SOCIO-ECONOMIC CHALLENGES IN THE TRANSITION TO A LOW-CARBON ECONOMY AT REGIONAL LEVEL IN BULGARIA

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Abstract

A number of dynamic events have taken place in recent years, leading to an uncertain global and national situation. One of these is the signing of the European Green Deal, which attempts to make Europe a climate-neutral continent. This, in turn, has further worsened the situation of some European countries, including Bulgaria. The presence of three active coal mining complexes in the country largely exposes it to serious challenges in the transition stages and hinders the finding of appropriate methods and instruments to reduce carbon dioxide emissions. The aim of the study is to explore the main socio-economic challenges in the transition to a low-carbon economy at a regional level and to present some of the author's views on limiting the negative impacts on regional development. The analysis of the available data shows that the sustainable dimensions of the three coal mining regions is highly threatened.

Key words: *Bulgaria, low-carbon economy, regional level, socio-economic challenges, transition*

INTRODUCTION

Climatic changes in the 1950s have led to serious negative consequences on the climate and the environment. The EC is taking a stand on this global problem, developing a mechanism to deal with the current situation, namely the signing of the European Green Deal. This strategic document aims to "turn the EU into a fair and prosperous society with a modern, resource-efficient and competitive economy in which there will be no net emissions of greenhouse gases in 2050 and economic growth does not depend on the use of resources" [5]. The European Green Deal is essential for the efforts of the EU to contribute to reducing climate change and protecting the environment by achieving sustainable economic growth and creating better living conditions for its citizens. Certain measures that meet these goals have been implemented, among which the transition to a low-carbon economy. The reduction of greenhouse gas emissions is also an important commitment on a European scale.

Essentially, it attempts to limit the effects of climate change, which requires the collaboration and input of all parties. Active governmental initiatives, involving businesses, citizens and public organizations are needed to face these challenges and guarantee a successful pathway to a low-carbon economy.

The transition to a low-carbon economy, or *decarbonization*, poses a serious socio-economic burden that necessitates complex solutions and efforts on government level, including the business sector and citizens. The following main issues can be highlighted:

(1)*Transformingt he energy system*: Reforms are needed to shift the current energy system to a low-carbon economy. Using renewable energy sources, such as solar and wind, may require the closure or adaptation of old coal-fired power plants. In this context, in 2011, the "Energy Roadmap to 2050" was adopted and published, underscoring the ambition to reduce greenhouse gases by 80-90% by 2050 [3].

(2)*Retraining and training*: With the introduction of new technologies and innovations in a significant amount of activities, many workers, especially in carbon-intensive sectors, such as coal mining and oil refining, will need retraining and training to find new jobs in the low-carbon economy.

(3)*Social consequences*: The social element is also a key point of the transition, including social hazards, such as job losses in carbon-intensive sectors and a change in the

economic structure. This can lead to social tension and insecurity. The initiative promotes economic and social development in the less developed regions of the EU by providing financial support and investment [6].

(4)*Economic investment*: Clean energy and infrastructure can be an expensive endeavour, but these investments are essential for the successful transition to a low-carbon economy. Cooperation between governments and private investors can raise funds for such projects.

(5)*Government policy and regulation*: Effective government policy and regulation underlie the transition to a low-carbon economy. The actions envision creating incentives and encouraging innovation, as well as more restrictive measures on carbon emissions.

(6)*Effective public participation*: Informed and involved citizens will benefit the transition process, as they have the opportunity to share their views and participate in decision-making [5].

In this context, it is necessary to make concrete proposals on alternative employment opportunities that would limit the negative effects of the disruptions that potentially exist in the regional labour market. One effective suggestion would be to exploit the local tourism potential as well as to look for new forms of agriculture. Both tourism and agriculture are sectors that are constantly diversifying, both in terms of the resources used and the expected results.

MATERIALS AND METHODS

Based on a review of the possible scenarios for the European energy transition, we offer an analysis of the situation in Bulgaria. Various methods and tools have been used in this research. Mainly advocated is the analysis of dynamic series and the formulation of some socio-economic and demographic projections that impact the creation of policies during thetransition to a low-carbon economy. Based on a review of possible scenarios for the European energy transition, we propose an analysis of the situation in Bulgaria. Different methods and tools are used in this study,

among which qualitative research with descriptive analysis as a methodological approach.

The Bulgarian National Statistical Institute [14] provides reliable quantitative data that can provide a solid basis for the analytical process.

Regression calculations have been used to establish the presence of a certain trend, which can serve to derive short and medium-term forecasts.

The expert assessment provides suggestions on future scenarios for sustainable regional development.

RESULTS AND DISCUSSIONS

Historically, coal has been one of the main fuels for the European economy. Since the 1990s, however, a transformation in utilizing coal as a fuel has been taking place in the EU. In order to reduce greenhouse gas emissions and promote cleaner energy sources, most EU member states (21 in total) have implemented measures to phase out the use of coal by 2030. This process has led to a reduction of jobs in coal mining and related industries. According to data from the Joint Research Centre, "between 2010 and 2018, the reduction of the labour force in Bulgaria (-21%) was the lowest among the member states" [11]. This has resulted from the specifics of the economic and social context in Bulgaria and the slower transformation of the coal mining sector, compared to other countries. A negative trend and serious hazards are observed as a result of decommissioning plans coming into force, especially in the energy and industrial sector, where disruptions can have a detrimental impact on jobs, as these sectors are among the biggest polluters and most carbon-intensive processes.

The fact that member states have different baseline conditions and available resources explains how some show a much faster economic development compared to others. The connecting element lies in the ecological transition, which must become an economic and social opportunity for all regions of Europe.

The strategic location of the Balkan Peninsula on the map of Europe, constitutes a great challenge to green transformation. The fact that not all countries are members of the EU complicates the implementation of carbon neutrality policies. An example of good practices in this context are Greece and Romania, as member countries and countries in the Western Balkans.

Stara Zagora region in the context of the "green deal" - social challenges

The European Green Deal affects countries from all over Europe, including the three main regions with developed coal mining in Bulgaria - Stara Zagora, Kyustendil and Pernik. In order to meet the EU requirements, all member states presented an Integrated National Energy and Climate Plan (INPEC). For Bulgaria, this plan envisages "removing administrative barriers to enter the RES market and stimulating the development of RES in industrial zones and the urban environment, mainly for own consumption", reaching up to 27% [12].

According to an EU-funded report on the challenges, needs and action plans for the most affected areas, the Stara Zagora region is also defined as such a region, which faces "the highest potential job loss in the mining and energy industries (total between 11.9 – 16.0 thousand jobs in 2026)" [20]. There is a relatively good diversification of the regional economy, however, this does not give the necessary grounds for complacency. The need for reorganization of core economic activities is glaring, as is the immediate redeployment of personnel to sectors other than energy. The same report lists the available unrealized resources, including "a strong base for the development of scientific research and development (R&D) and innovation; current notable energy infrastructure; significant potential for alternative land use; varied cultural and historical heritage, tourist infrastructure; opportunities for workforce skills transfer" [20].

The transition to a green economy requires socio-economic transformation in Bulgaria. According to those presented in the EC, Bulgaria should limit the production of energy from fossil fuels, including lignite coal, which is the basic resource of the Maritsa East energy complex.
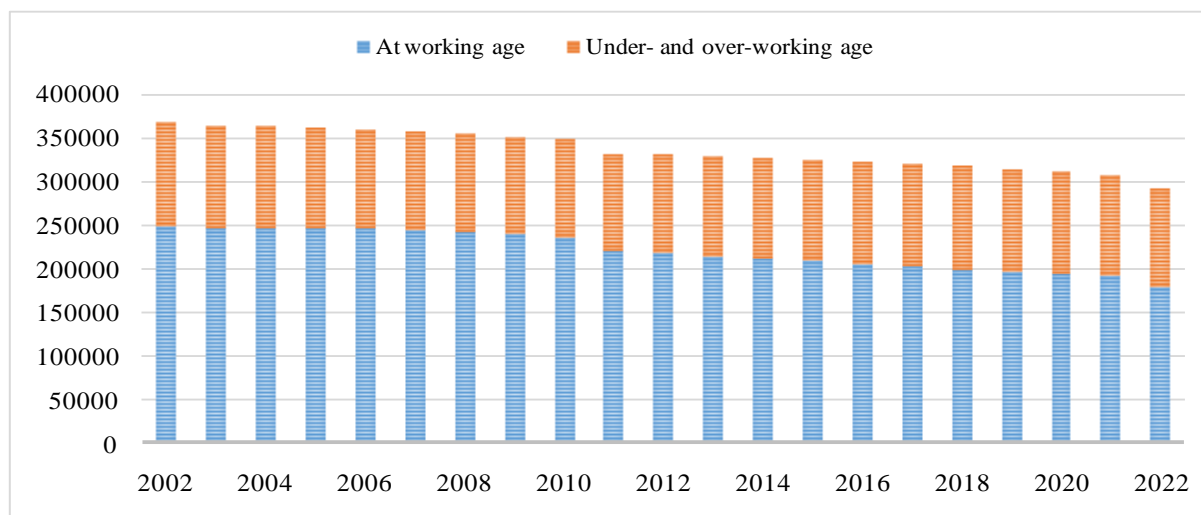

Fig. 1. Population dynamics in Stara Zagora region
Source: NSI, 2023 [14].

With its more than 10,000 direct employment jobs and even more employed in related industries, the energy complex is a kind of economic engine for the region. The reduction in the activity of coal power would have a direct impact on the socio-economic profile of the region.

Figure 1 shows the dynamics of the general population of the Stara Zagora region.

Figure 1 shows a clear decline in the population level in the region. Although there

are no shocks in the regional economic situation its attractiveness is decreasing.

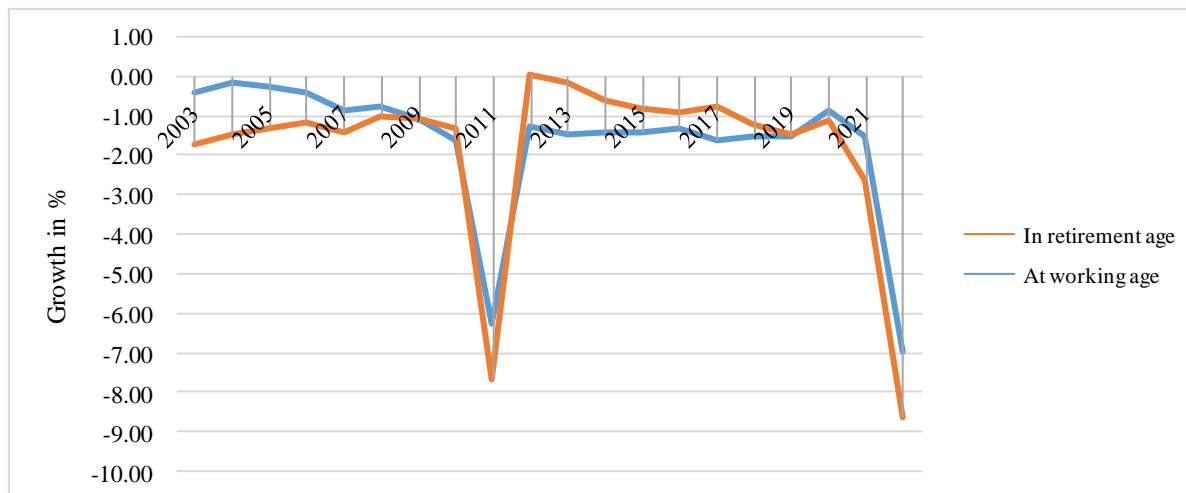Figure 2 shows a growth in population numbers in the region.

Fig. 2. Population growth in Stara Zagora region for the period 2002-2022
Source: NSI, 2023 [14].

Figure 2 shows two important trends in population dynamics:
-Since the beginning of the century, approximately every 8-10 years the population has repeatedly changed with the same force and importance. Both of the most pronounced negative declines were caused by exogenous events, such as the recession of 2011 and the Corona virus crisis of 2021-2022.

In these two downturns, negative growth has reached 7-8%.
-If the trend continues, the next major downturn will occur around 2030.
This year coincides with the manifestation of the measures against fossil energy and the subsequent socio-economic upheavals.
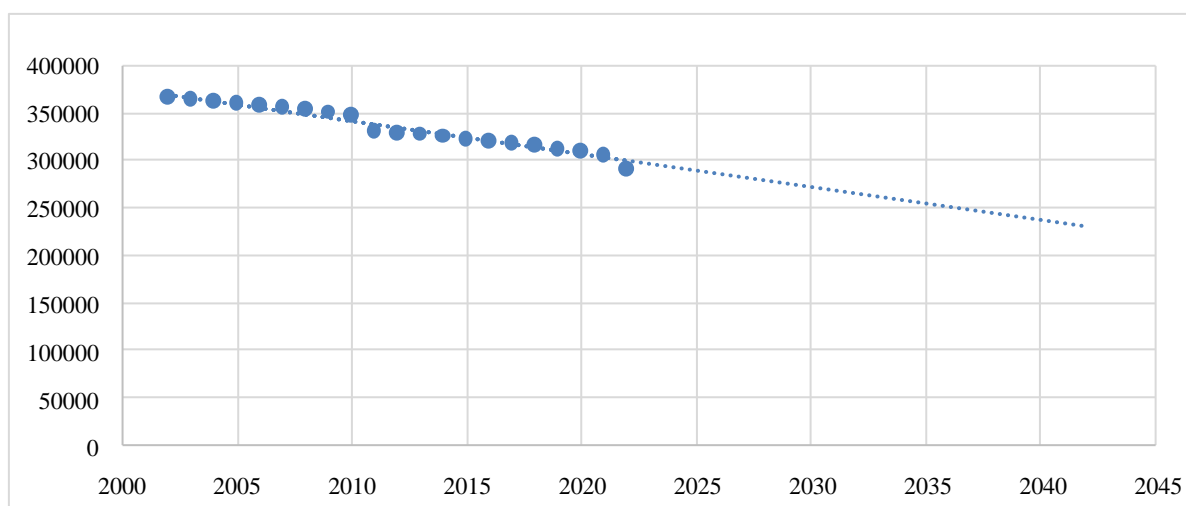

Fig. 3. Regression analysis for the population of the Stara Zagora region with a linear trend
Source: NSI, 2023 [14].

Figure 3 visualizes the data from a performed regression analysis. In this analysis, a simple test of the effect of time periods on the total population of the district was performed.

A linear regression was selected for the analysis of a dynamic series of 21 values. Based on the reliable data (provided by NSI) and the length of the dynamic series, which covers data for the period from 2002 to 2022,

the initial hypothesis that the regression model will have a high explanatory value was confirmed.

Evidence for this is the significance of Sig. F (0.0001) and P- value (0.00001) values for the free term (a) and the regress or parameter (b).

The results show that there is a clear linear trend in population change.

Regression Statistics
Multiple R = 0.9830
R Square = 0.9664

If this linear trend continues, the population will drop to 230,000 people in 2042, which is almost a 40% population loss for the first half of the 21st century. These figures are surprising because until recently, the region was thought to be attractive, largely due to the opportunities provided by coal-fired employers.

Tourism and land reconversion of the mining surfaces into agricultural land solutions for sustaining a green development of Stara Zagora region

In the context of the current work, it is logical to pay attention to what the alternative options will be after the transformation of the economy in the region. Emphasis should also be placed on the issue of the future of the open mine sites that have been decommissioned, their drainage, reclamation and possibilities for new usage. A potential opportunity is the search for a way of using them subsequently in different directions, one of which is "brownfield" tourism. However, clarification needs to be made as to which lands can be classified as such. There are many different definitions of "brownfields" in scientific literature. The concepts of European and American authors are radically different in the interpretation of this term. In a study carried out in 2020 [8]was propose selected definitions of brownfields in different countries around the world. In the Americas, specialists in the field have the understanding that brownfields are abandoned areas of different origins that are considered environmental burdens, significantly damaging the environment. In their view, there are a number of environmental,

economic and legislative barriers that prevent the reuse of these brownfield sites. Following this logic, it can be noted that there is untapped resource potential in these areas in countries on both continents. However, this is not the case in Central and Eastern European countries, where researchers in the field believe that these abandoned areas have the potential to be further exploited despite their contamination.

According to the European Commission's guidance [4], brownfields refers to abandoned disused industrial sites or disused former industrial, railway, military or commercial sites that may be contaminated or are considered to be so. They occur mainly in urban areas of regions where heavy industry used to be highly developed but has now ceased. Their appropriate usage requires coordinated intervention by owners, local authorities and citizens.

In a number of European countries, positive levels of interest from visitors and tourists in abandoned sites have been reported. Public policies in these countries have focused efforts on their redevelopment and promotion as tourist destinations.

Good practices in this non-traditional activity can be found in more developed countries such as the USA (Texas Commission on Environmental Quality, 2024) [15], Canada (Government of British Columbia, 2023) [13], the United Kingdom (Alker, S. & Stone, C., 2005) [1], Poland (The salt mine "Wieliczka", 2023) [16], the Czech Republic(Stáhlík, Z., 1994) [22], Slovakia (Rybár, P., 2017) [21], France (Bachimon, P., 2012), [2], where the re-use of such sites for tourism, recreation and leisure is considered economically viable.

"Brownfields" enable a specific type of tourism activity to take place. Practice shows that they are successfully developed in the countries of Central and Eastern Europe and this model can be applied in Bulgaria, in the coal mining areas that will undergo modifications.

Abandoned areas are transformed into places for cultural and social events thanks to creative imagination and freedom of experimentation. An example of such use is the Zollverein Park [17] in Germany, which

is a centre of cultural, artistic and educational institutions. Another example of a successful cultural space is the former steelworks turned into the Duisburg-Nord Landscape Park [10]. One can also point to the defunct Beringen Mine, a unique 10 hectare coal mining heritage site in Flanders, Belgium, converted into an integrated tourism leisure project in the coal mining area, the old power station of Saint-Denis, north of Paris, built in 1933. designed and maintained by the French director and producer Luc Besson, and last but not least, the impressive Hlubina Mine in the traditionally industrial post-socialist city of Ostrava, Czech Republic, an interesting example of cultural regeneration with a temporary use(Luca, 2019; Bosák et al, 2020) [8, 9].

A common feature of these parks is the heavy pollution of the areas in the recent past. Transforming abandoned areas into green spaces requires a lot of time and public funding, with often uncertain results, when residents may be afraid to use the already restored areas due to the unpleasant and infamous image of these abandoned areas in the past [19].

The seriousness of the problem is related to the damage to the land, and hence the disruption of environmental balance. This can be addressed by "optimizing the open land of former mines into agro-tourism land that focuses on education about agricultural and plantation activities that can attract tourists" [18]. Optimizing the open land of defunct mines for agro-tourism is a promising way to restore and reintegrate degraded land into the economy and ecosystem. However, this process requires careful planning and efforts in several key areas such as land condition assessment, land rehabilitation, agro-tourism planning and sustainable management.

CONCLUSIONS

The Green Deal actually represents a new economic model. For regions in transition, such as Stara Zagora, economic activities with a higher added value must be selected. This will lead to high personal revenues that can guarantee sustainable regional development.

The main challenge is the problem related to the employed in the sector - the lack of a clear plan for the future offered by the Bulgarian government. All the activities of the interested parties should be in the direction of preserving jobs and increasing income – this is a mandatory part of the transition to a new type of economy. In summary, we are suggesting the following main conclusions and recommendations:

-The unpredictable political and institutional environment poses a huge challenge to implementing the overall policy in the field of decarbonization. The adopted sustainability and transition plans were adopted without a clear debate about the interests of the local community. This created tensions that delayed the implementation of adequate replacement policies, which had not been well-defined.

-Stara Zagora region needs a comprehensive concept for its socio-economic development until 2050, in which to clearly define the basic branches of the regional economy. This is of key importance, as no one can yet commit to forecasting the development of the local economy.

-It is necessary to reduce the negative demographic growth by at least 50%, in order to at least preserve the basic demographic reserves. This is the most difficult task, requiring an extremely diverse toolkit. This recommendation corresponds to the previous one, since the strategic planning until 2050 must be based on a comprehensive analysis that unites all spheres of regional sustainable development.

-It is extremely important to involve the local community in the key decisions for the future of the region. Up to this point, the central government mainly determines the course of development for the Stara Zagora region. This goes against all modern principles of close-to-people decision-making. The principle of subsidiarity is key in the transformation process, which implies a more active participation of self-governing bodies (municipalities) in Bulgaria.

-It is necessary to increase the resilience of the region to exogenous impacts. The path to higher sustainability goes through higher public investment in technical and social

infrastructure to increase the attractiveness of the region. This is of particular importance for the peripheral areas of the region, which are represented by smaller municipalities, where a high natural tendency to depopulation is reported.

Shifting land use from mining to agriculture and tourism is a complex, multifaceted process that requires careful planning, environmental restoration, and community involvement. Although challenging, this can lead to sustainable land use that benefits local economies and ecosystems.

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