



Władysława ŁUCZKA

GREEN ECONOMY AND BIOECONOMY CONCEPTS IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

Władysława Łuczka, Prof. – *Poznan University of Life Sciences*

Correspondence address:

Wojska Polskiego Street 28, Poznań, 63-637, Poland

e-mail: luczka@up.poznan.pl

ABSTRACT: The purpose of this paper is to present green economy and bioeconomy as new concepts and economic categories related to sustainable development implementation. This paper discusses the essence and scope of green economy and bioeconomy. Based on a literature review, it presents different approaches to these concepts, their sources and the nature of their relationships with sustainable development. An attempt was made to answer the question on how much do these concepts contribute (at operational level) to sustainable development objectives. The rationale behind, and key objectives of, the development strategy for the European bioeconomy were presented. This paper is based on literature reviews and international documents published by various bodies, especially including the European Commission, UN and OECD.

KEY WORDS: sustainable development, green economy, bioeconomy, scientific discourse

Introduction

The rapid evolution of today's economy, society and environment becomes increasingly challenging to scientists, business practitioners and politicians. One of the core problems of the economy and environment is to restrain the environmental exploitation and pollution while ensuring economic growth and social well-being at both national and global level. These challenges are addressed by the sustainable development concept, roughly formulated in the 1987 "Our common future" report by the Brundtland Commission. At that time, sustainable development was defined as a "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (Our Common Future, 1987, p. 23). Since then, it has been actively discussed and interpreted in the literature (Robinson, 2004). In the Polish literature, the definition itself of sustainable development continues to be a problem. Some authors use it alternately with "durable sustainable development" or (less frequently) "eco-development" (Górka, Łuszczuk, 2014). From a dynamic perspective, sustainable development is a continuous complex process focused on ensuring balance between three subsystems: the economic, environmental and social subsystem. Because they evolve dynamically and impact each other's development in a volatile way, they are very unlikely to ever attain a balance. However, it may be concluded that, from a dynamic perspective, sustainable development is a continuous process focused on ensuring balance between the economic, environmental and social subsystems. The question arises how to attain the objectives of these subsystems while ensuring sustainability and what auxiliary tools need to be used to increase the opportunities for sustainable development?

In practice, a series of various barriers and restrictions hampers the fulfillment of sustainable development objectives because they require a new approach, new institutional solutions, regulatory instruments, and an axiological reorientation on economic, environmental and social aspects. Also, it brings new risks and uncertainty. This is not only about promoting new production methods focused on an efficient use of natural resources while strengthening the competitiveness of businesses and of the economy which provides growing benefits that the consumers too want to tap into. It is also important to increase consumer awareness and make them accept the environmental reorientation of their lifestyles and behavior patterns. The economic shift, especially in production but also in consumption (at operational level), requires the use of new tools that contribute to sustainable development. However, is it possible under the existing "brow economy" paradigm?

Or does it require the existing economic model to be redefined? These transformations require an active support and involvement from key political players without whom it would be difficult to effectively implement the sustainable development concept. The failure of efforts focused on sustainable development is caused by many factors, including the lack of an integrated implementation approach, lack of wide acceptance from enterprises and consumers, and insufficient commitment by state authorities. Therefore, the question on the ways of, and tools for, implementing the sustainable development concept remains open. At operational level, these tools include the green economy and bioeconomy.

The purpose of this paper is to present the essence and scope of green economy and bioeconomy concepts designed to address the issues of environmental exploitation and pollution. Based on a literature review, this paper presents different approaches to these concepts, their sources and the nature of their relationships with sustainable development. An action plan for green economy and bioeconomy was presented. An attempt was made to answer the question on how much do these concepts contribute (at operational level) to sustainable development objectives. This paper is based on literature reviews and strategic documents of the European Commission, OECD and UN.

Green economy: conceptual presentation of the problem

The literature fails to provide a binding definition green economy (GE); various definitions and interpretations exist. It was first mentioned in the *Blueprint for a Green Economy* (Pearce et al., 1989), a 1989 report by three renowned representatives of environmental economics, D. W. Pearce, A. Markandy and E. Barbier, for the British government. The definitions of green economy emerged later, especially after 2008, in many documents by the European Commission, international organizations (UN and OECD agencies), national agencies and research teams. In the US, the green economy concept was a response to the 2008 crisis. Some measures were also taken by various bodies as a kind of feedback to the Green Economy Initiative, a 2008 report by the United Nations Environment Program which considered the development of, and support for, green economy sectors to be a solution to the global economic crisis.

In the context of sustainable development, the term “green economy” itself gives rise to some doubt as it strongly emphasizes the relationships between the environment and the economy. This is confirmed by many observations, including the fact that green economy is equated with low-emission economy and low-carbon economy. However, on the other hand, this is

contradicted by definitions based on a combination of economic, social and environmental aspects.

UNEP defines green economy as “one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy can be thought of as one which is low carbon, resource efficient and socially inclusive” (Towards Green Economy, 2011, p. 9). This is the most frequently referred to and the less debatable definition of green economy found in the relevant literature. It combines the economic (improved well-being), social (ensuring social equity) and environmental (reducing environmental risks and ecological scarcities) aspects which makes it strictly consistent with the sustainable development concept. UNEP documents state that social aspect is underpinned by the need to ensure green jobs which will contribute to social inclusion and well-being. The above highlights the importance of public and private green investments which drive growth in employment while providing environmental effects such as reducing carbon emissions and pollution, enhancing energy and resource efficiency, and preventing the loss of biodiversity and ecosystem services (Towards Green Economy, 2011, p. 9).

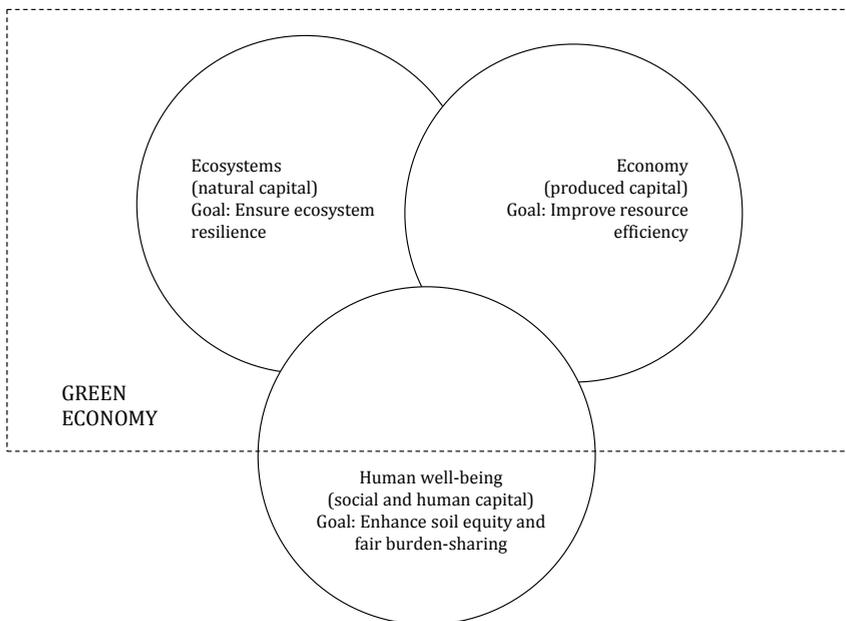
In turn, UNCTAD defines green economy as “an economy that results in improved human well-being and reduced inequalities, while not exposing future generations to significant environmental risks and ecological scarcities. It seeks to bring long-term societal benefits to short-term activities aimed at mitigating environmental risks” (UNDESA, 2012, p. 63). According to the International Chamber of Commerce, “Green Economy” is described as an economy in which economic growth and environmental responsibility work together in a mutually reinforcing fashion while supporting progress on social development” (Green Economy Roadmap, 2012).

The 2012 United Nations Conference on Sustainable Development (RIO+20) was a breakthrough for the development of the green economy concept. During the preparations for the conference, it was found that “Green economy can be seen as a lens for focusing on and seizing opportunities to advance economic and environmental goals simultaneously” (UNDESA, 2011, p. 63). Attention was paid to the need for a holistic approach and structural changes in the economies. It was found imperative to lay down the principles and objectives of a policy that extends over various (yet interconnected) development aspects to meet many global challenges. A key role was allocated to institutional solutions when it comes to both initiating and leading the economic restructuring process.

The conference was a summary of the 20-year implementation period of sustainable development principles, and focused on determining the conditions and opportunities for accelerated progress towards sustainable devel-

opment targets. The development of green economy and the mechanisms for dedicated institutional support were found to be of key importance for a wide implementation of the sustainable development concept. In the declaration adopted at the conference, green economy was found to be one of the important tools for the achievement of sustainable development. In the final documents, the participants emphasize: “We acknowledge that green economy in the context of sustainable development and poverty eradication will enhance our ability to manage natural resources sustainably and with lower negative environmental impacts, increase resource efficiency and reduce waste” (The future we want, 2012, p. 10). The key benefit from the emergence of the green economy concept is the fact that it attracted much interest around the world and renewed the global commitment to transform the existing unbalanced economic model so as to better align it with overarching objectives of sustainable development.

Figure 1. Green economy concept in the context of sustainable development



Source: The Environmental Indicator Report, 2012, p. 20.

Green economy is a new concept which provides comprehensive, integrated solutions to two global environmental challenges: climate change and traditional energy dependency. This is an integral concept as it respects the requirement for economic growth and improved competitiveness while meeting the need for preserving a durable ecosystem and addressing social

expectations on well-being (reducing social inequalities). Most definitions of green economy, as formulated by major international institutions (UNEP, OECD), share a common belief that ecosystems, the economy and human well-being (and the corresponding types of natural, produced, social and human capital) are inseparably interlinked (figure 1).

The green economy concept is based on the pursuit of two objectives of key importance for the environment:

- to ensure the resilience of ecosystems (and reduce pressure on natural systems so that their capacity for self-regulation is not undermined),
- to improve resource efficiency (and reduce the environmental effects of economic activity).

Ecosystem resilience is defined as the ecosystem's ability to tolerate disruptions while preserving its functions and without shifting to another (qualitative) condition. Ecosystem resilience is adversely affected by human activity which leads to climate change, loss of biodiversity, excessive use of natural resources and environmental pollution. This may result in depleting the natural resources or disrupting the relationships between the ecological components required to maintain stable environmental conditions. The impact of climate change and the adaptation of ecosystems to these changes create additional uncertainty and risk (The Environmental, 2012).

In turn, "resource efficiency" is a term which suggests a relationship with the economic interpretation of efficiency. It means linking the use of resources with economic effects so as to generate greater economic benefits while using less resources and reducing the environmental impact. A resource-efficient economy "is competitive, inclusive and provides a high standard of living with much lower environmental impacts" (EC, 2011).

The transformation towards green economy is based on the integration of economic and environmental policies which provides new opportunities in terms of sources of economic development while avoiding an imbalanced pressure on the quality and quantity of natural capital. At the same time, the integration may increase social justice and promote a fair distribution of burden related to policy making, environmental costs and access to environmental benefits.

In the green economy concept, an important role is played by investments and innovations which will contribute to: reducing the environmental pressures; mitigating the risk of adverse developments related to climate change, energy shocks and water scarcity; and increasing the employment level (green jobs) which will make it more widely accepted among society. The main fields of green investments are the energy sector, industry, transport, agriculture and tourism.

However, the market mechanism itself is not enough to refocus the investments towards green sectors or towards the greening of environmentally hostile sectors (by reducing carbon emissions). To achieve this, economic resources must be combined with regulations and public and private action. There is need for new institutional solutions, support in the form of R&D, financial incentive mechanisms and various forms of cooperation at global, national and local level to exchange information, knowledge and good practices. Incentive measures are particularly important in stimulating public and private environmentally-friendly investments aimed at increasing the competitiveness of green economy and boosting the acceptance of the green economy concept among businesspeople. The objective of incentives is to promote the acceptance of the sustainable development concept among undertakings who fear they might lose their competitive edge at implementation stage. This is an important aspect in the context of previous failures on the path towards sustainable development, caused by various factors, including the lack of conviction that environmental investments may boost economic competitiveness.

Currently, the green economy concept is considered to have been a driver of economic recovery after the 2008 crisis (Ryszawska, 2013; Szyja, 2015). Green economy attracts particular attention and enjoys strong political commitment in the European Union. This is based on the assumption that economic growth and environmental measures (as regards both resource use and generation of waste and pollution) may be complementary strategies because – rather than restricting – green economy may boost economic growth through investments in key and new sectors.

Bioeconomy: term, concept and applicative aspects

A new term, bioeconomy is strictly related to sustainable development, just like green economy. The first attempts to define bioeconomy were made in 1997-1998. However, a key role in creating the bioeconomy concept was played in the 2000s by Union and international institutions (European Commission, OECD) which laid the grounds for future development strategies. It was first defined in 2005 by the Directorate General for Science of the European Commission as “the sustainable, eco-efficient transformation of renewable biological resources into food, energy and other industrial products” (DG Research, 2005).

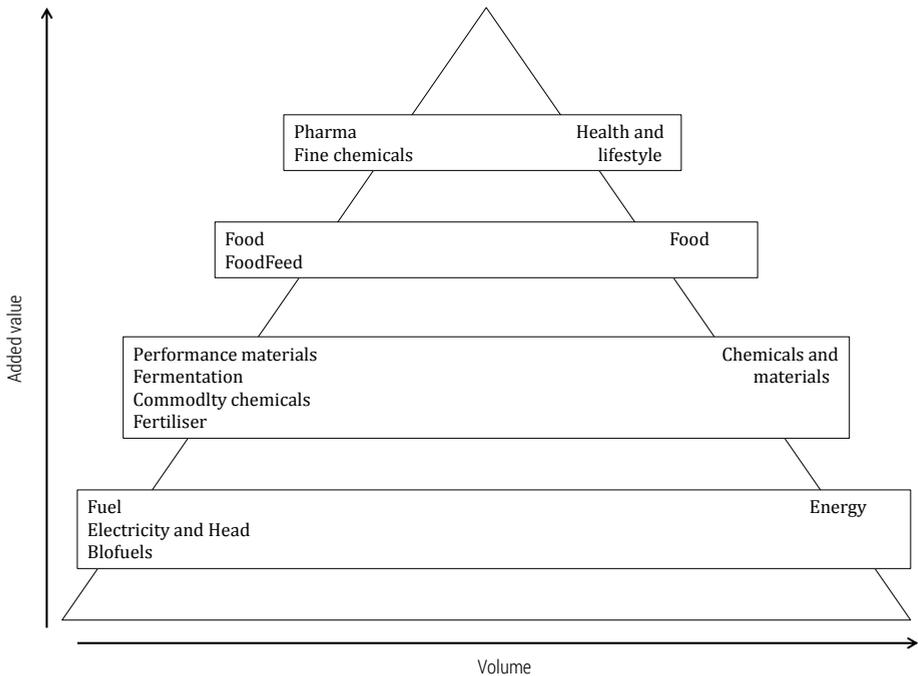
The approach to bioeconomy gradually evolved towards incorporating new components, key processes and economy sectors where it could be used. As a common characteristic, the definitions emphasize new opportunities for

leveraging biological resources based on environmental knowledge. The extended definitions indicate that bioeconomy contributes to sustainable development by replacing scarce (non-renewable) resources with renewable ones. Published in 2007, the White Paper on the Development of Bioeconomy, states that it “encompasses the production of renewable biological resources and their conversion into food, feed, bio-based products and bio-energy” (En Route, 2007). In 2009, OECD defined BE as “transforming life science knowledge into new, sustainable, eco-efficient and competitive products” (The Bioeconomy, 2009). That definition is quite often referred to in the literature which shows the links between BE and the sustainable development concept. It accentuates the transformation of environmental knowledge into products which are important for the economic and environmental dimensions of sustainable development. The White House provided a definition of bioeconomy which, though similar, does not emphasize the sustainable development aspect. According to their interpretation, bioeconomy is an economy “based on the use of research and innovation in the biological science to create economic activity and public benefit” (The White House, 2012).

These definitions differ by the scope of resources, processes and products encompassed by bioeconomy (Maciejczak, Hofreiter, 2013; Bugge, Hansen, Klitou, 2016). As regards resources, most definitions indicate the biomass to be the main renewable resource; when it comes to processes, biological ones are considered to be of core importance to bioeconomy (Gołębiewski, 2016; Adamowicz, 2017). In the literature, the strongest divergence exists between the views on the product scope. Usually, bioeconomy is believed to include food and (less frequently) feed and industrial products (Chyłek, 2011).

The definition of bioeconomy remains an open issue in the relevant literature. New definitions of bioeconomy are published, focusing on new aspects such as the importance of public goods and social innovation or the role of networking. However, most definitions emphasize the importance of biomass as a key biological resource with a great variety of possible uses. Depending on the intended purpose of biomass, different levels of value added may be attained, as illustrated by the biomass value triangle (figure 2). The triangle is based on energy derived from biomass which offers limited added value and has a large size. The vertex of the triangle represents the use of biomass for the manufacturing of drug products which are small in size while delivering high value added. Moving up through the possible uses of biomass and decomposing the resources into a cascade of more valuable intermediate chemicals and products means generating products which add increasingly more value.

Figure 2. The biomass value triangle



Source: Kretschmer et al., 2013, p. 86.

The use of biomass as an important development driver for bioeconomy depends on advances in life sciences and biotechnology and on the implementation of innovative solutions. Faster progress in this area establishes conditions that promote the use of the cascading principle while enabling an optimized use of biomass. This means improving productivity and adding more value in the supply chain. The cascaded use of renewables in many value-added products may be illustrated by the example of the forestry sector.

In bioeconomy, it is important to develop a sustainable supply chain based on circular economy which consists in a closed-loop product lifecycle. In this concept, value is created by reusing waste which become resources (production/operation/waste recovery). The shift from linear economy to circular economy is a way to reduce resource consumption and the amount of landfilled waste. According to estimations, the implementation of the package calling for the establishment of circular economy by 2030, as adopted by the European Union in 2015, will result in reducing food waste by 50%. The recycling ratios for municipal waste and packaging waste will be 65%.

Bioeconomy strategies

Since the very beginning, especially in the European Union, the development of bioeconomy has been based on economic policies. This reflects the strong commitment from the European Commission which sees the potential behind bioeconomy as a stimulator of economic growth, employment and competitiveness. The large development potential of bioeconomy is also recognized by the OECD who indicates the capability of bioeconomy to solve the global environmental problems (OECD, 2009). An important role in bioeconomy is believed to be played by innovation diffusion, especially in the field of biotechnology, renewable resources (including biomass) and their integration in various uses which adds more value to the products and supports sustainable development. The flow of knowledge and innovation to bioeconomy requires institutional support to stimulate the development of networking and cooperation at various scientific, industrial and administrative levels. Institutional support is necessary in order for the development potential of bioeconomy to be tapped into to the greatest possible extent

In 2012, the European Commission adopted the new, extended and more sophisticated definition of bioeconomy, published in the “Innovating for sustainable growth: A bioeconomy for Europe” strategy. That document defines bioeconomy as “an economy using biological resources from the land and sea as well as waste, including food wastes, as inputs to industry and energy production, it also covers the use of bio-based processes to green industries” (EC, 2012). The strategic document itself lays down the objectives, actions and priorities for bioeconomy development. The strategy uses a comprehensive approach to environmental protection, energy, resource management and food supply. The objective of the strategy is to build a competitive, energy-efficient economy based on innovation diffusion which ensures food security in accordance with the principles for sustainable use of renewable resources for industrial purposes while respecting environmental protection (Adamowicz, 2017; Gołębiewski, 2015; Pichlak, 2017).

The bioeconomy development strategy adopted in 2012 by the European Union is based on three pillars (EC, 2012):

1. Investing Union, national and private funds in bioeconomy research, innovation and skills, and reinforcing synergies with other actions.
2. Stronger policy interaction and coordination and engagement with stakeholders through the establishment of the bioeconomy panel and the bioeconomy observatory.
3. Market development and enhanced competitiveness of bioeconomy sectors through sustainable development of primary production; by transforming waste streams into value-added products; and by putting in

place mutual learning mechanisms to streamline production and waste management processes.

Many European countries and regions (e.g. Germany, Austria, Finland, Estonia) have their bioeconomy development strategies in place. Nineteen member countries have adopted or are in the process of designing a bioeconomy strategy (Bioeconomy, 2017). Strategies implemented at sectoral and regional level (e.g. in the agriculture, fisheries and waste management sectors) are based on networking between various entities: governments, public administration bodies, enterprises, representatives of industrial and business associations, and academic, scientific and technological institutions. As they develop, these links turn into a bioeconomy network which provides its participants with benefits resulting from synergies and from an optimized use of open innovations (table 1).

Table 1. Objectives and functions of the bio-business network

Objective	Function
Bio-business development	research and development; introduction of new bio-products and bio-processes
Delivery of bio-resources	coordination of bio-resource creation and circulation; bio-resource recovery
Sustainable development	creating the metabolism of agribusiness, closed agribusiness ecosystems, agribusiness symbiosis and smart specialization areas; shared use of resources and equipment
Orchestrating the material and energy flows	replacing bio-product streams; systems integration, i.e. integration of processes, production systems, water systems and heating systems

Source: Wiśniewska-Paluszak, 2018, p. 241.

Clusters are an important tool for the development of bioeconomy networking as they allow to focus the stakeholders' interest on specific bioeconomy sectors/products. Unlike traditional industrial clusters, bioeconomy clusters also include farmers, processors and their associations, e.g. cooperatives. Farmers are both cluster users and suppliers of bio-resources, and therefore play a double role. The clusters add value by optimizing the use of renewable bio-resources and transforming them into products intended for various purposes.

The final declaration of the European Bioeconomy Congress states that "regions should play a crucial role in successful development of bioeconomy potential, increasing the R&D and technology capacities, deployment of local Biocommunities organized on the base of local sustainable circular bioeconomy value chains" (Łódź Declaration, 2016). Currently, several European regions may be indicated which strongly focus on bioeconomy as a priority

for the economy and innovation; they may be regarded as bioeconomy leaders. Countries and regions with a high bioeconomy maturity level (the maturity criterion being the general innovation capacity, the existence of specific bioeconomic features, such as strategies or clusters, and the intensity of research and innovation activities) include Sweden, Finland, UK and Austria, as well as the Flemish Region (BE), Central Jutland Region (DK), South Holland, Baden-Württemberg and Hesse, and several Swedish and Finnish regions (Bioeconomy, 2017). Other regions are in the process of preparing their bioeconomy strategies by updating and upgrading their agricultural or industrial profile towards more integrated, sustainable, resource-efficient circular methods. However, most European regions – though convinced of the potential behind bioeconomy – are currently struggling with various problems involved in implementing bioeconomy at local level. These measures need to be backed up with knowledge transfer and with technological and institutional support. However, it is not known well enough how to strategically support the new value cycles of bioeconomy at local and regional levels. The development of new value cycles is a complex process as it must include not only the suppliers of sufficient quantities of biomass but also the entities who design products and develop new markets based on bio-products.

Strategies in place in different countries focus on the same priority areas for bioeconomy development. These include support for research and innovation, primarily in the field of biotechnology; promoting cooperation between industry, enterprises and research institutions; prioritizing the optimized use of biomass by implementing the cascading principle and recovering waste streams; and ensuring financial support for bio-based activities.

Conclusions

Green economy and bioeconomy are applicative concepts designed to implement sustainable development goals. Rather than replacing sustainable development, they support its implementation in the context of global environmental challenges, especially climate change and resource scarcity. The applicative aspect of both concepts provides new opportunities for economic development, employment and improved competitiveness, both in many existing sectors and in new ones based on renewables (e.g. the recycling industry). Both concepts share a common characteristic which is a systemic approach to economic transformation based on investments and innovations which provide environmental effects and are driven by institutional

support and by networking between the scientific and business communities.

While the bioeconomy concept assumes that economy should be transformed along three axes of sustainable development, the green economy concept places greater emphasis on the relationship between the economy and the environment. The concepts differ in the scope of transformation processes which are supposed to take place in the economy while providing environmental benefits. The green economy adopts a holistic approach to these processes and wants them implemented wherever possible across the economy. Conversely, in bioeconomy, the processes primarily extend over sectors related by supply or demand channels to biological renewables, and are based on the use of new biotechnology solutions.

In the context of ensuring food security, and considering the global environmental change, there is a growing need for the economy to shift towards renewables and to pursue sustainable production and consumption models. The transition towards a more sustainable economy through a more efficient use and effective management of bio-resources may contribute to reducing waste, pollution and climate change while also alleviating pressures on fossil resources.

Literature

- Adamowicz M. (2017), *Biogospodarka – koncepcja, zastosowanie i perspektywy*, „Zagadnienia Ekonomiki Rolnej” No. 1 (350), p. 29-49
- Bioeconomy development in EU regions. Mapping of EU Member States'/regions' Research and Innovation plans & Strategies for Smart Specialisation (RIS3) on Bioeconomy. Final Report – February 2017
file:///C:/Users/user/Desktop/MATERIAŁY%20D0%20ART/bioeconomy_development_in_eu_regions.pdf [19-20-2018]
- Bugge M., Hansen T., Klitou A. (2016), *What Is the Bioeconomy? A Review of the Literature*, “Sustainability” No. 8, p. 1-22
- Chyłek E.K., Rzepecka M. (2011), *Biogospodarka – konkurencyjność i zrównoważone wykorzystanie zasobów*, “Polish Journal of Agronomy” No. 7
- Dokurno Z., Fiedor B., Scheuer B. (2016), *Makroekonomiczna i metodologiczna perspektywa dyskursu wokół pojęcia zielonej gospodarki*, „Gospodarka Narodowa” No. 1 (281), p. 5-28
- EC (2012), *Communication from the Commission to the European Parliament, the Council, the European*
- Economic and Social Committee and the Committee of the Regions. Innovating for sustainable growth: a bioeconomy for Europe*, Brussels, https://ec.europa.eu/research/bioeconomy/pdf/official-strategy_en.pdf [23-10-2018]
- EC (2011), *Roadmap to a resource efficient Europe*, Communication from the Commission to the European Parliament, the Council, the European Economic and Social

- Committee and the Committee of the Regions, COM/2011/571, <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52011DC0571> [19-10-2018]
- En Route to the Knowledge-Based Bio-Economy* (2007), Cologne paper, https://dechema.de/dechema_media/Downloads/Positionspapiere/Cologne_Paper.pdf [19-10-2018]
- Gołębiewski J. (2016), *Zrównoważona biogospodarka – potencjał i czynniki rozwoju* (Sustainable bioeconomy: potential and development factors), in: A. Czyżewski, B. Klepacki (eds) *Problemy rozwoju rolnictwa i gospodarki żywnościowej w pierwszej dekadzie członkostwa Polski w Unii Europejskiej*, Warszawa, p. 344-363
- Gołębiewski J. (2015), *Instrumenty wsparcia badań i innowacji w zakresie biogospodarki w Unii Europejskiej*, „Roczniki Naukowe SERiA” Vol. XVII, Journal 8, p. 88-93
- Górka K., Łuszczuk M. (2014), „*Zielona gospodarka*” i *gospodarka oparta na wiedzy*, „Optimum. Studia Ekonomiczne” No. 3(69)
- Kretschmer B. et al. (2013), *Technology options for recycling agricultural, forestry and food wastes and residues for sustainable bioenergy and biomaterials*, Report for the European Parliament, STOA, IEEP
- Łódzka Deklaracja Bioregionów, Międzynarodowy Kongres Biogospodarki, Łódź, 6 października 2016, p. 5
- Maciejczak M., Hofreiter K. (2013), *How to define Bioeconomy*, „Roczniki Naukowe SERiA” Vol. XV, Journal 4
- DG Research (2005), *New perspectives on knowledge based bio-economy* (2005), DG Research, Conference report, Brussels, http://edz.bib.uni-mannheim.de/daten/edz-bra/gdre/05/kbbe_conferencereport.pdf [23-10-2018]
- OECD (2009), *The Bioeconomy to 2030. Designing a Policy Agenda. Main Findings and Policy Conclusions*, Report, <https://www.oecd.org/futures/long-termtechnologicalsocietalchallenges/42837897.pdf> [19-10-2018]
- Our Common Future, Report of the World Commission on Environment and Development, World Commission on Environment and Development, 1987, published as Annex to General Assembly document A/42/427, <http://www.un-documents.net/our-common-future.pdf> [23-10-2018]
- Pearce D., Markandya A., Barbier E. (1989), *Blueprint for a Green Economy, Report for the UK Department of the Environment*, London
- Pichlak M. (2017), *W kierunku gospodarki obiegu zamkniętego – przegląd koncepcji wdrażania zielonej gospodarki*, „Acta Universitatis Nicolai Copernici, Ekonomia” No. 1, p. 7-18
- Ratajczak E. (2013), *Rolnictwo i leśnictwo w świetle koncepcji biogospodarki*, 9th Congress of Polish Economists, Polish Economic Society, Warszawa, p. 1-9
- Robinson J. (2004), *Squaring the Circle? Some Thoughts on the Idea of Sustainable Development*, „Ecological Economics” No. 48(4), p. 369-384
- Ryszawska B. (2013), *Koncepcja zielonej gospodarki jako odpowiedź na kryzys gospodarczy i środowiskowy*, „Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu” No. 318, p. 47-56
- Staffas L., Gustavsson M., McCormick K. (2013), *Strategies and Policies for the Bioeconomy and Bio-Based Economy: An Analysis of Official National Approaches*, „Sustainability” No. 5, p. 2752-2769

- Szyja P. (2015), *Zielona gospodarka w Polsce – stan obecny i perspektywy*, „Nierówności Społeczne a Wzrost Gospodarczy” No. 41
- The Bioeconomy to 2030. Designing a Policy Agenda. Maine Findings and Policy Conclusions* (2009), OECD, International Futures Project, <http://www.oecd.org/futures/long-termtechnologicalsocietalchallenges/thebioeconomyto2030designingapolicyagenda.htm> [19-10-2018]
- The Environmental Indicator Report 2012: Responsibility in a Finite World*, German Advisory Council on the Environment, https://www.umweltrat.de/SharedDocs/Downloads/EN/01_Environmental_Reports/2012_06_Environmental_Report_Chapter_11.pdf?__blob=publicationFile&v=2 [23-10-2018]
- The future we want*, Outcome of the UNCSD 2012, <https://sustainabledevelopment.un.org/content/documents/733FutureWeWant.pdf> [23.10.2018]
- The White House (2012), *National Bioeconomy Blueprint*, Washington DC, https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/national_bioeconomy_blueprint_april_2012.pdf [19-10-2018]
- UNEP (2011), *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication*, https://www.cbd.int/financial/doc/green_economyreport2011.pdf [23-10-2018]
- UNDESA (2012), *A guidebook to the Green economy. Issue 1: Green economy, Green growth, and Low-Carbon development – history, definitions and a guide to recent publication*, UNDESA [20-11-2016]
- Wiśniewska-Paluszak J. (2018), *Sieci agrobiznesu w świetle teorii ekonomii*, Poznań <http://sustainabledevelopment.un.org/content/documents/GE%20Guidebook.pdf> 38 [19-10-2018]