# IMPLEMENTATION OF SHEPHERDISM IN THE RECLAMATION OF THE BEŁCHATÓW BROWN COAL MINE AS CARE FOR THE ENVIRONMENT, PEOPLE AND THE ECONOMY

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**Title**: Implementation of shepherdism in the reclamation of the Bełchatów brown coal mine as care for the environment, people and the economy

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## 1. ABSTRACT

The EU is currently under an energy transition and the phase-out of coal mining and burning. The Bełchatów brown coal mine is scheduled to stop its operations in 2036. It is crucial to analyse the transformation of the coal mining regions as a multilayered problem, which requires an insight into the creation of new employment opportunities, restructuring of the social institutions and remediation and revitalisation of the degraded environment. I focused on the implementation of wood pastures, which are currently not researched in the context of post-coal mining landscapes. Wood sheep pastures have a positive influence on degraded landscapes by enhancing the accumulation of soil organic carbon, soil formation, water-holding capacity, development of soil microorganisms and provision of varied habitats for different species. Local employment will have higher resilience if industrial heritage tourism is supported by pastoral tourism and the manufacturing of sheep-derived products. Through literature review, I found that the local economy, society and landscape altogether will benefit from shepherdism if it is implemented along with social change and land management transition towards community-led common pool resource institutions. They are advantageous by being governed by a group of members, local and scientific knowledge diversity, high consent with decisions, improved monitoring and socio-ecological endurance. Finally, the application of sheep pastoralism in multiple post-coal mining sites can contribute to the revival of sheep farming in Poland.

**Keywords**: mine reclamation, agroforestry, common pool resource, wood pasture, heritage tourism, Bełchatów, coal mine, remediation, shepherdism, pastoralism, post-capitalism, care

## 2. FOREWORD

This independent project was conducted in relation to a student design competition organised by the Bełchatów coal mine. During the course of writing, I submitted my proposal suggesting the implementation of wood pastures with a wool and dairy manufacture as the future use of the reclaimed landscape. I would like to thank Anna Peterson and Markus Christian Hansen for the writing advice, interesting conversations and for keeping me open-minded and curious.

# 4. INTRODUCTION

## 4.1 BACKGROUND

With the urgent transition to clean, renewable energy coal mines are on a decline in most of the EU. They are either already shut down or with decisions on closing dates (European Commission, Joint Research Centre, 2018). The largest coal mine in Poland, Bełchatów, which this thesis will focus on, is scheduled to stop its operations in 2036. The issues arising from its phase-out are not only those concerned with the rehabilitation of the degraded environment but also the need for the establishment of new workplaces and social transformation (Dańkowska and Sadura, 2021).

In this study, shepherdism will be presented as a potential land management method for post-industrial landscapes. Both mining and shepherdism have inherent relationships to the environment. However, while the former is linked to the exploitation of the resources yet 'caring for Polish energy sovereignty' (Dańkowska and Sadura, 2021), the shepherding profession provides care for the animals, the environment, cultural heritage and food sovereignty. In the mining sector, the worker's link to the landscape is related to the labour for their corporate employer, the Polish Mining and Conventional Energy Joint-Stock Company (PGE GiEK). In contrast, pastoralism contains a sense of freedom and community (Marcol and Kurcz, 2022).

According to the human geographer Andreas Malm (2016), there is also a symbolic relationship between wool and coal, namely the beginning of the Anthropocene era and capitalism. With the development of industrialisation in the XIX century, the expansion of the wool and textile industry led to a greater need for energy derived from water power and coal. Later, the development of steam power allowed for more efficient sourcing of coal, further expansion of semi-automated factories and steam-powered transportation (Braae, 2015). The ongoing development of capitalism can be characterised by the uncontrolled exploitation of resources and of society forced by market competition (Wood, 2002). This mechanism has eventually led to the detrimental consequences of the increasing global temperatures leading to fires, droughts and rising sea levels; depleted soils in overgrazed landscapes and livelihoods under constant threat (Langsdorf et al., 2022) from the insatiable hunger of private capital. The persisting productionist approach to managing nature "not only reduces what counts as care to a managerial 'conduct' of tasks to follow — but also inhibits the possibility of developing other relations of care that fall out of its constricted targets. It reduces care

from a co-constructed, interdependent relation into mere control of the *object* of care" (Puig de la Bellacasa, 2017).

I will treat this post-mining region transformation as a possibility of shifting from the controlling, exploitative approach to managing landscapes and societies to one of attending to the needs of all species. I will look at the problem of Bełchatów transformation through the lens of post-capitalist social theory, which is suggested by Napierała et al. (2022) in their case study of the development of this mining region. In "Care Manifesto" The Care Collective (2020) call for promiscuous care and changing the current hierarchies into radical egalitarianism inclusive and attending to the needs of all kinds of humans and non-humans in place of exploitation. They list the essential practices to be strengthened for the good functioning of caring communities, namely 1) neighbourliness and mutual support, 2) common public space not dictated by private interests, 3) sharing of material and immaterial resources, and 4) democracy with localised engagement and co-operative institutions as well as insourcing of services. Similarly, economic historian and social theorist Matthias Schmelzer (2022) in "The future is degrowth" lists pro-environmental initiatives, which instead of alienating, strengthen local communities. He includes projects like collective reforestation and regenerative farming. In relation to the need for local participation, I will look at the community-led pastoral common pool resource institutions as a landscape management method with the potential for social transformation.

In the following text, I will present my qualitative research on how shepherdism can be implemented in brown coal mine reclamations for the benefit of the environment, local community and the economy.

## 4.2 CASE: BEŁCHATÓW BROWN COAL MINE

Bełchatów brown coal mine and coal-fired Bełchatów Power Station are located in central Poland (Figure 2). The Power Station is currently the European Union's biggest emitter of $CO_2$ (37 mln tonnes), NO (34 mln kg) and $SO_2$ (75 mln kg) (Burchard-Dziubińska et al., 2021). Both are owned by PGE GiEK. The company is a part of the Polish Energy Group (PGE), which is the largest energy-producing enterprise in Poland. It is currently owned by the State Treasury. The coal mine is surrounded by pastures, arable land, villages and forests (Copernicus.eu, 2018). Bełchatów is the region most affected by the lack of water in Poland, which concluded in droughts caused by

lowered ground waters within the cone of depression around the mine sized 10 by 30 km (Jokiel, 2009).

Let us look at the current plan for the transformation of the Bełchatów coal mine. On its website, PGE GiEK presents plans for recultivation taking place since 1977. The inner spoil bank has been under the process of afforestation since 1993 (Figure 1). The area of 1300 ha after the recultivation will be handed over to the State Forests. On the outer spoil bank, the afforestation works have been done between 1977 and 1994. 1516 ha of forested land have been given to the State Forests, while 14 ha are used as a skiing slope, hotels and restaurants, 42 ha as a gypsum bank, and there are 15 wind turbines on top amounting to 30 MW energy production (Figure 1). Szczerców spoil bank of 365 ha was afforested until 2018. 20 ha on top was given to experiments on the energy crops of black locust and 2 ha of giant miscanthus (Figure 1). On the northern slope, there is grass terrain being prepared for sport and recreation. There are also plans of setting up more wind turbines on top. The two pits (Figure 1) are going to be turned into 100 m deep lakes in 2049, around which activities such as car racing tracks, hotels and sailing infrastructure will be introduced to stimulate the local economy and tourist industry (PGE, n.d.).

Most of the land has been or will be given to the State Forests (Bolibok, Kowalczyk, and Szeligowski, 2008). The State Forests are another state company, which has a monopoly over the Polish forests, which cover 30% of the country. They are widely criticised for the lack of public participation in the creation of forest management plans with several NGOs striving for change. According to organisations Lasy i Obywatele (Forests and Citizens) and Wspólny Las (Common Forest) informations about social forest consultations are obscure, hidden and with very short appeal time after the publication of the management plans on the company's website. Furthermore, the plans are written in a technical language with many specialist abbreviations making them incomprehensible for the local stakeholders (Lewińska, 2022). On the 2nd of March 2023, the Court of Justice of the European Union judged that Poland has been breaking the EU law by not letting NGOs and local people sue the State Forests to question their forest management plans (Kość, 2023). On the other hand, the local foresters complain about people littering and driving quads on their tree plantations (Lasy.gov.pl, 2022), which is an issue of estrangement from the landscape (García-Martín, Plieninger and Bieling, 2018).

The present societal state of this mining region was analysed in a thorough report "Slept-through revolution. Social situation in Bełchatów". With the high level of bias within local politics and media supportive of the coal mine, together with no coherent vision of the regional

transformation, local people are living in a state of anxiety about the future clinging on to the idea of prosperity brought by the mine in the 1980s. In the study sociologists Dańkowska and Sadura (2021) point out that the local inhabitants are aware of the regression in services and taxes coming from the mine and the power station in the last 30 years, yet, since the industry is the main employer in the area, people are afraid to raise critical voices or agree with environmental organisations such as Greenpeace, which they perceive as threats to the main economic resource fuelling their daily lives, education, culture, recreation and health care. Moreover, the people in the Bełchatów region claim that there is no issue with the accessibility of tap water. They do not notice droughts affecting the nearby forests, bogs and agriculture, which led to many small-scale farmers selling off their farms to bigger companies due to the low profitability of small-scale agriculture in such conditions. They do not pay attention to the smog and mercury falls, arguing that the air is clear. Additionally, in the last 10 years, there has been a trend of people leaving Bełchatów with at least 12000 people fleeing. Everyone knows someone, who has left and never came back. When asked about the worst scenarios after the mine closure, the union members listed a lack of workplaces, a high crime rate and a general lack of perspectives. Per Dankowska and Sadura's report (2021), it does not seem that the local community is convinced by the vision of PGE GiEK of a bright future and the maintenance of prosperity. However, there are voices seeing hope in the revival of the agricultural sector after the closure of the mine and local economic deterioration (Dańkowska and Sadura, 2021).

To put it shortly, the land is currently reclaimed in the direction of industrial forestry and renewable energy production. On top of that, PGE GiEK would like to stimulate the local economy through the introduction of the tourism industry. Yet, this future vision of the region is criticised by both social researchers (Napierała et al., 2022) and the inhabitants, who live in a state of anxiety, unknowing, what their livelihoods will become after the closure of the mine. Moreover, the local community is isolated from the management decisions about the landscape determined by PGE GiEK and the State Forests, which furthers their estrangement and lack of ownership of their own futures. In my text, I will discuss solutions to these issues brought by shepherding common pool resource institutions with the benefits for the people, the landscape and the economy.


Figure 1: Bełchatów brown coal mine (Source: Google Earth, 2020; Arent, 2023)

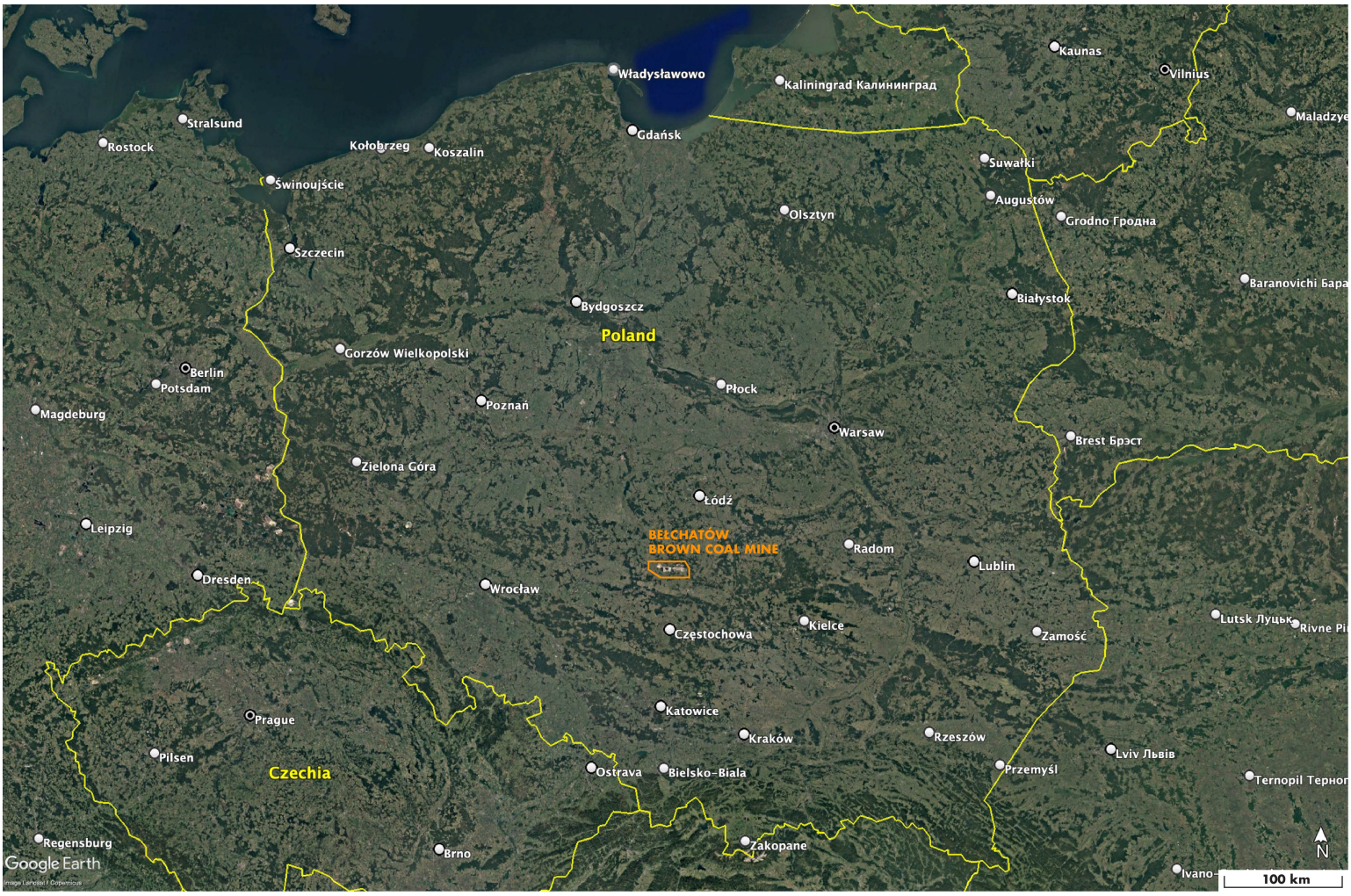


Figure 2: Location of the Bełchatów brown coal mine in Poland (Source: Google Earth, 2020; Arent, 2023)

## 5. METHOD

In my research, I started from a hypothesis that sheep pastoralism can be a multifaceted tool applied for the remediation of open pit coal mines with benefits for the local environment, society and economy. Through the literature review, I looked into these different fields in relation to shepherdism and the green transition of the mining regions. I analysed the area with the use of CORINE Land Cover 2018 and sociological reports. I read scientific texts about post-coal mining soil restoration with the use of pastoralism. That led me to reading philosophical texts about caring for soil ecosystems, which in turn carried me to post-capitalist literature, which proved useful to understand my approach to the transformation of the region. I also studied anthropological and geographical texts about pastoral landscapes and cultural heritage. That provoked my wish to better understand the history of the decline of the common land and wool industry in Poland. In my research, the link between the different sides is the notion of care for the degraded environment, society and economy. I decided to look into these different fields as I strongly believe, that the problems of the Anthropocene can only be tackled through multidisciplinary thinking.

## 6. RESULTS: BENEFITS OF AND FOR SHEPHERDISM

Let us start by considering shepherdism and its general benefits. Pastoralism can be looked at as a way of caring for the landscape, people and local economy as in the approach of urban designers Burns and Kahn working with three areas: of control: in this case the reclaimed post-mining landscape, the area of influence: here the local community, economy and politics and finally the area of effect: which is the further development of circular economy on the local level and contribution to the discourse of industrial landscape restoration (Braae, 2015). Sheep grazing is linked to multiple ecosystem services, which include supporting and habitat services such as grassland production influencing the diversity of insects, birds, plants and fungi; regulating services such as carbon sequestration and provisioning services supplying meat, milk and wool. It is also linked to a range of non-material cultural values including the preservation of cultural heritage, aesthetics, recreation, education, promoting animal-human interaction, tourism and health (Salachna et al., 2022). On one hand, we have the landscape heritage of shepherding related to the cultural landscape of meadow biodiversity, local food, textile production and the perception of individual freedom embedded in this profession (Kiereś et al., 2019). Yet, on the other hand, there's the

lingering specter of wool's relationship with the formation of capitalism.

The latter issue came from the still present modernist understanding of the landscape. Forester and philosopher Christopher Perley (2021) argues, that the nature discourse is persistently dominated by optimised land exploitation. In this perspective, the landscapes and whole regions are perceived as mere resources and so are the workers. With this uni-disciplinary attitude, many softer qualities of the landscapes are overlooked including the social relations, cultural heritage and the complexity of the human-landscape interactions beyond mining, forestry and agribusiness. Perley, after the sociologist Pierre Bourdieu (1977) and rural sociologist Leland Glenna (1996) calls for seeing landscapes as ideas grounded in the worldviews shaped by education, upbringing and one's level of reflexiveness. He compares the modernist approach to nature to a reduction of a child "to a calorie input-output machine".

Still, there are also consequences of the growing rewilding discourse leading to landscapes being misperceived as a polarisation of wild or rewilded areas opposed to production landscapes (Krauß and Olwig, 2018). As a result, the areas 'protected' from human use are set aside from the recreational, spiritual and aesthetic enjoyment of the local communities and visitors. Cultural anthropologist Werner Krauß and landscape geographer Kenneth Olwig associate this obsession with rewilding with the loss of pastoral landscapes and alternative ways of community living and managing the commons. Following anthropologist Anna Tsing they call for the search for new ways of dwelling, which the traditional approaches to living together with the landscape may provide. Instead of juxtaposing the raw wilderness against standardised agro-monocultures, higher protection and application of cultural landscapes could be beneficial for the creation of just, biodiverse futures.

Cultural landscapes and the tradition of sheep transhumance have been present in Poland since the 13th century with the arrival of the Wallachian shepherd tribe from the Balkans. Since that time the Carpathian Mountains have been under partial management by the shepherding communities. The Wallachian settlers stayed mainly in the high mountain meadows with their sheep, surviving on milk, wool and foraging, sometimes seeking refuge in the villages during the winter months. Until the 18th century, the local populations thrived on the community economy of sheep and dairy products while paying land taxes to the Piasts and later the Habsburgs. Everything changed in the second part of the 18th century with the growing demand for timber for the smelting industry and the ban on tree cutting and grazing meadow expansion. Eventually, Emperor Franz Joseph I recognised himself as the only owner of the forested land and prohibited the use of common pastures (Marcol and Kurcz, 2022).

Sheep wool export peaks were historically linked to the economic relationships with Russia. The high demand for woollen fabrics where noted in the 1870s, yet then the textile industry experienced a drastic fall caused by the loss of the Russian market during World War I. Wool production experienced growth again after World War II with Edward Gierek's state policies supporting intense development of industrialisation supported by loans from the West European countries and the USA. However shortly after it was affected by the economic and political crisis in the 1980s (Franaszek, 2010) and since the year 1990 wool production has decreased 16-fold notwithstanding the free market competition after the fall of the iron curtain and the economic transformation (Niżkowski, 2012).

Fortunately, according to the Polish agricultural scientist Roman Niżkowski et al. (2006), there is still a possibility of reviving sheep farming in Central and Eastern Europe through the implementation of the following conditions: "1) further development of slaughter lamb production by increasing reproduction rates, 2) development of milk production and processing as well as the local utilisation of wool and skins, 3) landscape management and marginal land grazing by small ruminants, and 4) direct sale development allowing middle-men costs to be reduced." As I will show in the following parts, the application of these practices, could not only resuscitate sheep farming in Poland but also contribute to post-mining landscape rehabilitation, enhancement of the local economy and strengthening of the local community.

## 6.1 LANDSCAPE

I will begin by presenting the findings on post-coal mining environment rehabilitation as many of the issues related to green transformation are rooted in soil and land use, and impact both the society and the economy, which I will discuss later in the text. The decision, of whether to apply pastoralism to the post-mining landscapes depends on which design strategy we choose to proceed with. Botanist Peter del Tredici (2007) differentiates between reclamation and restoration of degraded environments. The reclamation approach claims that we cannot turn back the ecological clock to the state before the mining's impacts on the environment. The restoration perspective deems the re-establishment of the ecological state from a given time in history possible. I will proceed with the reclamation approach with wood pastures in focus.

Pastures and agriculture are already established on 1600 ha of reclaimed coal mining land in

Lusatia, Germany. Similar plans are made for Jänschwalde and Cottbus-Nord opencast mines. Finally, Bełchatów is meant to devote 20% of the reclaimed area to farming (The Ministry for Economic Affairs and Energy of the State of Brandenburg, 2019). In some cases, it may even be a necessity to introduce grazing as ”surface mines are difficult to be reclaimed for anything other than pastures” (Krinke, 2001) due to the resulting anthroposoils being largely deprived of nutrients. In these conditions, grazing can be better than crop production as it requires soil of lower productivity (Maczkowiack et al., 2012) and pastures established on the previously mined land can be as productive as those on unmined land (Paton Colin et al., 2021).

### 6.1.1 TOXICITY

Not surprisingly, there are adverse effects of coal mining and burning pollution on animals. According to veterinary toxicologist Józef Szkoda et al. (2012), the data on the local animal population is telling, that heavy metal contamination around the Bełchatow coal mine and Bełchatów Power Station caused cadmium and lead accumulation in the kidneys and livers of deer, roe deer and wild boar above the levels allowed for human consumption. However, the amounts in their muscles were within the norms.

Fortunately, contaminated and degraded landscapes can be healed with time with the application of bioremediation and phytoremediation. Bioremediation relies on micro-organisms in the soil and groundwater breaking down organic contaminants into gentler, simpler compounds. Phytoremediation involves plants taking up contaminants from the soil and accumulating, biodegrading and volatilising them (Carman, 2001). Environmental geochemist Aleksandra Ukalska-Jaruga et al. (2022) studied the effects of soil amendments in post-mining contaminated soils on their toxicity to earthworms around Bełchatów. Per their research, we can see that the implementation of compost and liming in reclamation was successful in neutralising the pH and preventing the mobilisation of heavy metals making conditions more liveable for earthworms.

### 6.1.2 CARE FOR THE POST-MINING SOILS

Sheep grazing can have positive effects on post-mining soils. It has been reported that post-surface mining soils suffer from the depletion of soil organic carbon (SOC) by 70-80% and the

blending of soil horizons leading to carbon oxidation (Adeli et al., 2018). Livestock manure is proven to enrich the amount of soil organic matter, which is largely made up of SOC (Adeli et al., 2018). In turn, it can speed up soil-forming processes, water-holding capacity and the growth of microorganisms like mycorrhizal fungi and nitrogen-fixing bacteria beneficial for the up-taking of nutrients by plants (del Tredici, 2007). Furthermore, in a study at the Red Hill Mine, Mississippi the researchers showed that SOC was higher at 0-15mm depth under reclaimed pasture land use compared to reclaimed forested land (Adeli et al., 2018). However, excessive amounts of livestock animals can lead to overgrazing, which can lead back to carbon oxidation, high compaction and reduced activity in the soil, counteracting our desires to heal the soil ecosystem (Nair, 2012). In their study Adeli et al. (2018) proved that soil compaction was higher under reclaimed pasture compared to a reclaimed forest, thus a combination of woodland and pastures could be the best solution.

As we saw in the last parts, an inherently damaging relationship with the landscape is still present. In this case, it led to depleted soils polluted with heavy metals forcing us to apply extra efforts after the end of mining operations. The problem until now was caused by the land use of mineral extraction, against the complexity of natural ecosystems and our relationships with them. Implementation of pastures to the coal post-mining landscape was suggested by various researchers. Yet, I will argue for going beyond simple pastures with their issues such as soil compaction or overgrazing and transitioning towards agroforestry. An introduction of more complex, holistic landscapes would be beneficial for both the people and other species.

### 6.1.3 AGROFORESTRY AND WOOD PASTURES

Agroforestry systems are characterised by the combination of agriculture and the use of trees to create multifunctional systems with a range of benefits for different sectors. Due to their higher complexity compared to industrial agriculture and forestry, they can provide more workplaces, diverse sources of income and higher resilience to climate change to name a few. Agroforestry systems have already been used in the context of post-industrial landscape reclamation. Alley cropping, which is a combination of rows of trees with rows of crops, has been introduced on reclaimed brown coal mining landscapes in Lusatia in Germany. Grünewald et al. (2007) analysed that case as a tool for the production of woody biomass for energy transformation purposes. According to the researchers, the introduction of the crops of coppiced willow, poplar or

black locust could be a renewable resource for local energy production in combination with rows of *Medicago sativa* L. valuable for livestock feed production and nitrogen fixation necessary for the rehabilitation of the soil deprived of this mineral.

Yet, this is still a productionist approach neglecting our dwelling within an ecosystem consisting mainly of more-than-human species. Wood pastures provide a more inclusive approach providing both resources for human use and habitats for other species. They are systems, in which livestock grazing is combined with trees and shrubs scattered on the pastures. Based on various studies Chará et al. (2019) listed the advantages of such systems compared to pastures without trees. Such land use contributed to higher quality forage decreasing the need for supplying the feed from other sources, higher livestock production, higher carbon storage below and aboveground, increased soil quality through enhanced nutrient uptake, leaf litter and N-fixing trees, higher resilience to soil degradation and increased water holding capacity. Plieninger et al. (2015) analysed this type of landscape use in Europe using the LUCAS database identifying that 4.7% of the EU territory was covered by wood pastures. Poland had 1.5% of its territory used for wood pastures. Since this type of land use does not score high financially in competition with industrial agriculture and forestry, the EU introduced direct payments within the Common Agricultural Policy (CAP) for farmers managing wood pastures to reward the multitude of ecosystem services they provide. Plieninger et al. (2015) also encouraged wood pasture managers to seek support from the EU Rural Development Policy if they take environmental commitments in accordance with the guidelines of the Good Agricultural and Environmental Conditions (GAEC) of the CAP.

### 6.1.4 WOOD PASTURES AND BIODIVERSITY

In our case, we focus specifically on sheep grazing. Agronomist Kamila Musiał (2022) examined the influence of sheep grazing on grassland conservation in Nadnidziański Landscape Park in Poland. This management type greatly contributed to the conservation through the sheep biting away resprouting shrubs and trees, therefore preventing the successional overgrowth of the grassland. She found that sheep of native Polish breeds were well adapted to harsh environmental, thermic and humidity conditions as well as to the steep slopes. Moreover, Musiał suggested that extensive sheep grazing could be the cheapest and most efficient way of grassland conservation.

Pastures combined with woodland contain high habitat heterogeneity through their variety of spacial arrangements, differing light conditions, varied humidity, wind, temperature, soil fertility and rich plant communities. The openness of the landscape allows trees to develop bigger trunks and canopy volumes providing a range of ecological niches. It has been documented that they contribute to rich bee, spider, earthworm, saproxylic and click beetle communities, a high number of saprotrophic and mycorrhizal fungi and lichens (Plieninger et al., 2015). Söderström et al. (2001) confirmed that wood pasture land use affected the species richness of bird and invertebrate taxa in Sweden. Moreover, Somay et al. (2021) underlined that wood pastures are essential habitats for dung beetle conservation. Their importance lies in them being a transitional landscape between a forest and a grassland beneficial for multiple habitat needs, but also in the presence of manure habitats.

Through the accumulation of plant and animal residues, wood pastures support soil health and contribute to the restoration of soil organic carbon necessary for the re-establishment of ecosystem functioning in post-mining landscapes. Wood pastures are recognised by the EU as serving multiple ecosystem services, therefore deserving direct payments for the managers. Sheep grazing specifically is also the most efficient and cheapest way of conservation of certain types of grasslands. Considering the last two points the introduction of wood sheep pastures, could not only restore the landscape health but also have financial benefits for landscape management.

## 6.2 PEOPLE: THE BENEFITS OF THE COMMON POOL RESOURCE INSTITUTIONS

Now I will present the advantages of transforming hierarchical management of industrial landscapes to common pool resource (CPR) institutions. I will also show the inherent relationship of pastoralism with the use of commons and common pool resource institutions, and analyse the historical and current situation in Poland.

There is a substantial difference between CPR institutions described by Lyman and Child (2005) characterised by “access and use rights to, or ownership of, natural resources; collaboratively and transparently plan and participate in the management of resource use; and achieve financial and other benefits from stewardship” and historical commons in Poland. In Poland commons or ‘serwituty’ emerged from the feudal structures so that peasants could fulfil their duties towards their lords for example by accessing the common pastures with a determined number of livestock allowed to graze when one of three rotational crops was under rest. Peasants were also

allowed to source wood, which was important to build fences and canals, produce tools, and heat up their houses amongst other functions. In the agreements between the peasants and lords, it was stated how much, what kind of wood and when they could collect it as described by historians Andrzej Chwalba and Wojciech Harpula (2022). There are still a few ‘serwituty’ left with the remaining right to use the wood and pastures on the land belonging to the State Forests. For example, in Wąchock 200 people still can annually claim 281,1 $m^3$ of functional wood, 84,04 $m^3$ of aspen firewood and 320 $m^2$ of firewood branches from the local division of the State Forests (Horbaczewski, 2022). The persisting feudal commons are characterised by the right to access the land and use some of its resources, yet the crucial part of participation in decision-making is missing.

In turn, CPR institutions managed by the community can lead to increased landscape stewardship through acknowledgement of one’s own skills and strengthened relationships with the surroundings (Winkler and Hauck, 2019). Based on a literature review Klein et al. (2012) attributed multiple advantages to this method such as increased rate of application and consent with the decisions, diversity of local and ecological knowledge, enhanced physical resource management, better monitoring, fewer conflicts, strengthened relationships and trust between the members as well as “improved livelihoods; greater capacity to mobilise resources for community benefit; improved environmental conditions; and more resilient social-ecological systems”. Ratinger et al. (2021) after political economist Elinor Ostrom argued that "for the successful solution of public good problems, national officials need to work with local and regional officials, non-governmental organisations and local groups of citizens". They also provided other findings by Ostrom concluding that "cooperating users can do as good a job organising and protecting important resources as governments”. Since community-led CPR institutions are not the dominant method of land management, the question arises of how they should be managed to endure.

### 6.2.1 GOVERNANCE OF THE COMMON POOL RESOURCES

In "Shared patterns in long-term dynamics of commons as institutions for collective action" economist Mike Farjam et al. (2020) claimed, that after the initial establishment of a set of rules for the functioning of the CPR institutions, the resulting systems are characterised by high levels of resilience, self-governing the use of resources and management and being able to sustain functioning for centuries. Elinor Ostrom (1990) compared the different lasting CPR institutions and

defined a set of governance similarities between various locations. First of all, she listed defining the boundaries of the CPRs and deciding who can use them. Secondly, Ostrom placed "appropriation of rules restricting time, place, technology and/or quantity of resource units related to local conditions". As the third point, she positioned the possibility of changing rules by the users of the CPRs. Then, was the importance of having people monitoring the use of CPRs. Later, Ostrom mentioned sanctions for the misusage of the CPRs, followed by the possibility of having a third-party person support conflict resolution. Finally, she underlined, that the governments should not impose their guidelines over the rules of CPR institutions as that could impair the successful implementation of the mentioned practices. Moreover, she wrote that some of the endurance of the CPRs came from comprehending by the members the physical interdependence and potential joint harm caused by individuals. Community members engaged in well-functioning CPR institutions had an understanding, that their actions performed on the CPRs affected others and vice-versa. Klein et al. (2012) attributed multiple advantages to this strategy such as increased rate of application and consent with the decisions, diversity of local and ecological knowledge, enhanced physical resource management, better monitoring, fewer conflicts, strengthened relationships and trust between the members as well as “improved livelihoods; greater community capacity to mobilise resources for community benefit; improved environmental conditions; and more resilient social-ecological systems”.

### 6.2.2 COOPERATIVE GRAZING

CPR institutions still widely function in pastoral communities, which Klein et al. (2012) contrasted with commerce-oriented ranching. They described pastoralism as "oriented first towards meeting subsistence needs and then producing for trade and the market, and also because it relies more on human labour, local knowledge, common tenure, and some type of mobility." In Poland cooperative grazing is practised under the transhumance ‘sałasz’ tradition. In this cooperative sheep grazing the profits from milk are divided proportionally to the number of sheep heads per owner. Grazing and cheese production is supervised by a collectively elected head shepherd ‘baca’, who during the spring ritual ‘redyk’ mixes different flocks from local sheep owners ‘gazdas’ and takes them to the high mountain meadows. Traditionally ‘sałasz’ practices were performed on common pastures (Marcol and Kurcz, 2022). Pastoralists have historically dealt with harsh climatic and political circumstances, which forced them to adapt by strategies of "diversity, reciprocity and

cooperation, reserves, flexibility, mobility and shared access to resources". Klein et al. (2012) also mentioned the importance of diversification of livestock products, multispecies grazing, herds of different ages and reproductive structures as well as income from other sources such as agriculture, medicinal plants or wage labour. The authors provided an example of pastoralists from the Tibet Autonomous Region involved in practices of moral economy and mutual obligation of supporting community members through hard times by "inter-community resource-sharing arrangements". CPRs included land with usage rights shared by the members of the community. According to Klein et al., it was harder to prevent overstocking and overgrazing on privately owned rangeland even when it was owned by groups. Preventing mobility and flexibility limited sustainable land use and adaptation to changing conditions like droughts and low resource availability.

Social anthropologist Marius Warg Næss (2012) differentiated between household and cooperative pastoral production. Cooperative pastoralism consisted of herds from several owners in one big herd, yet some of the decisions were left to separate livestock owners. Cooperative structures let singular households seek income from diverse sources by freeing off some household members to pursue wage labour, leading to the higher economic resilience of the household. He also argued that livestock production required high labour investment and in the case of cooperative networks had higher investment returns. Cooperative structures had lower overall costs of expensive equipment and allowed children to pursue education, by not relying on their labour.

As I showed in this part, community-led CPR institutions have multiple benefits for the governance of natural resources, strengthening the community and also people's relationship with the landscape itself. They can contribute to lowering the costs of management of pastoral activities and also free up some family members to pursue other means of labour. Combining multiple sources of income and working collaboratively on shared land has proven socio-ecologically resilient in the long run (Ostrom,1990).

### 6.3 ECONOMY AND HERITAGE TOURISM

Now, let us move to a more specific social issue: employment opportunities coming from shepherdism. Within the current framework of PGE GiEK, the workplaces in Bełchatów are meant to come from the tourism industry, yet Napierała et al. (2022) criticise the current "neoliberal idea" of Bełchatów transformation based on a "hedonistic approach [which] leads to place commodification". They refer to the plan of stimulating the economy through the introduction of

two skiing slopes, horse and car racing tracks, sailing, hotels, and conference centres. The researchers claim that this approach may lead to a negative influence on social and environmental sustainability and that the region would benefit more from the higher participation of the local community in decision-making.

In a literature review, geographer William Price (2021) found that tourism cannot completely replace jobs lost in the closure of industrial operations in a given place. There is a need for multiple, varied income sources due to the future uncertainty coming from the multiplying economic crises. Ibanescu, Eva and Gheorghiu (2020) identified that tourism was supporting the resilience of rural communities, but simultaneously in times of crisis, a drop in visitors resulted in lower employment rates. They argued that tourism was a source of quickly manifested vulnerability during crises. It was visible at the beginning of the Covid-19 pandemic. According to Alexandru (2014), the demand for mass tourism likewise decreased with the global economic crisis and recession in 2009 making way for niche tourism. The authors claimed that niche tourism has been an increasingly popular choice and included characteristics such as "accentuating the importance of local development, therefore transferring economic development from macroscale to microscale", "active participation of tourists", "sustainable management of resources and decreased impact on the environment" and "sense of familiarity at the destination determining relationships between guests and host communities" amongst others. I suggest that shepherding could act as a driver of sustainable niche tourism in the area. This would alleviate the main issues associated with the form of tourism included in the current plan for the region after the mine closure.

Aside from tourism, sheep farming provides products such as regional souvenirs, food as well as farm accommodation, which act as commodities supporting the local economy providing workplaces and income on a small scale (Marcol and Kurcz, 2022). Similar projects are already being launched elsewhere. For example, pastoralism is already used as a means of sustainable development in the Silesian Beskids since the establishment of the Sheep Plus subsidy programme. The decision-makers see shepherding as a strategy to activate the local economy and revive cultural services such as ethnographic, recreational, spiritual and educational values (Salachna et al., 2022). The combination of industrial and pastoral heritage can act as a way of "imagining and assembling different kinds of futures" (May, 2020).

### 6.3.1 INDUSTRIAL HERITAGE AND TOURISM

According to the geographer William Price (2021) industrial tourism has been a growing sector since the early 1950s when the need to capitalise on the interest in the "history, technology, and social significance of industries" arose. Szromek, Herman and Naramski provided the example of the Ruhr region in Germany as proof of post-industrial tourism's contribution to economic development “to tap into the growing demand for postmodern consumption of culture to achieve social and economic restructuring” (Berkenbosch, Groote & Stoffelen, 2022) Poland has a developing industrial tourism sector with mines, factories and shipyards attracting visitors to come to given locations (Schlosser, 2014). In some cases of silver, copper or coal mines the touristic function became more profitable than the extraction itself changing the site's status from actively industrial to post-industrial. In Poland, there exists an Industrial Monuments Route, which consists of 42 post-industrial sites. Through physical documentation of technological and technical progress, the Polish post-industrial sites attract visitors by awaking their curiosity and satiating their cognitive needs (Szromek, Herman and Naramski, 2021). The tourists are also lured in by the unique, voluminous architecture, aesthetics and nostalgia.

Bełchatów in the current form of an industrial district started experiencing increased business tourism activity related to its mining operations in the 1990s, "when lignite mining and energy production were marketed in Poland". In 2014 with the inauguration of the exhibition "PGE Giganty Mocy" (PGE Giants of Power) educational tourism also started developing in the region (Figure 1). Finally, Napierała et al. (2022) expect the future of tourism in the area to co-evolve with the future industries of "green energy production, circular economy, bioeconomy, or creative industries”, which could come from the inclusion of the shepherding heritage in the future-making.

### 6.3.2 PASTORAL HERITAGE AND TOURISM

Shepherding heritage is seen by Krauß and Olwig (2018) as one of the ways in which traditional livelihoods can influence imagining a more sustainable future. For the multigenerational families making a living of pastoralism, sheep grazing is not only the source of income but also a way of life setting the rhythm and multispecies philosophy to their lives. Kohut family, who runs the Shepherd's Centre in Koniaków in Southern Poland consider their pastoral practice “a breeding ground of values, of what is true, of what is unchangeable, of a certain post-capitalist, but also post-

traditional philosophy of life". Maria Kohut describes shepherdism as something sacred and mystical, important for the eschatological education of children and for comprehending human-animal relationships (Marcol and Kurcz, 2022).

Since Poland joined the EU subsidy programmes in support of sheep pastoralism have been introduced. "Interreg V-A Poland-Slovakia 2014-2020" aimed at integrating Polish-Slovakian pastoral heritage and the "Carpathian convention promoted eco-tourism and development of pastoralism" (Marcol and Kurcz, 2022). In the Silesia region in Poland from 2008 until 2027 there has also been a subsidy programme called "Owca Plus" (Sheep Plus) with the goal of bringing the tradition of pastoralism back to the region. The aims are to breed sheep in the upper parts of the mountains to protect the meadow habitats, revive the shepherd profession, preserve and build pastoral architecture, cultivate local identity and heritage, develop craftsmanship and products derived from sheep as well as eco-tourism (Marcol and Kurcz, 2022). As a result, an increase in the sheep population could be observed in the last decade. With the subsidy schemes and Polish mass media promoting shepherding, there is a growing interest in this cultural and landscape heritage. The pastoral culture and landscapes of the Silesian Beskidy mountains attract many tourists to the region. Open grazing areas provide space for attractive views along recreational trails. The travellers are also lured in by the spring and autumn 'redyk' rituals of taking sheep out to the pastures and back to the farms. "These autumn returns are enriched with performances of highlander bands and folklore groups, lectures, shows of sheep cheese production, tasting regional dishes, handicraft workshops associated with the Wallachian culture (e.g., weaving, wood carving, carpentry, herbal medicine workshops) and musical competitions involving traditional shepherding instruments. In holiday time, some events are organised, which popularise local products and folk crafts. They often involve cheese production shows, handmade sheep shearing, wool processing, handicraft workshops and performances of regional bands and groups" (Salachna et al., 2022).

Pastoral and industrial heritage tourism both fall under the category of niche tourism, which is currently growing in popularity. They lure in visitors through authentic experiences of the history of technology and ways of living differently from the ones the tourists are used to. By the combination of different activities, they can be more resilient economically than separately, as Bełchatów so far had the touristic income coming from business visitors and educational offers while shepherding regions profit from dairy products and handicrafts, which I will focus on in the next section.

### 6.3.3 PROFIT FROM SHEEP PRODUCTS

#### CHEESE

The crafts and local foods are popular amongst tourists. Spatial economist Maria Hełdak et al. (2020) analysed the visitors' perception towards traditional and local products in another shepherding region, Podhale in the South of Poland. They underlined, that food has historically been one of the most crucial factors in the tourist experience, since "eating is one of the most fundamental human activities". Visitors are keen on trying the local flavours, which contributes to the uniqueness of their experience. Food in tourism can relate to different motivations. One can engage in food tourism and choose the destination based on the local taste bud experience, explore local cuisine while visiting the region mainly for other reasons, or get acquainted with local culture through gastronomy. Food can also be treated as a tourist product to take home with. According to Hełdak et al. "For some tourists, trying or buying local products is the main purpose of tourism activities". In a survey conducted by Charzyński et al. (2017) 37% of the respondents chose the sheep cheese ‘oscypek’ as a product characteristic of the Podhale region. The authors argued, that regional products should be used to initiate attractions such as tourist routes and distribution points.

Sheep cheeses such as ‘oscypek’ or ‘bryndza’ are the main source of income for Polish shepherds (Niżkowski, 2012), similar to the Swiss pastoral commoners of the Törbel region (Ostrom, 2009). The EU supports the production of local, traditional products through the system of protection and promotion of regional products being part of the First Pillar of the Common Agricultural Policy. It protects and creates workplaces and grants the continuity of cultural heritage (Hełdak et al., 2022). Due to the protection of the products’ labels, the producers have to meet a range of requirements to be able to sell the cheeses under long-established names. In the instance of ‘oscypek’, the cheese has to be made in the shepherd’s hut using the traditional manufacturing process (Molik et al., 2018).

#### WOOL

Now I will move on to the economic potential of sheep wool. Anthropologist Kinga Czerwińska (2016) claimed that the recent provision of the Sheep Plus subsidies and the comeback of sheep grazing in the Carpathians marked the return of interest in wool in the Polish design

industry. As a part of the project "Wool Design. Carpathians" young designers from the Visegrad countries were invited to rethink the use of wool in the context of the cultural and natural heritage of the mountain range. They looked into the properties of this material such as breathability, renewability, biodegradability and it not causing allergic reactions. In Poland, there are also informal communities selling and manufacturing raw wool manually from spinning to weaving. One example is a Facebook group called “Weaving marketplace and more” (Targowisko tkackie i nie tylko). Artisan wool is also produced ‘by shepherds’ in the Tatra mountains under the name of Tatrawool. There are very few bigger-scale wool processing manufactories for example Wełnomark in Rawa Mazowiecka near Łódź or Poltops in Żagań in South-West Poland.

The revival of traditional wool manufacturing and clothing production can be observed in Denmark with its Hjeholts Uldspinderi in Funen processing Danish wool or in Gotlands Spinneri in Sweden. Hjeholts markets its products through a visually attractive website and storytelling around tradition and sustainability. According to the Finnish craft researcher Riikka Räisänen (2019), this way of marketing is essential for selling wool products. However, despite that, the biggest wool spinning mill in Scandinavia, Novita, stopped production in 2018 due to “the poor availability of Finnish wool in large amounts, the high price of wool and unpredictable customers’ expectations” (Räisänen, 2019). For Räisänen the future of wool lies in high-end production and requires a big level of cooperation and specialised equipment. This interest can be observed in the luxury lifestyle media with articles such as “5 Ways To Make Sure Your Next Knitwear Purchase Is As Eco-Friendly As Possible” in British Vogue (Nast, 2019). According to a survey by McKinsey and Co “57 per cent [of respondents] have made significant changes to their lifestyles to lessen their environmental impact” (Granskog et al., 2020), which includes their fashion choices. In “Circular Economy Guidelines for the Textile Industry” Furferi, Volpe and Mantellassi (2022) discussed another benefit of wool for the sustainability discourse, namely the possibility of effective recycling of the yarns from used clothes. Finally, Corscadden, Biggs and Stiles (2014) explored the use of wool for sustainable insulation proving its competitiveness with other insulation materials in terms of thermal, natural and economic benefits.

To conclude, the economic potential of sheep products is dependent on the EU’s subsidies as small-scale local production performs poorly in competition in the international market. However, tourists identify the regional products such as ‘oscypek’ and food experiences can drive them to visit certain regions. Wool production is on a decline in Poland, but Räisänenen (2019) sees potential in high-quality, specialised production, while Corscadden, Biggs and Stiles (2014) and

Furferi, Volpe and Mantellassi (2022) explored wool's benefits of the circular economy. Finally, the potential of local, traditional products is seen by the EU as having advantages for sustainable development.

## 7. DISCUSSION

Sheep wood pastures have direct advantages on the post-coal mining landscapes and can sometimes be the only reclamation option for those degraded environments (Krinke, 2001). The anthroposoils resulting from mining activities are largely deprived of nutrients and soil organic carbon (Adeli et al., 2018). Through the accumulation of animal manure and plant residues sheep grazing can support the restoration of soil organic carbon, which in turn speeds up soil-forming processes, water-holding capacity, nutrient availability, development of soil microorganisms and biodegradation and volatilisation of heavy metals (Ukalska-Jaruga et al. 2022; del Tredici, 2007). Moreover, these cultural landscapes serve as a middle ground between inaccessible rewilded nature and industrial land use for people and a transitional habitat for other species providing a variety of niches (Krauß and Olwig, 2018; Plieninger et al., 2015).

However, a wider potential for just transformation of the post-mining regions opens up, when we take into consideration the social, cultural and economic aspects of shepherdism. Some of the problems coming from the closure of the mines are the low resilience of the social institutions, which for decades were dictated by the industry. The monopolisation of employment in a clash with the energy transformation leads to the disappearance of workplaces and means of income for the local inhabitants (Dańkowska and Sadura, 2021). Therefore, a systemic change in the social structures is necessary to endure for the next centuries. Referring back to the Care Manifesto (2022) for the functioning of caring post-capitalist societies the importance of the following should not be overlooked: "1) neighbourliness and mutual support, 2) common public space not dictated by private interests, 3) sharing of material and immaterial resources, and 4) democracy with localised engagement and co-operative institutions as well as insourcing of services". Per research findings by Elinor Ostrom (1990), community-lead common pool resource institutions on their own answer to the guidelines for the future just societies from the Care Manifesto. After the implementation of a set of rules, they contribute to a better application of resource management, diversity of knowledge and more resilient socio-ecological systems to name a few (Klein et al., 2012; Ostrom, 1990). One can argue that the reclaimed areas in the form of forests around the coal mines are commons, yet

there is a crucial difference between commons and community-led common pool resource institutions. The latter is characterised by the participation of the community members in the governance decisions, which is rarely the case with industrial forests or even rewilded grounds, which can be called commons merely by granting the public access to enter the land. Cooperative grazing managed by common pool resource organisations was proven to be better at overgrazing prevention compared to commercial rangelands (Klein et al., 2012). Furthermore, households involved in cooperative structures had a higher possibility to free up some of the family members to pursue other forms of labour, which contributed to the higher economic resilience of this social unit (Næss, 2012). In Poland, there are still pastoral 'sałasz' cooperatives. However, due to the privatisation of land, sheep grazing is now seen rather as a land management service done for meadow owners and is highly dependent on individual negotiations between the land owners and the shepherds, which makes the profession more precarious than if they were functioning as a common pool resource institution with ownership of the land (Marcol and Kurcz, 2022).

Finally, more material benefits from the implementation of shepherding to the post-mining landscapes can derive from the tourism industry and local production of sheep-derived products. Following Price (2021) the planners should combine different economic activities and attractions as tourism on its own cannot substitute the loss of workplaces after industrial activities. The introduction of a small-scale circular economy based on sheep products could contribute to income generation. Nonetheless, shepherdism in Poland currently relies on subsidy programmes such as Sheep Plus, which stimulate the development of local tourism, cultivation of traditional livelihoods and production of cheeses (Marcol and Kurcz, 2022). What contributed to the unprofitability of shepherding was also the loss of the Polish wool market in Russia (Franaszek, 2010) and later notwithstanding the international competition in textile trade after Poland opened up to the free market (Niżkowski, 2012). Still, if sheep wood pastures were introduced in multiple reclaimed sites, that could also contribute to the revival of sheep farming in Poland.

## 8. IMPLEMENTATION OF SHEPHERDISM IN THE BEŁCHATÓW COAL MINE RECLAMATION

Finally, I would like to consider my literature findings in the context of the transformation of the Bełchatów brown coal mine area. Currently, the landscape is reclaimed in the direction of forestry by the State Forests (Bolibok, Kowalczyk, and Szeligowski, 2008) and the remaining social

and cultural services are related to the profit generated by the coal mine and the coal power plant. In 2036 the income from these activities will cease and is planned to be replaced by the tourism industry. Napierała et al. (2022) deem this expensive idea to have low social, economic and environmental resilience as it relies on hedonistic, costly activities, which may not withstand future crises due to drops in visiting rates (Ibanescu, Eva and Gheorghiu, 2020). The introduction of shepherdism as a community-led common pool resource organisation could positively contribute to the sustainable development of the region by adding benefits from local food and textile production.

The local inhabitants do not have trust in the future prosperity of the region after transforming the income from mining activities to profit from tourism as described in the study by Dańkowska and Sadura (2021). I attribute this to the lack of involvement of the community in the management of the landscape and planning for the future by PGE GEiK and the State Forests. The State Forests are criticised by the Polish NGOs and judged guilty by the European Court of Justice for not involving the citizens in the planning of the Polish Forests, despite them being a public good (Lewińska, 2022). For that reason, transforming the system of landscape management from corporate to community-run could be the first step to providing the local inhabitants with ownership of their futures and shaping them to their needs rather than to the needs of industrial activities. Common pool resource institutions benefit the members by strengthening their relationships (Klein et al., 2012; Ostrom, 1990), pursuing multiple sources of income and "inter-community resource-sharing arrangements" as in the grazing cooperatives in the Tibet Autonomous Region supporting members struggling financially (Klein et al., 2012). The local inhabitants see a future in agriculture after the local economic deterioration (Dańkowska and Sadura, 2021). However, since the region is currently affected by droughts (Jokiel, 2009), land use such as pastoralism could be applied, as it requires soil of lower productivity than agricultural crops (Maczkowiack et al., 2012). Moreover, sheep grazing within wood pastures could restore the soil's water-holding capacity necessary for further development of the below and above-ground ecosystems (del Tredici, 2007). Manure could also benefit the remediation of the heavy metals present in the area (Ukalska-Jaruga et al., 2022).

Finally, since the sense of tradition is an important factor in the coal mining regions, mere technological transformation of the areas is not going to replace the lost values, pride and rituals (Dańkowska and Sadura, 2021). Therefore, together with the revitalisation of the landscape, there is a need for the creation of new traditions to replace what is lost. Shepherdism could be the means to bring back pride and a sense of belonging to a wider community of shepherds and people related to the protection of landscape and cultural heritage in Poland (Marcol and Kurcz, 2022).

## 9. CONCLUSION

To conclude, the economy, people and the environment will benefit from the introduction of shepherdism in the Bełchatów post-coal mining region if the landscape reclamation with sheep wood pastures is implemented alongside a social transformation towards the land being managed by a community-led common pool resource institution. The application of such a system could make the local community more socio-ecologically resilient and practice stronger stewardship of the surrounding landscape. However, an obstacle, which I identified comes from the fact, that the reclaimed land is currently governed by the State Forests criticised for their lack of inclusion of the local community in decision-making. Moreover, sheep product manufacturing relies on governmental subsidies, yet tourists appreciate it, which could bring seasonal profit to the region. Still, there are multiple scientific research examples for the successful implementation of livestock grazing in the restoration of soil ecology in post-mining areas, which could act as a sufficient argument in engineering discussions.

## 10. FURTHER RESEARCH

Further research is needed in understanding the environmental benefits of wood pastures on post-mining land. Moreover, it would be valuable to better comprehend the possibility of the implementation of common pool resource institutions in Poland. Studies should also be performed on the topic of sheep transhumance in relation to land ownership in Poland. Finally, it would also be important to understand the impact of coal mining and burning on heavy metal accumulation in livestock milk.

## 11. METHOD EVALUATION

My study would have been more complete if I conducted research alongside interviews with the inhabitants of the Bełchatów coal mine region.

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LIST OF FIGURES: