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## **Bioeconomy: the Sustainable Development Goals in our Days**

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### **Abstract**

The time period between the late 18th century and today marks the rise and global development of industrial civilization. With industrialization, a major transition occurred, from a social structure mainly dependent on renewable resources, to a society dependent on fossil-based raw materials.

The bioeconomy has been increasingly recognized in the sustainability debate over the last two decades, presented as a solution to a number of ecological and social challenges. Its premises include climate change mitigation, cleaner production processes, economic growth, and new employment opportunities. Yet, a transition to a bioeconomy is hampered by risk factors and uncertainties. In this paper, we explore the concept of bioeconomy, focusing on opportunities of achieving sustainability. Departing from an understanding of sustainability provided by the weak and strong sustainability paradigms, we first outline the definition and development of bioeconomy from a theoretical perspective.

The purpose of the article is to use Romania as an example of how a transition towards has been evolving in practice. The review indicates that the proposed direction and strategies of bioeconomy are promising, but sometimes contradictory, resulting in different views on the actions needed for its premises to be realized.

With human society, the process of economic development has had a huge rise. In all historical stages, people have capitalized on environmental factors through their quality of economic resources. Thus, there has always been an economic-environmental action plan designed to meet human needs and requirements. As time has passed, but more acutely in the last century, the problem of depleting these resources has arisen, but also of the more and more obvious degradation of the environmental quality. There is now scientific evidence that global climate change has reached a critical juncture.

**Keywords:** Bio-based economy, innovation, sustainability, renewable concepts, economic development.

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### **Introduction**

According to recent chronology of the evolution of the concept of sustainable development from an international, European and national perspective, as well as how it has gradually materialized both in UN and EU programmatic documents and in Romania's public policies. Romania, as a member of the United Nations (UN) and the European Union (EU), has expressed its support for the 17 Sustainable

Development Goals (SDGs) of the 2030 Agenda, adopted by UN General Assembly Resolution A / RES / 70/1, at the UN Summit on Sustainable Development in September 2015 (Gjorgievski, et al., 2021). The EU Council conclusions, adopted on 20 June 2017, “A sustainable future for Europe: the EU's response to the 2030 Agenda for Sustainable Development” is the document policy taken by the EU Member State on the implementation of the 2030 Agenda for Sustainable Development (Fahed and Daou, 2021).

One of the definitions of sustainable development most commonly referred to was introduced by the World Commission on Environment and Development: “sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Bodea, 1999). It is a contested definition with many interpretations, able to accommodate fundamentally different assumptions about human well-being, and the role of economic growth and natural resources in achieving sustainability (Al-Mawali, et al., 2021).

### **Review of the scientific literature**

The expanding bioeconomy is creating local and global environmental and social problems, including climate change, biodiversity loss, pollution, and geopolitical tension. With increasing awareness of the impacts of human activities on planet Earth, there is a growing consensus on the need for a large-scale transition towards sustainability. There is, however, no consensus on the root causes of sustainability issues, nor on how to address them (Carlson and Maffi, 2004). Thereafter, the development and modern understanding of the bioeconomy concept from a theoretical perspective, and identify aspects that may be paradoxical in regards to achieving sustainability. We use Romania as a case study to substantiate the theoretical discussion, providing an example of a country that is increasingly promoting a transition. Part of the novelty of the paper resides in framing the propositions of the bioeconomy within two opposing sustainability paradigms. Beyond endorsing the potential or rendering the limitations of the bioeconomy, raises the fundamental question of what the bio-based economy might imply for sustainability under the different definitions, and provides a basis for understanding or evaluating arguments in the debate on potential transition pathways for the future (Davidson-Hunt, 2008). The concluding discussion outlines some major uncertainties and questions to be addressed in order to facilitate a transition to a sustainable bioeconomy.

One area of debate is whether to adhere to a conception of sustainability belonging to the weak or the strong sustainability paradigm. In the weak sustainability paradigm, based in neoclassical economic thinking, the well-being of future generations is accommodated by ensuring that economic output is non-declining over time (Georgescu, 1995). In this paradigm, human well-being is equal to economic realization, and utility is derived from consumption of goods and services. In the strong sustainability paradigm, having its roots in ecological economics, the well-being of future generations is assumed to be dependent on sustaining the biophysical basis of the economy, and on values and attributes of human institutions that are non-marketable (Bodea, 1999).

It is therefore important and timely to implement guidelines to develop bioeconomy in a sustainable way. The increasing potential of interest in bioeconomy must be oriented in the right direction in order to make sure bioeconomy works for people, sustainable economic growth, while preventing climate change and not harming the environment (Hoff, et al., 2018). This will require significant efforts in terms of knowledge, policies and institutions, both at national level and through international collaboration (European Academies' Science Advisory Council (EASAC), 2018).



**Figure no. 1. Long term sustainable development**

Source: European Commission, 2018 Updated Bioeconomy Strategy

### Research methodology

In the realization of this paper was used a mixed research that involves an analysis of quantitative and qualitative methods regarding their possibilities to be integrated into a whole or a coherent system that would lead to the achievement of a well-defined research objective.

The research methods used are better suited to this process, and others less so. Also, certain methods are useful to achieve specific objectives at different stages of a complex research. The analysis of classical qualitative and quantitative methods in the perspective of their integration in complex, mixed methodological structures represents an important and topical research objective.

Several analytical-descriptive methods are used, and their choice was made to achieve a double objective. On the one hand, it is about the evaluation of specific elements of these methods, in relation to the perspective of mixed methodologies. On the other hand, it is desired to analyze these methods in relation to the empirical part of the paper, where they will be used to test certain hypotheses regarding the use of research methods in the field of sustainable development.

As a result, the research applied of this paper is methodological in nature and focuses on the presentation of specific elements regarding the following research methods: qualitative method and meta-analysis, as a quantitative method.

### Results and discussion

#### *The Development and Modern Understanding of the Bio-Based Economy*

The notion of a bio-based economy has its roots in the Chemurgic movement of the 1920s and 1930s. Over the last two decades it has become increasingly used and recognized in the sustainability debate and the status of the bio-based economy is often described as emerging or rapidly developing. Developments towards a bioeconomy include the formation of actor networks and the setting of research agendas. Innovation strategies and roadmaps have been published at sectorial, national, and regional levels, a development tracing back to the European Commission introducing the “knowledge-

based bioeconomy” (Romania's National Strategy for SUSTAINABLE DEVELOPMENT, 2019). Reflecting the broad reach of the concept, and the multitude of actors in bio-related sectors of society, efforts to facilitate a transition to a bio-based economy differ in scope and focus. Definitions of the concept are, to a large extent, formed by policy action, and range from including all advancements in life sciences and the biotechnological sector to only focusing on the application of biomass resources to phase out fossil-based raw materials in the production of electricity, heat, fuels, chemicals, and materials.

The notion of the bio economy is developing in a broader context of “bio”-related concepts, allowing for interlinkages and interpretations of the meaning of the term. Other closely-related economic concepts include the green economy, the sharing economy, and the circular economy. The bio-based economy has been conceptualized as an integral part of the circular economy, or as an opportunity to support the development of a more circular economy. Another way to conceptualize the link between these emerging economic concepts is to consider the sharing economy, the bio-based economy, and the circular economy as tools to lower the intensity of resource use of human economic activity, while all concepts fall under the umbrella of the green economy (Brasileiro, et al., 2021).

The bio-based economy is expected to bring socio-economic benefits. However, while it has the potential to support rural development and new employment opportunities, a shift to a bioeconomy might also crowd out certain types of production and consumption, and lead to a redirection of labor, capital, and investments from other sectors of the economy to bio-based sectors.

#### *Environmental Impact*

While green issues are driving the development of the bio-based economy, bio-based value chains are still having an impact on the surrounding environment, and productivity is, furthermore, dependent on the availability of production inputs, such as arable land, fertilizers, energy, and water. Considering the potential expansion of bio-based activities, concerns have been raised about environmental pressures, such as soil erosion, pollution of water sources, and biodiversity loss. Other issues include uncertainties regarding greenhouse gas performance, biosecurity, green washing, and invasive species introduced by the use of novel crops. A lack of indicators, measurements, and concrete actions to ensure the ecological sustainability of the bio-based economy have been identified, even though tools and methodologies, such as life cycle analysis and footprint accounts are sometimes mentioned. Additionally, it seems that while potential conflicting uses of production inputs and biomass are noticed, there are no clear procedures to deal with such trade-offs, and that priority often is given to economic aspects of a transition. Moreover, while the bioeconomy by the means of industrial symbiosis, the cascading use of biomass, and other novel ways of structuring the production process may reduce the risk for resource use conflicts, there is no clear way to determine what values to prioritize (e.g., a reduction in greenhouse gas emissions, economic prospects and local needs, or efficiency in biomass use), neither is it clear how to determine by whom these priorities should be set.

#### *European Context of Sustainable Development*

Within the EU, since 2006, the concept of sustainable development has been integrated into the Strategy for an Enlarged Europe, in a unitary and coherent strategic vision, with the general objective of continuously improving the quality of life for present and future generations. , for the creation of sustainable communities, able to manage and use resources efficiently and to capitalize on the potential of ecological and social innovation of the economy, in order to ensure prosperity, environmental protection and social cohesion. In 2010, as a continuation of the EU's sustainable development, the Europe 2020 Strategy was adopted to promote smart growth (based on: education, research, innovation), sustainable (based on reducing carbon emissions, energy efficiency, renewable resources) and inclusive (creating new jobs, reducing poverty, etc.). Together with the Member States and respecting the principle of subsidiarity, the EU is committed to becoming a leader in the implementation of the 2030 Agenda and, implicitly, of the 17 Sustainable Development Goals. The EU's response to the 2030 Agenda is to integrate the 17 SDGs into the Union's public policies, in order to support the global effort to build a sustainable future in collaboration with its partners. The 17 SDGs are already pursued by many of the European Union's policies, and Romania, as a member of this

community, aims through this strategy to integrate the objectives of the 2030 Agenda for Sustainable Development.

*Romania's Perspective on Sustainable Development*

Starting from the idea that the benefits of economic development must outweigh the costs, including those related to environmental conservation and improvement, Romania's first Sustainable Development Strategy in 1999 aimed at progressively improving and maintaining the well-being of the population in line with the requirements. rational use of natural resources and ecosystem conservation. Accession to the European Union in 2007 adjusted national priorities through the National Strategy for Sustainable Development. Horizons 2013-2020-2030 (SNDD), approved by the Romanian Government on November 12, 2008, aiming to reduce the socio-economic gap compared to that of the member states of the European Union. For sustainable development to succeed in Romania and, therefore, the 2030 Agenda, in according with the European Union's rules, this strategy is built around the citizen and the needs of future generations.

The strategy starts from the premise that sustainable development presents a framework of thinking that, once mastered by the citizen, will help to create a more equitable society, defined by balance and solidarity and that can cope with the changes brought about by global, regional and national levels, including demographic decline. The care of the state towards the citizen and the respect of the citizen towards the institutions, towards his neighbor, about the moral values and the cultural and ethnic diversity will lead to a sustainable society.

Economically, it is necessary to guarantee a long-term economic growth that will benefit the citizens of Romania. Although a country's economy is often measured by figures that do not take into account the potential of the citizen, transforming the economy into a sustainable and competitive one requires a new course of action that focuses on innovation, optimism and resilience of citizens. Such an approach will create a culture of entrepreneurship in which the citizen can achieve materially and aspirationally.



**Figure no. 2. THE 17 GOALS | Sustainable Development**

2020 *Source: Romania's Sustainable Development Strategy, 2021 DEPARTMENT OF SUSTAINABLE DEVELOPMENT*

**The 17 sustainable development goals to transform our world:**

**GOAL 1:** No Poverty Globally, the number of people living in extreme poverty declined from 36 per cent in 1990 to 10 per cent in 2015. But the pace of change is decelerating and the COVID-19 crisis risks reversing decades of progress in the fight against poverty. New research published by the UNU World Institute for Development Economics Research warns that the economic fallout from the global pandemic could increase global poverty by as much as half a billion people, or 8% of the total human population. This would be the first time that poverty has increased globally in thirty years, since 1990.

More than 700 million people, or 10 per cent of the world population, still live in extreme poverty today, struggling to fulfil the most basic needs like health, education, and access to water and sanitation,

to name a few. The majority of people living on less than \$1.90 a day live in sub-Saharan Africa. Worldwide, the poverty rate in rural areas is 17.2 per cent—more than three times higher than in urban areas.

For those who work, having a job does not guarantee a decent living. In fact, 8 per cent of employed workers and their families worldwide lived in extreme poverty in 2018. One out of five children live in extreme poverty. Ensuring social protection for all children and other vulnerable groups is critical to reduce poverty.

**GOAL 2: Zero Hunger** After decades of steady decline, the number of people who suffer from hunger – as measured by the prevalence of undernourishment – began to slowly increase again in 2015. Current estimates show that nearly 690 million people are hungry, or 8.9 percent of the world population – up by 10 million people in one year and by nearly 60 million in five years.

The world is not on track to achieve Zero Hunger by 2030. If recent trends continue, the number of people affected by hunger would surpass 840 million by 2030.

According to the World Food Programme, 135 million suffer from acute hunger largely due to man-made conflicts, climate change and economic downturns. The COVID-19 pandemic could now double that number, putting an additional 130 million people at risk of suffering acute hunger by the end of 2020.

With more than a quarter of a billion people potentially at the brink of starvation, swift action needs to be taken to provide food and humanitarian relief to the most at-risk regions.

At the same time, a profound change of the global food and agriculture system is needed if we are to nourish the more than 690 million people who are hungry today – and the additional 2 billion people the world will have by 2050. Increasing agricultural productivity and sustainable food production are crucial to help alleviate the perils of hunger.

**GOAL 3: Good Health and Well-being** Ensuring healthy lives and promoting well-being at all ages is essential to sustainable development. Currently, the world is facing a global health crisis unlike any other — COVID-19 is spreading human suffering, destabilizing the global economy and upending the lives of billions of people around the globe.

Before the pandemic, major progress was made in improving the health of millions of people. Significant strides were made in increasing life expectancy and reducing some of the common killers associated with child and maternal mortality. But more efforts are needed to fully eradicate a wide range of diseases and address many different persistent and emerging health issues. By focusing on providing more efficient funding of health systems, improved sanitation and hygiene, and increased access to physicians, significant progress can be made in helping to save the lives of millions (D'Amato, Veijonaho and Toppinen, 2020).

Health emergencies such as COVID-19 pose a global risk and have shown the critical need for preparedness. The United Nations Development Programme highlighted huge disparities in countries' abilities to cope with and recover from the COVID-19 crisis. The pandemic provides a watershed moment for health emergency preparedness and for investment in critical 21st century public services.

**GOAL 4: Quality Education** Education enables upward socioeconomic mobility and is a key to escaping poverty. Over the past decade, major progress was made towards increasing access to education and school enrollment rates at all levels, particularly for girls. Nevertheless, about 260 million children were still out of school in 2018 — nearly one fifth of the global population in that age group. And more than half of all children and adolescents worldwide are not meeting minimum proficiency standards in reading and mathematics.

In 2020, as the COVID-19 pandemic spread across the globe, a majority of countries announced the temporary closure of schools, impacting more than 91 per cent of students worldwide. By April 2020, close to 1.6 billion children and youth were out of school. And nearly 369 million children who rely on school meals needed to look to other sources for daily nutrition.



Never before have so many children been out of school at the same time, disrupting learning and upending lives, especially the most vulnerable and marginalised. The global pandemic has far-reaching consequences that may jeopardize hard won gains made in improving global education.

**GOAL 5: Gender Equality** Gender equality is not only a fundamental human right, but a necessary foundation for a peaceful, prosperous and sustainable world.

There has been progress over the last decades: More girls are going to school, fewer girls are forced into early marriage, more women are serving in parliament and positions of leadership, and laws are being reformed to advance gender equality.

The effects of the COVID-19 pandemic could reverse the limited progress that has been made on gender equality and women's rights. The coronavirus outbreak exacerbates existing inequalities for women and girls across every sphere – from health and the economy, to security and social protection.

Women play a disproportionate role in responding to the virus, including as frontline healthcare workers and carers at home. Women's unpaid care work has increased significantly as a result of school closures and the increased needs of older people. Women are also harder hit by the economic impacts of COVID-19, as they disproportionately work in insecure labour markets. Nearly 60 per cent of women work in the informal economy, which puts them at greater risk of falling into poverty.

The pandemic has also led to a steep increase in violence against women and girls. With lockdown measures in place, many women are trapped at home with their abusers, struggling to access services that are suffering from cuts and restrictions. Emerging data shows that, since the outbreak of the pandemic, violence against women and girls – and particularly domestic violence – has intensified.

**GOAL 6: Clean Water and Sanitation** While substantial progress has been made in increasing access to clean drinking water and sanitation, billions of people—mostly in rural areas—still lack these basic services. Worldwide, one in three people do not have access to safe drinking water, two out of five people do not have a basic hand-washing facility with soap and water, and more than 673 million people still practice open defecation.

The COVID-19 pandemic has demonstrated the critical importance of sanitation, hygiene and adequate access to clean water for preventing and containing diseases. Hand hygiene saves lives. According to the World Health Organization, handwashing is one of the most effective actions you can take to reduce the spread of pathogens and prevent infections, including the COVID-19 virus. Yet billions of people still lack safe water sanitation, and funding is inadequate.

**GOAL 7: Affordable and Clean Energy** The world is making progress towards Goal 7, with encouraging signs that energy is becoming more sustainable and widely available. Access to electricity in poorer countries has begun to accelerate, energy efficiency continues to improve, and renewable energy is making impressive gains in the electricity sector.

Nevertheless, more focused attention is needed to improve access to clean and safe cooking fuels and technologies for 3 billion people, to expand the use of renewable energy beyond the electricity sector, and to increase electrification in sub-Saharan Africa.

The Energy Progress Report provides global dashboard to register progress on energy access, energy efficiency and renewable energy. It assesses the progress made by each country on these three pillars and provides a snapshot of how far we are from achieving the 2030 Sustainable Development Goals targets.

**GOAL 8: Decent Work and Economic Growth** Sustained and inclusive economic growth can drive progress, create decent jobs for all and improve living standards.

COVID-19 has disrupted billions of lives and endangered the global economy. The International Monetary Fund (IMF) expects a global recession as bad as or worse than in 2009. As job losses escalate, the International Labor Organization estimates that nearly half of the global workforce is at risk of losing their livelihoods.



Even before the outbreak of COVID-19, one in five countries – home to billions of people living in poverty – were likely to see per capita incomes stagnate or decline in 2020. Now, the economic and financial shocks associated with COVID-19—such as disruptions to industrial production, falling commodity prices, financial market volatility, and rising insecurity—are derailing the already tepid economic growth and compounding heightened risks from other factors.

**GOAL 9: Industry, Innovation and Infrastructure** Inclusive and sustainable industrialization, together with innovation and infrastructure, can unleash dynamic and competitive economic forces that generate employment and income. They play a key role in introducing and promoting new technologies, facilitating international trade and enabling the efficient use of resources.

However, the world still has a long way to go to fully tap this potential. Least developed countries, in particular, need to accelerate the development of their manufacturing sector if they are to meet the 2030 target, and scale up investment in scientific research and innovation.

**GOAL 10: Reduced Inequality** Reducing inequalities and ensuring no one is left behind are integral to achieving the Sustainable Development Goals.

Inequality within and among countries is a persistent cause for concern. Despite some positive signs toward reducing inequality in some dimensions, such as reducing relative income inequality in some countries and preferential trade status benefiting lower-income countries, inequality still persists.

COVID-19 has deepened existing inequalities, hitting the poorest and most vulnerable communities the hardest. It has put a spotlight on economic inequalities and fragile social safety nets that leave vulnerable communities to bear the brunt of the crisis. At the same time, social, political and economic inequalities have amplified the impacts of the pandemic.

On the economic front, the COVID-19 pandemic has significantly increased global unemployment and dramatically slashed workers' incomes.

**GOAL 11: Sustainable Cities and Communities** The world is becoming increasingly urbanized. Since 2007, more than half the world's population has been living in cities, and that share is projected to rise to 60 per cent by 2030.

Cities and metropolitan areas are powerhouses of economic growth—contributing about 60 per cent of global GDP. However, they also account for about 70 per cent of global carbon emissions and over 60 per cent of resource use.

Rapid urbanization is resulting in a growing number of slum dwellers, inadequate and overburdened infrastructure and services (such as waste collection and water and sanitation systems, roads and transport), worsening air pollution and unplanned urban sprawl.

**GOAL 12: Responsible Consumption and Production** Worldwide consumption and production — a driving force of the global economy — rest on the use of the natural environment and resources in a way that continues to have destructive impacts on the planet.

Economic and social progress over the last century has been accompanied by environmental degradation that is endangering the very systems on which our future development — indeed, our very survival — depends.

**GOAL 13: Climate Action** 2019 was the second warmest year on record and the end of the warmest decade (2010- 2019) ever recorded.

Carbon dioxide (CO<sub>2</sub>) levels and other greenhouse gases in the atmosphere rose to new records in 2019.

Climate change is affecting every country on every continent. It is disrupting national economies and affecting lives. Weather patterns are changing, sea levels are rising, and weather events are becoming more extreme.

Although greenhouse gas emissions are projected to drop about 6 per cent in 2020 due to travel bans and economic slowdowns resulting from the COVID-19 pandemic, this improvement is only



temporary. Climate change is not on pause. Once the global economy begins to recover from the pandemic, emissions are expected to return to higher levels.

Saving lives and livelihoods requires urgent action to address both the pandemic and the climate emergency.

**GOAL 14: Life Below Water** The ocean drives global systems that make the Earth habitable for humankind. Our rainwater, drinking water, weather, climate, coastlines, much of our food, and even the oxygen in the air we breathe, are all ultimately provided and regulated by the sea.

Careful management of this essential global resource is a key feature of a sustainable future. However, at the current time, there is a continuous deterioration of coastal waters owing to pollution, and ocean acidification is having an adversarial effect on the functioning of ecosystems and biodiversity. This is also negatively impacting small scale fisheries.

Saving our ocean must remain a priority. Marine biodiversity is critical to the health of people and our planet. Marine protected areas need to be effectively managed and well-resourced and regulations need to be put in place to reduce overfishing, marine pollution and ocean acidification.

**GOAL 15: Life on Land** Nature is critical to our survival: nature provides us with our oxygen, regulates our weather patterns, pollinates our crops, produces our food, feed and fibre. But it is under increasing stress. Human activity has altered almost 75 per cent of the earth's surface, squeezing wildlife and nature into an ever-smaller corner of the planet.

**GOAL 16: Peace and Justice** Strong Institutions Conflict, insecurity, weak institutions and limited access to justice remain a great threat to sustainable development.

The number of people fleeing war, persecution and conflict exceeded 70 million in 2018, the highest level recorded by the UN refugee agency (UNHCR) in almost 70 years.

In 2019, the United Nations tracked 357 killings and 30 enforced disappearances of human rights defenders, journalists and trade unionists in 47 countries.

And the births of around one in four children under age 5 worldwide are never officially recorded, depriving them of a proof of legal identity crucial for the protection of their rights and for access to justice and social services.

**GOAL 17: Partnerships to achieve the Goal** The SDGs can only be realized with strong global partnerships and cooperation.

A successful development agenda requires inclusive partnerships — at the global, regional, national and local levels — built upon principles and values, and upon a shared vision and shared goals placing people and the planet at the centre.

Many countries require Official Development Assistance to encourage growth and trade. Yet, aid levels are falling and donor countries have not lived up to their pledge to ramp up development finance.

Due to the COVID-19 pandemic, the global economy is projected to contract sharply, by 3 per cent, in 2020, experiencing its worst recession since the Great Depression.

Strong international cooperation is needed now more than ever to ensure that countries have the means to recover from the pandemic, build back better and achieve the Sustainable Development Goals.

## **Conclusions**

A transition to bioeconomy has cross-sectoral reach, and has been introduced as a way of meeting multiple sustainability objectives. However, it seems that visions and strategies of the bioeconomy are sometimes contradictory, resulting in different views on the priorities and actions needed for the premises of the bio-based economy to be realized. Thus, as the main results, there is no uniform answer to the question if the bio-based economy can prove a viable alternative to the current fossil-based economic system. From an understanding of sustainability adhering to the principles of the weak

sustainability paradigm, there is not necessarily a conflict between these objectives, given the assumptions of the ability of technological change to mitigate environmental impacts and the role of market-based instruments in achieving sustainability. The strong sustainability paradigm assumes that different forms of capital are non-substitutional, that there are biophysical limits to growth, and that technological change cannot address the root causes of unsustainable consumption patterns.

As for the case of Romania, it illustrates a situation where the concept of a bioeconomy is receiving increasing attention, and where biophysical and socio-economic preconditions for a transition are considered favourable. Even so, there are challenges and uncertainties, particularly when considering the prospects of the bioeconomy from the perspective of the strong sustainability paradigm. The vision for a bioeconomy in Romania entails increasing the use of bio-based resources in different societal sectors, while optimizing the value of ecosystem services. Yet, the developments to date have been much in line with the weak sustainability paradigm, promoting a production oriented view of biomass, and technological and market-based interventions to facilitate a transition.

Acknowledging different understandings of sustainability may help broaden the debate on the bio-based economy, and allow for the exploration of multiple transition pathways and their potential implications. Using the frame of weak and strong sustainability could also help uncover the underlying premises of seemingly contradictory visions and strategies, in Romania and elsewhere. Yet, there is a need to operationalize these concepts, and to develop methods and tools that could support the discussion on the viability of the bioeconomy as a whole. Efforts are underway, but there are still no clear ways to determine priorities and address trade-offs in the context of conflicting sustainability paradigms.

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