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BIOECONOMY – PRESENT AND FUTURE

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Abstract
The pressure on ecosystems has intensified as a result of excessive pollution, overexploitation and depletion of natural resources. This imposes the need of a radical change in the existing methods of processing, storage, recycling and disposal of biological resources by establishing sustainable production and consumption models.
The need to step up the transition to both clean energy and sustainable, resilient and equitable food systems has never been stronger and clearer. Future implementation of the EU Bioeconomy Action Plan will need to take into account the implications for food and energy prices, as well as the prices of energy-intensive products and global supply chains, and address the resulting additional pressures on natural resources at ecosystem boundaries. Activities in the bioeconomy sectors are especially reliant on healthy ecosystems to ensure a sustained production of biomass, but at the same time activities along the bioeconomy supply chains generate environmental impacts which can damage local and global ecosystems.
The bioeconomy is directly related to 11 of all 17 Sustainable Development Goals but though the EU undertakes the steps necessary to achieve sustainability, there is still a wide range of actions to be taken in order to ensure the transition towards bioeconomy and to mitigate and eliminate the negative impacts on the environment.
In the study we have focused on three important indicators that give insight about current state and trends in EU and Bulgaria about bioeconomy, respectively employment in the bioeconomy, turnover in bioeconomy, and value added at factor cost in the bioeconomy. The trend in Bulgaria follows that of the EU for those indicators which indicates the continuity of the measures adopted at the EU level and the consistency of the actions at the supranational level.
The paper is based on a thorough review of available reports, analysis of official documents as action plans, communications, programs, strategies and data related to bioeconomy at EU level, reviewed in the context of global efforts for achieving sustainability.
The main objective of this research is to represent the international efforts aimed at the protection of natural resources and to evaluate the measures taken to stimulate the EU transition towards bioeconomy.
Keywords: *Bioeconomy, European Union, Sustainability, Sustainable Development Goals*
JEL: *Q01; Q56; Q57*

Introduction

Europe is confronted with an unprecedented and unsustainable exploitation of its natural resources, significant and potentially irreversible changes to its climate and a continued loss in biodiversity that threaten the stability of the living systems on

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which it depends (COM (2012) 60 final). The main cause of the biodiversity crisis is the highly extractive, wasteful, and polluting economy. Over the past decades, the level of this extraction has long since exceeded that which the earth can renew. Today's linear 'take-make-waste' economic system is therefore placing a huge burden on nature. Such pressures have been attributed mainly to major value chains such as food, the built environment, energy, and fashion (Ellen MacArthur Foundation, 2021).

The need to step up the transition to both clean energy and sustainable, resilient and equitable food systems has never been stronger and clearer. Future implementation of the EU Bioeconomy Action Plan will need to take into account the implications for food and energy prices, as well as the prices of energy-intensive products and global supply chains, and address the resulting additional pressures on natural resources at ecosystem boundaries (COM (2022) 283 final).

In order to cope with an increasing global population, rapid depletion of many resources, increasing environmental pressures and climate change, Europe needs to radically change its approach to production, consumption, processing, storage, recycling and disposal of biological resources (COM (2012) 60 final). The first steps towards stopping and reversing the biodiversity loss, should begin with transforming the production and consumption systems which issues can only be tackled through transformative economic, social, political, and technological changes. This means fundamentally transforming the way products and food are made, used, and reused and redesigning the economy to help achieve a nature-positive future (Ellen MacArthur Foundation, 2021).

The role of individual and societal values to mitigate the on-going ecological breakdown should also be taken into account. Defining a safe and just space for self-identity and values, could be the first step in addressing this crucial aspect. There is also a need for acting upon historically embedded and current injustices, as well as actively reducing the causes for the vulnerability, and reduction of over-consumption in the EU (Giuntoli et. al., 2023).

Since 1949 the United Nations and the European Economic Community (EEC), which was incorporated into the European Union, have been making significant efforts to improve living conditions, to protect nature and to adhere more strictly to the principles of sustainable development. However, the first official document to bring the bioeconomy to the fore is the Strategy on Innovating for Sustainable Growth: A Bioeconomy for Europe, accepted in 2012 and updated in 2018 (COM (2012) 60 final; COM (2018) 673/2), followed by the launching of the EU Bioeconomy Monitoring System in 2020.

The main objective of this research is to represent the international efforts aimed at the protection of natural resources and to evaluate the measures taken to stimulate the EU transition towards bioeconomy.

Materials and methods

The paper is based on a detailed review of reports, analysis and official documents as action plans, declarations, programs and statistical data related to bioeconomy, its implementation and the policies aimed at supporting the transition towards bioeconomy at EU level in the context of global efforts for achieving sustainable development.

The analysis is based on the definition of bioeconomy adopted by the EC (COM(2018) 673/2), respectively that bioeconomy covers all sectors and systems that rely on biological resources, their functions and principles. It includes and interlinks: land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources; and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services.

One of the main limitations of the study is the availability of data for the period under consideration, and for the main indicators considered in the research, the available information refers to the 2008-2020 period.

Results and discussion

The EU Bioeconomy Strategy (COM (2018) 673/2)) defines five objectives to be achieved: (1) Ensuring food and nutrition security; (2) Managing natural resources sustainably; (3) Reducing dependence on nonrenewable, unsustainable resources, whether sourced domestically or from abroad; (4) Mitigating and adapting to climate change; and (5) Strengthening European competitiveness and creating jobs.

Activities in the bioeconomy sectors are especially reliant on healthy ecosystems to ensure a sustained production of biomass, but at the same time activities along the bioeconomy supply chains generate environmental impacts which can damage local and global ecosystems (Sinkko et. al., 2023).

By evaluating the capacity of existing bioeconomy models, Verkerk et. al. (2021) outline some important gaps: (1) Some bioeconomy sectors and products are not well covered and most of the existing models are focused on a given sector; (2) the sectoral scope of most models result in their limited ability of capturing the cross-cutting issues of the bioeconomy transition and addressing multiple bioeconomy objectives which interferes with the successful transition to a sustainable and circular bioeconomy; (3) the existing models are focused on products with established markets and not properly capture the emergence of new or innovative products; and (4) most of the models provide information on national level and a much smaller number of models provide such information at sub-national level while impacts typically occurre at regional or local level.

A study of Mubareka et. al. (2023) shows that for the last decade some aspects of the EU bioeconomy are following positive trends, but others are not. While the trends at EU level show that the resource efficiency is improving, waste recovery

and value of raw biomass, the pressures on ecosystems from forestry and agriculture are in fact increasing, and in the case of forestry, this is impacting the carbon sink. In the study we have focused on three important indicators that give insight about current state and trends in EU and Bulgaria about bioeconomy, respectively employment in the bioeconomy, turnover in bioeconomy, and value added at factor cost in the bioeconomy.

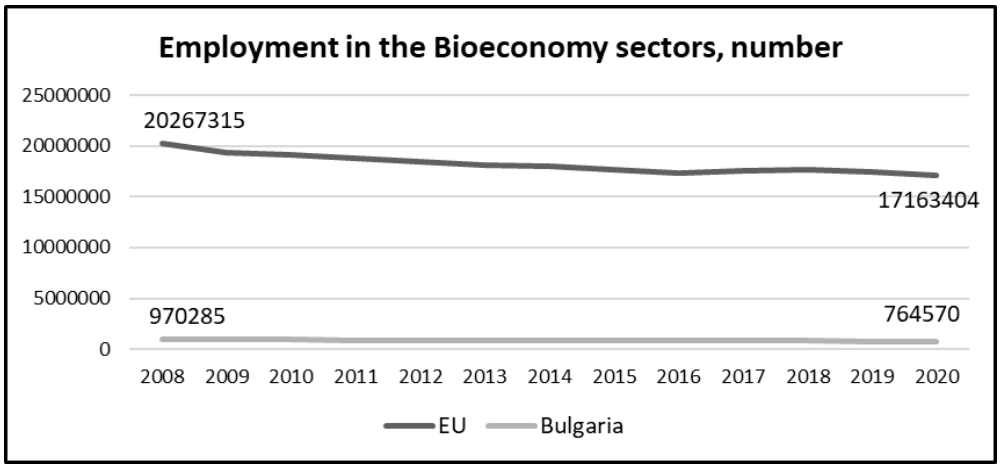

Figure 1. Employment in the Bioeconomy sectors in EU and Bulgaria, number of persons employed

Source: Tamošiunas et. al, 2022

It is observed a negative trend in employment in last twelve years both in the EU and in Bulgaria (Fig.1). The decrease of employment at EU level is 15.32 % (or more than 3 million people), while in Bulgaria this drop is by 21.20% (or almost 206 thousand people). Unfortunately, there are no available data that can give deeper inside what are these negative trends due to. One hypothesis is that this is due to the implemented innovations. Another hypothesis is that at the beginning of the period inhenced bioeconomy research is observed, and multiple projects are implemented and finalized in all the bioeconomy sectors.

According to a third hypothesis, the level of employment in the bioeconomy sectors follows the general trend at the EU level, according to which from 2013 to 2018 there is a smooth growth, and between 2019 and 2020 there is a sharp decline in the number of employed, with unemployment reaching levels lower than those at the beginning of the period under consideration.

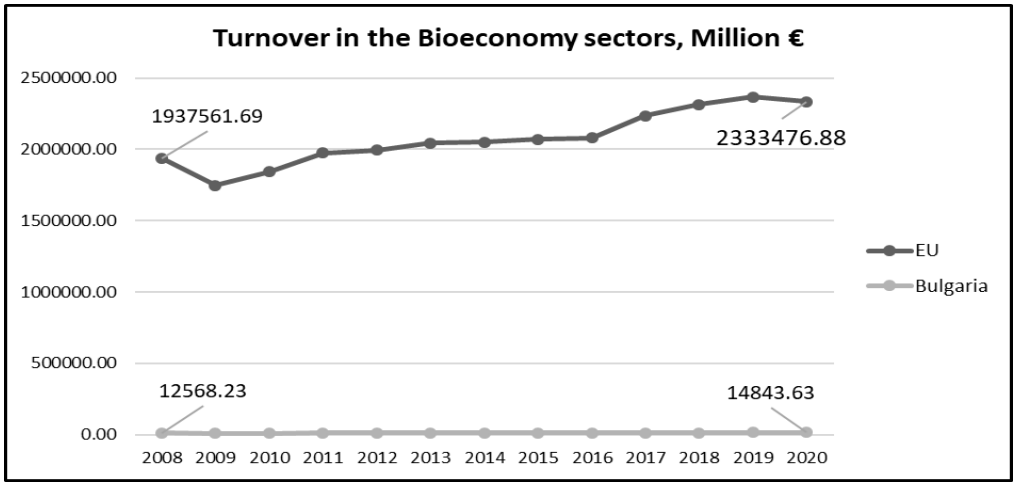

Figure 2. Turnover in the Bioeconomy sectors in EU and Bulgaria, € million

Source: Tamošiunas et. al, 2022

While employment is following negative trend, turnover in the bioeconomy is showing increase both in EU and Bulgaria for the last twelve years (Fig.2). At EU level increase is by 20.43 %, and in Bulgaria by 18.10%. We can firmly state that both paces are very similar and close.

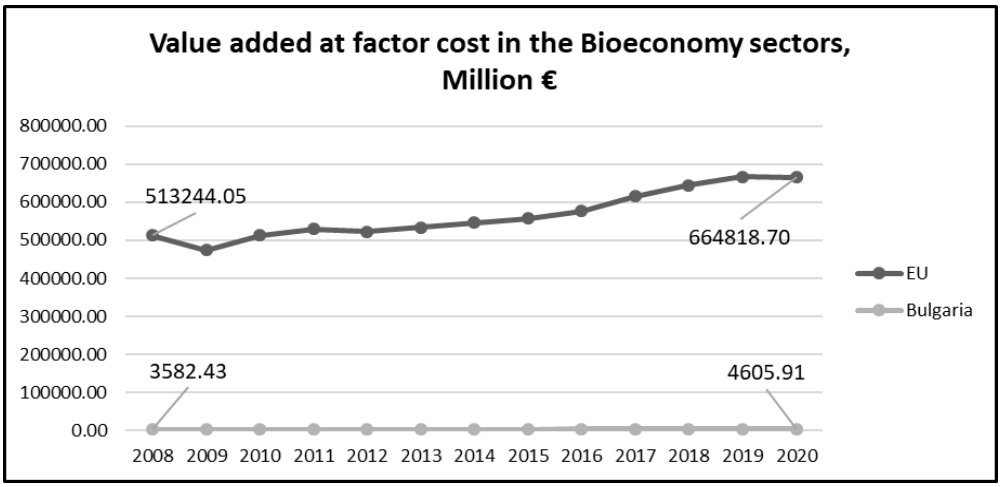

Figure 3. Value added at factor cost in the Bioeconomy sectors in EU and Bulgaria, € million

Source: Tamošiunas et. al, 2022

The value added at factor costs in the bioeconomy sectors show increase with similar pace in last 12 years both at EU level and in Bulgaria (Fig.3). At EU level the increase is by 29.53%, close to it is those in Bulgaria it is 28.57%.
As it is visible from figures 1 to 3, the trend in Bulgaria follows that of the EU both for the employment, the turnover and the value added at factor cost. This indicates the continuity of the measures adopted at the EU level and the consistency of the actions at the supranational level.

Conclusion

Though the EU undertakes the steps necessary to achieve sustainability, there is still a wide range of actions to be taken in order to ensure the transition towards Bioeconomy and to mitigate and eliminate the negative impacts on the environment.
The ability to innovate has increasingly determined the success and competitive strength of industry. But even in a global economy where mainly high technological industries have been thriving, a large part of prosperity is still directly derived from basic natural, biological resources, as they are the raw materials for the majority of the products on which we depend on a day to day basis. Although they are the basis of the oldest economic activities, new technologies such as life sciences and biotechnology are now transforming them into one of the newest, at the frontier of the emerging knowledge-based economy.
The current state of development of the Bioeconomy is a result of significant long-term work at international level. The EU is taking the necessary steps to ensure the sustainable use of natural resources but still there is a great number of actions that should be taken on a global level so the transition towards Bioeconomy could become possible.
In 2008 it is estimated that the European bioeconomy has an annual turnover of almost € 2 trillion, value added of more than € 0.5 trillion and employs more than 20 million people. By 2020 there is an increase in the turnover to over € 2.3 trillion, and in value added to about € 0.67 trillion while there is a decrease in the number of people employed to a little over 17 million people. The same trend is observed in Bulgaria where the number of people employed in the bioeconomy sectors decreases from 0.97 million people in 2008 to 0.75 million people in 2020. For the same period there is an increase in the turnover from € 12.6 billion to €14.8 billion, and an increase in the value added from about € 3.6 billion to € 4.6 billion.
The EU economy is still very resource-dependent which outlines the need of accelerating the transition towards a regenerative growth model and accepting more sustainable production and consumption practices.
At the moment, many bioeconomy models have been developed and implemented, which cover separate sectors of the bioeconomy, but to better integrate the three dimensions of sustainable development and the goals outlined in the updated EU Bioeconomy Strategy and to achieve the United Nations' Sustainable Development

Goals, it is of great importance to develop and implement such models that cover all sectors of the bioeconomy, as well as innovative products and activities, but which at the same time can reflect the impacts at sub-national and local levels.
The shifting towards bioeconomy and achieving sustainability is a global challenge and so it requires the outlining and acceptance of common goals, followed by co-ordinated international policies and actions.

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