourist attractiveness of the region is to be built using the potential of mining heritage, as it is already the case with Cigeľ former coal mine, where mining museum is located.

Overall, the Plan identifies more than 200 projects in different sectors, which could lead to creating up to 10 000 new jobs. Mainly due to the lack of financial resources or not respecting environmental objectives, not all of them will be further developed. However, it was calculated that even realizing 30% of them will be sufficient to replace jobs lost as a result of termination of mining activities (**Figure 7.4**).



**Figure 7.4.** Potential of new jobs creation for the next years [67]

Employees, who lose their jobs as a result of transformation, will receive appropriate severance pay, depending on their length of service, together with opportunity for a new employment. While for some former miners it will be a sufficient form of assistance, others are more vulnerable, especially older people who are less flexible and not ready for changes. They will require various assistance, both in re-entering the labor market and in dealing with social problems that may be caused by unemployment. It is necessary to provide them with broad support in the process of searching for a new job, adaptation to a new workplace, as well as educating them about the rights and obligations of the unemployed. Experience from other coal regions shows that for some former workers difficulties in finding a new job may cause problems, such as increased addictions (alcoholism, gambling), deterioration of family relationships or even increase in crime. In the Upper Nitra region there are already social organizations dealing with the mitigation of such effects of unemployment and their activity is to be further developed.

The society is aging, retirees and pensioners are a significant part of the population and their number will increase in the coming years. In the region there are also many people with occupational diseases, people who have suffered

accidents at work and people with disabilities. They all will be more vulnerable to the transition, thus their needs have to be addressed. Development of social services and improvement of health care are planned.

Although the region's economy is not only focused on coal-related activities, but is more diversified, HBP is still the main enterprise. The Plan recognizes the need for new innovations, they may be based on the region's traditional industry, using existing assets, such as experienced workforce and infrastructure or completely new activities: automotive industry, electro mobility, automation, Industry 5.0. Moreover, it states that newly emerging economic sectors should have no negative impact on the environment and sustainable investments will be prioritized. As the development of SMEs positively affects the diversification of the economy, the small number of them in the Upper Nitra region is one of the main aspects covered in the Plan. Additionally, SMEs currently face many problems, such as low efficiency, administrative burdens and difficult access to financing, as the main beneficiary of EU funds is the public sector. This causes a decline in the number of self-employed people. Therefore, new entrepreneurs are planned to be provided with broad support in the field of business consulting, establishing and further development of economic activities. Moreover, activities are planned to increase entrepreneurs' awareness of the possibility of obtaining funds, especially from the EU, and support them with technical assistance in the process of applying for various financing.

The transition in the Upper Nitra region was initiated by local authorities, long before the Slovak government made a commitment to end coal subsidies and defined milestones and specific time frames. Work on creating a transformation plan began with a series of public debates and workshops. People from various groups were invited, including the Prime Minister, representatives of the European Commission, mayors, local entrepreneurs, environmental activists and numerous experts. Comprehensive analysis was possible to be carried out due creating four working groups, each focusing on different aspects of transition: economy, transportation, tourism, and social infrastructure [68]. It led to defining the vision and main pillars of transformation and creating the first draft of the plan. Then it was presented to the wider group of stakeholders for assessment and, after taking into account around

150 comments, the draft plan was updated. In order to give all citizens a chance to actively participate and provide comments, four public hearings were organized in different cities and several hundred people took part in them. Their views and reflections were incorporated in the final version of the plan, which was released for government approval [67]. The whole process took four months and included extensive consultations, many reviews and evaluation sessions, which allowed all stakeholders, as well as ordinary citizens to be truly involved and heard. Equally important aspect was consistent cooperation between stakeholders on national, county and regional levels.

## 8. Overall assessment of TJTPs

The plans were assessed using defined criteria, what is presented in the **Table 2**. Principles, depending on how many criteria have been met, were marked with three colors. For comparative purposes, a simple scale was developed according to which: the principle marked green was awarded 3 points, yellow - 2 points and red - 1 point. The maximum number of points is 21. Based on it, the plan for the Upper Nitra (UN) region will be the most effective (18 points), followed by the Western Małopolska (WM) region (15 points) and the least effective one - Karlovy Vary (KVK) region (14 points). In the following part assessment of the WM region plan will be discussed.

**Table 2.** Principles for effective TJTP - overall assessment

		WM	KVK	UN
1. Include plan for sustainable transformation of energy system		Yellow	Red	Green
1.1.	Is the plan for phasing out fossil fuels ambitious enough and does not lead to prolonged use of them?	NO	NO	YES
1.2.	Are investments planned to increase renewable energy in the region, along with specific projects proposed?	YES	NO	YES
2. Strive for climate neutrality in line with EU targets for 2030 and 2050		Yellow	Yellow	Green
2.1.	Do the Plans make a commitment to at least a 55% GHG emissions reduction by 2030?	NO	NO	YES
2.2.	Do the Plans contain measures to scale down carbon-intensive industries or to transition them to a climate neutral economy?	YES	YES	YES
2.3.	Will the regions contribute to the achievement of the national climate targets through other measures as well (e.g. low-emission transport, energy efficiency)?	YES	YES	YES

3. Do not harm environment and include revitalization projects				
3.1.	Do the Plans include measures to remediate the environment?	YES	YES	YES
3.2.	Do they take into account the polluter pays principle?	NO	NO	NO
3.3.	Do the Plans promote circular economy, energy efficiency increase, energy use reduction?	YES	YES	YES
4. Provide broad support for people losing jobs				
4.1	Will support be extended to people not directly related to the mining industry?	YES	YES	NO
4.2	Are changes in the skills profiles demanded identified and plans for upskilling/reskilling of employers included?	NO	YES	YES
4.3	Will jobseekers be provided with any needed assistance?	YES	YES	NO
4.4	Do the Plans recognize the need for creating good quality jobs?	NO	YES	NO
5. Address the issues of various vulnerable groups				
5.1.	Do the Plans address problems affecting the deterioration of the quality of life?	YES	YES	YES
5.2.	Do the Plans identify most vulnerable groups and address their needs (lowest income group, socially excluded)?	NO	YES	YES
5.3.	Do the Plans address issues related to the migration of young people and depopulation risk?	YES	YES	YES
5.4.	Do the Plans include dedicated support for long-unemployed people?	NO	NO	YES
6. Provide a path for economic diversification				
6.1.	Do the Plans recognize importance of SMEs and provide	YES	YES	YES

	support for their development?			
6.2.	Do the Plans promote sustainable industries?	YES	YES	YES
6.3.	Do the Plans include unjustified support for large enterprises?	NO	YES	NO
7. Creating process is transparent, open and inclusive				
7.1.	Are working groups diversified?	YES	YES	YES
7.2.	Have mining companies been included in discussions?	YES	YES	YES
7.3.	Have open meetings and discussion been organized?	NO	NO	YES

## 8.1. Evaluation of Western Małopolska plan

Based on the evaluation carried out, TJTP for the WM region is average and many aspects can be improved. Almost none of the defined criteria, apart from Principle 6, are fully respected. A major issue is the lack of ambitious national targets in line with the EU's climate objectives, for both phasing out coal and CO<sub>2</sub> emissions reductions. Without new regulation, transformation will be significantly delayed. Another problem is the failure to respect PPP as the Plan does not contain any information on the units responsible for pollution. Therefore, attention should be paid to ensure that when the mines working in the region are finally closed, the remediation costs are not transferred to EU funds or taxpayers.

In the case of Principle 4, a main problem is identifying how demand skills profiles will change and what skills will be especially needed in innovative, newly created companies. Without it, it is not possible to create appropriate training courses or other programs aimed at reskilling. Although the Plan mentions the need to reskilling employees itself, it does not provide any details on how this would be done or to what extent. This may be caused by the assumption that most former coal-employees should be able to find jobs in sectors with a similar skill set that will not require retraining. However, it could be improved, following

the example provided by the plans of the UN region, where it is projected to establish cooperation between educational institutions and enterprises and introduce the possibility of "dual learning", i.e. combined learning with working. Due to it, young people already during their education have the opportunity to acquire specific skills needed on the labor market, which results in better job opportunities. It is essential that the creation of new educational opportunities takes place with the participation of entrepreneurs and with clear communication of their needs. Additionally, the Plan failed to ensure that the newly created jobs will be characterized by conditions at least as good as those that will be lost. It is important that this is fulfilled, as it might result in a less enthusiastic and eager approach to the transformation.

There are also major shortcomings in Principle 5. The Plan does not identify any group of most vulnerable and no dedicated support is projected for those for whom the transformation effects may be greater. Moreover, it does not provide dedicated support for the long-unemployed, and as the experience of other coal regions shows, it may be the cause of serious social problems. Transformation will not affect everyone equally and the lack of support for the most exposed people will aggravate the problems they face and further deepen social inequality.

As for Principle 7 evaluating participation, while the working groups have been inclusive and transparent, the problem was the lack of open meetings and public discussions. The only chance for the general public to take an active part was by providing comments through the website. The case of the UN region shows the importance of organizing public hearings and discussions - several hundred people took part in them and provided valuable contributions. Moreover, increasing the involvement of residents in the process helps raise awareness, which further lead to greater support for transformation.

The **Table 3** shows SWOT analysis for the WM region, within which strengths, weaknesses, opportunities and threads were defined. The strengths are the lack of total dependence on coal for both the economy and employment in the region. The region's economy is diversified, which will positively affect further development opportunities. Additionally, the overall level of education is good, with many educational opportunities due to the proximity to various



academic institutions. On the other hand, the closure of the mining industry will have an impact on many other related industries and will further increase the effects of the transformation on other sectors. Presently, the dynamics of GDP growth in the region is lower compared to the voivodship. Another weakness is a negative demographic trend related to the migration of young people and the aging of society. Transformation may exacerbate these problems, so special attention should be paid to take actions to mitigate them. The region's opportunity is its relatively high investment potential, resulting from favorable geographic location, high level of urbanization and industrial traditions. Therefore, actions should be taken to attract investors to establish new activities in the region. Another favorable circumstance is the fact that sectors where there is a shortage of workers currently, correspond with those in which former miners would like to find employment. Moreover, starting work in these sectors will not require retraining or acquiring new skills.

The close vicinity of Silesia and numerous economic ties between them negatively affects the transformation process in the region. Firstly, Silesia, as the largest mining region in the country, will require significant investment outlays and wide-ranging activities, which creates a risk that the problems of the WM region may be sidelined. Presently, this region receives additional dedicated support, in the absence of similar aid for WM. Moreover, people currently working in Silesia will also face the loss of their current jobs, which will further increase unemployment. Furthermore, the region's location, between two strong agglomerations (Silesia and Krakow), adversely affects its attractiveness for both residents and investors and may result in increasing marginalization.

**Table 3.** SWOT analysis for Western Małopolska region

<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>▪ Good level of education, developed academic background</li> <li>▪ the economy not entirely dependent on coal</li> <li>▪ employment in coal and related industries accounts for a small share of general employment</li> </ul>	<ul style="list-style-type: none"> <li>▪ Lower dynamics of the region's GDP development compared to the voivodship</li> <li>▪ Many jobs indirectly linked to the mining industry, which will be impacted as well</li> <li>▪ Negative demographic trends</li> </ul>
<b>Opportunities</b>	<b>Threads</b>
<ul style="list-style-type: none"> <li>▪ investment potential (favorable geographic location, relatively high level of urbanization, industrial traditions)</li> <li>▪ jobs opportunities without reskilling requirement</li> </ul>	<ul style="list-style-type: none"> <li>▪ the location between two strong agglomerations</li> <li>▪ increasing the negative effects of transformation through links with Silesia</li> <li>▪ the region's problems may not be properly addressed by focusing on the transformation of Silesia</li> </ul>

## 9. Sustainable development indicators

In 2015, with the 2030 Agenda for Sustainable Development, all Member States of the United Nations adopted a shared action plan to face social, economic and environmental challenges [69]. All countries and all stakeholders are to work together to steer the world into a sustainable future, leaving no one behind. The core of it are the 17 Sustainable Development Goals (SDGs) (**Figure 9.1**), which emphasize the need for development on all three dimensions: the economic, social and environmental simultaneously and in a balanced manner. The SDGs present an ambitious and extensive vision, with objectives, among others, to improve life quality of all people, protect human rights and to build inclusive and just societies, where needs of most vulnerable groups are addressed. Furthermore, it is emphasized that these strategies must be implemented together with creating conditions for sustainable economic growth, tackling climate change and preserving the environment.

Together with the 17 SDGs, 173 related detailed targets were announced, along with indicators to evaluate how they are being achieved [70]. In the following part, selected goals and indicators that can be used to assess the progress of transformation are presented.



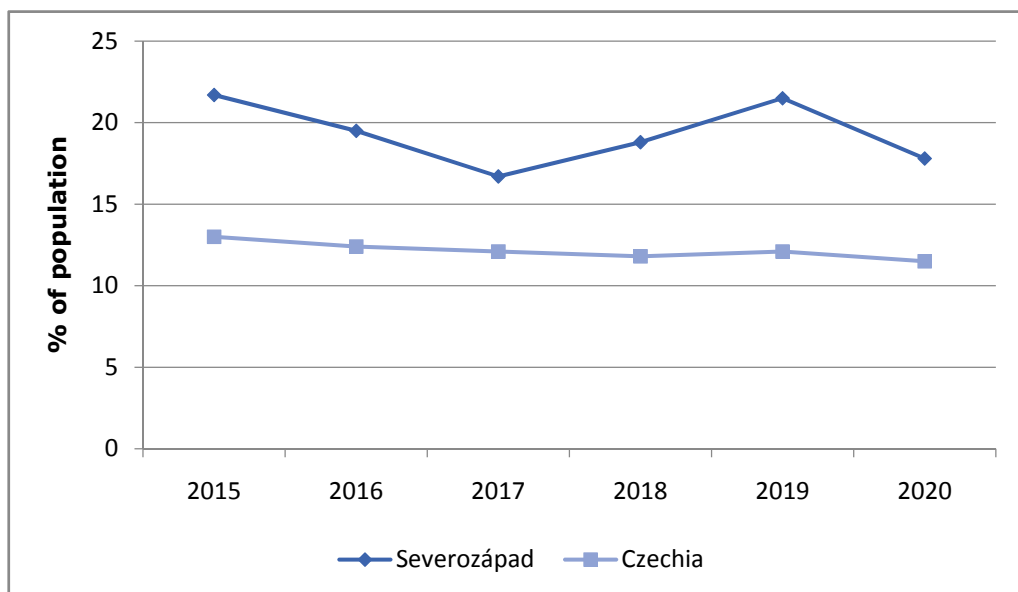
**Figure 9.1.** Sustainable Development Goals [71]

**Goal 1.** End poverty in all its forms everywhere

**Indicator 1.1:** People at risk of poverty or social exclusion

Poverty and social exclusion affect people's overall well being and health, together with limiting their educational and professional opportunities, which further exacerbates poverty and leads to more inequality. Therefore, external help is necessary to be able to obtain improvement in these environments, such as dedicated support in finding employment, improvement of the education system, social and tax benefits. As people at risk of poverty or social exclusion will be more vulnerable to the effects of the transformation, special attention needs to be paid to reduce their share in societies undergoing transition.

**Figure 9.2** shows a comparison of this indicator for the Czech Republic and the Severozápad region, which includes the KVK region together with Usti nad Labem, another mining region of the country. The value of this coefficient for mining areas is much higher and is subject to greater fluctuations over time. The transformation should result in a reduction of this ratio.



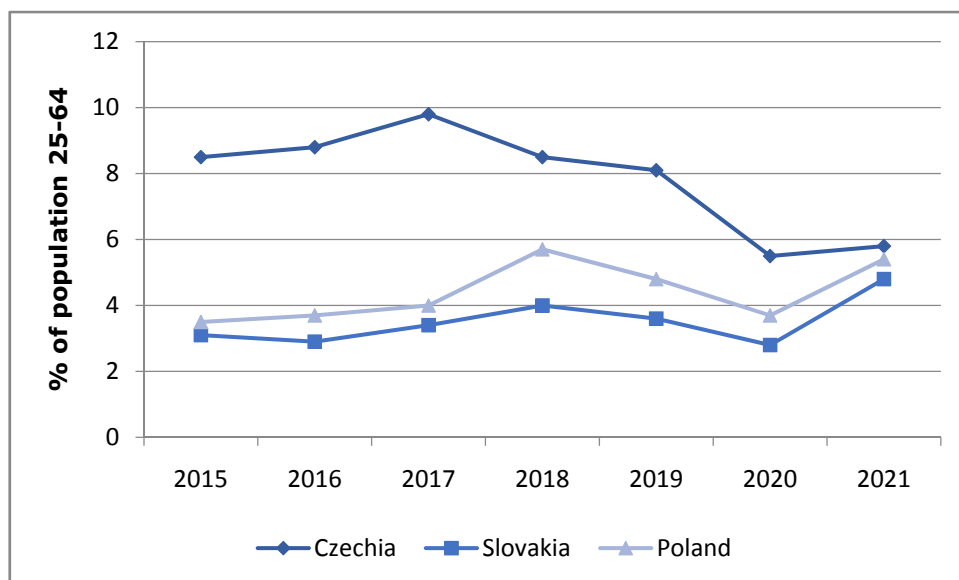
**Figure 9.2.** People at risk of poverty or social exclusion (% of population) [72]

**Goal 4.** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

**Indicator 4.1:** Participation rate of adults in learning

Adult learning most often refers to continuing education after finishing initial education. It includes courses, training programs, postgraduate schools or studies at universities, as well as self-learning. Lifelong learning is essential for the success of the transformation, as the continuous development of skills and acquiring new ones leads to the obtaining the flexibility necessary in the transforming economy. Such people adapt to changes faster and, in the case of necessary layoffs, will have fewer problems with re-entering the labor market and changing professions. Therefore, creating adult education opportunities should be widely supported and promoted.

Participation rate of adults in learning indicator describes the percentage of people aged 25-64 in the general population who stated that they participated in formal or non-formal education and training. As **Figure 9.3** shows, in the case of the three analyzed countries it is rather low, although an upward trend can be observed recently. Measures should be taken to further increase its value, especially in transforming coal regions.



**Figure 9.3.** Participation rate of adults in learning [73]

**Goal 7.** Ensure access to affordable, reliable, sustainable and modern energy for all

**Indicator 7.1:** Renewable energy share in the total final energy consumption

This indicator is used to monitor progress towards both Goal 7 and Goal 13 on climate action. As RES are to be the main energy source after phasing out fossil fuels, continuous efforts should be made to develop them and to promote such investments.

While a significant increase in the share of RES is noticeable, in the case of the analyzed countries, none of them met the EU's 20% goal by 2020 [74]. Therefore, it may not be possible to achieve the even more ambitious targets for 2030 without taking additional measures. Impossibility to ensure energy security in the form of alternative sources can lead to prolonged use of fossil fuels and hamper the transformation. Therefore, monitoring this indicator may be helpful in assessing the transition progress.

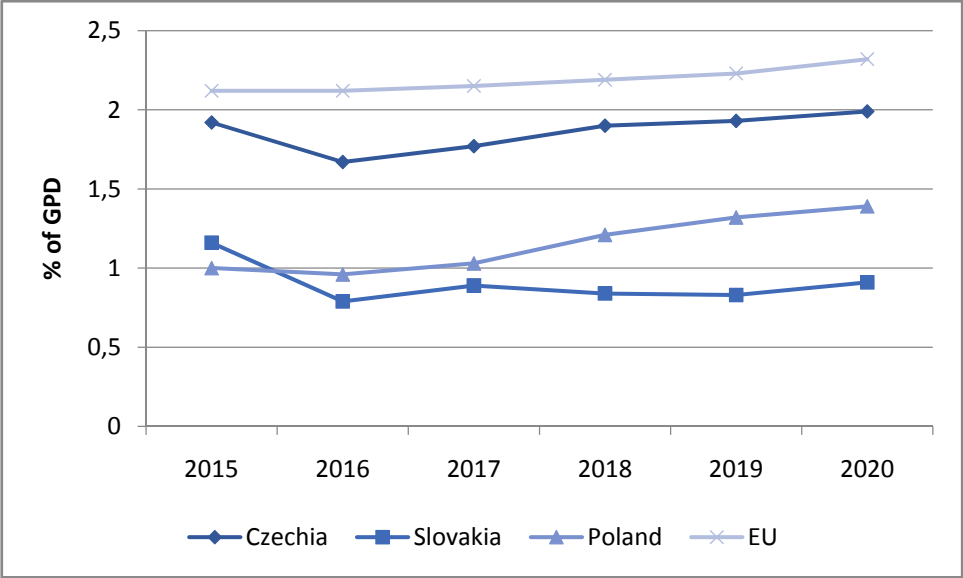
**Goal 9.** Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

**Indicator 9.1:** Research and development expenditure as a proportion of GDP

The R&D sector includes scientific research and projects aimed at developing, improving existing processes or creating new solutions. Expenditure on R&D has a direct impact on economic development by increasing the productivity and efficiency of activities. An innovative approach and technological progress will be particularly important when facing the challenges related to transformation.

The EU average R&D expenditure accounted for 2.32% of GDP in 2020, with the long-range goal to increase it to 3% of GDP. As the **Figure 9.4** shows, in the analyzed countries this indicator is lower than the EU average, however, in case

of Poland and Czechia, has increased significantly over the last decade and was one of the highest increases in the EU.



**Figure 9.4.** Gross domestic expenditure on R&D [75]

**Indicator 9.2:** Proportion of small-scale industries in total industry value added

The target is to strive for the greatest possible share of small enterprises in the economy, facilitate their access to funding and their integration into value chains and markets. As SMEs will be essential both for creating new workplaces and diversification of the economy, in regions undergoing transition this indicator should increase in the future. Especially since all analyzed coal regions have undertaken in their plans the commitments to significantly support the creation and development of small-scale industries.

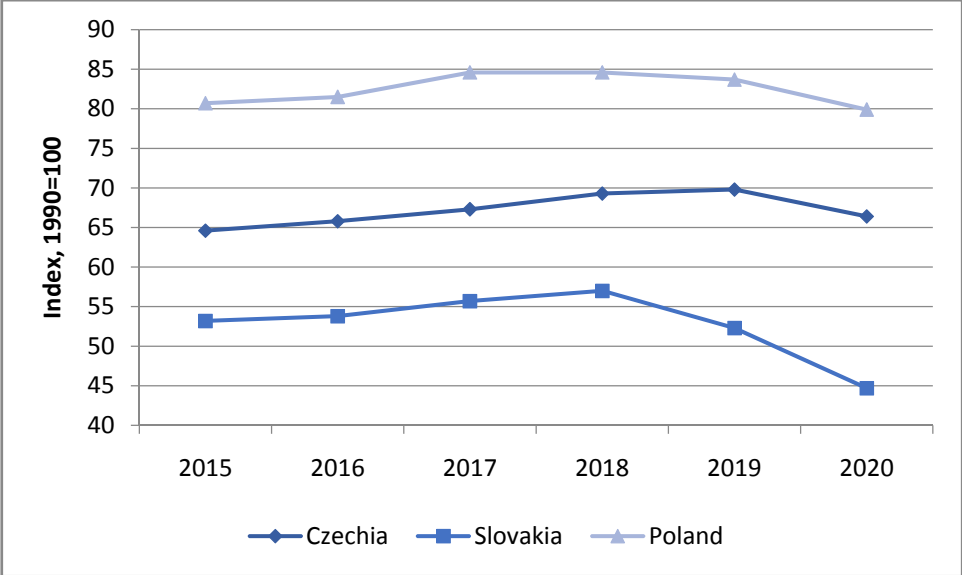
**Goal 13.** Take urgent action to combat climate change and its impacts

**Indicator 13.1:** Net greenhouse gas emissions

Goal 13 focuses on mitigating climate change, striving for the lowest possible impact on the environment and supporting all activities leading to

climate neutrality. The phase-out of fossil fuels and the transformation of energy systems will significantly contribute to the reduction of greenhouse gasses, mainly CO<sub>2</sub>. Therefore, indicator 13.1 is one of the most important coefficients when evaluating progress made. Monitoring it will help determine whether regions undergoing transformation are fulfilling their commitments and if they are ambitious enough.

The EU has set a goal to reduce emissions by 55% and all countries should contribute to it. However, decreasing of net greenhouse gas emissions varies significantly between Member States, as shown on **Figure 9.5** on the example of three analyzed countries.



**Figure 9.5.** Net greenhouse gas emissions [76]

**Goal 15.** Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

**Indicator 15.1:** Proportion of land that is degraded over total land area

Mining activities have caused significant soil contamination and land damage, especially in the case of opencast mining. Moreover, degraded lands are prone to erosion which poses a threat of desertification. Post-mining areas



require revitalization in order to be reused for new economic and social investments.

Each of the analyzed plans contains projects aimed at restoring the post-mining areas to a usable condition. This indicator can be used to assess the effectiveness of revitalization works in these regions.

## 10. Summary and conclusions

The increasingly urgent need to mitigate climate changes result in more and more ambitious climate goals being set by the EU. It has made a commitment to achieving climate neutrality by 2050, and such an ambitious plan requires the cooperation and great effort of all Member States. The biggest changes will be needed in carbon intensive sectors such as the energy sector and heavy industries. Therefore, regions highly dependent on coal will be the most affected and will need support to decarbonise their economy. For this purpose, the JTF has been established to ensure that the transformation towards climate neutrality is just and inclusive, leaving no one behind.

The transformation process in three selected countries was analyzed and the TJTPs prepared by the regions were evaluated. The focus was set in particular on assessing the case of Western Małopolska. Although it generally fulfills considered principles and includes examples of good practice, it nevertheless contains, to a greater or lesser extent, shortcomings in almost all defined criteria. The major problem is the lack of a phasing-out coal timeframe compatible with the EU's climate objectives. This is due to the lack of sufficiently ambitious national targets, however the region should define its own, which would be in line with EU goals. In addition, the targets for reducing CO<sub>2</sub> emissions are also inconsistent with the current ones and need to be adjusted. Due to the very distant date of termination of mining activities in the region, the projects and planned activities are presented in a very general, theoretical and vague manner. Meanwhile, the fact remains that urgent and specific actions are required. It is essential to accept the need for changes as soon as possible, as delaying it, prolonged use of fossil fuels and carrying out related activities that are increasingly struggling to compete, will only increase the final cost.

Furthermore, an important aspect is to raise the awareness of the society of regions undergoing transition, especially people who are directly affected, as many things can be improved in this matter. The negative attitude of the inhabitants of coal regions may delay the transformation and on the other hand, their contribution cannot be underestimated, as they may provide valuable insights and propose solutions. All measures should be taken to guarantee that

the general public is not against the transformation process and, moreover, not only passively accept it but take an active part in it. It should be ensured that there is general knowledge about the goals, challenges and the reasons why it is necessary. Transformation must not be associated with a threat to stability and prosperity, but with a chance for the development of the region, strengthening the economy and improving the quality of life.

Lastly, as shown in the example of Western Małopolska, regions undergoing transition should take advantage of good practices from other coal regions. It was presented how the plan could be improved by applying methods used in other regions considered. Although it is not possible to create one general transformation plan, coal regions share some similarities and, through gaining knowledge about positive and negative impacts of implemented measures, can identify success factors and transfer them to their cases. The transformation is a broad process that will affect every country, therefore cooperation between them will bring mutual benefits, accelerate the process and result in a successful transition to climate neutrality.

## 11. References

- [1] 'The European Green Deal. COM(2019) 640 final'. European Commission, Dec. 11, 2019.
- [2] 'Global Energy Monitor's Global Coal Mine Tracker'. Accessed: May 15, 2022. [Online]. Available: <https://globalenergymonitor.org/projects/global-coal-mine-tracker/>
- [3] 'Initiative for coal regions in transition'. European Commission. Accessed: Jun. 15, 2022. [Online]. Available: [https://energy.ec.europa.eu/topics/oil-gas-and-coal/eu-coal-regions/initiative-coal-regions-transition\\_en](https://energy.ec.europa.eu/topics/oil-gas-and-coal/eu-coal-regions/initiative-coal-regions-transition_en)
- [4] Alves Dias, P. et al., 'Recent trends in EU coal, peat and oil shale regions, EUR 30618 EN'. Publications Office of the European Union, Luxembourg 2021. doi: 10.2760/510714, JRC123508.
- [5] 'Coal production and consumption see rebound in 2021'. Eurostat, May 02, 2022. Accessed: May 25, 2022. [Online]. Available: <https://ec.europa.eu/eurostat/en/web/products-eurostat-news/>
- [6] 'Production in industry - annual data [NRG\_CB\_SFF\_\_custom\_2817755]'. Eurostat. Accessed: May 25, 2022. [Online]. Available: <https://ec.europa.eu/eurostat/>
- [7] 'Production of electricity and derived heat by type of fuel [NRG\_BAL\_PEH\_\_custom\_2816629]'. Eurostat. Accessed: May 25, 2022. [Online]. Available: <https://ec.europa.eu/eurostat/>
- [8] *Regulation (EU) 2021/1056 of the European Parliament and of the Council establishing the Just Transition Fund*. 2021.
- [9] *Regulation (EU) 2020/852 of the European Parliament and of the Council on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088*. 2020.
- [10] 'Commission Staff Working Document on the territorial just transition plans'. European Commission, Sep. 2021.
- [11] 'Toolkit for assessing effective Territorial Just Transition Plans'. WWF - European Policy Office, May 2021.
- [12] 'Seven Golden Rules for open and inclusive just transition planning at the regional level'. Europe Beyond Coal, Jul. 2019.
- [13] 'Coal industry across Europe'. EURACOAL European Association for Coal and Brown coal, Feb. 2020.
- [14] 'Europe's coal exit. Overview of national coal phase out commitments'. Europe Beyond Coal. Accessed: Jun. 10, 2022. [Online]. Available: <https://beyond-coal.eu/europes-coal-exit/>
- [15] Sheldon P., Junankar R., De Rosa Pontello A., 'The Ruhr or Appalachia? Deciding the future of Australia's coal power workers and communities'. University of New South Wales, Industrial Relations Research Centre, Oct. 2018.
- [16] Arora, A., Schroeder, H., 'How to avoid unjust energy transitions: insights from the Ruhr region', *Energ Sustain Soc* 12, 19 (2022), doi: <https://doi.org/10.1186/s13705-022-00345-5>.
- [17] Dahlbeck E., Gärtner S., 'Just transition for regions and generations. Experiences from structural change in the Ruhr area'. WWF Germany, Jan. 2019.
- [18] Robert P. Taylor, 'A Review of Industrial Restructuring in the Ruhr Valley and Relevant Points for China'. Institute for Industrial Productivity, Jul. 2015.

- [19] 'Germany: The Ruhr Region's Pivot from Coal Mining to a Hub of Green Industry and Expertise'. World Resources Institute, Apr. 2021. Accessed: Jun. 11, 2022. [Online]. Available: <https://www.wri.org/just-transitions/germany-ruhr-region>
- [20] Ciobanu C., 'Coal will always be part of the story'. Accessed: Jun. 15, 2022. [Online]. Available: <https://www.just-transition.info/coal-will-always-be-part-of-the-story/>
- [21] 'Case study: Genk's ongoing transition'. The Platform for Coal Regions in Transition is an initiative, European Commission.
- [22] Freire M., 'Genk's transformation honors its heritage', *Revo/ve*, Sep. 2020.
- [23] 'Discover - Thor Park'. Accessed: Jun. 15, 2022. [Online]. Available: <https://thorpark.be/en/discover/>
- [24] 'Building a Paris Agreement Compatible (PAC) energy scenario'. CAN Europe, European Environmental Bureau, 2020.
- [25] de Bruyn et al., S, 'Energy-intensive industries – Challenges and opportunities in energy transition, study for the committee on Industry, Research and Energy (ITRE)'. Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, Luxembourg 2020.
- [26] European Court of Auditors., *The polluter pays principle: inconsistent application across EU environmental policies and actions. Special report No 12, 2021*. LU: Publications Office, 2021. Accessed: Jun. 13, 2022. [Online]. Available: <https://data.europa.eu/doi/10.2865/590639>
- [27] 'Climate Change 2022. Impact, Adaptation and Vulnerability. Summary for Policymakers.' IPCC, 2022.
- [28] 'Fair Energy Transition for All: What Vulnerable People Have to Say'. King Baudouin Foundation, Mar. 2022.
- [29] Wawak S., 'Stimulants and barriers to the development of small and medium enterprises', *Journal of Modern Management Process*, no. 3(1), 2018.
- [30] 'Bilans zasobów złóż kopalin w Polsce wg stanu na 31 XII 2020 r'. Państwowy Instytut Geologiczny - Państwowy Instytut Badawczy, 2021.
- [31] 'Produkcja wyrobów przemysłowych w latach 2016–2020, Produkcja ważniejszych wyrobów przemysłowych w maju 2022 roku'. GUS.
- [32] 'Zużycie paliw i nośników energii w 2020 roku'. GUS.
- [33] 'Import i eksport surowców mineralnych i niektórych półproduktów w 2020 roku'. Państwowy Instytut Geologiczny – Państwowy Instytut Badawczy, 2021.
- [34] 'Polityka energetyczna Polski do 2040 r.' Ministerstwo Klimatu i Środowiska, 2021.
- [35] 'Program dla sektora górnictwa węgla kamiennego w Polsce'. Ministerstwo Aktywów Państwowych, 2022.
- [36] *Umowa Społeczna dotycząca transformacji sektora górnictwa węgla kamiennego oraz wybranych procesów transformacji województwa śląskiego*. 2021.
- [37] 'Just Transition Fund – allocations per Member State'. European Commission. Accessed: Jun. 20, 2022. [Online]. Available: [https://ec.europa.eu/info/sites/default/files/about\\_the\\_european\\_commission/eu\\_budget/jtf\\_current.pdf](https://ec.europa.eu/info/sites/default/files/about_the_european_commission/eu_budget/jtf_current.pdf)
- [38] 'Stopa bezrobocia rejestrowanego'. GUS BDL, 2021.
- [39] 'Zatrudnienie w górnictwie węgla kamiennego w Zagłębiu Górnośląskim'. IBS Research Report, Sep. 2020.

- [40] 'Regional profile. Małopolska, Poland'. Platform for coal regions in transition, European Commission, 2020.
- [41] *Uchwała nr 269/22 Zarządu Województwa Małopolskiego z dnia 1 marca 2022 r.* Accessed: Jun. 25, 2022. [Online]. Available: <https://bip.malopolska.pl/umwm>
- [42] 'Terytorialny Plan Sprawiedliwej Transformacji dla Małopolski Zachodniej (projekt 2.1)'. Mar. 2022. Accessed: Jun. 25, 2022. [Online]. Available: <https://bip.malopolska.pl/api/files/2863756>
- [43] 'Policy Statement of the Government , Government of the Czech Republic'. Jan. 2022. Accessed: Jul. 31, 2022. [Online]. Available: <https://www.vlada.cz/en/jednani-vlady/policy-statement/policy-statement-of-the-government-193762/>
- [44] 'Plán Spravedlivé Územní Transformace'. Ministerstvo pro místní rozvoj. Accessed: Jul. 31, 2022. [Online]. Available: [https://www.dotaceeu.cz/getmedia/7cbef27f-97ee-416f-b04f-44c9568b7ee1/PSUT-dokument\\_1.pdf.aspx?ext=.pdf](https://www.dotaceeu.cz/getmedia/7cbef27f-97ee-416f-b04f-44c9568b7ee1/PSUT-dokument_1.pdf.aspx?ext=.pdf)
- [45] 'Operační program Spravedlivá transformace 2021–2027'. Ministerstvo životního prostředí. Accessed: Jul. 31, 2022. [Online]. Available: [https://www.mzp.cz/cz/opst\\_2021\\_2027](https://www.mzp.cz/cz/opst_2021_2027)
- [46] 'Ministry of the Environment, Press Release'. Accessed: Jul. 31, 2022. [Online]. Available: [https://www.mzp.cz/cz/news\\_20220329-O-50-tisic-vyssi-podpora-pro-tepelna-cerpadla-a-omezeni-plynovych-kotlu-Sazime-na-obnovitelne-zdroje](https://www.mzp.cz/cz/news_20220329-O-50-tisic-vyssi-podpora-pro-tepelna-cerpadla-a-omezeni-plynovych-kotlu-Sazime-na-obnovitelne-zdroje)
- [47] 'Assessment of the final national energy and climate plan of Czechia'. European Commission, Oct. 2020. Accessed: Jul. 31, 2022. [Online]. Available: [https://energy.ec.europa.eu/topics/energy-strategy/national-energy-and-climate-plans-necps\\_en](https://energy.ec.europa.eu/topics/energy-strategy/national-energy-and-climate-plans-necps_en)
- [48] 'EU subsidy - Transformation platform'. Accessed: Jul. 31, 2022. [Online]. Available: [https://dotaceeu.cz/cs/evropske-fondy-v-cr/kohezni-politika-po-roce-2020/uhelne-regiony/plan-spravedlive-uzemni-transformace-\(psut\)/transformacni-platforma](https://dotaceeu.cz/cs/evropske-fondy-v-cr/kohezni-politika-po-roce-2020/uhelne-regiony/plan-spravedlive-uzemni-transformace-(psut)/transformacni-platforma)
- [49] 'Company - Sokolovská uhelná'. Accessed: Jul. 31, 2022. [Online]. Available: <https://www.suas.cz/spolecnost>
- [50] 'General unemployment rate by regions'. Czech Statistical Office, 2021.
- [51] 'Gross domestic product per capita (CZK)'. Czech Statistical Office, 2020.
- [52] 'Plán spravedlivé územní transformace Karlovarského kraje. Verze: 5.1.'. Sep. 2021. Accessed: Jul. 31, 2022. [Online]. Available: <https://www.rskkvk.cz/assets/uploads/1631516947-191673738513727038651659690615.pdf>
- [53] 'National Energy and Climate Plan of the Czech Republic'. Ministry of Industry and Trade, Nov. 2019.
- [54] '300 milionů korun investice do ekologizace - Sokolovská uhelná'. Jan. 2022. Accessed: Aug. 01, 2022. [Online]. Available: <https://www.suas.cz/10-suas/aktuality/975-300-milionu-korun-investice-do-ekologizace>
- [55] 'Climate action in Czechia. Latest state of play'. European Parliamentary Research Service, Feb. 2021.
- [56] 'Nothing "just" about Czechia's Transition planning'. CAN Europe, Mar. 2021.
- [57] 'Status of the Territorial Just Transition Plans in central and eastern Europe'. CEE Bankwatch Network, Mar. 2021.

- [58] 'Operační program Spravedlivá transformace'. Regionální Stálá Konference Karlovarského Kraje. Accessed: Aug. 01, 2022. [Online]. Available: <https://www.rskkvk.cz/dotace/fond-pro-spravedlivou-transformaci>
- [59] 'Climate action in Slovakia. Latest state of play'. European Parliamentary Research Service, Oct. 2021.
- [60] 'Slovak Republic'. International Energy Agency. Accessed: Jun. 17, 2022. [Online]. Available: <https://www.iea.org/countries/slovak-republic>
- [61] Slovakia, 'Integrated National Energy and Climate Plan for 2021 to 2030'. Slovak Ministry of Economy, Dec. 2019. Accessed: Jun. 16, 2022. [Online]. Available: [https://energy.ec.europa.eu/topics/energy-strategy/national-energy-and-climate-plans-necps\\_en](https://energy.ec.europa.eu/topics/energy-strategy/national-energy-and-climate-plans-necps_en)
- [62] 'Report on the activities of HBÚ and OBÚ SR in 2021'. Hlavný Banský Úrad. Accessed: Jun. 16, 2022. [Online]. Available: <https://www.hbu.sk/rocna-sprava-sprava-o-bozpz/rocne-spravy>
- [63] 'Analysis and forecast of the labor market development in Prievidza'. Office of Employment, Social Affairs and Family Prievidza, 2022. Accessed: Jun. 16, 2022. [Online]. Available: <https://www.upsvr.gov.sk/pd/urad-psvr/aktivita-uradu/regionalne-analyzy-a-spravy>
- [64] 'Región - Lepsia horná Nitra'. Accessed: Jun. 16, 2022. [Online]. Available: <https://www.lepsiahornanitra.sk/region/>
- [65] 'Aktualizácia Akčného plánu transformácie uhoľného regiónu horná Nitra'. PwC, MIRRI SR, Dec. 2021.
- [66] 'Low-Carbon Development Strategy of the Slovak Republic until 2030 with a view to 2050'. Nov. 2019.
- [67] 'The case of Upper Nitra - The process to develop transition strategy and action plan'. PwC, May 2020.
- [68] Límová Z., 'Local communities in Slovakia plan a post-coal future', *Heroes of Just Transition. CEE Bankwatch Network publication*, Dec. 2018.
- [69] 'Transforming Our World: The 2030 Agenda for Sustainable Development'. United Nations, 2015.
- [70] 'The 17 Goals, Sustainable Development'. United Nations. Accessed: Sep. 06, 2022. [Online]. Available: <https://sdgs.un.org/goals>
- [71] 'Communications materials - United Nations Sustainable Development'. Accessed: Sep. 06, 2022. [Online]. Available: <https://www.un.org/sustainabledevelopment/news/communications-material/>
- [72] 'Persons at risk of poverty or social exclusion by NUTS regions'. Eurostat.
- [73] 'Adult participation in learning (sdg\_04\_60)'. Eurostat.
- [74] 'Share of renewable energy in gross final energy consumption (sdg\_07\_40)'. Eurostat.
- [75] 'Gross domestic expenditure on R&D (sdg\_09\_10)'. Eurostat.
- [76] 'Net greenhouse gas emissions (sdg\_13\_10)'. EEA.