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## **GREEN ECONOMY INDICATORS**

### **1. Introduction**

The present process of defining and researching the green economy began in 2008 with the establishment of the Green Economy Initiative by UNEP (United Nations Environmental Programme). The first measure taken within the Initiative was Professor Barbier's report titled *Global Green New Deal*. The next step was taken after the climate conference in Copenhagen in 2009, when UNEP put forward the concept of a green economy as a method to address the most important environmental, social and economic challenges and as an opportunity for the favourable development of all the states. UNEP started preparations for the international conference on sustainable development, which was supposed to take place in 2012, again in Rio de Janeiro (the so called RIO+20). One of the flagship reports produced in partnership with research centres and business entities as part of the preparations was the Green Economy Report (2011). Simultaneously, other reports and studies were being prepared by international organisations, associations and partnerships, based either on the green economy concept or the green growth idea, which is an object of interest in OECD studies.

The following question appeared in the public debate: how is the actual green economy implementation process underway to be measured? The answers were given firstly by the international organizations OECD, UNEP, World Bank, Global Green Growth Institute, as well as the consulting company Dual Citizen. Also the author of this chapter proposed the Green Economy Index.

Presentation of the various approaches toward measuring the implementation of the green economy will be presented in following part of this chapter.

## 2. Overview of approaches to measure the green economy and green growth

There is no single internationally-accepted definition of the green economy. It is still in the process of creation and specification, and therefore there are numerous perceptions of it. It has been noted however that “while interpretations of the ‘green economy’ vary to some degree, there is much common ground between the concepts employed by governments, businesses and international organisations globally. Basically, a green economy implies a departure from the ‘business as usual’ economic paradigm, to one with regulatory measures and strong financial incentives for innovation, investments (for example, in green technologies), sustainable consumption behaviour, and information-sharing.”<sup>1</sup>

International organisations participating in the public debate over green growth and the green economy created their own definitions. The within presentation thus begins (Table 1) with an overview of the main characteristic and definitions of the green economy presented by:

- Global Green New Deal,
- OECD,
- United Nations Environmental Program,
- World Bank,
- Global Green Growth Institute,
- European Environmental Agency.

Table 1. Selected definitions of the green economy and green growth

The introducing entity	Characteristics and definitions
Global Green New Deal 2009	The economic crisis provides the opportunity to introduce a global green new deal, which consists in stimulating the economy towards the development of green sectors, green infrastructure and green jobs. A greening infrastructure is a process of transforming a business activity such that it reduces emissions of greenhouse gases and consumption of resources, produces less waste, and reduces social inequalities at the same time, ensuring the return on natural, human and economic capital.
OECD 2010	“Green growth” means striving for economic growth and development, simultaneously preventing environmental degradation, biodiversity loss and the unsustainable use of natural resources. “Green growth” means separating the effects of a business activity from the effects of an environmental activity, as well as striving for investment in the environment to be the driving force of economic growth.

<sup>1</sup> *Green Economy Report*, 2010, p. 16.

World Bank 2012	Green growth is an effective growth in terms of using clean resources, i.e. reducing pollution and environmental degradation, resistant to natural hazards and using environmental management to prevent other disasters.
Global Green Growth Institute 2012	Green growth is the new revolutionary development paradigm that sustains economic growth while at the same time ensuring climate and environmental sustainability. It is aimed at reducing poverty, creating jobs, social integration and the sustainability of ecosystems, alleviating climate changes, supporting biodiversity, and providing access to clean energy and water.
UNEP 2011	A green economy is one that has a positive influence on people's well-being and social equity, while reducing environmental risk and the consumption of natural resources.
European Environmental Agency 2012	Green economy is an economy where environmental, economic and social policies and innovations support societies in the effective use of resources, while at the same time improving human well-being, accentuating social integration and protecting the natural systems which sustain life on the Earth.

Source: B. Ryszawska, *Zielona gospodarka – teoretyczne podstawy koncepcji i pomiar jej wdrażania w Unii Europejskiej* [Green economy – the theoretical basis of the concept and measurement of its implementation in the European Union], Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, Wrocław 2013.

The analysis of the numerous definitions allows us to distinguish the most important keywords used in them (Table 2).

Table 2. Keywords used in various definitions of a green economy

Definitions	Keywords		
	1	2	3
[UNEP 2009]	Greenhouse gases Resources	Waste Social inequalities	
[OECD 2011b]	Growth Biodiversity	Economic development Environmental degradation Natural resources	
[The World Bank 2012]	Effective growth Environment Disasters Pollution	Natural hazards Environmental management Pure growth	

Tab. 2 (cont.)

1	2	3
Global Green Growth Institute [www.globalgreengrowthforum.com]	Economic growth Ecosystems Water Climate sustainability Energy Jobs	Environmental sustainability Social integration Poverty Development Biodiversity Climate changes
[UNEP 2011]	People's well-being Environmental risk	Social equity Natural resources
European Environmental Agency [EEA 2012]	People's well-being Social integration Policy Economics Protection of natural systems	Resources Environment Earth Society Life

Source: own work.

Hence the selection of indicators should be done in such a way as to provide the best possible depiction of all the various aspects of a green economy, as postulated in the various definitions. The choice of indicators is one of the most important and, at the same time, the most difficult tasks faced, since their quality has a direct impact on the reliability of the final classification and the accuracy of assessments based on the results obtained in the process. The problem of proper selection of indicators is one of the most important factors deciding on the quality and reliability of assessments of the green economy.

The choice of indicators in the measuring a green economy is also key to the evaluation of its practical implementation. Typically, the list of available indicators is relatively long. The research dilemma lies in the choice of the most suitable subset, as the set of potential indicators is practically infinite.

Measurement should encompass both the appraisal of the present state of the environment and the external pressures resulting from human activities and governmental policies designed to stimulate a green economy. Each individual objective can be represented by several or, in some cases, several dozens of indicators.

The green economy indicators are a specific group. Much like the set of indicators of sustainable development, they should not only provide a good representation of several distinctive areas of human life (economic, social, environmental), but also show the correlations between those areas, while at the same time providing a proportionate and representative illustration of the fundamental aspects of the 'greenification' process.

### 3. Analytical evaluation of the existing sets of green economy indicators

The formal sets of indicators recommended for the measurement of green economies are based on the expertise and knowledge of international organizations and made in response to the need for precise evaluation of green economy objectives.

#### 3.1. Global Green Economy Index

The *Global Green Economy Index* (GGEI) represents a synthetic approach to global measurement of the green economy at present. In this context, it may be useful to compare the results of both indices – this will be presented in the final section of this paper.

The GGEI was established in 2010 by Dual Citizens Inc. as a comprehensive analytical instrument, aimed at providing a reference point for the observation, analytical evaluation, improvement of operation, and market image of all actors concerned with the green economy.<sup>2</sup> Based on studies conducted in 2011 and 2012, it tracks the results obtained in 27 countries representing more than 90% of the green economy potential globally (Argentina, Australia, Brazil, Canada, China, Denmark, Finland, France, Germany, Iceland, India, Israel, Indonesia, Italy, Japan, Mexico, the Netherlands, New Zealand, Norway, South Africa, South Korea, Spain, Sweden, Turkey, the United Arab Emirates, Great Britain, and the United States).

The evaluation covered four main areas:

- leadership in implementing a green economy (activities of public institutions, management, informing the stakeholders, development of institutions, international cooperation);
- internal policies (renewable energy, emission reductions);
- investment in green technologies;
- green tourism.

The individual areas were weighted separately (Table 3), but the weighting criteria were not published. The most pronounced share in the index – 35% each – was attributed to: internal policies for renewable energy and emission reductions, and clean tech investment. The remaining two areas – leadership and green tourism – are weighted 15% each. The weight distribution allows for tracking the importance of individual forms of activities by the authors: international forum activities (55%), greenhouse gas emissions (40%) and renewable energy

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<sup>2</sup> *The 2011 Global Green Economy Index. An Analytic Tool Measuring National Green Reputation & Performance. Fall 2011, Dual Citizen Inc., 2011.*

investment (30%). The index defines the priorities of the present global debate on the green economy by accentuating the impact of participation in the international initiatives, official positions and pronouncements of national governments with respect to green economy, and policies in support of renewable energy, cleantech investment incentives, and providing the legal foundation for the proper regulation of private enterprises.

Table 3. Categories and indicators used in the calculation of the *Global Green Economy Index* (GGEI)

Category	Indicator	Weighting (%)	Description/source
Leadership 15%	Head of State	15	Head of State's advocacy for green issues ( <i>Google trends</i> )
	Media Coverage	10	Positive media coverage of national green economy ( <i>Google trends</i> )
	International forums	55	National positions & statements in international forums (based on reports from <i>Earth Negotiation Bulletin</i> , <i>Climate Action Network</i> )
	International Aid	20	Commitment to sustainability in aid programs ( <i>Commitment to Development Index</i> )
Policy 35%	Commitment to Renewable Energy	20	Current/2020 renewables share of final energy (Eurostat; national reporting)
	Clean Energy Policies	25	Adoption of best practices (scored by <i>Dual Citizen Inc.</i> on scale of 0–10)
	Emissions	40	National emission trending ( <i>2012 Environmental Performance Index – Yale</i> )
	Renewable Energy Goals	15	Progress towards renewable goals (Eurostat, national reporting)
Cleantech investment 35%	Investment Volume	30	Recent investment volume in clean energy ( <i>Who's Winning the Clean Energy Race? – Pew</i> )
	Cleantech Commercialization	30	Business climate for clean tech commercialization ( <i>Cleantech group reporting</i> Ernst & Young)
	Cleantech Innovation	30	Business climate for clean tech innovation ( <i>Global Cleantech Innovation Index 2012; The Clean Energy Patent Growth Index 2011</i> )
	Investment Facilitation	10	Strength of green investment & export promotion (scored by <i>Dual Citizen Inc.</i> on scale of 0–10)

Sustainable Tourism 15%	Travel & Tourism Competitiveness	45	Country's competitiveness in sustainable tourism ( <i>Travel &amp; Tourism Competitiveness Report</i> WEF)
	Accreditation Schemes	45	Presence & strength of national schemes ( <i>Destinet, Dual Citizen Inc. Research</i> )
	Ministry Evaluation	10	Strength of green tourism promotion (scored by <i>Dual Citizen Inc.</i> on scale of 0–10)

Source: *The 2012 Global Green Economy Index*, Dual Citizen Inc., 2012, p. 3.

In its 2014 edition of GGEI, Dual Citizen LLC commissioned a strategic review of the index, with the aim of revising its methodology and framework to more accurately reflect the different aspects of a green economy. This process yielded two important changes:

- 1) expansion of the sectors covered, going beyond tourism to include other efficiency sectors like buildings, transport and energy;
- 2) integration of environmental performance to the GGEI such that both the economic and environmental pillars of a green economy could be explored;
- 3) linkage between leadership and climate change showing whether national political rhetoric and policy was actually having a positive impact on the country's climate change performance;
- 4) the number of countries was enlarged to 60.<sup>3</sup>

Dual Citizen noted that the concept of a green economy is still a nascent one, gradually becoming more defined as the theoretical and practical parts of it are tested and developed. Therefore publishing the GGEI requires a series of decisions, often balancing the depth and breadth of issues.

### 3.2. Measuring Progress towards a Green Economy by United Nations Environmental Program

The second initiative, as expressed in the UNEP study *Measuring Progress towards a Green Economy*, postulates that the measurement of advances in economic transformation requires the use of both social and environmental indicators, since they best illustrate the impact of the economy upon the environment. These can be supplemented by other indicators of considerable informative value, such as the measures of sustainable production and consumption, investment in green

<sup>3</sup> <http://www.dualcitizeninc.com/global-green-economy-index/economic-environmental-indicators.php?id=6>

sectors of the economy, renewable energy sources, and green public tendering. Until now, the process employs a set of existing indicators of sustainable development. The most important ones are the environmental indicators used to measure the actual impact of the economy (such as the use of resources and the emission of pollutants).

Another important category in this approach is that of social indicators, used to measure human well-being and social justice. The most commonly employed indicators are those postulated in the *Millennium Development Goals*, the sustainable development indicators, and the *Human Development Index*. Of the environmental ones, the most frequently used include: the eco-footprint, greenhouse gas emission indicators, and natural capital indicators (UNEP 2012b, p. 11).

Apart from the typical social and environmental indicators, UNEP postulates the use of gauges to measure the impact of governmental policies and initiatives towards a green economy. The list of recommended indicators is divided into three major areas. The first category includes indicators for the evaluation of the present state of the environment, the risks and positive trends, and tracking the advance of particular environmental goals. The second includes indicators used to track the effects of governmental initiatives and the effectiveness of economic policies. The third area tracks the impact of the green economy on human well-being and social equity.

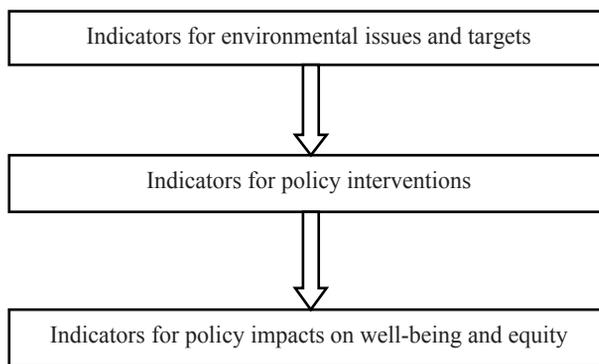


Fig. 1. Categories of green economy indicators in the UNEP approach

Source: UNEP 2012b, p. 12

The group of environmental indicators recommended by UNEP covers four areas: climate changes, management of ecosystems, resource productivity and efficiency, and management of chemicals and waste. The prominence of these four areas is also emphasized in other studies (Table 4).

Table 4. Environmental issues and related indicators

Issues	Indicators
Climate change	<ul style="list-style-type: none"> <li>• Carbon emissions (ton/year)</li> <li>• Renewable energy (share of power supply) (%)</li> <li>• Energy consumption per capita (Btu/person)</li> </ul>
Ecosystem management	<ul style="list-style-type: none"> <li>• Forestland (ha)</li> <li>• Water stress (%)</li> <li>• Land and marine conservation area (ha)</li> </ul>
Resource efficiency	<ul style="list-style-type: none"> <li>• Energy productivity (Btu/USD)</li> <li>• Material productivity (ton/USD)</li> <li>• Water productivity (m<sup>3</sup>/USD)</li> <li>• CO<sub>2</sub> productivity (ton/USD)</li> </ul>
Chemicals and waste management	<ul style="list-style-type: none"> <li>• Waste collection (%)</li> <li>• Waste recycling and reuse (%)</li> <li>• Waste generation (ton/year)</li> </ul>

Source: own research based on UNEP 2012b, p. 15.

The policy interventions category comprises five major areas: green investment, green fiscal reform, pricing of external effects and ecosystem services, green procurement, and training in green qualifications (Table 5). These areas represent the key directions for decision makers to influence and stimulate the development of a green economy. They reflect the new challenges for the green transformation and emphasize the role of states in regulating and coordinating their activities towards this goal.

Table 5. Policy interventions in green economy and related indicators

Policy	Indicators
Green investment	R&D investment (% of GDP) Investment in the environmental goods and services sector (EGSS) (USD/year)
Green fiscal reform	Fossil fuel, water and fishery subsidies (USD or %) Fossil fuel taxation (USD or %) Renewable energy incentives (USD or %)
Pricing of external effects and ecosystem services	Carbon price (USD/ton) Value of biodiversity (USD/ha of forestland) Value of ecosystem services (e.g. water provision)
Green procurement	Expenditure in sustainable procurement (USD/year and %) CO <sub>2</sub> and material productivity of government operations (ton/USD)
Training in green qualifications	Training expenditure (USD/year and % of GDP) Number of people trained (person/year)

Source: own research based on UNEP 2012b, p. 15.

The third category of indicators illustrates the impact of the economy on human well-being, health, and the quality of life (Table 6). It groups indicators tracking such areas as employment, the value of ecosystem production and services, total wealth, access to resources, and health.

Table 6. Indicators of well-being and equity

Well-being and equity	Indicators
Employment	Employment structure (person, %) Income generated Gini coefficient
EGSS performance	Value added (USD/year) Employment (jobs) CO <sub>2</sub> and material productivity
Total wealth	Value of natural resource stock Net annual value addition/removal 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 Number of people hospitalized due to air pollution

Source: own research based on UNEP 2012b, p. 15.

The content of the above categories confirms the growing interest in the green economy, suggesting potential directions of development towards the establishment of a consistent set of indicators, since the critical problem at this point lies in the lack of their homogeneity. Each authoring organization employs their own set of indicators, oftentimes based on quite divergent definitions. The choice presented herein reflects the above postulates.

### 3.3. OECD indicators

The OECD report *Towards Green Growth* points out that green growth has not been formulated to replace the sustainable development, but it is his component. The scope of green growth is hence narrower, and is expressed through specific operational policy in support of the attainment of measurable progress on the economic and environmental objectives.<sup>4</sup> According to the authors of the re-

<sup>4</sup> OECD, *Towards Green Growth 2011*, p. 11.

port, the policy of green growth must be placed within the framework of a coherent, integrated strategy involving supply and demand, both in the economy as a whole and its individual sectors. The implementation of the green growth benefits from the fact that it is based on existing initiatives in a number of countries to promote sustainable development, and that it aims to identify “clean” sources of economic growth. The OECD proposed list of indicators to measure green growth is listed below in Table 7.

Table 7. Structure of OECD themes and indicators of green growth

Group/theme	Proposed indicators
1	2
The socio-economic context and characteristics of growth	Economic growth, productivity and competitiveness Labour markets, education and income
Environmental and resource productivity	Carbon & energy productivity: CO <sub>2</sub> productivity ( GDP per unit of energy-related CO <sub>2</sub> emitted, Real income per unit of energy-related CO <sub>2</sub> emitted) Energy productivity: Energy intensity by sector (manufacturing, transport, households, services); share of renewable energy in TPES and in electricity production
	Resource productivity Material productivity (non-energy) Waste generation intensities and recovery ratios Nutrient flows and balances
	Water productivity
	Technology and innovation (Renewable energy (in % of energy-related R&D), Environment-related technologies (in % of total R&D, by type) All-purpose business R&D (in % of total R&D)
	Patents of importance to GG in % of country applications under the Patent Cooperation Treaty Environment-related and all-purpose patents, Structure of environment-related patents
	Natural asset base
Renewable stocks (fresh water resources, area of forests, fish stock)	
Non-renewable stocks (stock of fossil fuels, selected minerals)	
Biodiversity and ecosystems (land covered, land use)	
Environmental quality of life	Environmental health and risks (Population exposure to air pollution)
	Environmental services and amenities (Population with sustainable access to safe drinking water)

Tab. 7 (cont.)

1	2
Economic opportunities and policy responses	Environmental goods and services (Gross value added in the EGS sector, Employment in the EGS sector)
	International financial flows (Carbon market financing)
	Prices and transfers (share of taxes in end-use prices)
	Regulations and management approaches
	Training and skill development

Source: *Moving towards a Common Approach on Green Growth Indicators*, Green Growth Knowledge Platform, 2013, <http://www.greengrowthknowledge.org>, p. 42.

### 3.4. Indicators of the European Environmental Agency

In 2012, the European Environmental Agency – one of the biggest research institutions, globally involved in setting the standards of diagnostics and measurement of environmental problems – published a revived annual report of indicators recommended for the task of assessment of a green economy. According to the Agency’s report, the overarching concept of a green economy recognises that ecosystems, the economy and human well-being, and the related types of capital they represent, are intrinsically linked. At the core of these lie the continued challenges of improving resource efficiency whilst ensuring ecosystem resilience in the natural systems that sustain us.<sup>5</sup> Support for ecosystem resilience involves reduction of environmental pressure, predominantly from the production and consumption processes in modern societies.

In the opinion of the authors of the *Environmental Indicator Report 2012*, the main principles, objectives and activities in a green economy include:

- “equity and fairness, both within and between generations;
- consistency with the principles of sustainable development;
- a precautionary approach to social and environmental impacts;
- an appreciation of both natural and social capital alongside other forms of capital;
- sustainable and efficient resource use, consumption and production;
- the need to fit in with the existing macroeconomic goals, through the creation of green jobs, poverty eradication, increased competitiveness and development in key sectors”.<sup>6</sup>

With respect to the task of measuring the environmental issues, the European Environmental Agency employs their own design in the form of a DPSIR model,

<sup>5</sup> EEA (2012), p. 6–7.

<sup>6</sup> *Ibidem*, p. 19.

based on a set of indicators grouped into the following five categories: D – *Driving force indicators* – describe the social and economic development and the corresponding changes in lifestyles and the overall levels of consumption and production. Primary driving forces are demographic changes and economic activities (energy use, transportation); P – *Pressure indicators* – describe developments in the release of greenhouse gases and other substances into the air and water, the use of resources, and use of land. They indicate changes in the environment, as well as the deterioration of natural resources; S – *State indicators* – provide a comprehensive overview of the environment, with quantitative and qualitative description of physical, biological and chemical phenomena (e.g. temperature, habitat diversity, waste concentration); I – *Impact indicators* – describe the relevance of changes in the state of the environment, and the corresponding implications for ecosystems, the economy, and human well-being and health (smog, soil acidity, heavy metals in food products); R – *Response indicators* – refer to responses by society and policymakers that attempt to prevent, compensate, ameliorate, or adapt to changes in the state of the environment (fuel catalysis in vehicles, taxation, environmental surcharges).<sup>7</sup>

### 3.5. The joint project of four international organizations

A notable initiative for the standardization and integrated measurement of green economy and green growth was the joint project of four international organizations: **Global Green Growth Institute (GGGI), Organization for Economic Cooperation and Development (OECD), the United Nations Environment Programme (UNEP) and the World Bank**. The authors of this initiative share the view that both concepts – a green economy as postulated by the UNEP and green growth piloted by the OECD – are closely related, since they both involve some of the same aspects of economic management based on the strongly accented pillars of environmental and social issues. Policymakers and economic decision-makers need instruments for precise monitoring of this process. However, there has been no agreement between these institutions as to the choice of indicators that can be used to measure the advance of the green economy. The list of potential indicators is very long, but not quite fit for addressing the problems of management on the operational level, at least at the present.

An interesting discussion on the determinants and specificity of the measurement of a green economy measurement can be found in *Moving towards a Common Approach on Green Growth Indicators*. The authors suggest that the measurement cannot be reduced to the correlations between the economy and the environment,

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<sup>7</sup> *Ibidem*, p. 131.

but should also attempt to measure the ‘green qualities’ of individual economic endeavours. This raises a range of problems. For example, environmental services are an important element of economic activities, and they are utilized in many economic activities along with natural resources, but they are rarely included in national accounting systems.<sup>8</sup> The above-mentioned document places a strong emphasis on the fact that the design of instruments for measuring and monitoring a green economy is still in its infant phase. Consequently, the indicators used for the process should be flexible, dynamic, and address the sustainability of all aspects of the phenomenon under study, with the potential for evolution in response to updated results of scientific research.

The integrated sets of indicators should focus on several important aspects, such as: natural capital, state policies in support of a green economy, and socio-economic problems.

With respect to natural capital, the indicators should reflect: the evaluation of the present state of the environment, the risk of resource depletion, resource use, resource and energy productivity, biodiversity, access to ecosystem services, and the environmental aspects of human well-being. Examples in this category include such indicators as: forestation, mineral resources, protected areas, energy consumption, energy productivity, the share of renewable energy, recycling of waste, green patents, R&D expenditures, and environmental innovations.<sup>9</sup>

With respect to state policies in support of a green economy, the indicators should reflect the level of employment and the instruments of policymaking. Examples include: expenditure for training in green qualifications, environmental taxes, eco-subsidies, and the taxation of fuels.

The category of socio-economic problems groups together indicators related to such issues as: poverty reduction, social justice, elimination of social exclusion. Examples include: GDP growth, Gini coefficient of disposable income distribution, labour productivity, access to water, access to health services.

### **3.6. Green Economy Index (GEI) created by Bożena Ryszawska**

The construction of GEI began with an overview of the definitions of a green economy presented in selected strategic documents. The approach proposed by the author consists in an iterative outline and specification of green economy areas and objectives, starting with numerous definitions and common keywords. Specific objectives and variables for measuring the execution of these individual objectives are distinguished by area. Successive steps enable the specification of the scope of a green economy and examination of the actual transformation pro-

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<sup>8</sup> GGKP (2013).

<sup>9</sup> *Ibidem*, p. 13–14.

cess underway as is, i.e. without deformations or added elements. The process of getting closer and closer to comprehending a green economy does not mean free and chaotic discussions. Each step is based on source documents, analysing the content of definitions and grouping keywords together in order to ensure compliance with the actual process underway. The following areas were distinguished: society, economy and environment (including: environmental condition, natural capital and environmental pollution).

The selection procedure of variables for measuring a green economy is the key element in the construction of the synthetic indicator. The selection of indicators used for constructing a synthetic indicator will always trigger a debate. The measurement of a green economy covers assessment of the environmental condition, the pressure exerted on the environment by human activity, and the policies pursued by governments which support actions in favour of a green economy.<sup>10</sup>

Table 8. Areas and indicators for the synthetic Green Economy Index

Area Indicators for particular areas	Indicator
1	2
<b>I. Ecosystems / biodiversity / natural capital</b>	
Changes within forests and other woodlands	1
Common birds occurrence	2
<b>II. Emissions, pollution, waste</b>	
Greenhouse gases emissions per capita	3
Amount of hazardous waste generated <i>per capita</i>	4
Sulphur oxides (SO <sub>x</sub> ) per capita	5
<b>III. Consumption of resources</b>	
Primary energy use per capita	6
Resource productivity	7
<b>IV. Poverty and social inequalities</b>	
People at risk of poverty or social exclusion	8
Gini coefficient of equivalent disposable income	9
Subjective well-being	10
<b>V. Economy</b>	
Unemployment rate	11

<sup>10</sup> The experience of the following international institutions was used in creating the set of indicators for measuring a green economy: the European Environmental Agency, the Global Green Growth Institute (GGGI), the Organisation for Economic Cooperation and Development (OECD), the United Nations Environmental Programme (UNEP) and the World Bank.

Tab. 8 (cont.)

1	2
Gross Domestic Product	12
Competitiveness	13
<b>VI. Environmental policy and strategies</b>	
Share of environmental taxes in total tax income	14
Green public procurement	15
Public expenditure on environmental research and development	16
Surface of protected areas	17
<b>VII. Green economy sectors</b>	
Ecological/sustainable agriculture	18
Renewable energy production	19
Recycling	20
Green patents <i>per capita</i>	21

Source: own research.

The Green Economy Index was first calculated in 2013; it illustrates the positions of individual states in the process of their transition to green economy on the basis of the latest data for 27 European Union member states.

### 3.7. Related green economy indices

Other green economy related indexes are provided by the NASDAQ OMX Group.

The NASDAQ OMX Green Economy (NASDAQ Green) is a family of indexes tracking the growing environmental and clean-energy sector, also known as the Green Economy. The NASDAQ OMX Green Economy Index began its calculations on September 22, 2010.

The Green Economy is the shift of economic development towards sustainable practices in business, which appeared strongly after the global crisis. The Green Economy is attracting investors and the Green Economy Index is a response, an answer for it to provide a global benchmark for institutional and retail investors. The main areas of investment are energy efficiency, renewable energy generation, pollution mitigation, sustainable transportation, green buildings, and waste and water management (Ryszawska, 2013). The Green Economy family of indexes includes regional, sector and sub-sector indexes.

Therefore the NASDAQ OMX Green Economy is an example of an index that is totally dedicated to those companies offering sustainable production and

services, while the other indices presented in this paper evaluate all types of business activities in the field of applying sustainable practices and policies. The NASDAQ OMX Global Index Group is engaged in the design, development, calculation, licensing, and marketing of NASDAQ OMX Indexes. Support for it is provided by SustainableBusiness.com, LLC. In 2014 there were 375 companies chosen, with a market cap of \$50 million or higher, from a universe of over 460 companies.

#### 4. Results of analysis and conclusions

Changing the way that society manages the interaction of the environmental and economic domains requires actions across all sectors. The green economy concept can play a valuable role in this context by providing a coherent vision to guide policy and planning. Currently the abstract conception of the green economy provides little guidance to decision-makers. Policymaking and planning require a clear understanding of where we stand today and how we are progressing. That means translating the strategic vision into concrete and measurable goals, targets and indicators.<sup>11</sup>

There is a growing awareness concerning the need for international unification of the indicators used to measure a green economy. Existing indicators represented slightly different approaches and methodologies, based on their own definitions of the subject to be measured. On the other hand it is promising that the presented and analyzed indicators and indices of a green economy have common areas, which are presented in Table 9 below.

Table 9. The structure of the areas proposed for measuring the green economy

Year	Institution/ Author	Environment	State policy		Social aspects and well-being	Economy	Green Economy sectors
1	2	3	4		5	6	7
2010	The Global Green Economy Index (GGEI) Dual Citizen		State policy	Leadership		Clean technology investment	Sustainable tourism
2010	Global Green Growth Institute	Natural Resources Ecosystems Climate and air quality			Well being	Economy	

<sup>11</sup> *Towards an green economy, EU environmental policy targets and objectives 2010–2050*, EEA Report No. 8/2013, Copenhagen 2013, p. 5.

Tab. 9 (cont.)

1	2	3	4	5	6	7
2011	OECD	Low carbon and resource efficient economy Protection of natural capital	The implementation of appropriate policies and the use of economic opportunities posed by green growth	Quality of life related with environment	Socio-economic problems	
2012	Europea Environmental Agency	Ecosystem (natural capital) <i>goal: ensure ecosystem resilience</i>		Human well-being (social and human capital) <i>goal: enhance social equity and fair burden-sharing</i>	Economy (produced capital) <i>goal: improve resource efficiency</i>	
2012	United Nation Environmental Program	Environment	Policy and action of states	Life's quality and social equity		
2012	World Bank	Environment		Society	Economy	
2013	Common Initiative of Global Green Growth Institute (GGGI), OECD, United Nation Environmental Program (UNEP) and World Bank	Natural capital Environment and resource productivity	State policy supporting green economy.	Quality of life related with environment	Socio-economic problems	
2013	Green Economy Index of Bożena Ryszawska	Ecosystems/biodiversity/natural capital Resource consumption Emissions, pollution, waste	Environmental strategies and policies	Poverty and social inequalities	Economy	Green economy sectors
2014	Global Green Economy Index Dual Citizen (new version)	Environment and natural capital	Leadership and climate change		Market and investment	Efficiency sectors

Source: own work based on: EEA, *Towards a green economy in Europe*, European Environmental Agency, source: own work based on: *Moving towards a Common Approach on Green Growth Indicators*, Green Growth, EEA; *Towards a green economy in Europe*, European Environmental Agency, Copenhagen 2013; The World Bank, *Inclusive Green Growth: The Pathway to Sustainable Development*, Washington, DC, 2012 Knowledge Platform, 2013.

Common areas include:

- the environment,
- state policy,
- social aspects and well-being,
- the economy.

Two synthetic indices additionally include an area called “green economy sectors”.

In comparing the green economy indicators with sustainable development indicators the new issues emphasised include: the role of government policies and actions, and green economy sectors. Those areas represent the key directions for decision makers to influence and stimulate the development of a green economy. They reflect the new challenges for the green transformation and emphasize the role of states in regulating and coordinating the activities towards this goal.

The topic of green economy indicators is going to grow in importance in upcoming years. This will be connected with locating a green economy at the centre of regional and national development strategies.

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## ABSTRACT

The chapter is an attempt to answer the question: how is the actual green economy implementation process underway to be measured? The answers were given firstly by the international organizations OECD, UNEP, World Bank, Global Green Growth Institute, as well as the consulting company Dual Citizen. Also the author of this chapter proposed the Green Economy Index. There is a growing awareness concerning the need for international unification of the indicators used to measure a green economy. Existing indicators represented slightly different approaches and methodologies, based on their own definitions of the subject to be measured. The topic of green economy indicators is going to grow in importance in upcoming years. This will be connected with locating a green economy at the centre of regional and national development strategies.

**Key words:** green economy indicators, measurement of green economy.

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## Appendix

The Green Economy Index (GEI) was calculated by B. Ryszawska for individual states and subsequently standardised within the range (0, 1) to present differences between the states. The states are arranged from the ones with the highest index values to the states with the lowest value.

Table A. Green Economy Index values for EU member states in 2013

EU 27	Ranking list	Standardised GEI	GEI
Sweden	1	1.00	0.66
The Netherlands	2	1.00	0.66
Denmark	3	0.96	0.65
Austria	4	0.96	0.65
Germany	5	0.88	0.62
Great Britain	6	0.81	0.60
Belgium	7	0.69	0.56
Ireland	8	0.68	0.56
France	9	0.66	0.55
Finland	10	0.66	0.55
Slovenia	11	0.53	0.52
Luxembourg	12	0.52	0.51
Latvia	13	0.52	0.51
Malta	14	0.50	0.51
Italy	15	0.48	0.50
Lithuania	16	0.43	0.48
Hungary	17	0.40	0.48
Estonia	18	0.40	0.47
The Czech Republic	19	0.37	0.47
Poland	20	0.36	0.47
Slovakia	21	0.34	0.46
Spain	22	0.34	0.46
Romania	23	0.21	0.42
Cyprus	24	0.20	0.41
Portugal	25	0.16	0.40
Bulgaria	26	0.03	0.36
Greece	27	0.00	0.36

Source: B. Ryszawska, *Zielona gospodarka – teoretyczne podstawy koncepcji i pomiar jej wdrażania w Unii Europejskiej* [Green economy – the theoretical basis of the concept and measurement of its implementation in the European Union], Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, Wrocław 2013, p. 169.

Table B. Global Green Economy Index 2014

	Country	Index
1	2	3
01	Sweden	68.1
02	Norway	65.9
03	Costa Rica	64.2
04	Germany	63.6
05	Denmark	63.2
06	Switzerland	63.1
07	Austria	63.0
08	Finland	62.9
09	Iceland	62.6
10	Spain	59.2
11	Ireland	59.0
12	New Zealand	58.8
13	France	56.4
14	Colombia	56.1
15	Portugal	55.8
16	Peru	55.8
17	Kenya	55.4
18	Brazil	55.3
19	Chile	55.1
20	United Kingdom	54.6
21	Netherlands	54.2
22	Uruguay	54.1
23	Mauritius	51.5
24	Zambia	51.3
25	Italy	51.2
26	Ethiopia	50.6
27	Rwanda	50.4
28	United States	50.1
29	Canada	49.6
30	Taiwan	47.5

Source: The Global Green Economy Index. Measuring National Performance in the Green Economy, 4<sup>th</sup> Edition – October 2014, Dual Citizen LLC, p.12, [www.dualcitizeninc.com](http://www.dualcitizeninc.com)