

Article

Green Deal, Green Growth and Green Economy as a Means of Support for Attaining the Sustainable Development Goals

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Abstract: The aim of the study is to present the concept of green economy and other notions and concepts related to it and to assess their significance for the formation of development policy and practical solution of problems of socio-economic development. In the part focusing on information and definitions, the premises for the emergence of the issue of the greening of economic processes as a new phenomenon of contemporary development have been presented, as well as various definitions of green economy, green growth, the principles of implementing green economy, and the implementation of green transformation processes. In the further part of the study, measures and indicators of green economy and green growth are presented, as well as the connection of these concepts with the idea and objectives of sustainable development. The review of green economy and green growth indicators includes indicators prepared by specialised agencies of the United Nations, UNEP, UNCTAD, UN ESCAP, UN FGG, OECD, the European Union, and the World Bank. Selected indicators of individual authors and countries have also been presented. The last part of the study presents the concept of the New European Green Deal and its link to the implementation of the Sustainable Development Goals adopted for the current decade. In conclusion, an attempt has been made to present both the expectations and opportunities of emphasising the issue of the greening of the economy, as well as the weaknesses and threats resulting from the excessive confidence in this concept.

Keywords: green economy; green growth; green deal; sustainable development; green growth indicators; green economy principles



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1. Introduction

Since 1989, in discussions on development issues, more and more new terms derived from the adjective “green” have appeared, such as “green economy”, “green growth”, and “green deal”, drawing attention to the connection between the economy and the biosphere, especially to the role of plants on Earth. The so-called “greening” of development strategies and policies refers to different levels of territorial systems and different sectors of economy and is one of the topics of discussion, especially in international politics, on the ways of making the concept of sustainable and balanced development a reality. For several years, the concept of a “New Green Deal” has been discussed on a global, European, and national scale. The various concepts of green economy derive from the greening of the leaves, in which, through chlorophyll, sunlight and water, natural substances are produced that humans process into various products for consumption or further processing. This natural, reproducible, and renewable way of transforming nature’s components and the sun’s energy into materials for use in production and consumption processes has become vulnerable because of the threats to the environment, especially to natural vegetation communities, which have increased since the industrial revolution.

The use of the adjective “green” in relation to economic phenomena is a symbolic way of drawing attention to the importance and the need to protect the natural factor in the economy. The first to draw attention to this problem were environmental economists,

who in 1989 presented a report for the British government called *Blueprint for Green Economy* [1]. This report was linked to the need to define the then new concept of sustainable development and the implications this development might have for the definition of economic progress and the formulation of development policy and project evaluation methods. The initially unspecified concept of green economy was further developed in two subsequent reports by this team of authors (*Blueprint 2* and *Blueprint 3*) published in 1991 and 1994. All three reports were based on the results of research conducted in previous years. While the first report focused on the use of economics in formulating national environmental policy, the second and third reports broadened the focus to global economic problems, including the effects of climate change, ozone depletion, tropical forest devastation, resource loss, and deterioration in developing countries. Since then, the issue of greening economic phenomena and problems has appeared more and more often in various contexts and situations. One of the factors of such interest in green economy were the preparations for the so-called UN Millennium Summit, which took place in 2000, when the Millennium Declaration was announced, adopted in 2002 at the summit in Rio de Janeiro, in which the Millennium Development Goals for the first decade of the 21st century were formulated, focusing on the implementation of the principles of sustainable and balanced development (Rio + 10). The next special focus on green economy came with the outbreak of the global financial crisis in 2008. Since then, it has become a key subject on the agenda of various bodies and international organisations. It is a topic that also came to the attention of various bodies of the European Union and then, through their activity, all member states. From the originally formulated concept of a green economy, new ones have grown, referring to constantly emerging new problems of growth and development on a global scale, encompassing individual regions and fields of economy.

The object of analysis and evaluation of this study is to present the evolution of the concept of green economy, the essence of other related concepts and notions and to indicate their significance for policymaking and the practical solution of problems of socio-economic development. The informative and definition part of the article covers three levels: greening of economic processes as a new phenomenon of contemporary development; defining the concepts of green economy and green growth; the principles of implementing green economy and green transformation processes. The next part of the study presents measures and indicators of green economy and green growth and links these concepts with the concept and objectives of sustainable development. The last part of the study is devoted to the presentation of the new European Green Deal. The paper is based on the analysis of documents and literature mainly referring to the concepts of “green economy”, “green growth”, and “green deal” in the context of “sustainable development goals”. The paper provides a systematic overview of different initiatives, official, political, and institutional, and tries to link these with the theoretical concept of sustainability.

2. The Greening of Economic Processes

Since the dawn of time, man has lived surrounded by nature and used its elements in farming to satisfy his production and consumption needs. With low population densities and limited possibilities to transform nature, man’s ecological environment was reborn in a natural way. Intensification and improvement of production processes, economic expansion, and the extension of industrial centres, urbanisation, population movements, and development of new areas, accelerated by the industrial revolution and unhindered development of the free-market economy system, intensified the pressure on the natural environment and its degradation. The dangers resulting from the predatory way of managing and exploiting nature were noticed after the Second World War, when the processes of universal industrialisation, urbanisation, and demographic densification accelerated.

The traditional industrial-market paradigm of development, which did not provide solutions to the key economic and social problems of the globalising world, began to be questioned loudly when, in the 1960s, onerous and difficult environmental problems were recognised, and a little later the adverse phenomena and effects of climate change.

Recognition of these phenomena led to the emergence in the late 1960s and early 1970s of the concept of sustainable development, which has been enriched continuously to this day, as well as the concept of eco-development and “green economy”, which is particularly related to the natural environment, and other related concepts, such as “green growth”, “green governance”, “greening the economy”, and “green transformation”. Threats posed by the depletion of natural resources, degradation of nature and the environment, and climate change have drawn attention to the need to protect nature, preserve the biosphere and environmental values, and restore the functioning of natural ecosystems. Activities in this area taking place in the economic, social, and political spheres can be described as “greening”.

The economic aspects of the threat posed by the traditional development paradigm and the need to green the economy were first recognised by English environmental economists. Their proposed concept of “green economy” refers to natural biological processes and the primary production of plants and draws attention to ways of farming that make the greatest possible use of biological processes under the influence of solar energy to produce goods, services, and energy without harming the environment or the climate. For this reason, the concept of green economy, as well as green growth, is inextricably linked to the concept of sustainable and balanced development. An enduring link and interplay between these two concepts can be observed. As a result, first the concept of sustainable development, creating the possibility of satisfying current needs without limiting the ability to satisfy the needs of future generations, and then the greening of the economy, treated as a way to solve economic, social, and environmental problems, and practical implementation of the concept of sustainable development began to be treated as a perspective for a radical transition to a green economy, a more efficient and socially acceptable economy, a low-carbon economy, an economy that conserves resources and biodiversity and mitigates climate change [2–4].

The concept of green economy means moving towards an economic model based on sustainable and balanced production, exchange, consumption, and sharing of economic and social benefits, with particular care for nature and the environment. Green growth means increasing the potential of green activities and sectors as drivers of economic growth. In relation to climate, similar importance is attached to building climate resilience by reducing fossil fuel consumption and greenhouse gas emissions identified with the so-called low-carbon development.

The concept of greening the economy can be defined as a process of transition from management according to the traditional industrial-market paradigm of development to a paradigm of inclusive development, based on sustainability and restoration of ecological balance. The hierarchical sequence of concepts related to the greening process is shown in Figure 1. It shows how green economy is related to other concepts that serve to achieve the goals of sustainable and balanced development. The hierarchy of these links was shown in the report: TEEB-The Economics of Ecosystem and Biodiversity for National and International Policy Makers-Summary: Responding to Value of Nature published in 2009 and again in 2012 [5] and used in other publications [3]. Although the different concepts emerged separately and independently, they were all linked to the revival of these issues during the Great Financial Crisis, which between 2008 and 2011 disrupted global economic growth [6–10]. Despite the end of the crisis, these issues are still present in international, regional, and national politics.

During the financial crisis, the interest in green economy was mainly political, which was externalized in the actions of various international agencies and institutions. During a discussion initiated by the United Nations Environmental Programme (UNEP), as part of the search for anti-crisis measures in 2008, specific areas were identified where large-scale public investments could be proposed in the form of so-called “green stimulus packages” to revive the “green economy” [7]. This inspired a number of countries to put this concept into practice as an instrument for recovery from the crisis.

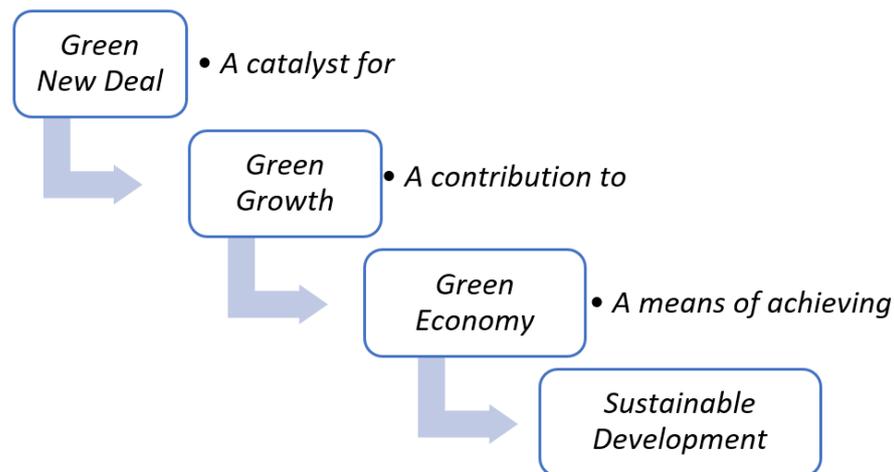


Figure 1. The hierarchy of green economy concepts [3,5].

In 2008, UNEP also announced the so-called Green Economy Initiative to analyse and develop ways to support investments in the so-called green economy sectors and actions increasing the greening of environmentally harmful sectors. Part of this initiative was the preparation of a report entitled *Global Green New Deal*, which was published in 2009. The report presents a proposal for a set of environmental instruments to stimulate recovery from the crisis and strengthen and balance the global economy. According to the authors of the report, green stimulation packages targeted at specific areas could strengthen the development of green economy. The programme called on governments to stimulate the development of green sectors by allocating significant resources for three purposes: (i) economic recovery, (ii) poverty eradication, and (iii) reducing carbon emissions and ecosystem degradation.

In 2009, in the run-up to the Copenhagen Climate Change Conference, the UN published a statement supporting green economy as a possible way to mitigate the effects of the global financial crisis, boost economic recovery, strengthen food security, prevent environmental degradation and other risks regarding water and energy shortages and climate change. The increased interest in the green economy was then linked to preparations for the UN Rio + 20 Conference on Sustainable Development, which was organised in 2012. An important document addressing the development of the green economy was UNEP's 2011 *Green Economy Report*, which defined the green economy as "an economy that improves human well-being and social equity while significantly reducing environmental risks and ecological shortages. It is low-carbon, resource-efficient and socially inclusive" [11]. This widely cited definition has inspired many other similar formulations proposed by various international organisations and research centres [12].

According to the *Guide to Green Economy* published by the United Nations, between 2009 and 2012 there were about 30 reports and studies on the nature, definition, and implementation of national green economy strategies [8]. Shorter definitions are known, such as the one given by a coalition of different NGOs, defining the green economy as "a resilient economy that provides a better quality of life for all within the planet's ecological limits" [6]. There are also more developed definitions, among which we can mention the definition formulated by Danish NGOs, which defines green economy not as a state but as a process of transformation and dynamic progress. Green economy, in this sense, eliminates the systemic distortions and dysfunctions of mainstream economics and ensures human well-being and equal access to opportunities for all members of the community, while maintaining the integrity of the planet. These organisations argue that an economy cannot be green if it is not fair [13]. The document *Towards a Green Economy* [11] describes the stages of implementing a green economy, specifies the type and use of green investments and the orientation of development processes mainly towards the provision

and use of natural capital and energy [12]. The dynamic development of the green economy concept occurred in 2011–2012, when numerous reports, documents and studies of various international institutions and national teams relating to the greening of the economy were published. Leading among many institutions were: UN World Conferences, various UN Agencies, including in particular the UN Environment Programme UNEP, the OECD, the World Bank, the European Union and its Environment Agency (EEA), and specialized institutions set up to study the issue of green economy development and implementation, such as the Green Economy Knowledge Platform (GEKP), the World Resources Institute (WRI), the Global Green Growth Institute (GGGI), the UN Department for Economic and Social Affairs (UNDESA), the UN Economic Commission for Asia and the Pacific (UN-ESCAP), various UN specialised agencies, e.g., ILO, FAO, UNCTAD, UNFCCC, and UNESCO, and others. National institutions have also taken an interest in and conducted research on green economy. Since 2013, there has been a growing interest in both the practical implementation of the concept and in ways to assess progress in implementation and measure outcomes. The chronology of the emergence of the more important concepts and ideas of green economy in the context of other related concepts is presented in Table 1.

Table 1. Significant milestones in global and European Green Economy development ¹.

1972	UN Conference on the Human Environment. Declaration; We have only one earth.
1987	Report of the World Commission on Environment and Development (WECD)–“Our Common Future”.
1989	Blueprint for a Green Economy, Report 1.
1991	Blueprint for a Green Economy, Report 2.
1992	UN Conference on Environment and Development (UNCED), Rio Earth Summit-Agenda 21.
1994	Blueprint for a Green Economy, Report 3.
1997	UN General Assembly. Review and Appraise the Implementation of “Agenda 21” Rio + 5.
2000	UN Millennium Summit. Millennium Development Goals (MDGs).
2002	World Summit on Sustainable Development (WSSD), Rio + 10.
2008	UNEP; Green Economy Initiative (GEI), Global Green New Deal (GGND).
2009	UN Climate Change Conference in Copenhagen.
2010	UNEP Global Ministerium Environmental Forum in Nusa Dua. EC: A Strategy for Smart and Sustainable and Inclusive Growth.
2011	UNEP Green Economy Report: Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication. UN Document: Working Towards a Balanced and Inclusive Green Economy. OECD: Towards Green Growth. UNEP, ILO: Green Jobs. Towards Decent Work in a Sustainable, Low-Carbon World. WRI: A compilation of Green Economy Policies, Programs and Initiatives from Around the World. WRI: Adapting for a Green Economy: Companies, Communities and Climate Change. UNCTAD: The Road to Rio+20: For a development-led green economy. Issue 1, 2, 3. EC: Roadmap to a resource efficient Europe.
2012	UN Conference on Sustainable Development (UNCSD) Rio+20. UNEP: Measuring Progress Towards a Green Economy. UN Department of Economic and Social Affairs (DESA): A Guidebook to Green Economy: Issue 1 and 2: Exploring Green Economy Principles and Green Economy Transition. EEA: Environmental Indicator Report 2012: Ecosystem Resilience and Resource Efficiency in a Green Economy in Europe. World Bank: Inclusive Green Growth: The Pathways to Sustainable Development.
2013	High-Level Political Forum on Sustainable Development (HLPF). Green Growth Knowledge Platform (GGKP): Moving towards a Common Approach on Green Growth Indicators. EEA: Towards a green Economy in Europe. EU Environmental Policy Targets and Objectives 2010–2050.
2014	UNEP: Using Indicators for Green Economy Policymaking.
2015	Transforming Our World: the 2030 Agenda for Sustainable Development-Sustainable Development Goals (SDGs).

Table 1. *Cont.*

2016	Green Growth Knowledge Platform: Measuring Inclusive Green Growth at the Country Level.
2017	OECD: Green Growth Indicators. PAGE: The Green Economy Progress Measurement. Application.
2019	European Commission. New European Green Deal Strategy.

¹ Own elaboration using different official documents and publications.

The European Union has been actively involved in building the concept of sustainable development, but interest in green economy in its documents only emerged in the run-up to the Rio+20 summit in 2012. At that time, green economy was defined as “a low-carbon and resource-efficient economy that delivers growth, creates jobs and eradicates poverty by investing in and preserving the natural capital on which the long-term survival of the planet depends. It is a low-carbon, resource-efficient, and socially inclusive economy” [14,15]. The European Commission then defined its approach to green economy in an environmental action programme treating natural capital and biodiversity conservation as a kind of life insurance. The leading document from the perspective of green economy became the Europe 2020 Strategy, the central element of which is the promotion of sustainable development in all areas of the economy, environment, and social life. In the preparation of this strategy and its dissemination, a number of specific documents directly related to the issue of greening the economy were developed [12].

3. Defining Green Economy and Green Growth

Green economy can be considered from three perspectives: conceptual–theoretical, application–implementation and measurement of the results of its implementation. The theoretical–conceptual perspective is important for the phase of strategy formulation, policy creation, and the elaboration of development programmes. Although individual definitions differ in details, emphasising the aspects which are the main axis of interest for a given organisation as the entity formulating the definitions, they are all related to the concept of sustainable development, developed since the 1970s, in which the three planes: economic, social, and environmental are treated equally and inseparably. This interconnection between planes and the need to balance needs and interests between generations should be externalized in the New Green Economic Deal, which through green economy, green growth and sustainable development can be achieved as a moving target state. The concept of green economy focuses on the relationship and interdependence between economy and the ecosystem providing a basis for operationalising the concept of sustainability. Most definitions distinguish between the concept of sustainable development and that of green economy, giving the latter a role as a tool for achieving sustainable development goals [16].

One of the most widely quoted definitions of a green economy was proposed by the United Nations Environment Programme UNEP, which defines green economy as one that results in “increased human well-being and social equity while reducing environmental risks and ecological shortages” [17]. At the core of the green economy concept is the conviction that economic development is structurally linked to policies that protect natural resources and the quality of the natural environment [18]. In many countries, attention has been paid to ensure that the packages of the “New Green Deal” include such fiscal solutions relating to the environment that will be both stimulators of the current economy and the basis for sustainable development in the future [19].

Regardless of how it is defined, the concept of green economy includes such basic elements as: elimination of environmental threats and preservation of its values; rational management of natural resources and raw materials; social inclusion and economic efficiency. Investments limiting harmful emissions of gases and pollutants, pro-ecological social behaviour, and economic activity ensuring economic efficiency and growth are of key importance for the implementation of this concept. The concept of green economy is therefore closely linked to the concept of green growth ensuring climate resilience and a

sustainable development process. Green growth, which gained interest especially during the financial crisis of 2008–2011, was recognised as an important alternative to the traditional way of recovering from economic recession by combining ad hoc intervention with ensuring long-term sustainable growth through the use of green factors that enhance the sustainability of the economy [20]. For definitions of green economy, green growth, and low-carbon economy, see Table 2 [21,22].

Table 2. Selected definitions of green economy, green growth and low-carbon development [11,14,16,17,21–25].

Organisation	Definition
Green Economy	
UNEP (2011)	The green economy is one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities.
UNCTAD (2011)	The green economy is an enabling component of the overarching goal of sustainable development. It is defined 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.
International Chamber of Commerce, Green Economy Task Force	The green economy is an economy in which economic growth and environmental sustainability work together in an mutually reinforcing fashion, while supporting progress and social development.
EEA (2013)	The green economy is one in which environmental, economic and social policies and innovations enable society to use resources efficiently—enhancing human well-being in an inclusive manner, while maintaining the natural systems that sustain us.
Green growth	
OECD (2011)	Green growth is about fostering economic growth and development while ensuring that the natural assets continue to provide the resources and environmental services on which our well-being relies. To do this it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities.
World Bank (2012)	Growth that is efficient in its use of natural resources, clean in that it minimizes pollution and environmental impacts, and resilient in that it accounts for natural hazards and the role of environmental management and natural capital in preventing physical disasters.
UN ESCAP (2012)	Green growth (. . .) is a strategy of sustaining economic growth and the job creation necessary to reduce poverty in the face of worsening resource constraints and climate crisis.
Low-carbon development	
FGG (2011)	Development emphasizing reduction in use of fossil fuels as the engine for development (climate-resilient development).
OECD (2011)	Low-carbon development strategies are forward-looking national economic development plan or strategies that encompass low-emission and/or climate-resilient economic growth.

In addition to the definitions formulated by teams of researchers working for international organisations, the issue of green growth and green economy has been addressed by researchers in various academic centres and working independently. Cato et al. presented the view that the academic literature on green economy covers a wide range of topics relating to both green economics and green growth and points to the need to assess economic growth not only in terms of its impact on the size of GDP, but also on the assessment of welfare and environmental quality. Many studies point to the limited capacity to design rational development policies that take into account all the necessary rationally related elements [26,27]. The global green economy cannot be directed only at increasing GDP with the help of green stimulators, it should provide the opportunity to carry out the necessary structural changes; the structure of resources used, modes of production, the level and structure of consumption, reducing emissions and losses, etc. actions to prevent environmental degradation and climate change. However, greening the economy cannot be seen as a panacea for ensuring growth [28].

An important aspect of the concept of green growth and greening the economy is that it can be linked to the transformation processes taking place rapidly and widely at the turn of the 20th and 21st centuries both in the countries of Central and Eastern Europe and in many developing countries. Transformation emerges as an important concept referring both to the economic and social system and to its adaptation to environmental requirements and sustainable development goals. Green transformation enables the transformation of existing systems in terms of economic structures, governance institutions and the role of actors into new alternative forms that take into account the adaptation of sustainable development principles [29].

In the application–implementation dimension, green economy includes elements such as green products and services, green investments, green economic sectors, green public procurement, green taxes and other management instruments, green jobs, and green economy-friendly consumption [9]. The first element is formed by products and services that have a low environmental impact throughout their life cycle. This means that they are manufactured or offered using components that are not harmful to the environment and can be reused in the recycling process, especially by implementing the so-called “closed loop economy”. Green products and services must meet certain environmental requirements. Green investments include both the construction of infrastructure to protect the environment, investments producing products and not emitting greenhouse gases, saving energy, as well as other types of activities in the sphere of production, use of raw materials and energy. Green sectors have always been associated with agriculture and forestry, the protection of the natural landscape, production of renewable energy, and development of the bio-economy and environmentally friendly technologies. Green public procurement and green taxes are instruments, activities, and processes in which public authorities positively influence the procurement of environmentally beneficial goods, services and other forms of action and economic and social growth and development. Green jobs are forms of employment that contribute to reducing consumption of energy and natural resources, limiting the amount and types of waste and pollution, reducing greenhouse gas emissions, and protecting ecosystems and conserving biodiversity. Sustaining green economic sectors also depends on consumption that avoids waste, losses and manages waste rationally. Companies, households, and citizens are primarily responsible for implementing green economy, but also local and regional communities, states, public authorities and organisations, and international organisations. The key question is to what extent the right concepts are feasible and are implemented in economic and social practice. The concepts themselves are not always universal or optimal proposals for solutions, and the solutions themselves may also show weaknesses or contain solutions that are difficult to achieve at a particular time or under particular conditions. Some such weaknesses are shown in Table 3, which includes characteristics of the green economy and green growth concepts formulated by various international organisations.

Table 3. Characteristics of green economy and green growth in different organizations reports [3].

Organisation/Authors	Title	Key Aspects of Definition	Measurement Agenda	Key Shortcomings
European Commission	Europe 2020: a strategy for smart, sustainable and inclusive growth (2010)	Green economy broadly defined as ‘smart, sustainable and inclusive growth’.	National and EU level indicators	Thematic areas are broad but do not cover the full spectrum of the green economy.
OECD	Towards green growth (2011)	Good economic policy at the heart of green growth. Economy must be ‘flexible’, ‘dynamic’ and use the resource efficiently.	30 OECD green growth indicators.	Unequivocal support for potential of unlimited ‘green’ growth. Economic policy with added environmental benefits.

Table 3. Cont.

Organisation/Authors	Title	Key Aspects of Definition	Measurement Agenda	Key Shortcomings
UNEP	Towards a green economy (2011)	Moving towards a green economy can be profitable, it is possible to combine healthy living with strong economic growth.	Questions role of GDP in assessing well-being. Indicators for decision-making and policy design.	Solutions offer little innovation. Based only on mainstream sustainable development (markets, technology, regulations).
HM Government	Enabling the transition to a green economy (2011)	Based on need for strong, sustainable and balanced growth and strong economic arguments for immediate action on climate change. Green economy defined by its benefits to the UK economy: new international markets to be captured and opportunities for growth.	Government to provide information on expected impacts of climate change and resource risks. Measurement not on 'Policy Timeline'.	Social imperatives of the green economy are absent. Regulation framed as solely a burden on businesses.
World Bank	Inclusive green growth (2012)	'Inclusive green growth is the pathway to sustainable development' (World Bank 2012, xi). 'Growth itself is good, but it has not been green or inclusive enough'.	How green policies affect conventionally measured GDP. Incorporating the environment into accounting.	Insistence that growth must be green but not slower. Narrow range of economic perspectives considered. Heavily reliant on existing solutions.
GGKP	Moving towards a common approach on green growth indicators (2013)	Claims existing definitions have a lot in common. States no definition of its own for its 'common approach'.	Approach based on communication need, not monitoring. Adopts OECD's headline indicators. Wealth accounting as complementary.	Masks green economy under green growth. Bases indicators on natural assets as input to a production function only.
Global Green Growth Institute (GGGI)	GGGI focuses on green growth implementation across various national contexts	'Green growth seeks to fuse sustainable development's economic and environmental pillars into a single intellectual and policy planning process, thereby recasting the very essence of the development model so that it is capable of producing strong and sustainable growth simultaneously' (Samans 2013, 3). Policy frameworks will be context specific. Resilience, equity and inclusivity are important.	Based on GDP. Set by particular national contexts.	Focuses on green growth, no criticism of growth.

Green growth can be one of the pillars of sustainable development, and green economy is one of the three main planes of this concept already developed earlier, mainly since the early 1970s. However, the two terms, “green economy” and “green growth, contain common elements and their differences have gradually blurred and have often been used interchangeably. This was also due to the search for an integrated approach combining all elements and planes of the concept of sustainable development, to which both concepts were closely related. Differences occurred depending on which elements in a given plane were brought to the fore.

The concept of green growth, although similar to that of the green economy, has a clear quantitative aspect referring to the growing demand for goods and services resulting from population growth, increased development aspirations and the need to reduce poverty. It grew out of the interest in greening issues by institutions, such as the World Bank, the OECD, the Global Green Growth Institute (GGGI), and the United Nations Economic Commission for Asia and the Pacific (UN-ESCAP). According to the OECD [21], green growth means striving for economic growth and development while preventing environmental degradation, loss of biodiversity, and irrational use of natural resources (investing in the environment according to this concept should be the driving force of economic growth). Green growth policies serve to promote economic development and the standard of living of the population by conserving and making good use of natural capital, which includes natural and economic resources in the form of raw materials, energy, water, biomass, and many other products or services that affect human well-being.

The relevance and effectiveness of such policies depend on a good understanding of green resources and growth drivers and the relationships between them. This requires adequate information resources, measurement indicators and monitoring and evaluation methods. The implementation and monitoring of green economy and green growth in individual countries should enable international comparisons leading to a more complete identification of problems and coordination of actions on a global scale [8,13]. To this end, various international organisations and research teams are developing packages, indicators, and ways to measure greening and assess its impact.

According to the World Bank, green growth is one that ensures resource efficiency, results in reduced pollution and environmental degradation, and averts various disasters through proper management of natural capital and the environment as a whole. According to the GGGI (Global Green Growth Institute), green growth is a revolutionary new development paradigm that sustains economic growth while ensuring climate and environmental resilience. It targets poverty reduction, job creation, social inclusion, and ecosystem sustainability, mitigating climate change, supporting biodiversity, providing access to clean water and energy [30]. GGGI is an international institute that collects information and conducts research on green growth and its promotion. It supports the preparation of green growth plans especially in developing countries in four priority areas: energy, water, land use and green cities [13].

The concepts of green growth and green economy were formed in a similar period, at the beginning of the second decade of the 21st century, but in different environments and addressed to different audiences. The notion of green economy refers to the state and structure of the economy, its nature and way of functioning, while the term green growth has a dynamic character and refers to the use of green production factors to increase economic effects (production resources, production, consumption, income), which can be used to accelerate development processes. Growth has a quantitative character, while development is a phenomenon with a broader content, including, besides quantitative changes, also qualitative changes, such as structural changes in the economy, technical and technological progress, implementation of innovations, reduction of labour intensity of production and burdensomeness of work, provision of social services, and the protection of environmental and cultural values. Growth is generally necessary for development to occur, which may be delayed or indirect. Green growth can take green economy to a

higher level of development, so the concept of green growth can be useful in formulating development strategies and policies, green transformation policies.

According to the OECD [21], green growth policies serve to promote economic development and human well-being through the conservation and appropriate use of natural capital, which includes natural and economic resources in the form of raw materials, energy, water, biomass, and many other products or services that contribute to social well-being. The relevance and effectiveness of these policies depend on a good understanding of green resources and growth drivers and the relationships between them. This requires appropriate information resources, measurement indicators, and monitoring and evaluation methods.

4. The Principles of Green Economy and the Elements of Green Transformation

While the definition of green economy was supposed to serve the interpretation of the concept itself, ways of concretising this concept and ways of achieving the desired state were also sought. This was to be achieved by developing principles of implementation and ways of operation. Various organisations defining the green economy proposed a number of proposals in this regard, especially in the run-up to the Rio + 20 Conference. An overview of these proposals was published by UNDESA in 2012 in the second edition of its Green Economy Handbook [31]. A list of the most frequently proposed green economy principles in relation to the fundamental planes of sustainable development is provided in Table 4.

Table 4. Green Economy Principles [31].

Type	Principles
Economic	<p>Recognizes natural capital and values</p> <ul style="list-style-type: none"> • Integrated in economic development and growth models • Internalizes externalities • Promotes resource and energy efficiency • Creates decent work and jobs data
Environmental	<p>Protects biodiversity and ecosystems</p> <ul style="list-style-type: none"> • Invest in and sustains natural capital • Recognizes and respects planetary boundaries and ecological limits • Advances international environmental sustainability goals
Social	<p>Delivers poverty reduction, well-being, livelihoods, social protection and access to essential services</p> <ul style="list-style-type: none"> • Is socially inclusive, democratic, participatory, accountable, transparent, and stable • Is equitable, fair and just-between and within countries and between generations

The principles and guidelines for the practice of implementing green economy were the result of consultations and cooperation within the so-called Green Economy Coalition, 2012, a global network of institutions working for the transformation of the existing economic model into a new green, rational and inclusive economy operating on the principles of sustainability and durability. The key principles include: the sustainability principle, the justice principle, the dignity principle, the healthy planet principle, the inclusion principle, the good governance and accountability principle, the resilience principle, the efficiency and sufficiency principle, the generations principle. These principles are quite general and can be adapted for inclusion in more specific programmes for the development and transformation of the green economy.

The transition to a green economy was presented in a joint report by UNDESA, UNEP and UNCTAD [32], in which the invited authors addressed the benefits, challenges and risks of implementing the green economy concept in the perspective of achieving the sustainable

development goals. The report mainly addresses three areas: macroeconomic development issues; international trade and challenges for green policies in the context of achieving sustainable development goals; and poverty eradication and social equity implementation. From UNEP's perspective, the green economy is not only an opportunity to improve well-being and reduce inequality, but also to reduce environmental risks and constraints. It was pointed out that most of the publications on this topic refer to the microeconomic scale, whereas macroeconomic analyses are also needed. On the macroeconomic scale, it was pointed out that there is a need to develop analyses and research on inter-generational welfare, the effectiveness of environmental expenditure, the policy of supporting supply (production) and demand (consumption), structural changes in economic growth and global financial support for initiatives in the green economy. In the trade sphere, it is necessary to look for potential opportunities and threats that may arise during the transition to a green economy, to identify the relative position of leading trading partners implementing the green economy concept, as well as the role of the international community in ensuring that trade and investment policies serve recognised green economy objectives.

On the level of challenges to the green economy, it was pointed out that green economy is the leading theme in which the problems arising from the environmental crisis have focused. The divergences in defining green economy and the consequences that may arise from this between ecologists and economists were defined. It was pointed out that green economy is a huge complex of issues on a global scale, and it is difficult to reach a consensus in this respect, especially on a microeconomic scale and in the short term. On a general and long-term scale, however, green economy is environmentally friendly, sensitive to the needs of conservation of natural resources, minimising the emission of harmful substances and ecological threats. One of the dangers that is pointed out is that green economy is considered as something definitive, replacing the concept of sustainable development. Green economy should support, not replace, sustainable development. This risk is important when applying the policy of green protectionism or attempts to transfer and adapt ready-made models.

The following are considered key elements of green transformation: proper valuation of natural capital, selection of appropriate ways of regulation and support incentives, appropriate use of economic and legal instruments for environmental regulation, development of a sustainable model of production and consumption, equitable distribution of income and ensuring social standards, investing in education and dissemination of knowledge, and building green skills. Natural capital began to be treated as an important factor of production and a determinant for raising the welfare of the population [21]. The transition to a new green deal should take place with broad inclusion and adaptation of economic greening programmes to regional and local conditions [22]. The main objective of the transition is to strengthen the changes leading to the transition from the traditional economy model to a green economy model providing economic growth, higher income levels and other economic benefits while maintaining environmental sustainability and social inclusion. An interesting proposal for the practical transition from a low-carbon economy to a green economy on a national, business, and community scale was proposed by P. Szyja [9], which is presented in Table 5.

This proposal points to practical tasks and activities that can be undertaken at each of the three stages of transformation. It is important that the proposed actions can be framed in the form of measurable quantitative indicators.

Despite the presence of various definitions of the green economy and green growth, especially in the sphere of influence of international organisations, these concepts and ways of defining them are often criticised due to the high flexibility and difficulty of delimitation and overlapping with issues falling under the concept of sustainable development and the achievement of sustainable development goals. The search for appropriate measures and indicators for green growth, green economy and green economic governance is therefore still on-going.

Table 5. Stages of transformation towards the green economy [16].

Stage \ Entity	Countries	Enterprises	Society
Low-carbon economy	<ul style="list-style-type: none"> achieving the emission targets; defining the emission standards for machines and devices; Emission Trading System introduction. 	<ul style="list-style-type: none"> low-carbon technology implementations; purchase of low-carbon machines and vehicles. 	<ul style="list-style-type: none"> low-carbon vehicle investments; increasing the share of public transport and bicycles users.
Greening the economy	<ul style="list-style-type: none"> thermal upgrading of public buildings; renewable energy sources development; supporting ecological investments through financial instruments; subsidizing green vehicles; green public procurement. 	<ul style="list-style-type: none"> production plant modernization; environmental management system introduction; enriching the range of ecological products; creating green jobs. 	<ul style="list-style-type: none"> thermal upgrading of residential buildings; purchase of ecological goods and services.
Green economy	<ul style="list-style-type: none"> green tax reform; raising the share of renewables in energy consumption; ecological transport development; industrial policy focused on green sectors; restrictions and controls in waste generation. 	<ul style="list-style-type: none"> zero emission production; dominant share of ecological products and services; green jobs. 	<ul style="list-style-type: none"> green houses; microelectric power plants; solar panels.

5. Measures and Indicators for Green Economy and Green Growth

Conventional assessment of the state of the economy and economic growth is usually performed using the GDP measure. In the assessment of economic and social development, a number of other indicators characterising economic, social, and environmental aspects of management are used. In the transition to a green economy, additional characteristics gain importance, especially from the environmental sphere. When traditionally understood economic growth is usually treated as synonymous with welfare improvement, green growth additionally takes into account security aspects (Ferguson, 2014). When assessing green growth and the transformation to a green economy, the need arises to broaden the assessment criteria to include new or alternative measures of economic, social and environmental progress, especially when linking the transformation processes to the pursuit of a new green deal that ensures the achievement of sustainable development goals. Indicators are also needed to determine the level of transformation of the economy to the goals set by the new green economic deal, to new sustainable development goals. It is therefore important to correctly formulate the objectives of green transformation, to determine the level and timetable for their achievement, to formulate measures and indicators, and to search for appropriate data to carry out an evaluation of the implemented development strategy and policy.

The implementation and monitoring of green economy and green growth in individual countries should enable international comparisons giving a more complete understanding of the problems and coordination of actions on a global and national scale [8,12,13,16]. To this end, research teams and international organisations are developing packages of metrics,

indicators, and ways to measure the level of greening and its assessment. Individual elements of green economy and green growth drivers should be as precisely defined, quantified and measurable as possible.

One of the earlier proposals are indicators proposed by the United Nations Environmental Programme (UNEP). The intention of this organisation is to use green economy indicators for an integrated assessment of policies and methods for shaping green development processes on a national and global scale. In order to evaluate changes in national development policies, it proposes to place emphasis on investing in and applying clean technologies, strengthening environmental services, and supporting environmental protection. Each national programme should take into account the specific local political, economic, and institutional circumstances. The set of environmental and social indicators proposed in 2012 for measurement in the three areas is as follows: 1. indicators of environmental problems and objectives (climate change, ecosystem management, resource efficiency, chemical and waste management); 2. indicators of policy interventions (green investment, green fiscal reform, valuation of externalities and ecosystem services, green skills training); 3. indicators of quality of life and social equity (employment, environmental products and services sector, well-being, access to resources, health). The detailed set of indicators is presented in Table 6. Each of the specified groups of indicators contains from two to four (39 in total) specific indicators. The indicators are collected on a dedicated Green Growth Knowledge Platform (GGKP), which in addition to these indicators includes a global list of scientists and experts [33]. The GGKP was launched in January 2012 in Mexico by the GGGI, OECD, UNEP, and the World Bank.

Table 6. Review of green economy indicators by UNEP [16,33].

Environmental	
Climate change	Carbon emissions (ton/year)
	Renewable energy (share of power supply) (%)
	Energy consumption per capita (Btu/person)
Ecosystem management	Forestland (ha)
	Water stress (%)
	Land and marine conservation area (ha)
Resource efficiency	Energy productivity (Btu/USD)
	Material productivity (ton/USD)
	Water productivity (m ³ /USD)
	CO ₂ productivity (ton/USD)
Chemicals and waste management	Waste collection (%)
	Waste recycling and reuse (%)
	Waste generation (ton/year) or landfill area (ha)
Policy	
Green investment	R&D investment (% of GDP)
	EGSS investment (USD/year)
Green fiscal reform	Fossil fuel, water and fishery subsidies (USD or %)
	Fossil fuel taxation (USD or %)
	Renewable energy incentive (USD or %)
Pricing externalities and valuing	Carbon price (USD/ton)
	Value of ecosystem services (e.g., water provision)
Green procurement	Expenditure in sustainable procurement (USD/year and %) CO ₂ and material productivity of government operations (ton/USD)
Green job skill training	Training expenditure (USD/year and % of GDP)
	Number of people trained (person/year)

Table 6. *Cont.*

Well-being and equity	
Employment	Construction (person, %) Operation and management (person, %) Income generated (USD/year) Gini coefficient
EGSS performance	Value added (USD/year) Employment (jobs)
Natural and human capital	Value of natural resource stocks (USD) Net annual value addition/removal (USD/year) Literacy rate (%)
Access to resources	Access to modern energy (%) Access to water (%) Access to sanitation (%) Access to health care (%)
Health	Level of harmful chemicals in drinking water (g/litre) Number of people hospitalized due to air pollution (person) Road traffic fatalities per 100,000 inhabitants (transport related)

In 2014 the UNDP published a document entitled “Using indicators for shaping the green economy policy”, which are framed under four groups: (1) problem identification, (2) policy formulation, (3) policy evaluation, and (4) policy monitoring and evaluation [16]. This set goes beyond the scope of green economy and green growth.

The OECD has developed its own set of indicators with a list from 1917, including 26 core indicators, each of which may have additional component, complementary or substitutive indicators (Table 7).

Table 7. Review of green growth indicators by OECD [16,34].

Environmental and Resource Productivity of the Economy	
Carbon & energy productivity	1. CO ₂ productivity 1.1. Production-based CO ₂ productivity GDP per unit of energy-related CO ₂ emitted 1.2. Demand-based CO ₂ productivity Real income per unit of energy-related CO ₂ emitted 2. Energy productivity 2.1. Energy productivity (GDP per TPES unit) 2.2. Energy intensity by sector (manufacturing transport, households, services) 2.3. Share of renewable energy In TPES, in electricity production
Resource productivity	3. Material productivity (non-energy) 3.1. Demand based material productivity (comprehensive measure; original units in physical terms) Real income per unit of materials embodied in final demand, materials mix 3.2. Production-based (domestic) material productivity GDP per unit of materials consumed, materials mix <ul style="list-style-type: none"> • Biotic materials (food, other biomass) • Abiotic materials (metallic minerals, industrial minerals) 3.3. Waste generation intensities and recovery rations By sector, per unit of GDP or value added, per capita 3.4. Nutrient flows and balances (N, P) <ul style="list-style-type: none"> • Nutrient balances in agriculture (N, P) Per agricultural land area and change in agricultural output 4. Water productivity Value added per unit of water consumed, by sector (for agriculture: irrigation water per hectare irrigated)

Table 7. Cont.

Multifactor productivity	5. Environmentally adjusted multifactor productivity (comprehensive measure; original units in monetary terms)
Natural Asset Base	
Natural resources stock	6. Index of natural resources Comprehensive measure expressed in monetary terms
Renewable stocks	7. Freshwater resources Available renewable resources (groundwater, surface water) and related abstraction rates (national, territorial)
	8. Forest resources Area and volume of forests; stock changes over time
	9. Fish resources Proportion of fish stocks within safe biological limits (global)
Non-renewable stocks	10. Mineral resources Available (global) stocks or reserves of selected minerals (tbd): metallic minerals, industrial minerals, fossil fuels, critical raw materials; and related extraction rates
Biodiversity and ecosystems	11. Land resources Land cover conversions and cover changes from natural state to artificial state
	<ul style="list-style-type: none"> • Land use: state and changes
	12. Soil resources Degree of topsoil losses on agricultural land, on other land
	<ul style="list-style-type: none"> • Agricultural land area affected by water erosion, by class of erosion
	13. Wildlife resources (to be further refined)
	<ul style="list-style-type: none"> • Trends in farmland, forest bird populations or breeding bird populations • Species threat status, in percentage of species assessed or known • Trends in species abundance
The environmental dimension of quality of life	
Environmental health and risk	14. Environmentally induced health problems and related costs (e.g., years of healthy life lost as a result of degraded environmental conditions)
	<ul style="list-style-type: none"> • Population exposure to air, and the related health risks and costs
	15. Exposure to natural or industrial risks and related economic losses
Environmental services and amenities	16. Access to sewage treatment and drinking water
	16.1. Population connected to sewage treatment (at least secondary, in relation to optimal connection rate)
	16.2. Population with sustainable access to safe drinking water
Economic opportunities and policy responses	
Technology and innovation	17. Research and development expenditure of importance to green growth
	<ul style="list-style-type: none"> • Renewable energy sources (% of energy-related R&D) • Environmental technology (% of total R&D, by type) • All-purpose business R&D (% of total R&D)
	18. Patents of importance to green growth (% of a country's patent families worldwide)
	<ul style="list-style-type: none"> • Environmental-related and total patents • Structure of environment-related patents
	19. Environment-related innovation in all sectors
Environmental goods and services	20. Production of environmental goods and services (EGS)
	<ul style="list-style-type: none"> • Gross value added in the EGS sector (% of GDP) • Employment in the EGS sector (% of total employment) • To be complemented with:
	Environmentally related expenditure (level and structure)

Table 7. Cont.

International financial flows	21. International financial flows of importance to green growth % of total flows and % of GNI 21.1 Official development assistance 21.2 Carbon market financing 21.3 Foreign direct investment
Prices and transfers	22. Environmentally related taxation subsidies <ul style="list-style-type: none"> • Level of environmentally related tax revenue (% of GDP, % of total tax revenues; in relation to labour-related taxes) • Structure of environmentally related taxes (by type of tax base) • Level of environmentally subsidies 23. Energy pricing (share of taxes in end-use prices) 24. Water pricing and cost recovery (tbd)
Regulations and management approaches	25. Indicators to be developed
Training and skill development	26. Indicators to be developed

The authors of this classification avoid creating synthetic indicators but use an extensive, two-tier set of indicators that allow for a detailed characterisation of the problem with particular attention to the social context and country specificities. The list of indicators is not closed and can be supplemented. The proposed indicators can be aggregated into four internally consistent groups of indicators [34]:

1. Environmental and resource productivity indicators, which reflect the impact on productivity and economic efficiency of factors, such as energy and other resource use, with a focus on carbon economy.
2. Natural assets base, which includes indicators to monitor the use of natural capital-renewable and non-renewable resources, biodiversity, and ecosystem features in accordance with the principles of sustainable development.
3. Environmental dimension of quality of life. Indicators of this group concern the environmental impact on human health and the possibility of generating risks and threats, resulting from the contamination of air, water, and other factors.
4. Economic opportunities and policy responses. Indicators in this group verify the potential for welfare improvements and opportunities for growth and development through processes of greening the economy.

Indicators on green economy and green growth are also collected and published by the European Environment Agency (EEA). In its 2012 report, it included a set of 225 indicators grouped into the following five groups: (1) driving force indicators: 50 indicators relating to socio-economic development, including transport, tourism, energy consumption; (2) pressure indicators: 71 indicators relating to greenhouse gas emissions and other air, water and soil pollutants; (3) condition indicators: 33 indicators describing the state of the environment; (4) impact indicators: 46 indicators describing changes in the environment and their impact on ecosystems, the economy and human health; (5) response indicators: 25 indicators that illustrate how politicians and the public react to environmental problems [14]. The Central Statistical Office in Poland has also proposed a set of indicators to characterise the state of greening of the economy [35]. Against the background of general indicators showing socio-economic conditions and economic performance (population, labour market, education, living conditions, information society, national accounts), the following four groups of measures and indicators for monitoring and assessing the state of green economy were distinguished: (1) natural capital indicators: 16 indicators divided into three groups (biodiversity and the state of ecosystems, renewable resources, non-renewable resources); (2) indicators of environmental production efficiency: 18 indicators divided into

three groups (resource management, energy use and greenhouse gas emissions); (3) indicators of the environmental quality of life of the population: 16 indicators relating to the relationship between human health and the state of the environment, as well as access to and use of environmental services; (4) indicators relating to economic policies and their consequences in the economic, social, and environmental spheres. This group includes 19 indicators concerning agricultural policy, environmental policy, fiscal policy, implementation of new technologies and innovations, management, and public procurement. In total, the set of green economy indicators in Poland includes 34 groups of thematic indicators divided into 85 detailed indicators. An overview of green economy indicators in Poland is presented in Table 8.

Table 8. Review of green economy indicators in Poland by CSO [16,35].

Natural Asset Base	
Biodiversity	<ol style="list-style-type: none"> 1. Share of legally protected area in total country area. 2. Farmland Bird index. 3. Forest Bird index. 4. Share of endangered species in total number of species.
Land use	<ol style="list-style-type: none"> 1. Agricultural land designated for non-agricultural purposes and forest land designated for non-forest purposes. 2. Degree of reclamation and management of devastated and degraded land.
Forest resources	<ol style="list-style-type: none"> 1. Forest cover. 2. Forest growing stock 3. Timber removal. 4. Share of damaged forest stands area in total forest area
Freshwater resources	<ol style="list-style-type: none"> 1. Indicator of surface waters availability per capita. 2. Exploitable underground water resources. 3. Water exploitation index
Mineral resources	<ol style="list-style-type: none"> 1. Share of extraction in hard coal resources. 2. Share of extraction in lignite resources. 3. Share of extraction in natural gas resources
Environmental and resource productivity of the economy	
Domestic material consumption	<ol style="list-style-type: none"> 1. Resource productivity (GDP/DMC). 2. Domestic material consumption per capita
Waste management	<ol style="list-style-type: none"> 1. Share of waste recovered in waste generated. 2. Share of waste disposed in waste generated. 3. Municipal waste generated per capita. 4. Municipal waste collected separately in relation to total waste. 5. Recycling of packaging waste.
Nitrogen and phosphorus balances	<ol style="list-style-type: none"> 1. Gross nitrogen balance. 2. Gross phosphorus balance.
Energy productivity	<ol style="list-style-type: none"> 1. Primary energy productivity. 2. Final energy intensity of the economy
Renewable energy	<ol style="list-style-type: none"> 1. Share of renewable energy in gross final energy consumption
Greenhouse gas emissions	<ol style="list-style-type: none"> 1. Greenhouse gas emissions. 2. Greenhouse gas emissions by emission source. 3. Greenhouse gas emissions in non-ETS sectors.
Environmental quality of life	
Gaseous air pollutants	<ol style="list-style-type: none"> 1. Average number of days with exceeded value of 120 $\mu\text{g}/\text{m}^3$ by 8-h ozone concentration. 2. Urban population exposure to air pollution by ozone (SOMO35). 3. Premature deaths attributable to ozone exposure

Table 8. Cont.

Particulate air pollutants	<ol style="list-style-type: none"> 1. Emissions of PM10 and PM2.5 per capita. 2. Urban population exposure to air pollution by PM10. 3. Urban population exposure to air pollution by PM2.5. 4. Premature deaths attributable to PM2.5 exposure.
Noise	<ol style="list-style-type: none"> 1. Percentage of plants exceeding industrial noise limits. 2. Percentage of population exposed to road traffic noise in agglomerations of over 100 thousand inhabitants. 3. Percentage of households exposed to excessive noise
Access to drinking water	<ol style="list-style-type: none"> 1. Access to drinking water.
Municipal sewage treatment	<ol style="list-style-type: none"> 1. Percentage of population using sewage network. 2. Wastewater treatment facilities per 1000 population not using the sewage network.
Green areas	<ol style="list-style-type: none"> 1. Green areas in cities per capita. 2. Green areas in cities as % of total area of cities.
Economic opportunities and policy responses	
Organic farms	<ol style="list-style-type: none"> 1. Organic agricultural area as % of total agricultural area. 2. Payments for organic farming as % of total payments for agriculture under the agri-environmental programme.
Outlays on environmental protection	<ol style="list-style-type: none"> 1. Outlays on fixed assets for environmental protection in relation to GDP. 2. Share of outlays on fixed assets for environmental protection in investment outlays of the national economy. 3. Household expenditures on environmental protection per capita.
Environmental taxes	<ol style="list-style-type: none"> 1. Share of environmental tax revenues in GDP. 2. Share of environmental tax revenues in total revenues from taxes and social contributions
Research and development (R&D) intensity	<ol style="list-style-type: none"> 1. Research and development (R&D) intensity. 2. Research and development (R&D) expenditure per capita. 3. Outlays on fixed assets for environmental protection in research and development activity in % of total outlays on fixed assets for environmental protection. Inventions and patents
Inventions and patents	<ol style="list-style-type: none"> 1. Patent applications in environment-related technologies as % of total patent applications filed at the European Patent Office. 2. Patents in environment-related technologies granted as % of total patents granted by the European Patent Office. 3. Patent applications in environmental technologies as % of total patent applications filed at the Patent Office of the Republic of Poland. 4. Patents in environmental technologies granted as % of total patents granted by the Patent Office of the Republic of Poland.
Eco-innovation	<ol style="list-style-type: none"> 1. Eco-innovation index
Green technology	<ol style="list-style-type: none"> 1. Participants of GreenEvo.
Eco-Management and Audit Scheme (EMAS)	<ol style="list-style-type: none"> 1. Organisations with Eco-Management and Audit Scheme (EMAS) registration. 2. Sites of organisations with Eco-Management and Audit Scheme (EMAS) registration
Green public procurement	<ol style="list-style-type: none"> 1. Green public procurement in % of total public procurement.

Similar sets of indicators relating to green growth and green economy, based on OECD and UNEP indicators, have been developed in many other European countries. It should also be noted that there are also other proposals for indicators relating to the global scale (GGEI-Global Green Economy Index) or for assessing the green growth policy and the degree of implementation of green economy principles (Green Economy Progress-GEP).

The Global Green Economy Index was published in 2010 by Dual Citizen, a US-based consulting firm. The index proposes to measure green economy in four main areas: leadership and climate change; performance sectors; markets and investment; and the environment. These indicators are grouped into 20 thematic areas, the number of which, as well as the number of specific indicators, can be increased. In addition to indicators of a quantitative nature, a number of qualitative indicators of a different nature have been

proposed in this set. This means that the assessment using these indicators can be highly subjective. The set of these indicators is presented in Table 9.

Table 9. Review of indicators of the Global Green Economy Index [16,36].

Dimension	Area	Example of Indicator/Data Source
Leadership & Climate Change	Climate Change Performance	Emissions per capita (data from International Energy Agency–IEA)
	International Climate Forums	Country behaviour during international forums (analysis of ECO reports)
	Head of State	Analyses the Google search results with name of head of state + keyword “green economy” (analysis of actions towards the development of the national green economy)
	Media Coverage	Analyses the Google search results with name of the country + keyword “green economy” (analysis of actions towards the development of the national green economy)
Efficiency Sectors	Buildings	Extent of sustainable buildings in the countries (data obtained from Leadership in Energy and Environmental Design LEED)
	Transport	CO ₂ transport emissions data published by The International Energy Agency–IEA
	Tourism	Qualitative analysis of national tourism website (assessment in promoting sustainable tourism)
	Energy	Data on national renewable electricity outputs as a percentage of total electricity output (statistics from IEA and World Bank)
	Resource Efficiency	Recycling rate (access from WASTE ATLAS)
Markets & Investment	Renewable Energy Investment	Attractiveness of national markets for renewable energy investment measure (data access from IRENA)
	Cleantech Innovation	Number of companies located listed on the Cleantech Group’s annual Cleantech 100 list and measure of clean energy patents reported by the Clean Energy Patent Growth Index CEPGI
	Corporate Sustainability	Identification of the top 3 companies in each country in terms of market capitalization and assessment of the effort to improve the sustainability of their business by Carbon Disclosure Project (CDP) and Science Based Targets (SBT)
	Green Investment Promotion and Facilitation	Assessment of national investment websites
Environment	Agriculture Air quality Water resources Water and sanitation Biodiversity and habitat Forests	Performance scores based on the Environmental Performance Index (EPI)

One of the ways to measure the progress of building green economy is a composite indicator developed by PAGE-Partnership for Action on Green Economy called GEP-Green Economy Progress. This indicator was developed with the cooperation of several organisations forming the so-called Green Flagship Initiative for building an Inclusive Green Economy. The index contains two components: GEP Index, a set of green economy advancement level indicators, and Dashboard of Sustainability of Indicators. The GEP Index, a set of advanced indicators, contains thirteen indicators, which are included in Table 10.

Table 10. Review of indicators of the Green Economy Progress Index [16,37].

Indicator	Description
Green trade	Export of environmental goods according to OECD and APEC (% of total export).
Environmental patents	As a measure of green technology innovation, patent publication in environmental technology by filing office (% of total patents).
Renewable energy sources	Share of renewable energy supply (of total energy supply).
Energy use	Energy use (kg of oil equivalent) per USD 1000 GDP (constant 2011 PPP).
Palma ratio	Ratio of the richest 10% of the population's share of income divided by the share of the poorest 40%.
Access to basic services	This is a composite measure created by the average access to three basic services with key social and environmental implications: Access to improved water sources (% of total population), Access to electricity (% of total population), Access to sanitation facilities (% of total population).
Air pollution	PM2.5 pollution mean annual exposure (micrograms per cubic meters)
Material footprint	Raw material consumption of used biotic and abiotic materials (tons/person).
Marine and terrestrial protected areas	Sum of terrestrial protected area (% of total land area) and marine protected area (% of territorial waters).
Gender inequality index	A composite reflecting inequality in achievements between men and women across three dimensions: (a) reproductive health; (b) empowerment; and (c) the labour market.
Pension coverage	Share of population above statutory pensionable age receiving an old age pension, by contribution and sex.
Education (Mean years of schooling)	Average number of years of education received by people aged 25 and older, converted from education attainment levels using official durations of each level.
Life expectancy	Life expectancy at birth indicates the number of years a new-born infant would live if prevailing patterns of mortality at the time of its birth were to remain stable throughout its life.

Sets of indicators describing green growth and the green economy are also proposed by individual researchers and research teams. They are often synthetic indicators based on data from Eurostat, UN, OECD, or national statistical offices. An example of such a set is the Green Economy Index presented in Table 11 developed by Bożena Ryszewska, which contains 21 indicators grouped into the following seven areas: Ecosystems, biodiversity and natural capital; Emissions, pollution and waste; Resource consumption; Poverty and social inequalities; Economics; Environmental policies and strategies; Green economy sectors [8].

Table 11. Areas and Indicators of Green Economy Index [8]. The permission was received from the publisher Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu.

Area	Indicator
I. Ecosystems, biodiversity and natural capital	1. Changes within forests and other woodlands 2. Common bird occurrence
II. Emissions, pollution and waste	1. Greenhouse gas emissions per capita 2. Amount of hazardous waste generated per capita 3. Sulphur oxides (SO ₂) per capita
III. Consumption of resources	1. Primary energy use per capita 2. Resource productivity
IV. Poverty and social inequalities	1. People at risk of poverty or social exclusion 2. Gini coefficient of equivalent disposable income 3. Subjective well-being
V. Economy	1. Unemployment rate 2. Gross Domestic Product 3. Competitiveness

Table 11. Cont.

Area	Indicator
VI. Environmental policy and strategies	<ol style="list-style-type: none"> 1. Share of environmental taxes in total tax income 2. Green public procurement 3. Public expenditure on environmental research and development 4. Surface of protected areas
VII. Green economy sectors	<ol style="list-style-type: none"> 1. Ecological/sustainable agriculture 2. Renewable energy production 3. Recycling 4. Green patents per capita

The six sets of green economy indicators have many features in common. However, their specificities, strengths and weaknesses should be pointed out. Comparing them in four dimensions: economic, social, environmental, and political, it can be concluded that the set of OECD indicators has the relatively broadest, fullest, and most equal scope. The UNEP set of indicators, focusing on aspects of greening and social issues omits economic indicators in favour of political indicators. The Global Economy Index is less representative of social aspects but pays attention to cross-cutting relationships. The indicators measuring the progress of the green economy (GEP Index) emphasise social aspects rather than political ones. The indicators developed and applied in Poland are comprehensive and emphasize synthetic forms of assessment.

6. Green Economy and Green Growth as Compared to Sustainable Development

After the Second World War, in the 1950s and 1960s, there was an explosive growth in industrial production, widespread intensification of agricultural production, and intensified urbanisation. These processes took place without paying much attention to the progressive degradation of the natural environment, the growing problem of waste and pollution and the increasing threat of regional and global environmental disasters. The lack of rationality in the environmental sphere created the risk of crisis phenomena in the economic and social spheres. The awareness of the emerging threats was perceived in various circles, which made it the subject of the deliberations of the 23rd Session of the UN General Assembly in 1968, resulting in the publication of a report on the state of the environment and the resulting threats in 1969. The growing international interest in environmental protection issues led to the adoption of the so-called Stockholm Declaration at the UN conference in 1972 under the slogan “We only have one earth”, which, despite its non-binding character, became the interpretation and point of reference in shaping international relations connected to the use of natural environment [38]. It states that human beings have the right to freedom, equality, and adequate living conditions in an environment of a quality that ensures dignity and well-being. However, man bears responsibility for protecting and improving the environment for present and future generations. The developed action programme included 109 recommendations grouped under the following six headings: (1) land use and shaping of human settlements; (2) environmental management of natural resources; (3) identification and control of harmful substances; (4) environmental education and information; (5) environmental protection in poor countries; (6) international basis for environmental action [39].

The Stockholm Declaration raised environmental protection to the status of a fundamental function of every state and indicated the need to establish a specialised UN organisation for environmental protection. This became the aforementioned United Nations Environment Programme, which from 2012 began to develop the concept of a green economy. The concept of sustainable development, on the other hand, has been the responsibility of the UN World Commission on Environment and Development since 1983. This Commission, under the chairmanship of Gro Harlem Brundtland, is credited with formulating a universal definition of sustainable development, in the report *Our Common Future*,

published in 1987 and leading the discussion on its implementation. The Rio Conference in 1992, taking into account the challenges of the 21st century, produced the “Agenda 21 Strategy”, a global action programme for the United Nations and other organisations, as well as governments, local authorities, and various sectors of society. International declarations and programmes were successively transferred into the strategies of the European Communities and individual countries. Sustainable development was recognised as one of the most important future challenges for the European Communities as early as 1990, as reflected in the Maastricht Treaty and the Treaty establishing the European Community in 1992. Since then, the concept of sustainable development has been introduced into various Community acts and into policies, strategies, and programmes concerning environmental protection, agriculture, fisheries, forestry, energy, transport, and waste management. In 1992, Poland developed the so-called First Ecological Policy based on the principles of sustainable development.

Initially, the concept of sustainable development had a declarative and programmatic character, for which implementation and practical solutions were sought. The idea was sustained at subsequent world conferences organised by the UN, including the so-called Millennium Summit in 2000, the Earth Summit in 2002 in Johannesburg, and the Rio + 20 Earth Summit in Rio de Janeiro in 2012. The Millennium Declarations and Goals are aligned with the idea of sustainable development seen from a global perspective. The Johannesburg Summit, referring to previous declarations, highlighted humanitarian issues and human dignity. The Rio + 20 summit summed up the achievements of the previous decade and highlighted new phenomena, such as the global economic crisis and the fight against terrorism. As regards sustainable development, the debate focused on the issue of green economy and the institutionalisation of cooperation at three levels: global, national, and local, and on three planes: economic, social, and natural. The concept of green economy developed in the OECD and World Bank environment seemed to meet the criteria of a more targeted, practical way of implementing the idea of sustainable development. The Rio + 20 Summit recognized that the most important problems to be solved concern issues such as: jobs, energy, cities, food, water, oceans, natural disasters, i.e., issues falling mostly under the concept of green economy. The final document of the Rio + 20 summit, entitled “The future we want”, includes a list of sustainable development goals to be achieved by 2030. It points to the need to integrate action in three basic areas of sustainable development: long-term economic growth and the equitable distribution of benefits among nations and social groups; protection of natural resources and the environment to preserve the environmental heritage for future generations; and social development that provides food, education, energy, health care, water, sanitation, and other services to people around the world. One form of achieving these goals could be green growth, leading to the strengthening of the green economy.

The concept of sustainable and balanced development, defined in 1987 by the UN World Commission on Environment and Development, growing out of the need to counteract degradation of the natural environment, soon covered the social and economic spheres. Over the decades, it has been enriched by contributions from various scientific disciplines, so that it has become the basic paradigm for all development strategies, policies and programmes formulated both by international organisations, national governments, and local government bodies. Its essence is still to ensure sustainable improvement of the quality of life of contemporary and future generations by shaping rational proportions between different types of capita, economic, human, and natural [40–42]. The concept of sustainable development is used by various scientific disciplines, entrepreneurs and economic activists, and politicians. Three parallel processes can be observed. The first consists in expanding the field of sustainability to spheres beyond the environmental, social, and economic, e.g., to the legal or institutional plane. The second means intensifying and strengthening the internal links between the planes [38]. The third one focuses on the search for new forms of realization and practical implementation of the concept into socio-economic practice. In this third trend, more than a dozen concepts and forms can

be listed, which also include various attempts to green the economy, green growth, and green economy [12,43]. In the European Union, the concept of sustainable development was introduced in legislation, which enforced relevant practical actions. The programme adopted for the period 2010–2020 called the “Strategy for smart, sustainable and inclusive growth”, abbreviated as the “Europe 2020” strategy, was of particular importance. The European Union adopted for implementation a plan containing five objectives in the areas of employment, innovation, education, social inclusion and climate change and energy management, which were to be implemented by 2020. In each of these areas, Member States set their own national targets. Particular importance was attached to shaping green economy. Its implementation was conditioned on the efficient use of resources (especially primary resources), transition to a low-carbon economy, greater use of renewable energy sources, increasing energy efficiency, and implementation of new technologies and innovations (especially of ecological nature). Green economy, like the entire concept of sustainable development, relates directly to agriculture, forestry, and rural areas, which are associated with food security, the maintenance of environmental resources, and regeneration of labour resources, preservation of landscapes, and national and regional cultural heritage.

Of key importance for the consolidation of the concept of sustainable and balanced development was the agenda adopted in 2015 at the UN World Conference in New York, “Transforming our world: the 2030 Agenda for Sustainable Development” (Figure 2). By adopting the “Agenda 2030” document, more than 190 countries committed to pursue 17 sustainable development goals in their policies, broken down into 169 specific tasks. The goals adopted in “Agenda 2030” can be grouped into five areas marked by the following concepts, the 5P: people, planet, prosperity, peace, partnership. These goals cover a wide range of challenges related to poverty, hunger, health, education, gender equality, climate change, peace, and social justice. They replaced the previously adopted Millennium Development Goals, which were to be met by 2015 [44].



Figure 2. Sustainable development goals [45].

7. Greening the Economy and the New European Green Deal

The European Union has also actively participated in the processes of developing the concept of green economy initiated by the UN, OECD, and other international organisations. In 2012–2013, the European Environment Agency formulated its own definition of a green economy and a set of 225 indicators to assess progress and monitor the implementation of the concept of green growth and green economy. The issue of greening the economy was also present in the activities of individual Member States. This led to the formulation of the New European Green Deal concept.

The concept of a green deal in Europe has been shaped especially since the Paris Climate Agreement signed in 2018. Underpinning the various measures in this area was the conviction that it was necessary to reduce greenhouse gas emissions by almost a half in

a decade to 2010 levels and to achieve the so-called climate neutrality by 2050 at the latest. To achieve these goals, the economy needs to be decarbonised in just three decades. In addition to reducing greenhouse gas emissions, there is a pressing need to halt the strong trend of disappearance of many species and forms of biological life.

Climate and environmental change required the introduction of a new economic model—low-carbon but economically efficient and respecting social justice. The European Green Deal strategy aims to achieve net zero greenhouse gas emissions in 2050, furthermore it will decouple economic growth from resource consumption and not discriminate against any person or region. It was announced in December 2019 and has been endorsed by Parliament and the Council of Europe. It is gradually being implemented [46]. The European Green Deal is a new strategy for growth that aims to transform the European Union into a just and prosperous society living in a modern, resource-efficient and competitive economy.

As already mentioned, it aims to achieve zero net greenhouse gas emissions by 2050, with economic growth decoupled from the use of natural resources. It also aims to protect, preserve, and enhance natural capital and to protect the health and well-being of citizens from risks and adverse effects of environmental and climate change. The implementation of this strategy should be equitable, inclusive, and sustainable. The European Green Deal includes a complex of ambitious, multi-directional guidelines relating to the policies that shape the ways in which the environment is managed, as well as to the direct entities managing the use of environmental resources. The pathway to the final goal involves further rigorous commitments made to reduce gas emissions from the current 40–55% compared to 1990 levels, increase the production and share of renewable energy consumption to 32%, and reduce energy demand by 32.5% [7,46,47]. To achieve these targets, it has become necessary to introduce new regulations for industry, transport, and agriculture, as well as restrictions on energy consumption in residential buildings. The transition to a “clean” closed-loop economy, counteracting biodiversity loss and reducing pollution levels will require action in all sectors of the economy in the form of: new investments in environmentally friendly technologies, supporting industrial investments, introducing cleaner, cheaper, and healthier forms of transport, decarbonising the energy sector, ensuring greater energy efficiency in buildings and working with international partners to set reasonable environmental standards. The implementation of the strategy requires financial support and technical assistance for those who will be most affected by the transition to a green economy. The mechanism for a just transition will serve this purpose. The idea of the European Green Deal is shown in Figure 3.

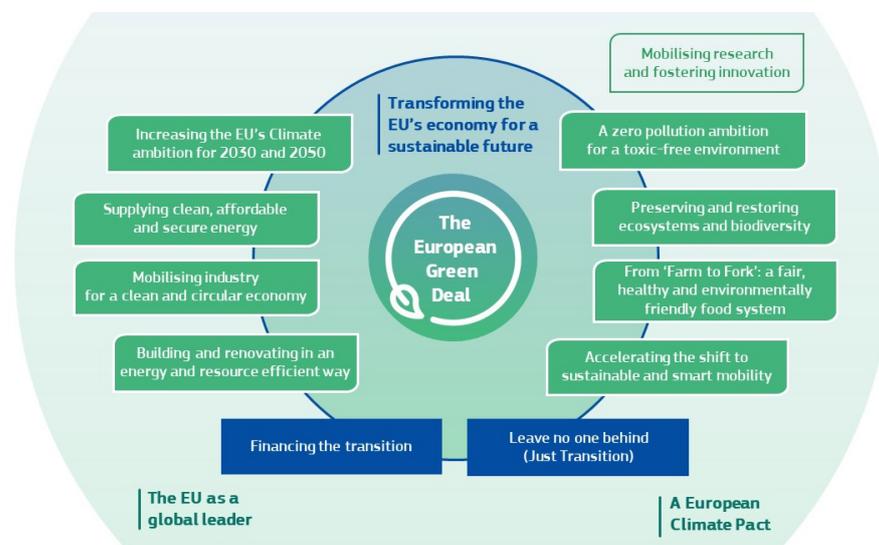


Figure 3. Elements of the European Green Deal [48].

The European Green Deal is the European Union's first such comprehensive strategy to protect the natural environment and combat climate change. With it, Europe aspires to be the first climate-neutral continent. This means that all the Member States have to make appropriate commitments. In order to achieve the ambitious goal of climate neutrality-necessary for the protection of human, animal and plant life-it is essential to transform energy, rebuild production systems and ensure the safe existence of people. It is necessary to develop measures for clean, waste-free technologies and to implement circular economy systems. To achieve this, changes are needed in many areas of Community and national policy. The diversification of European energy sources and the creation of an integrated energy market require both new technical or legal solutions and an assurance of security, solidarity and mutual trust. In an effort to reduce EU dependence on energy imports, energy efficiency must be improved. All measures that strengthen the EU's overall competitiveness should be supported by scientific research and innovation processes. At the heart of the European Green Deal lies the need for consistent adherence to the principles of sustainable development in all areas of economic and social life. The following ten principles have been identified:

1. a pollution-free Europe-covers air, water and various industrial pollution issues;
2. the transition to a circular economy—a roadmap for the introduction of a clean, closed-loop industrial economy began to be developed in 2000;
3. the “From Farm to Table” programme, which involves creating a fair, healthy, and environmentally friendly food system. It is a programme for greening the agricultural economy, which mainly involves reducing the use of pesticides, artificial fertilisers and increasing the area of organic farming;
4. the Green Common Agricultural Policy, a reform ensuring the development of agriculture, environmental protection, reduction of gas emissions and positive externalities of rural farming;
5. building transformation mechanisms, providing support for regional energy transformation programmes, new solutions, housing renovation, etc.;
6. financing the transition, creating funds for green innovation and public investment;
7. supporting Member States' national plans to improve energy systems that produce clean, secure, and affordable energy, as well as climate improvement plans;
8. sustainable transport, to adopt strategies for sustainable and intelligent mobility and improve alternative fuel production and infrastructure;
9. protecting Europe's natural capital, a proposal for an EU biodiversity strategy by 2030;
10. achieve climate neutrality by 2050 by preparing a new climate law linked to the European Climate Pact.

In the areas indicated, work and activities continue on developing concepts and seeking ways to implement them both at the level of various EU bodies and in individual Member States.

One of the elements of the European Green Deal is the European Climate Pact, which should focus society's attention on measures to reduce greenhouse gas emissions and seek potential ways to improve the climate and preserve the viability of the natural environment. The European climate targets for 2030 envisage a reduction of greenhouse gas emissions by at least 50% and potentially up to 55% compared to 1990 levels. This will involve reviewing all significant climate policy objectives, including, inter alia, the emissions trading scheme, the identification of climate-sensitive locations in individual economic sectors and the level of carbon and other gas emissions charges across the economy. The modification of the tax system, especially for energy products and electricity, will be part of these changes. In agriculture, the important issue is the emission of gases related to land use and animal husbandry, sustainable use of materials and means of production, waste reduction and recycling. However, the zero emissions target to be achieved by the new European Green Deal by 2050 will not be easy.

The popularisation of the concept of a green economy and green growth, which for many years has attracted the attention of scientists, social activists, and politicians,

has translated into attempts to introduce into economic policy provisions supporting pro-environmental practical actions in various sectors of the economy, which can be described as “greening”. This was particularly true for polluting sectors—industry, energy, transport, and agriculture. To this end, various measures and instruments were used, both of a normative nature (e.g., introduction of protection zones, bans or orders), and of an economic and financial nature. In implementing the concept of green economy, the emphasis was initially placed on the use of a tax system that applied the “polluter pays” principle. It prevented the generation of pollution and enabled the accumulation of resources for environmental restoration. This system of management was particularly important in areas of high natural value and in productive sectors making intensive use of natural environmental elements. Its value is still significant, but it is not sufficient to solve the problems that grow with the increase of adverse climatic events. The concept of sustainable development and green economy requires searching for new tax solutions, new types of investments, new resource management systems—especially energy sources that ensure both the preservation of environmental values and sustainability and effectiveness of economic processes and social progress. According to the calculations of OECD [21], the continuation of the current model of economic growth based on the use of fossil fuels would lead to an increase in greenhouse gas emissions by 50% in 2050 and doubling of the number of premature deaths to 3.6 million people per year. Projections also indicated a global increase of 55% in water demand and a possible 10% decrease in terrestrial global biodiversity. This indicated the need for a deeper greening of the economy and the search for new instruments to make it a reality. Such opportunities should be sought in a new structure for the generation and use of energy sources, as well as in new green resource-saving technologies and green tax reform. Work to increase renewable energy production has produced visible results. Renewable energy production in the EU increased from 3847.3 to 17,066.6 MWh between 2005 and 2013 alone. Green economy efforts and the state of progress varied from country to country. Calculated for the beginning of the second decade of the 21st century by Bożena Ryszawska, the Green Economy Index (GEI), based on indicators relating to seven areas [8], indicates that Poland was then in a rather distant 20th position among the then 27 EU member states. Only in the area concerning emissions, pollution and waste did Poland rank 7th. The countries most advanced in implementing the green economy concept were Sweden, the Netherlands, Denmark, and Austria (Table 12). The Green Economy Index assesses the countries in a synthetic way, as a summary of all seven assessed areas. Within each of these, a country’s position can deviate quite significantly from the overall GEI. Taking Sweden as an example, the leader in terms of the summary index, it ranks only 26th in the sphere of diversity of ecosystems and biodiversity, and 22nd in the sphere of resource consumption. The Netherlands, ranked 2nd overall, is only 11th in Area VII—green economy sectors. Last placed, Greece and Bulgaria are 8th in resource use and 6th in diversity of ecosystems and biodiversity. Leading positions in individual areas, apart from Sweden (Areas IV and VII), are held by: Ireland—area I, Latvia—II, Malta—III, Germany—V, and Denmark—VI.

Modern economy uses energy produced mainly from non-renewable resources, the main component of which is coal. There is also a shift away from a coal-based economy to an economy using renewable energy sources, including those of biological origin, produced in accordance with the green economy principles. Measures are therefore needed to stimulate the search for and investment in new energy generation technologies that do not emit greenhouse gases. Financing is needed for investments in new infrastructure and new energy sources, which can be raised by issuing green bonds. Changing the structure of energy production and increasing energy efficiency can be achieved through increased taxation of fossil fuel energy and fiscal support for renewable energy production. One form of this could be a carbon tax levied on fossil fuels in an amount proportional to the amount of carbon dioxide emitted when the fuel is burnt. The trading of emissions and the right to use resources, which has become a practice in many European Union member states, is also used to support the greening of the economy. Hopes for a green economy became

particularly evident during the widespread economic and financial crisis of 2007–2011 and the post-crisis search for ways to revive the economy. According to the opinion of the European Economic and Social Committee (EESC), an important tool for such a revival could be environmental fiscal reform, “encouraging a shift of the tax burden from labour to the use of natural resources, facilitating the preservation of existing jobs and the creation of new ones in many sectors of the economy [9].

Table 12. Positions of the UE countries in respect to the overall GEI (Green Economy Index) as well as for the particular areas [8]. The permission was received from the publisher Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu.

EU 27	IZG	I	II	III	IV	V	VI	IV
Austria	4	22	15	13	5	2	6	2
Belgium	7	7	20	15	8	9	8	12
Bulgaria	26	6	16	24	27	19	16	26
Cyprus	24	11	24	21	14	24	15	25
Czech Republic	19	25	18	25	9	15	25	15
Denmark	3	23	13	7	4	8	1	3
Estonia	18	3	26	26	20	11	9	8
Finland	10	5	23	27	2	5	18	5
France	9	9	9	3	13	10	19	17
Germany	5	27	5	9	11	1	3	4
Greece	27	19	19	8	24	27	24	18
Hungary	17	2	4	12	21	22	27	22
Ireland	8	1	14	10	15	16	23	14
Italy	15	24	11	5	19	21	10	10
Latvia	13	4	1	18	26	7	17	7
Lithuania	16	8	3	14	23	13	20	20
Luxemburg	12	20	25	16	6	17	4	16
Malta	14	21	22	1	10	12	12	27
Netherlands	2	10	8	4	3	3	2	11
Poland	20	14	7	20	17	14	21	24
Portugal	25	13	27	11	22	25	22	13
Romania	23	18	2	17	25	18	26	23
Slovakia	21	17	21	23	12	20	11	21
Slovenia	11	15	12	19	7	23	14	6
Spain	22	16	17	6	18	26	13	9
Sweden	1	26	10	22	1	4	5	1
UK	6	12	6	2	16	6	7	18

Legend: I. Ecosystems, biodiversity and natural capital; II. Emission, pollution and waste; III. Consumption and resources; IV. Poverty and social inequalities; V. Economy; VI. Environmental policy and strategies; VII. Green economy sectors. The last positions are marked with dark grey, and the first positions with light grey.

Green economy is usually treated as a tool aimed at achieving sustainable development and as an element combining economic, social, and environmental objectives. However, it does not replace the concept of sustainable development, but represents its narrower scope allowing operationalization on three main levels and demonstrating the effects of

management. Green economy can therefore be seen as a set of principles, objectives and actions that include [11,14,17,21,49]:

- adherence to the principles of sustainable development, i.e., the rational use of resources to achieve economic and social objectives by present generations without compromising the interests of future generations;
- rational use of natural and social capital through the application of various tools, such as internalisation of external costs or ecological accounting;
- holistic programming of resource use, guiding production and consumption processes, calculating the costs of the whole and individual stages of the product life cycle, and improving production and consumption management;
- aligning economic systems with macroeconomic objectives and global trends, through the creation of green jobs, poverty eradication, and enhanced competitiveness and growth in key sectors of the economy.

The practical application of the above principles and actions is revealed in green growth, expanding the reach of green economy and increasing its share in GDP creation. The dynamic growth of green economy slowed down during the crisis years 2012–2014 (Table 13). The greening mechanism referred not only to individual economic sectors and productive activities. Currently, the concepts of sustainable development and greening are increasingly directed also to the sphere of consumption and consumer behaviour.

Table 13. Value and production dynamics of the green economy sectors in the Visegrad Group countries and the EU (in million EUR) in the years 2008–2014 [49].

Year	2008	2009	2010	2011	2012	2013	2014
European Union–28 countries	571.834	553.748	618.261	681.132	691.737	700.305	709.543
Dynamics	-	96.84	111.65	110.17	101.56	101.24	101.32
Poland	47.212	49.831	50.316	52.159	52.431	53.002	53.488
Dynamics	-	105.55	100.97	103.66	100.52	101.09	100.92
Czech Republic	28.574	29.190	32.475	32.733	36.186	35.876	35.066
Dynamics	-	102.16	111.25	100.79	110.55	99.14	97.57
Slovakia	11.824	12.769	13.474	13.849	14.952	15.584	16.437
Dynamics	-	107.99	105.52	102.78	105.37	104.23	105.47
Hungary	17.989	19.422	19.717	19.258	20.613	20.972	21.031
Dynamics	-	107.97	101.52	97.67	107.04	101.74	100.28

Not only the popularisation of appropriate production practices and techniques, but also environmentally friendly household operations and consumer habits have begun to take on greater importance.

8. Conclusions

The problem of the threats posed by increasing pollution and environmental degradation grew in the second half of the 20th century as the population grew, urbanisation and industrialisation progressed, agriculture intensified, and the level of knowledge and awareness increased. First, biologists recognized that the population was, for the first time in its history, standing on the edge of a precipice and should radically change its attitude towards nature and the entire natural environment. The degradation of ecosystems has already affected a third of the population living on our planet, and the threat of degradation affects most of the areas inhabited by humans. The threats have also been recognised by climatologists, who have pointed out that climate change is evident not only in inhabited areas but also in the polar regions, with negative impacts on the entire planet.

The awareness of global threats perceived by scientists gradually began to permeate the sphere of international politics, and entered the sphere of interest of various national, social and business bodies. The degradation of ecosystems, the devastation of forests and other plant communities, greenhouse gas emissions, global warming, rising ocean levels, etc. caused by the burning of fossil fuels, overexploitation of nature, urbanisation, and the concentration of the population and economy in metropolitan areas, as well as various errors in the management of natural resources, have been publicised at global conferences and through the activities of various international institutions, especially the UN and OECD. UNEP reports pointed to the growing threats, the need to take preventive action and the costs associated with saving the earth's biosphere.

The threats perceived in the 1970s and 1980s were rationally embedded in the concept of sustainable development, which became the basic paradigm for development policies and strategies across the world and in individual countries. This issue has also taken an important place in the strategies, policies, and development programmes developed and implemented in the European Union. Green economy and green growth have become one of the forms of implementation of the sustainable development concept. The interest in the issues of nature protection, preservation of biodiversity and regeneration of ecosystems has entered general awareness as a symbolic "greening" of the economy.

In the initial period of shaping the concept of sustainable development, the interest in the environmental plane prevailed, which was reflected in the popularisation of activities related to eco-development or organic farming. After the period of equal treatment of the environmental, economic, and social planes at the time of recovery from the financial crisis in the first decade of the 21st century and the search for new anti-crisis strategies, there was a return to a special treatment of the issue of greening the economy in the form of the concept of the green deal, not only as an anti-crisis remedy, but also as a way of preserving the values of the natural environment and biodiversity and, perhaps most of all, as a way of counteracting excessive emission of greenhouse gases considered to be the main cause of climate change. The need to adapt to climate change has become particularly important in agriculture and rural area.

Nowadays, the process of greening, which expresses concern for the environment, does not only concern sectors which make intensive use of land, water, and other natural components, but also the entire economy and human communities. The concept of greening has therefore been a constant preoccupation of international organisations and global institutions, with the European Union also following in its footsteps. Following the adoption of the "Agenda 2030" strategy by the United Nations, the European Union in December 2019 announced a Communication on the "European Green Deal" Strategy [48].

The idea of a new European Green Deal is only one of many detailed concepts of sustainable development addressed by various international organisations, most notably the UN. The UN resolution "Transforming our world: 2030 Agenda for Sustainable Development", adopted in 2015, detailed 17 Sustainable Development Goals, which can be considered as an integrated way of implementing socio-economic development processes in all countries of the world. The European Green Deal is a new strategy, to be implemented in the member states of the European Union, for economic growth, the protection of ecosystems and biodiversity, and the strengthening of equitable prosperous societies, with the sparing use of natural resources, the increasing use of renewable energy sources, and the minimisation of greenhouse gas emissions contributing to climate change.

The awareness of environmental and climate risks, knowledge gathering, and the dissemination of information on green economy, green growth, and the need for green development is only a preparation for practical action. This stage of practical prevention and mitigation of undesirable changes has certainly begun and has already reached varying levels of progress in individual countries. The paper provides a systematic overview of different initiatives (official, political, institutional), and tries to link them with the theoretical concept of sustainability. The analysis seems to assume more greening and more cooperation by stable nations. These also require continued peace and cooperation

between major world actors. Even if the present international situation will not permit these in the short term, the green movement constitutes a promising idea instead of passive attitudes and chaos. The implementation of green management concepts cannot be merely declarative; it requires specific forms of investment and educational support. There is a need for scientific research to obtain a deeper understanding of the state of implementation and possible forms of green management as one of the important forms of implementing the concept of sustainable socio-economic development.

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