
The Key Security Problems Related to the Pro-Environmental Economic Transformation and the Implementation of the Principles of Sustainable Development into the Economy

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Abstract:

Purpose: The aim of this article is to describe the key security problems related to the pro-environmental economic transformation and the implementation of the principles of sustainable development into economic processes. The impact of the SARS-CoV-2 (Covid-19) coronavirus pandemic on changes in the level of environmental pollution and an increase in the level of pro-environmental awareness of citizens was also examined.

Approach/Methodology/Design: The main research methodology was based on the analysis of the results of scientific research and a synthetic description of the key conclusions drawn from the review of the literature describing various aspects of the analyzed issues concerning the key security problems related to the pro-environmental economic transformation and the implementation of the principles of sustainable development into economic processes. The research methods used in the study included critical analysis of the literature, comparative analysis, and analysis of the available data.

Findings: The analysis of scientific data shows that under the anti-crisis, interventionist state aid programs offered during the SARS-CoV-2 (Covid-19) pandemic for economic entities, the formula of reviving economic activity was applied, counteracting the rise in unemployment in a classic approach, i.e. basically without taking into account the incentives business to undertake pro-environmental economic ventures, green investments, significantly increase the scale of implementation of sustainable development goals. Only now is this topic appearing in some economic regions of the world, such as the European Union, which has an anti-crisis program to support economic entities with the use of public funds, which is to lift the economy out of recession, and takes into account selected sustainable development goals within the so-called New Green Deal. An important role in this matter is also played by the annual UN climate summits COP. Despite of all the initiatives, still the division between the richest and the poorest increases and creates tension on both international and

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international levels. The aforementioned results in security problems and increase of dangerous trends i.e., uncontrolled migrations than could be even greater in case climate change will speed up.

Practical Implications: *On a global scale, the SARS-CoV-2 (Covid-19) coronavirus pandemic has caused problems in terms of scaling up the implementation of the Sustainable Development Goals. On the other hand, in many countries, during the pandemic, opportunities appeared to accelerate the processes of pro-environmental transformation of the classic economy towards a green, sustainable circular economy. Unfortunately, however, these opportunities were not used. Anti-crisis, interventionist programs of public financial aid were launched, offered to enterprises and companies in order to activate economic activity and limit the scale of unemployment growth. Unfortunately, this interventionist, anti-crisis financial public aid was not directed mainly at activating pro-ecological economic ventures and green investments. That can result in further increase of climate change related threats and lead to increase in increase of instabilities in cybersecurity, food security, access to water, uncontrolled migration, etc.*

Originality/Value: *The main advantages of this article result from the multifaceted, synthetic and critical analysis of the data available in the source literature. The conducted research shows an urgent need to reduce greenhouse gas emissions and slow down the process of global warming and reduce the scale of the drastic effects of climate change over the next several decades. The SARS-CoV-2 (Covid-19) coronavirus pandemic increased the pro-environmental awareness of citizens, but did not significantly accelerate the processes of pro-ecological transformation of the economy.*

Keywords: Security, climate change related threats, pro-environmental transformation of the economy, green economy, sustainable development goals, renewable energy sources, Covid-19, environmental social responsibility, eco-innovations.

JEL classification: Q01, Q20, Q28, Q32, Q42, Q53, Q57, O10, O44, F02, F52, H56.

Paper Type: Research article.

1. Introduction

In 2020, the SARS-CoV-2 (Covid-19) coronavirus pandemic has become the largest factor affecting all areas of people's lives, the functioning of economic entities and institutions and whole sectors of the economy. In 2020, due to the pandemic, many countries experienced an economic recession. In addition, the Coronavirus pandemic has accelerated the processes of digitization of the economy (Gołębiowska, 2017, Golczak, Golinowski, Kamycki, Lewandowski, Pająk, Płaczek, Prokopowicz, and Wesołowski, 2021).

Since the beginning of the pandemic, there has been an acceleration in the development of the digital economy, in particular the operation of companies in the cyberspace became very popular in many industries and sectors. More and more companies develop their activities via the Internet, remotely providing their services and selling their products under e-commerce. In connection with the development of e-commerce, the pandemic also accelerated the development of e-banking, including

mobile banking. Accordingly, the importance of improving cybersecurity techniques is also growing. Many companies that were rather reluctant before - have switched during the pandemics to remote, electronic operation over the Internet. The development of e-commerce increases the importance of internet marketing, including viral marketing, Real-Time marketing conducted on social media portals, therefore, in recent years, there has been an acceleration in the development of technologies typical of the fourth technological revolution. Technological advances in ICT, Internet and Industry 4.0 are taking off rapidly. The coronavirus pandemic could have accelerated this technological progress, because the pandemic caused an increase in the digitization and internetization of communication processes, research and analysis processes, economic processes, etc.

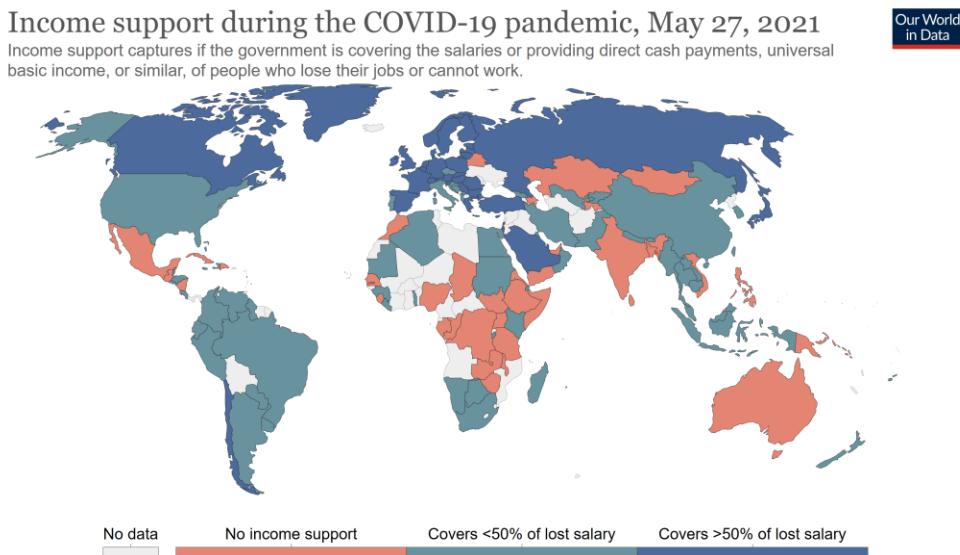
In the situation of various lock-downs introduced by governments, which covered specific service sectors of the economy and the required or recommended use of home quarantine, many companies have introduced a remote work formula to their employees. Previously traditional, stationary education processes carried out in schools and universities were converted into a remote formula, conducted online with the use of Internet messengers and videoconferencing applications.

Many companies have moved their sales channels to the Internet. The turnover of online stores increased. People ordered more and more products and services online as well as were settling matters with offices and public institutions via the Internet (Gołębiowska, 2017; Sikorski, 2013).

The pandemic has accelerated the internetization and digitization of economic processes. However, many micro-enterprises and SME sector companies offering services provided traditionally as part of the appearance of customers in specific public places, e.g., tourism, catering, hotel, etc., cultural institutions, including theaters, cinemas, galleries, etc., were forced to suspend their activities or significantly reduce the scale of their services and therefore faced serious financial problems. Children and students took part in e-learning. In scientific world various events, such as scientific conferences, symposia and meetings, were held remotely with use of internet messaging and videoconferencing applications.

As part of the anti-crisis, interventionist public aid programs (Gołębiowska, 2017; Domańska-Szaruga, Prokopowicz, 2015) offered during the SARS-CoV-2 (Covid-19) coronavirus pandemic for business entities, the formula of economic activity recovery, counteracting the rise in unemployment in a classic approach, i.e., basically without taking into account motivating business to undertake pro-environmental economic ventures, green investments, a significant increase in the scale of implementation of the sustainable development goals. Only now is this topic appearing in some economic regions of the world, such as the European Union, which has an anti-crisis program to support economic entities with the use of public funds, which is to lift the economy out of recession, and takes into account selected sustainable development goals within the so-called New Green Deal (Figure 1).

Figure 1. Grants (income support) to cover lost wages. Income support during the COVID-19 pandemic, May 2021.



Source: Hale, Angrist, Goldszmidt, Kira, Petherick, Phillips, Webster, Cameron-Blake, Hallas, Majumdar, and Tallow (2021). "A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker)." *Nature Human Behaviour*. – Last updated 27 May, 11:14 (London time)

Note: This income support may not apply to workers in all sectors, and may vary at the sub-national level.
OurWorldInData.org/coronavirus • CC BY

Source: Internet portal OurWorldInData.org (<https://ourworldindata.org/covid-income-support-debt-relief>), for: Hale, Angrist, Goldszmidt, Kira, Petherick, Phillips, Webster, Cameron-Blake, Hallas, Majumdar, Tallow (2021). „A global panel database of pandemic Policies (Oxford Covid-19 Government Response Tracker).” *Nature Human Behaviour*.

Globally, the SARS-CoV-2 (Covid-19) coronavirus pandemic has caused problems in scaling up the implementation of the SDGs. On the other hand, in many countries, during the pandemic, opportunities appeared to accelerate the processes of pro-environmental transformation of the classic economy towards a green, sustainable circular economy. Unfortunately, these opportunities were not taken advantage of to the optimal extend. Anti-crisis, interventionist programs of public financial aid were launched, offered to enterprises and companies in order to activate economic activity and limit the scale of unemployment growth. Unfortunately, this interventionist, anti-crisis financial public aid was not directed mainly at activating pro-ecological economic ventures and green investments.

Due to the decline in economic activity and the shortening of international chains of supply and supply logistics, which occurred in 2020 and was caused by the SARS-CoV-2 (Covid-19) coronavirus pandemic, the amount of pollutant emissions to the natural environment has decreased, including both the water, air and land. However, the scale of these positive, pro-environmental processes was too small to trigger positive, permanent trends of a significant, successive decline in the level of

environmental pollution and greenhouse gas emissions in subsequent periods - i.e. 2021. There was no appropriate increase in financial outlays as part of pro-environmental state intervention, as part of ecological policy, an increase in the scale of implementation of the goals of sustainable development and pro-environmental transformation of the economy.

On the other hand, during the pandemic, there was also an increase in the general social pro-environmental awareness of citizens and the possibility of accelerating the processes of pro-ecological transformation of the classic economy to a zero-emission, sustainable, green circular economy has opened up. Thanks to the growing importance of environmental policy and increasing scale of implementation of the sustainable development goals, the probability of a global climate crisis, which may appear at the end of the current 21st century, has a chance to be reduced (Prokopowicz, 2020b; Gołębiewska, 2015). However we shall observe the newest trends because not all the actors on the international arena are willing to take climate change to their consideration while developing their economic power.

Since the reduction in pollution and greenhouse gas emission was impermanent many threats recognized before COVID-19 crisis are still valid and some are even more important than before 2020. Especially, the cybersecurity due to increase of internet importance shall be taken under consideration. Social and economical instabilities incurred due to the lack of health security - pandemic is another one. The changes in the level of the Gross Domestic Product in Poland caused by the pandemic economic crisis in 2020 are presented in Figure 2.

Figure 2. Gross Domestic Product in Poland in the period: January 1996 - June 2021 (last value: 11.10% for Q2 2021).



Source: Internet portal www.bankier.pl (accessed on 5.11.2021).

The growing importance of the pro-environmental transformation of the economy is confirmed by the annual UN climate summits of the Conference of the Parties (COP26) organized by the United Nations Framework Convention on Climate Change (UNFCCC). The last of its kind, the 26th climate summit was held from

October 31 to November 12, 2021 (Glasgow Climate Change Conference – October–November 2021, Website: "United Nations Climate Change", 31 Oct – 12 Nov 2021). The Intergovernmental Panel on Climate Change (IPCC) also took part in the above-mentioned 26th COP26 Climate Summit. On November 4, the IPCC experts presented the results of the latest Report of the Working Group I entitled "*Climate Change 2021: The Physical Science Basis*" (published August 9, 2021) at a special event jointly organized with the UNFCCC Subsidiary Body for Science and Technology Advice (*AR6 Climate Change 2021: The Physical Science Basis* (2021)).

IPCC Sixth Assessment Report, Intergovernmental Panel on Climate Change (IPCC), August 9, 2021). The primary goal of the IPCC is to provide political leaders and governments of individual countries with annual scientific assessments of the ongoing and future climate change, its effects and threats, as well as proposing strategies for carrying out a pro-environmental transformation of the economy. The latest report of the Intergovernmental Panel on Climate Change (IPCC), published on August 9, 2021, shows that the process of global warming is proceeding faster than previously thought.

Therefore, it is imperative to reduce emissions of carbon dioxide (CO₂) and other greenhouse gases as soon as possible. In the situation of a significant and efficiently implemented reduction of greenhouse gas emissions, the scale of the negative effects may be reduced to a large extent in the next several decades. According to the content of the Report of the I IPCC Working Group, "*Climate Change 2021: the Physical Science Basis*", it may take 20-30 years before the positive effects of the currently implemented pro-environmental transformation of the economy, including the development of renewable energy sources (*Climate change widespread, rapid, and intensifying – IPCC 2021*). IPCC Sixth Assessment Report, Intergovernmental Panel on Climate Change (IPCC), August 9, 2021). In addition, the content of this report indicates the need to accelerate the processes of pro-environmental transformation of the economy and shorten the period of achieving zero emission of greenhouse gases in order to slow down the process of global warming and reduce the negative effects of climate change (Greater Ambition Now Critical as UN Climate Change Conference Opens, Website: "United Nations Climate Change", 31 Oct - 12 Nov 2021).

During the Conference there were several discussions upon the security aspects of the environmental economic transformation and the implementation of the principles of sustainable development. In particular the events listed below took places:

1. Roundtable on "Climate change, migration and health: transforming tomorrow – a call to action" co-organized by IOM, WHO, Lancet Migration, and University College London (UCL), 04.11.2021.
2. High-level policy discussion on "Climate change, migration and health: interconnected challenges for the 21st century" co-organized by IOM, WHO and Lancet Migration, UCL and sponsored by the Government of France,

09.11.2021.

3. UN System event: "The Health Argument of Climate Action: The COP26 Health Programme", 09.11.2021, (COP26: Direct Linkages Between Climate Change, Health and Migration Must be Tackled Urgently – IOM, WHO, Lancet Migration, 2021).

4. High-level side event at COP26 "Climate, Peace and Stability: Weathering Risk Through COP and Beyond", co-hosted by Germany, adelphi and the Munich Security Conference, with Luxembourg, Nauru, and the United Arab Emirates, the event aimed to build on multilateral momentum to establish leadership and guiding principles for climate action which can advance peace and stability, 09.11.2021.

During the last of the aforementioned events the Secretary General of NATO said "Climate change is making our world more dangerous. It increases competition over scarce resources, such as water and land, and it forces millions of people to flee. Therefore, it matters for security and for NATO." (Climate, Peace and Stability: Weathering Risk Through COP and Beyond, 2021).

The Director General of The International Organization for Migration stated clearly that "As the impacts of disasters, land degradation and water scarcity become more intense and devastating, it has become critical to address the impacts of climate change on migration, displacement and health. (...) These issues are interconnected but have been addressed in a siloed manner for too long. We must address them together." (COP26: Direct Linkages Between Climate Change, Health and Migration Must be Tackled Urgently – IOM, WHO, Lancet Migration, 2021).

These are only few security problems important from the sustainability point of view.

2. The Scope and Methods of Research

The study was mainly based on a desk research analysis using quantitative data available for the key security problems related to the pro-environmental economic transformation and the implementation of the principles of sustainable development into economic processes and the analysis of available literature and legal regulations. Due to fast development of the situation (COP 26 UN Climate Change Conference) also press releases and media reports were taken under consideration in order to address the strategic aspect that will be further explored in the research and text of legal documents.

The theoretical issues were selected after conducting the analysis of available literature and legal regulations. Last but not least, the Authors have decided upon using in the study research methods as a critical analysis of the literature, legal acts, comparative analysis, case study analyse and secondary data analysis.

3. Determinants of the Pro-Environmental Transformation of the Polish Economy and Energy Security

Providing high level of energy security is a priority in Poland. With that respect, the most important is to cover the growing demand for fuels and energy in connection with the forecasted economic growth, while ensuring uninterrupted energy supplies. Maintaining a high index of energy independence, increase diversification of the energy mix and diversification of directions of supplies of imported fuels are of the key importance. It applies to both crude oil and natural gas, which is also associated with the necessity of infrastructure development in these sectors (Executive Summary Of Poland's National Energy And Climate Plan For The Years 2021-2030 - NECPPL, 2019).

In Poland, there is still a large share of classic energy based on the combustion of fossil fuels. In terms of transport, the level of development of electromobility is very low, in fact, there is almost no electromobility at all, no developed infrastructure for the development of electromobility. The share of renewable energy sources, including wind energy, solar energy, etc., is only about 20% of total electricity production. There is no nuclear energy. The construction of a nuclear power plant is only planned. On the other hand, the share of renewable energy has been growing for several years. First of all, wind turbines are erected and photovoltaic panels and solar water heating systems are installed on the roofs of houses and residential buildings, office buildings and others. In addition, geothermal power plants are planned to be built. The largest energy companies plan to gradually increase the share of renewable energy in the context of total electricity and heat production in the coming years. Energy based on biofuels is also developing, but to a limited extent. Moreover, the development of renewable energy should become an important factor of economic growth in the future (Jackson, 2009).

In order to accelerate the processes of pro-ecological transformation of the energy sector, the state offers citizens non-returnable financial subsidies for the construction of home, small electric and / or thermal energy plants, primarily as part of the development of renewable energy based on photovoltaic panels, solar water heating installations and the construction of wind turbines. In addition, in connection with the increasingly frequent problem of drought, water shortages and forest fires, the state has offered non-returnable financial subsidies since this year for the creation of home or farm or other farms, in gardens, ponds, ponds, etc. in order to collect rainwater. It is planned in large cities next year to expand the necessary infrastructure for charging vehicles with electricity, primarily passenger cars equipped with electric motors. Electromobility has been dominant in rail transport since the 1990s. In addition, for several years, the sorting of garbage into several fractions has been introduced and recycling is developed. For 2 years, flower meadows with houses for insects have been created in larger cities in the areas of lawns and in city parks. In larger cities, for several years, bike rentals and electric scooters and scooters have been installed on the streets.

In addition, legal solutions are used to mobilize citizens to buy a new vehicle equipped with fuel-efficient technologies and emitting less exhaust gases instead of an old vehicle that emits more air pollutants. To sum up, in the last few years, a lot has started to change in terms of the implementation of the principles of sustainable development, social environmental (ecological) responsibility, pro-ecological reforms of implementing eco-innovations in economic processes, etc. However, these pro-ecological reform processes are still too slow, because in order to counteract the unfavorable global warming process, there are only 10-15 years left to complete the necessary pro-ecological transformation of the energy sector.

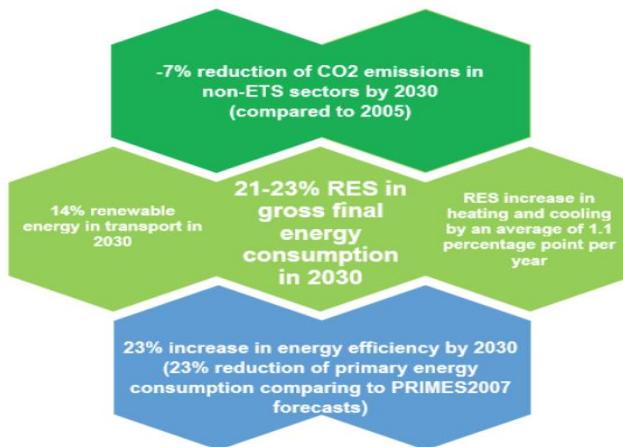
It is important to mention that Poland as an EU member state had to prepare and submit Poland's National Energy and Climate Plan (NECPPL) for the years 2021-2030 (NECP PL) to the European Commission. The aforementioned happened on 30.12.2019 as a fulfillment of the obligation set out in Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11.12. 2018 on the Governance of the Energy Union and Climate Action. The document presents the objectives, targets, policies and measures in five dimensions of the Energy Union:

1. decarbonization,
2. energy efficiency,
3. energy security,
4. internal energy market,
5. research, innovation and competitiveness.

The document mentioned above also refers to research, innovation and competitiveness aspects in the energy security field. It is clear that the development of competitiveness of the economy will be of significant importance for realization of the objectives and policies mapped in the NECPPL. This dimension is particularly interwoven with other pillars of energy union, providing new technologies and solutions supporting energy transformation. The main objective of this dimension is to reduce the civilization gap between Poland and economically highly developed countries, and to improve the quality of life of Polish society.

Poland also plans to increase the competitiveness of the economy through a more complete use of social and territorial resources as well as automation, robotization and digitization of enterprises. By supporting the development of energy innovations, it is planned to increase the competitiveness of the Polish energy sector, and thus maximize the benefits for the Polish economy. Another goal is the acceleration of technology sales by Polish companies on foreign markets, combined with the growing importance and competitiveness of Polish science on the international stage. The foundation for the realization of the objectives in this area are: an increase in expenditure on research and development in Poland (from 0.75% of GDP in 2011 to 2.5% of GDP in 2030) and the establishment of new, better suited to today's conditions, rules for using this inputs (Executive Summary of Poland's National Energy and Climate Plan for 2021-2030 - NECPPL, 2019) (Figure 3).

Figure 3. Poland's climate and energy targets until 2030



Source: Executive Summary Of Poland's National Energy And Climate Plan For The Years 2021-2030 - NECPPPL, 2019, <https://www.gov.pl/attachment/e64830c9-440f-4f17-b3e7-8abd7667d406>.

The EU in its evaluation of the NECPPL highlighting many aspects to be adjusted. Especially the greenhouse gas emissions shall be improved, renewables, energy efficiency need more attention and further regulations. With the respect to internal energy market - Poland shall move away from regulated prices of gas and electricity amount other EU advices.

Bearing in mind energy security issues, Poland is invited to modify its requirements for gas storage, to comply with Regulation 2017/1938 (of the European Parliament and of the Council of 25.10.2017, concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010) to allow more diversification of suppliers and domestic production of bio methane. Regarding the plan for new nuclear capacity, Poland would benefit from implementing a fuel procurement policy, to enable secure, diversified deliveries of nuclear fuels from alternative fuel assembly producers (Commission Staff Working Document, Assessment of the final national energy and climate plan of Poland, 2020).

In particular, with the respect to the Covid- 19 crisis, Commission is expecting Poland and other EU countries to act with accordance to 2021 Annual Sustainable Growth Strategy encouraging them to include in their recovery and resilience plans investment and reforms in a number of 'flagship' areas. Especially 'Power up', 'Renovate' and 'Recharge and refuel' flagships are directly related to energy and climate action and to the contents of the final national energy and climate plans.

Measures under the ‘Reskill and upskill’ flagship are also essential to foster the climate and energy transition in all Member States. In turn, the Recovery and Resilience Facility will provide opportunities to accelerate Poland’s green transition while contributing to economic recovery. In order to follow the commitment of the European Council to achieve a climate mainstreaming target of 30% for both the multiannual framework and Next Generation EU, Poland’s recovery and resilience plan will have to include a minimum of 37% expenditure related to climate. Reforms and investments should effectively address the policy challenges set out in the country-specific recommendations of the European Semester, and will have to respect the principle of ‘do no harm’ (Annual Sustainable Growth Strategy, 2021).

Based on Poland’s final national energy and climate plan, and on the investment and reform priorities identified for Poland in the European Semester, the Commission services invite Poland to consider, while developing its national recovery and resilience plan, the following climate and energy-related investment and reform measures:

1. Measures supporting investments in renewable energy to reduce dependency on coal, and in energy efficiency in buildings and industry;
2. Measures enhancing energy system integration and promoting the decarbonisation of gas consumption, including by developing the market for storage technologies and clean hydrogen;
3. Measures fostering sustainable transport, including developing and modernising the public transport infrastructure, promoting intermodal transport networks and electromobility.

The above mentioned measures are indicative in nature and not meant to be exhaustive. They aim to orient reflections in the development of the national recovery and resilience plan. They do not prejudge the position of the Commission on the actions to be proposed. This position will, *inter alia*, need to comply with the agreed legislative text on the Recovery and Resilience Facility (Commission Staff Working Document, Assessment of the final national energy and climate plan of Poland, 2020).

4. The Essence of the Environmental Social Responsibility of Citizens and Business Entities

In recent years, the issue of integrating the Millennium Goals of Economic Development and Sustainable Development (17 Goals to Transform Our Word, 2020) with the strategy of corporate social responsibility in enterprises, companies and other economic entities has been considered. Companies, corporations and other economic entities should enrich their philosophies, missions, strategies, procedures, and policies containing defined assumptions of corporate social responsibility with pro-environmental issues. In connection with the need to gradually increase the scale of pro-ecological and pro-environmental policies, including the Millennium

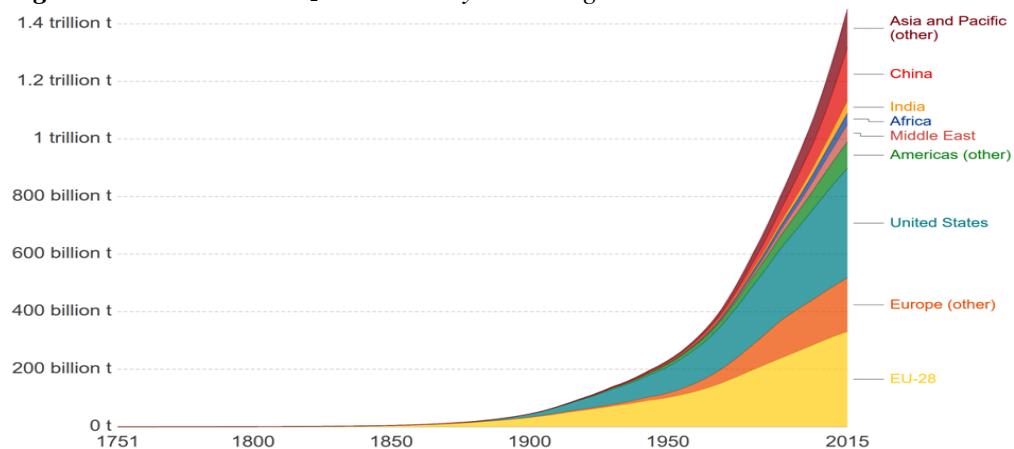
Development Goals and Sustainable Development in business entities, the implemented assumptions of corporate social responsibility should be integrated with pro-environmental issues.

Therefore, as a result of this integration, the concept of social environmental responsibility is created in companies, corporations and other economic entities. This process is already happening. More and more business entities, as well as financial and public institutions, amend their missions, strategies, policies and procedures by adding sustainable development goals and guidelines of specific national and sectoral pro-environmental policies to the already implemented principles of corporate social responsibility. Therefore, more and more business entities and institutions in their missions, strategies of their business and other activities have defined goals of social and environmental responsibility (Prokopowicz, 2020a; Gołębiewska, 2015).

In individual countries, national environmental policies, legal norms established by the ministries of the environment and/or climate that define the principles of environmental protection and restrictions on greenhouse gas emissions are not the same. Due to the fact that internationally operating companies and corporations may adjust the objectives of corporate social responsibility (CSR) to national conditions in their strategies and policies. Therefore, national ecological and pro-environmental policies should be unified and standardized with simultaneous, gradual development in connection with the need to increase the scale and outlays for environmental protection, protection of biodiversity of natural ecosystems, protection of the biosphere and climate (Kehoe, Romero-Muñoz, Polaina, Estes, Kreft, Kuemmerle, 2017). The national goals of corporate social responsibility set out in specific legal norms, suggested and implemented by companies and institutions, should be unified and standardized on a global scale.

The key problem of pro-environmental policy is the reduction of growing greenhouse gas emissions. The chart below show cumulative carbon dioxide (CO₂) emissions by region from the year 1751 onwards. Emissions are based on territorial emissions (production-based) and do not account for emissions embedded in trade (Figure 4). One of the key aspects and goals of the social environmental responsibility of citizens and economic entities is the protection of nature and biodiversity. In particular, biodiversity plays a key role in balancing (Goodland, 1995) the ecosystem processes of organic matter flow, energy and biochemical processes, water transpiration, the creation of fertile soil, oxygen emissions to the atmosphere by the flora of ecosystems, ecological relationships between species of various forms of flora, fauna and other types of living organisms, etc. Maintaining high level of biodiversity in the natural environment is an important factor for the proper and sustainable functioning of the natural ecosystems of the various environments of the planet Earth's biosphere. In order to improve the techniques and instruments for the protection of nature and biodiversity of natural ecosystems, legal norms should be properly updated and amended.

Figure 4. Cumulative CO₂ emissions by world region.



Source: Ritchie H., Roser M. (2017). CO₂ and other Greenhouse Gas Emissions (in:) Internet portal "Our World in Data", May 2017, (<https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions>), after: OWID based on the Global Carbon Project (2017).

Legal norms should be an element of systemic activation to the increase in the implementation of the principles of sustainable development into economic processes, increase in social environmental (ecological) responsibility, development of pro-ecological reform programs in the implementation of eco-innovation into economic processes, etc. Healthy and sustainable environment also is connected to healthy people that can conduct their living, produce food, have access to water, avoid conflicts, do not migrate in uncontrolled way, etc.

5. Problems and Determinants of the Pro-Environmental Transformation of the Economy that Require Normative Elaboration

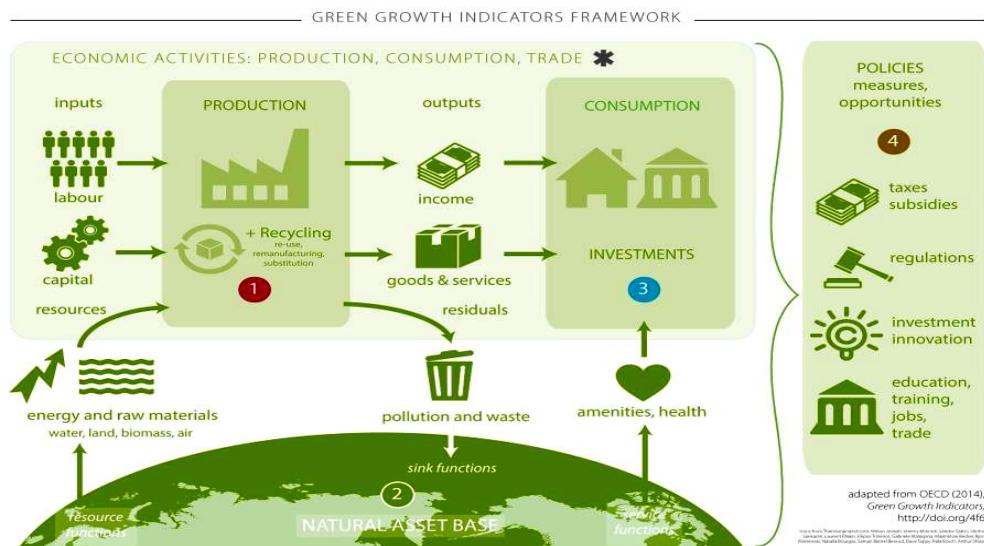
In addition to universities and research institutes, more and more non-governmental organizations, organizations created from the bottom by communities inform about the need to implement the principles of sustainable development, about the need to develop ecological innovations, implement pro-ecological reforms, etc. Thus, more and more ecological problems appear in discussions not only in the scientific community but also among politicians.

In many countries, political organizations such as the Green Party focused upon importance of the environmental security are gaining an increasing number of seats in parliaments in various countries. The problems of ecology are more and more often discussed internationally at international scientific conferences and UN climate summits. Legal norms are introduced in the European Union, which force individual countries to introduce pro-ecological reforms, e.g. in the energy sector and in the production of packaging, in electromobility, etc., (Prokopowicz, 2020b; Gołębiowska, 2015).

These types of problems can be solved through international cooperation that should be developed not only in Europe but on a global scale, since the process of global warming affects the entire globe. In recent years, also some financial institutions, such as the World Bank, spend more and more money on pro-ecological investments (Hanna, Xu, and Victor, 2020).

Increasing number of institutions, including financial sector representatives, are becoming promoters of the necessary introduction of the sustainable development principles, however, the scale of real activities aimed at disseminating sustainable pro-ecological development is still too small (Bouma, Jeucken, and Klinkers, 2017). Therefore, it is necessary to oblige certain institutions and enterprises operating in the media sector to promote pro-environmental social campaigns in the media they manage (Figure 5).

Figure 5. Green Growth Indicators Framework



Source: Green Growth Indicators 2014 (in:) "OECD iLibrary" website, OECD Green Growth Studies, ISSN: 22229523. Available online:
<http://www.oecd.org/greengrowth/green-growth-indicators/>; https://www.oecd-ilibrary.org/environment/green-growth-indicators-2013_9789264202030-en/,
<https://doi.org/10.1787/22229523>.

Another issue that requires normative elaboration is the legal protection of ecological innovations and new ecotechnologies. Greater protection of green intellectual property can lead to greater access to green technologies to prevent climate change and other related problems (Amran, Periasamy, and Zulkafli, 2014). The creation of ecological innovations and pro-ecological patents should be well protected by law. On the other hand, the legal protection system should be structured in such a way that the created ecological innovations, pro-ecological patents and new green technology solutions can be quickly and efficiently implemented into

production processes carried out by commercial entities and public sector institutions.

The next problem requiring normative elaboration is the aspect of more precise legal regulation of transboundary pollution of the natural environment. Cross-border pollution of the natural environment, including pollution of air, water, etc., pollution of derived radioactive waste, industrial pollution emitted from various production processes, plastic pollution, etc., is with no doubt a growing security threat (Achankeng, 2003). Therefore, it is necessary to improve international cooperation in order to reduce the scale of cross-border pollution of the natural environment from country to country and to reduce various types of pollutants emitted into the environment, which are not biodegradable and adversely affect natural ecosystems and humans (Le Saout, Hoffmann, Shi, Hughes, Bernard, Brooks, Bertzky, Butchart, Stuart, Badman, and Rodrigues, 2013).

In the process of pro-environmental transformation of the economy, an important role can also be played by clusters connecting companies, enterprises and institutions cooperating with each other. Pro-environmental clusters should participate in the process of implementing the principles of sustainable development, social environmental (ecological) responsibility, pro-ecological reforms of implementing eco-innovations in economic processes, etc. For aforementioned to happen, the interventionist role of the state is necessary, consisting in activating clusters to participate in the process of pro-ecological transformation of the economy. Legal regulations should be improved, thanks to which green clusters will be created. The role of local government is also important, as it may be a member of specific clusters. Green clusters can be an important element of the pro-ecological transformation of the classic brown economy to a sustainable, green circular economy (Barbier, 2009).

Next important issue of the pro-ecological transformation of the economy is the normative activation of institutions and economic entities, which are currently the main promoters and implementers of the necessary introduction of the principles of sustainable development in business. In addition to universities and research institutes, more and more non-governmental organizations, organizations created from the bottom by communities inform about the need to implement the principles of sustainable development, about the need to develop ecological innovations, implement pro-ecological reforms, etc.

Thus, more and more ecological problems appear in discussions not only in the scientific community but also in politics. In many countries, political organizations such as the Green Party are gaining an increasing number of seats in parliaments in various countries. The problems of ecology are more and more often discussed internationally at international scientific conferences and UN climate summits (Lenzen, Moran, Kanemoto, Foran, Lobefaro, and Geschke, 2012). Legal norms are introduced in the European Union, which force individual countries to introduce pro-

ecological reforms, eg in the energy sector and in the production of packaging, in electromobility, etc. Such problems can be solved through international cooperation. This international cooperation should develop not only in Europe but on a global scale, because the process of global warming affects the entire globe. In recent years, also some financial institutions, such as the World Bank, spend more and more money on pro-ecological investments. More and more institutions are becoming promoters of the necessary introduction of the principles of sustainable development, however, the scale of real activities aimed at promoting sustainable pro-ecological development is still too small (Prokopowicz, 2020a; Gołębiewska 2015).

Addressing the subject further, there is another issue requiring normative amendment is pro-environmental education, also referred to as environmental education or environmental education. Environmental education at all stages of education is important (Barth, Godemann, Rieckmann, and Stoltenberg, 2007). The transition to green technologies, the pro-ecological transformation of the energy sector, the development of renewable energy sources requires, above all, the cooperation of citizens representing various business environments, politics, science, etc. around the world. As part of environmental education, it is crucial to start with schools teaching children how to deal with the environment, respect and appreciate the biosphere of planet Earth (Cebrián and Junyent, 2015).

As part of environmental education, among other things, we must encourage or raise the public awareness about the need to respect nature, plant more trees, reduce plastic consumption by creating biodegradable substitutes for it, develop waste recycling eco-technologies, etc. The statement - You are right that apart from changes in legal norms, you should start with schools, especially at a young age to move effectively and in a faster way. This will increase the possibilities and scale of effective implementation of the pro-ecological transformation of the traditional brown economy into a sustainable, green circular economy in the next few years - has never been been more up-to-date (Prokopowicz, 2020b; Gołębiewska 2015).

In line with the above, in order to improve the techniques and instruments for the protection of nature and biodiversity of natural ecosystems, legal norms should be properly updated and amended. Legal norms should be an element of systemic activation to the increase in the implementation of the principles of sustainable development into economic processes, increase in social environmental (ecological) responsibility, development of pro-ecological reform programs in the implementation of eco-innovation into economic processes, etc.

Studying the phenomena deeper, there is yet another important problem of the pro-environmental transformation of the economy, which requires the amendment of legal norms, concerns the reduction of the level of environmental pollution, and the necessary amendment to legal regulations. In the last few decades, a serious problem has been the pollution of the natural environment with lead compounds. Lead

pollution of air, water and food has a very negative impact on many forms of flora and fauna life and also on humans. It is necessary to change legal regulations that will motivate companies and enterprises to switch to environmentally friendly technologies, creating eco-innovations implemented in production processes, creating pro-environmental substitutes for lead compounds harmful to humans and the biosphere, etc., if the scale of pro-environmental, general social awareness of citizens increases significantly. In addition, the increase in the pro-environmental, general social awareness of citizens will cause consumers to choose more environmentally friendly offers. Then, competition in business may force the addition of pro-environmental issues to the mission, development strategy and advertising campaigns presenting the offer of products and services, implementation of sustainable development goals, increasing the scale of pro-environmental social responsibility (Baumgartner and Rauter, 2017).

The SARS-CoV-2 (Covid-19) coronavirus pandemic could accelerate these processes (Helm, 2020). However, the scale of the pandemic's impact on the pro-environmental project was relatively small in relation to the opportunities that appeared (Golczak, Golinowski, Kamiński, Lewandowski, Pająk, Płaczek, Prokopowicz, and Wesołowski, 2021; Gołębiewska 2015). As part of the anti-crisis (Gołębiewska, 2017; Domańska-Szaruga and Prokopowicz, 2015), Keynesian, interventionist state aid programs for business entities, the formula of reviving economic activity, counteracting the increase in unemployment in the classical approach was applied, i.e., basically without taking into account the motivation of business to undertake pro-environmental economic ventures, green investments, and a significant increase in the scale of implementation of sustainable development goals (Jänicke, 2011).

Only now is this topic appearing in some economic regions of the world, such as the European Union, which has an anti-crisis Keynesian (Gołębiewska, 2015; Gwoździewicz and Prokopowicz, 2015; Gołębiewska, 2017) program of supporting economic entities with the use of public financial means, which is to lift the economy out of the recession, and takes into account selected goals of sustainable development within the so-called The New Green Deal.

6. Determinants of the Implementation of the Principles of Sustainable Development in Business

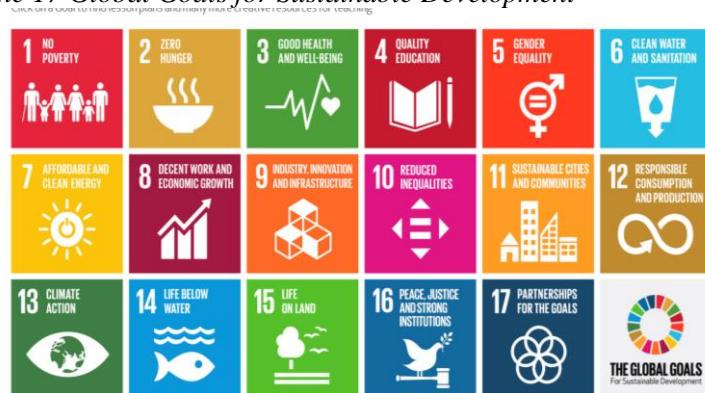
The SARS-CoV-2 (Covid-19) coronavirus pandemic increases the general social pro-environmental awareness of citizens. However, companies and enterprises themselves neither will carry out pro-environmental reforms nor will scale up their sustainable development goals unless they are forced to do so. For now, some companies and enterprises add to their missions, development strategies and advertising campaigns of their offers the issues of achieving the goals of sustainable development, the issues of pro-ecological activities, green investments, pro-ecological technologies and eco-innovations. However, the scale of real green

actions in relation to the declarations made and shaping the company's image in advertising campaigns is small in relation to the facts (Hepburn, O'Callaghan, Stern, Stiglitz, and Zenghelis, 2020).

The reason is the so far low level of profitability and/or additional costs resulting from undertaking green business ventures. As only some business entities undertake selectively selected sustainable development goals to be implemented, market competition is currently not a key factor in motivating undertaking green business ventures (Khan, Naseem Siddiqui, Khan, Ullah, Wali, Uddin Khan, Ismail, and Ihtisham, 2021).

The key issue is to change the provisions of legal norms shaping the functioning of economic entities so that these provisions motivate companies and enterprises, including international corporations to a much greater extent, to undertake pro-environmental investments, implement pro-ecological technologies, create eco-innovations and use them in production processes, significantly increase the scale implementation of the sustainable development goals, respecting the principles of pro-environmental social responsibility, etc., (Figure 6).

Figure 6. The 17 Global Goals for Sustainable Development



Source: The 17 Global Goals for Sustainable Development, in: "Global Goals.org" website, 2015-2020, (<https://www.globalgoals.org>; <https://worldslargestlesson.globalgoals.org>).

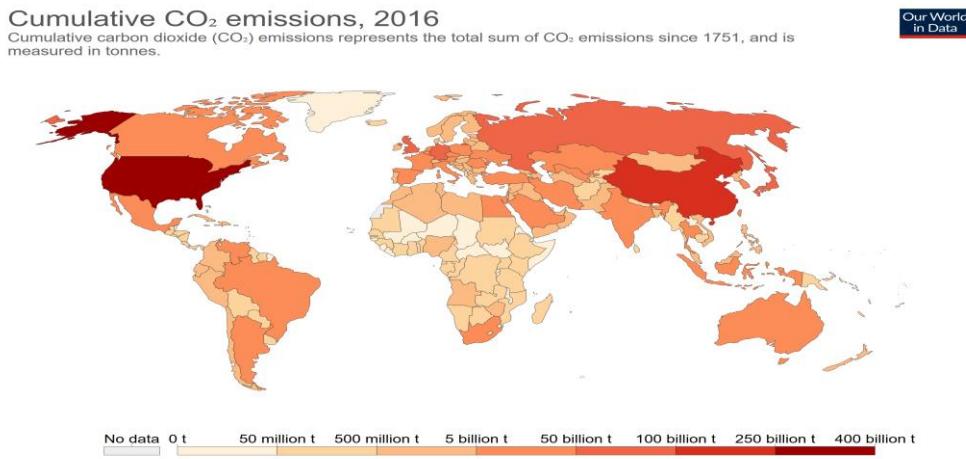
Another important issue of implementing and improving the implementation of the goals of sustainable development in economic entities is the management of green business ventures. Improving the process of managing ecological projects, managing pro-ecological business ventures, i.e., green business management and/or green management, i.e., management processes that take into account the process of implementing the principles of sustainable development, social environmental (ecological) responsibility, pro-ecological reforms, implementing eco-innovations to economic processes, etc., contributes can (depending on the specificity of specific pro-ecological economic projects and their effects) reduce greenhouse gas emissions, limit the negative impact of economic ventures, human civilization

activity on the climate, counteract unfavorable climate changes, counteract the ongoing process of global warming (Warner, Zommers, Wreford, Hurlbert, Viner, Scantlan, and Tamang, 2019), increase the scope of environmental protection, including the protection of biodiversity of natural ecosystems (Chong, 2014).

Therefore, improving the process of managing ecological projects, managing pro-ecological economic ventures, and therefore managing green business and/or green management, is also an important element of the pro-ecological transformation of the traditional, brown economy to a sustainable, green circular economy (Prokopowicz, 2020b; Gołębowska, 2017).

In addition to the above microeconomic (green economic undertakings implemented by individual companies, public and financial institutions, etc.) and mesoeconomic (green branches, sectors of the economy) approach, the macroeconomic approach (green economy in the context of the entire economy and the country with a specific environmental policy) is also of vast importance. As part of the improvement of the state's environmental policy, further changes to the legal norms should be made, which will strengthen and increase the scale of the processes of implementing the principles of sustainable development, social environmental (ecological) responsibility, pro-ecological reforms, implementing eco-innovations in economic processes, development of green entrepreneurship, green banking, green finance, etc., (Prokopowicz, 2020a; Gołębowska, 2017) (Figure 7).

Figure 7. Cumulative CO₂ emissions, 2016 Total carbon dioxide (CO₂) emissions represent the total sum of CO₂ emissions since 1751 (in tonnes).



Source: Ritchie H., Roser M. (2017). CO₂ and other Greenhouse Gas Emissions (in:) Internet portal "Our World in Data", May 2017, (<https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions>), after: Hadley Center (HadCRUT4), after: Global Carbon Project (GCP); Carbon Dioxide Information Analysis Center (CDIAC).

Unfortunately, many commercial sectors entities are not interested in implementing the principles of sustainable development due to the additional costs that they would have to bear (Mittal and Sangwan, 2014). Without state aid, appropriate economic policy taking into account the principles of sustainable development, normative regulations that would force commercial enterprises to implement the principles of sustainable development, the process of developing pro-ecological reforms will be slow, too slow. And yet the process of global warming is progressing faster and faster, humanity has less and less time to introduce the necessary pro-ecological reforms, primarily to reduce greenhouse gas emissions, improve segregation, recycling and waste disposal, develop energy based on renewable energy sources, replace plastic with biodegradable materials (Kanakaraj, Velappan, Chandra Babu, Sadulla, 2006), development of electromobility, protection of biodiversity of natural natural ecosystems, etc., (Janishevski, Santamaria, Gidda, Cooper, and Brancalion, 2015).

Due to the fact that many companies in the commercial sectors are not interested to follow the principles of sustainable development, the role of universities and research institutes is crucial in this matter. Nowadays, they are key promoters of the necessity to implement the principles of sustainable development. Scientists should promote the introduction of the necessary pro-ecological reforms in the available forms and media, thanks to which it will be possible to implement sustainable economic development in the economies of individual countries based on the concept of green economy. This is one of the most important global problems of the 21st century.

In view of the above, it is necessary to increase the scale of state intervention as part of activating and motivating enterprises and citizens to implement the principles of sustainable development into their economic and other activities. Without the state's financial support from public funds, the processes of implementing the principles of sustainable development into the economic processes of enterprises and other economic entities will proceed too slowly in relation to the needs. Therefore, the so-called green external financing should be implemented both by commercially operating financial institutions as well as by public institutions and government agencies pursuing a pro-environmental policy (Fullwiler, 2015).

Accordingly, a key question arises: How to induce global companies to practice environmental sustainability? In other words, how to persuade companies polluting the environment, energy plants emitting greenhouse gases, banks to credit pro-ecological projects (Gołębiewska, 2015; Gołębiewska 2017; Dmowski and Prokopowicz, 2010), politicians to create normative solutions that will significantly accelerate the processes of implementing the principles of sustainable development into economic activity? In the current reality, the key issue is the widest possible publication of the results of scientific research presenting the accelerating process of global warming and the threats related to climate disasters, which will intensify in the coming years.

The key issue is the coordination of processes and appropriate updating of legal norms in the field of implementing the principles of sustainable development, social environmental (ecological) responsibility, pro-ecological reforms in implementing eco-innovations in economic processes, etc., (Geels, 2011). An interventionist environmental policy of the state and co-financing from public funds of the state for the implementation of pro-ecological transformation processes of the traditional brown economy to a sustainable, green circular economy are necessary (Reichel, Schoenmakere, Gillabel, Martin, and Hoogeveen, 2016).

Another aspect is the growing importance of environmental policy aimed at both economic entities and their clients, including citizens. In my opinion, all citizens should feel the stakeholders of the green economy, because each citizen should participate in the process of pro-environmental transformation of the classic economy to a sustainable, green circular economy to the best of their abilities. Only in this way can the process of this transformation be carried out as efficiently, quickly and efficiently as possible, and thus the risk of a global climate catastrophe will be reduced in several dozen years. This is important in the context of saving the biosphere and climate of planet Earth in the 21st century.

Under perfect conditions, if all citizens and all enterprises, companies and institutions within their scope, as far as possible, start implementing the principles of sustainable development, observing social environmental (ecological) responsibility, participating in the implementation of the process of pro-ecological reforms, implementing eco-innovation in economic processes, etc., then the process is the ecological transformation of a traditional brown economy to a sustainable, green circular economy will be smoother and faster.

It is very important because most in this matter depends on what humanity will do in terms of the pro-ecological transformation of the economy in the next decade. If the pace of the green revolution is still as slow as in previous years, greenhouse gas emissions will not be reduced quickly, the process of global warming will progress equally quickly in the following years and around the middle of the 21st century the critical point of the amount of CO₂ in the atmosphere and the global warming process will be exceeded.

After crossing this critical point, the unfavorable climate changes taking place will enter a phase of irreversible and constantly accelerating processes, which in such a negative scenario will lead, according to the results of climatological research, to the climate of Armageddon at the beginning of the 22nd century. The scale of permanent fires, drought, lack of water and food will cause a global cataclysm unknown to mankind so far. This catastrophic scenario must be avoided. It all depends on what will be done in the next decade.

7. Other Important Security Issues Related to Pro-Environmental Economic Transformation

There are many security issues related to implementation of sustainable development, still due to limited space the Authors will only address them briefly and treat this article as a base for further research. With growing cases of cyberattacks (Jakubczak, 2016) the sustainability and cybersecurity are phenomena or vital importance not only to competitiveness of public and private entities but also entire economies and security in general - on national and global level.

The attacks are conducted as cybercrimes but also can be part of cyberwarfare and oftentimes it is impossible to distinguish the nature of it (Jakubczak, 2017). The level of protection in information and communications technology (ICT) shall enable to establish suitable level of trust so concepts like ethics, rule of law and economy, secure technology can be present in cyberspace. Trust in ICT is crucial in order to achieve the United Nations Sustainable Development Goals (SDG) (The 17 Global Goals for Sustainable Development, 2015).

The SDGs are expression of an ambitious and wide ranging global vision for a sustainable future. In order to achieve them the governments need to show both political and economic will. However, the United Nations also expects businesses to engage play in achieving the SDGs. Some sectors have to be more present, and with globalization not slowing event during the COVID-19 crisis, it is obvious that ICT industry has a vital role to play in driving progress towards the global transformation required by SDGs. The biggest dilemma is related to meeting the requirements of the nowadays world and providing not only fast information exchange but also taking care of the cybersecurity, especially with the respect to critical infrastructure.

The governments have to answer the question - how to create a more liberal market environment and fund many of the necessary improvements in connectivity while keeping the high standard of ever growing demand for cybersecurity. Looking to the future the role of governments, particularly in less developed economies, in effectively addressing these challenges may prove problematic. The rapid pace of technological development within the ICT industry may revolutionise how the SDGs can be achieved. Some critics may also said that it is impossible to avoid the the tensions between the SDGs and continuing commitments to economic growth. (Jones, 2017).

One of the important aspects that has not been recognized as a separate SDG is health security. There is a broad discussion upon the securitization of health where health related threats are considered as a threat to a nation's security (Jakubczak, 2020). Many of the Authors taking part in it see the health securitization as related only to highly virulent infectious diseases and bioterrorist threats. For this reason, the agenda for global health security has a skewed priority setting in health, creating a disconnect between perceived threats to health and the leading causes of morbidity

and mortality worldwide (Stevenson, 2014). Still there are voices that the response to virus outbreaks like Ebola in 2015 was not sufficiently tackled by global community (Smith, 2015).

In 2015 there was a strong voice from the health experts side calling for inclusion of an additional Sustainable Development Goal (SDG18) that would recognise global health security as an important stand-alone component of the post-2015 development agenda. It was made with the respect of Ebola virus outbreak in the west African countries of Sierra Leone, Guinea, and Liberia, has reignited global health security debates. This health emergency was inspiration to propose the additional goal, “to reduce the vulnerability of people around the world to new, acute, or rapidly spreading risks to health, particularly those threatening to cross international borders” (Kickbusch, 2015).

Despite of the fact that the World is facing next COVID-19 waves and generally more and more scientists agree that the threats related to health security will be more and more often commonly experienced still this has not been addressed properly. With the respect to COVID-19 crisis it is worth to mention that National action alone is insufficient and a clear global plan to exit the pandemic is necessary.

Countries that opt to live with the virus will likely pose a threat to other countries, notably those that have less access to COVID-19 vaccines. The uncertainty of lockdown timing, duration, and severity will stifle economic growth as businesses withhold investments and consumer confidence deteriorates. Global trade and travel will continue to be affected. Political indecisiveness and partisan policy decisions reduce trust in government. (Oliu-Barton, 2021).

The debate on climate change and its impact upon security has been ongoing for many years now. More and more experts agree that the phenomena in speeding up in an uncontrolled and unpredictable way. Interesting and worrying content is presented in the body of the document by the Intergovernmental Panel on Climate Change (IPCC). It addresses serious issues as desertification or the degradation of large areas and the impact of greenhouse gases on ecosystems. At the same time their Authors highlight the importance of sustainable land management and food security. The 2019 report (supplemented in 2020) explains how climate change is affecting the earth (An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems, 2019).

Another document by the same body, but issued a year earlier, includes pessimistic predictions about the increase in global temperature (An IPCC Special Report global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty, 2018).

According to the aforementioned documents, the current efforts to reduce greenhouse gas emissions and reduce the effects of global warming are not enough. Therefore, changes should be made immediately to the way people use natural resources. These changes must concern all levels of human functioning - both an individual and the entire state, as well as organizations and international corporations should take care of resources and nature.

In case the aforementioned threats are not addressed the serious problems might arise - related to extreme weather events and disasters, food security (volatile prices and provision) and water access (trans-boundary water management, water controlled by private entities) also both treated as a tool for speculation, increase of conflicts and livelihood insecurity and illegal and uncontrolled migration, sea-level rise and coastal degradation as well as, last but not least, the unintended effects of climate policies adaptation and mitigation.

Generally threats related to illegal and uncontrolled migration that can be increased by climate change and used as a part of hybrid warfare (as observed on the external EU border - Lithuania, Poland with Belarus) and general instability.

In general, climate change is best understood as a ‘threat multiplier’ that interacts with and compounds existing risks and pressures in a given context, and could increase the likelihood of instability or violent conflict. An understanding of the relationship between climate change and security is possible only through a rigorous exploration of the complex interactions between different risk factors, where climate change is understood as a variable that affects pre-existing economic, environmental, political and social pressures.

The risks presented by climate change are compound, complex and interrelated with other pressures and contextual factors, and there are interaction and feedback loops between the risks. Analyses of the range of compound risk trajectories show that the risks are greatest in fragile states, but can also present challenges in more stable states that experience pockets or periods of fragility (Vivekananda, 2016).

This part of the article is planned to be further addressed and studied to the wider extend in the future research since it requires more time and study, and due to its complexity cannot be properly explained in this article but will be addressed in more specific manner in further works of the Authors.

8. Conclusions

Sustainable pro-ecological economic development conducted in accordance with the philosophy of green economy, financed by green finance, etc., is a new idea and its importance should be further developed to obtain the status of the development of civilization main idea in the 21st century (Prokopowicz, 2020b; Gołębiewska, 2017). The security aspects of the aforementioned shall also be addressed with high

level of attention. In connection with the above, perhaps the global policy of sustainable development can be strengthened. Epidemic comparable to COVID-19 appear frequently and on the philosophical level reminds the mankind of the magnitude of forces and laws of nature. Perhaps the SARS-CoV-2 coronavirus pandemic causing the COVID-19 disease will also force people to reflect on this issue.

One of the effects of a pandemic is that man remembers that he is only one of the millions of different life forms that have existed for millions of years on planet Earth in a balance of many species of life, including flora, fauna, fungi and microorganisms with natural ecosystems evolving in this period (McElwee, Turnout, Chiroleu-Assouline, Clapp, Isenhour, Jackson, Kelemen, Miller, Rusch, Spangenberg, Waldron, Baumgartner, Bleys, Howard, Mungatana, Ngo, Ring, and Santos, 2020). Perhaps in the coming years, citizens will apply the principles of sustainable, pro-ecological development to a greater extent (Dobson, Pimm, Hannah, Kaufman, Ahumada, Ando, Bernstein, Busch, Daszak, Engelmann, Kinnaird, Li, Loch-Temzelides, Lovejoy, Nowak, Roehrdanz, and Vale, 2020).

In view of the above, the processes of implementing the principles of sustainable pro-ecological development should be developed according to the principles of a sustainable, green circular economy. By increasing the scope of implementation of the principles of sustainable pro-ecological development carried out in accordance with the principles of sustainable, green circular economy, activities related to nature protection, protection of natural biological ecosystems, protection of terrestrial biodiversity (Kehoe, Romero-Muñoz, Polaina, Estes, Kreft, and Kuemmerle, 2017) and its preservation for future generations can also be improved (Everard, Johnston, Santillo, and Staddon, 2020).

Due to the increasingly frequent weather anomalies, the progressing global warming process, the adverse effects of climate change (droughts, floods) (Munroe, Roe, Doswald, Spencer, Möller, Vira, Reid, Kontoleon, Giuliani, Castelli, and Stephens, 2012) and crises caused by natural factors (epidemics), the growing environmental pollution, the need and necessity to implement the principles of sustainable, pro-ecological development into economic processes is growing in line with the principles of a sustainable, green circular economy. That shall also result in increase in general security including health security, cybersecurity and diminishing of threats related to climate change. Perhaps the development of the SARS-CoV-2 (COVID-19) coronavirus pandemic will change human thinking about the importance of ecology, sustainable development of civilization, including the need to develop civilization in accordance with the principles of a sustainable, green circular economy (Prokopowicz, 2020a).

Therefore, after the era of the SARS-CoV-2 coronavirus pandemic, there may be an increase in the scale of implementation of the principles of sustainable, pro-ecological development conducted according to the principles of a sustainable, green

circular economy. If this happened, the adverse side effects of the development of civilization to date, such as the increasing pollution of the natural environment in recent years, an increase in greenhouse gas emissions, accelerating the process of global warming, more and more frequent weather anomalies (droughts, floods) and their adverse effects (droughts, fires) perhaps they will decrease, negative processes and effects will be limited (Newbold, Hudson, Hill, Contu, Lysenko, Senior, Börger, Bennett, Choimes, Collen, Day, Palma, Díaz, Echeverria- Londoño, Edgar, Feldman, Garon, Harrison, Alhusseini, and Purvis, 2015).

Other threats related to climate change and new technologies will surely not diminish but grow. The above-mentioned pro-ecological reforms implemented in accordance with the concept of green economy are necessary to at least partially slow down the process of global warming. We owe it to future generations, we owe it to our children and grandchildren. One of the key elements and principles of a sustainable, green circular economy, i.e., primarily the implementation of pro-ecological reforms consisting in the implementation of the principles of sustainable pro-ecological economic development, is nature protection, protection of natural biological ecosystems, protection of earth's biodiversity and its preservation for future generations (Blicharska, Smithers, Mikusiński, Rönnbäck, Harrison, Nilsson, and Sutherland, 2019). Also there are initiatives by the EU that stimulate the development of the synergy security with the respect to promotion of renewable energy increase and greenhouse gas emissions decrease and how it shall be linked to the recovery from the COVID-19 crisis.

Many other security aspects also shall be considered with the respect to SDGs and climate change – cybersecurity, health security and migration – this article also addressed them in attempt to signal their importance for deeper further research.

References:

- 17 Goals to Transform Our Word. United Nations. Sustainable Development Goals website, 2015-2020. <https://www.un.org/sustainabledevelopment>.
- Achankeng, E.J. 2003. Globalization, Urbanisation and Municipal Solid Waste Management in Africa. Proceedings of African Studies Association of Australasia and the Pacific: African on a global stage.
- Aized, T., Shahid, M., Bhatti, A.A., Saleem, M., Anandarajah, G. 2018. Energy security and renewable energy policy analysis of Pakistan. Renew. Sustain. Energy Rev. 84, 155-169.
- Amran, A., Periasamy, V., Zulkafli, A.H. 2014. Determinants of climate change disclosure by developed and emerging countries in Asia Pacific. Sustainable Development, Vol. 22, No. 3, 188-204.
- Annamalah, S., Paraman, P. 2021. The Malaysian Dilemma: Constructing a Sustainable Economy in the PostCOVID-19 Era. International Journal of Advance Research and Innovation, 991), 1-3, SEGi University College, Kuala Lumpur, Malaysia.
- Annual Sustainable Growth Strategy. 2021. COM(2020) 575 final. <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52020DC0575>.

- AR6 Climate Change 2021: The Physical Science Basis. 2021. IPCC Sixth Assessment Report, Intergovernmental Panel on Climate Change (IPCC).
<https://www.ipcc.ch/report/ar6/wg1>.
- Bancer, D., Czechowska -Kosacka, A., Kosacki, R. 2015. Biogazownie źródłem paliw alternatywnych. Czas. Inż. Lądowej Śr. Archit. 32, 1.
- Barbier, E.B. 2009. Rethinking the Economic Recovery: A Global Green New Deal. UNEP.
- Barth, M., Godemann, J., Rieckmann, M., Stoltzenberg, U. 2007. Developing key competencies for sustainable development in higher education. Int. J. Sustain. High. Educ., 8, 416-430. <https://dx.doi.org/10.1108/14676370710823582>.
- Baumgartner, R.J., Rauter, R. 2017. Strategic perspectives of corporate sustainability management to develop a sustainable organization. Journal of Cleaner Production, 140, 81-92. <https://doi.org/10.1016/j.jclepro.2016.04.146>.
- Blicharska, M., Smithers, R.J., Mikusiński, G., Rönnbäck, P., Harrison, P.A., Nilsson, M., Sutherland, W.J. 2019. Biodiversity's contributions to sustainable development. Nature Sustainability. <https://www.researchgate.net/publication/337522739>; <https://rdcu.be/bXARU>. DOI: 10.1038/s41893-019-0417-9.
- Bouma, J.J., Jeucken, M., Klinkers, L. 2017. Sustainable Banking: The Greening of Finance. Routledge.
- Byczkowski, A. 1999. Hydrologia, tom II. Wyd II Wydaw. SGGW Warszawa.
- Cebrián, G., Junyent, M. 2015. Competencies in Education for Sustainable Development: Exploring the student teachers' views. Sustainability, 7, 2768-2786.
<https://dx.doi.org/10.3390/su7032768>.
- Central Statistical Office. (WWW Document). 2000. URL <https://stat.gov.pl/obszary-tematyczne/srodowisko-energia/energia.htm>.
- Ciechanowska, M. 2020. Europejski Zielony Ład wyzwaniem dla transformacji polskiego przemysłu naftowego i gazowniczego. Nafta-Gaz, 76.
- Chapple, K. 2008. Defining the Green Economy: A Primer on Green Economic Development. University of California, Berkeley.
- Chong, J. 2014. Ecosystem-based approaches to climate change adaptation: progress and challenges. International Environmental Agreements: Politics, Law and Economics, 14(4), 391-405. <https://doi.org/10.1007/s10784-014-9242-9>.
- Climate change widespread, rapid, and intensifying – IPCC. 2021. IPCC Sixth Assessment Report. Intergovernmental Panel on Climate Change (IPCC).
<https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr>.
- Climate, Peace and Stability: Weathering Risk Through COP and Beyond. 2021.
<https://weatheringrisk.org/en/event/climate-peace-and-stability-weathering-risk-through-cop-and-beyond>.
- Commission Staff Working Document, Assessment of the final national energy and climate plan of Poland. 2020.
https://ec.europa.eu/energy/sites/default/files/documents/staff_working_document_assessment_necp_poland_en.pdf.
- COP26: Direct Linkages Between Climate Change, Health and Migration Must be Tackled Urgently – IOM, WHO, Lancet Migration.
https://weatheringrisk.org/sites/default/files/document/Summary_COP26_Climate_Security_Side_Event.pdf.
- Correlje, A., Van der Linde, C. 2006. Energy supply security and geopolitics: A European perspective. Energy Policy, 34, 532-543.
- Criqui, P., Mima, S. 2012. European climate-energy security nexus: A model based scenario analysis. Energy Policy, 41, 827-842.

- Ćwil, M. 2011. Biogaz zintegrowany z siecią gazową—alternatywa dla rozwoju biogazowni rolniczych w Polsce? Czysta Energi, 16-17.
- Czyż, H., Kitczak, T., Sarnowski, A., Karasiuk, M. 2011. Użytkowe, przyrodnicze i energetyczne walory przymorskich użytków zielonych. Rocznik Ochrony Środowiska, 13, 1055-1068.
- Dec, B., Krupa, J. 2014. Wykorzystanie odnawialnych źródeł energii w aspekcie ochrony środowiska. Przegląd Nauk.-Metodyczny Edukacja Dla Bezpieczeństwa, 3, 722-757.
- Dmowski, A., Prokopowicz, D. 2010. Rynki finansowe, Warsaw: Wydawnictwo Centrum Doradztwa i Informacji Difin sp. z o.o., 304-320.
- Dobson, A.P., Pimm, S.L., Hannah, L., Kaufman, L., Ahumada, J.A., Ando, A.W., Bernstein, A., Busch, J., Daszak, P., Engelmann, J., Kinnaird, M.F., Li, B.V., Loch-Temzelides, T., Lovejoy, T., Nowak, K., Roehrdanz, P.R., Vale, M.M. 2020. Ecology and economics for pandemic prevention. Science, 369(6502), 379-381. <https://doi.org/10.1126/science.abc3189>.
- Domańska-Szaruga, B., Prokopowicz, D. 2015. Makroekonomiczne zarządzanie antykryzysowe. 34 Zeszyty Naukowe Uniwersytetu Przyrodniczo – Humanistycznego w Siedlcach, 107, Seria: Administracja i Zarządzanie (34). UPH Wydział Nauk Ekonomicznych i Prawnych, Siedlce, 37-48.
- Dye, C.Y., Yang, C.T. 2015. Sustainable trade credit and replenishment decisions with credit-linked demand under carbon emission constraints. Eur. J. Oper. Res., 244, 187-200.
- Everard, M., Johnston, P., Santillo, D., Staddon, C. 2020. The role of ecosystems in mitigation and management of Covid-19 and other zoonoses. Environmental Science and Policy, 111, 7-17. <https://doi.org/10.1016/j.envsci.2020.05.017>.
- Executive Summary of Poland's National Energy And Climate Plan For The Years 2021-2030 – NECPPL. 2019. <https://www.gov.pl/attachment/e64830c9-440f-4f17-b3e7-8abd7667d406>.
- Faber, A. 2020. Potencjał i konsekwencje rolnej produkcji biomasy dla energetyki (WWW Document). URL https://zielona-energia.cire.pl/pliki/2/potenc_konsekwenc_.pdf.
- Fullwiler, S.T. 2015. Sustainable Finance: Building a More General Theory of Finance. Binzagr Institute for Sustainable Prosperity, Working Paper No. 106.
- Gawlik, L. 2020. Polski Zielony Ład? Jak sprostać wyzwaniom stojącym przed krajową energetyką. Energetyka Cieplna i Zawodowa.
- Geels, F.W. 2011. The multi-level perspective on sustainability transitions: Responses to seven criticisms. Environmental Innovation and Societal Transitions, 1, 24.
- Glasgow Climate Change Conference – October-November 2021. Website: United Nations Climate Change. <https://unfccc.int/conference/glasgow-climate-change-conference-october-november-2021>.
- Golczak, K., Golinowski, K., Kamiński, J., Lewandowski, K.J., Pająk, K., Płaczek, J., Prokopowicz, D., Wesołowski, Z. 2021. Prognoza globalnego kryzysu finansowo-gospodarczego zdeterminowanego przez pandemię koronawirusa w obszarze gospodarczym, społecznym, politycznym i geopolitycznym. Prognoza kryzysu w obszarze gospodarczym. In: P. Soroka, A. Skrabacz, P. Wilczyński, K. Golczak, R. Kołodziejczyk, K. Pająk, A. Mitrega (red.) Raport zawierający diagnozę i prognozę globalnego kryzysu finansowo-gospodarczego zdeterminowanego przez pandemię koronawirusa w obszarze gospodarczym, społecznym, politycznym i geopolitycznym. Dom Wydawniczy Elipsa, Warszawa, 87-120.

- Gołębiowska, A. 2015. Zasada zrównoważonego rozwoju w prawie międzynarodowym. Zarządzanie zrównoważonym rozwojem jednostek samorządu terytorialnego, (ed.) E. Sobczak, Warsaw, 7-23.
- Gołębiowska, A., Zientarski, B.P. 2017. Ponowne wykorzystywanie informacji sektora publicznego w administracji. Kancelaria Senatu RP, Warsaw.
- Gołębiowska, A. 2017. Implementacja dyrektywy Parlamentu Europejskiego i Rady w sprawie ponownego wykorzystania informacji sektora publicznego. Ponowne wykorzystywanie informacji sektora publicznego w administracji, A. Gołębiowska, P. B. Zientarski (ed.), Warsaw, 11-31.
- Gołębiowska, A., Zientarski, P.B. 2017. Aspekty prawne ponownego wykorzystywania informacji sektora publicznego w administracji. Ponowne wykorzystywanie informacji sektora publicznego w administracji, A. Gołębiowska, P.B. Zientarski, (ed.), Kancelaria Senatu, Warsaw, 31-45.
- Goodland, R. 1995. The concept of environmental sustainability. Annual Review of Ecology and Systematics, 26(1), 1-24.
- Górka, K. 2014. Zasoby naturalne jako czynnik rozwoju społeczno-gospodarczego.
- Górka, K., Szyja, P. 2020. Zielony Ład Gospodarczy oraz wybrane problemy rynku energii i gospodarki wodnej. Biblioteka Ekonomia i Środowisko, 35.
- Green Growth Indicators. 2014. OECD iLibrary” website, OECD Green Growth Studies, ISSN: 22229523. Online: [http://www.oecd.org/greengrowth/green-growth-indicators/](http://www.oecd.org/greengrowth/green-growth-indicators;); https://www.oecd-ilibrary.org/environment/green-growth-indicators-2013_9789264202030-en, <https://doi.org/10.1787/22229523>.
- Grzesik, M., Szufa, S., Romanowska-Duda, Z. 2011. Rośliny energetyczne i urządzenia dla przetwarzania i spalania biomasy. Inwestowanie W Energ. Odnawialną-Aspekty Ekol. Technol. Finans. Benchmarking” Pol. Akad. Nauk Oddz. W Łodzi Kom. Ochr. Śr. 978-983.
- Gwoździewicz, S., Prokopowicz, D. 2015. The role and application of Keynesian macroeconomic anti-crisis theories in the context of development of the financial system in Poland. Globalization, the State and the Individual, International Scientific Journal, Free University of Varna “Chernorizets Hrabar”, Chayka, Varna, Bulgaria 9007, 3(7), 47-58.
- Hanna, R., Xu, Y., Victor, D.G. 2020. After COVID-19, green investment must deliver jobs to get political traction. Nature, 582(7811), 178-180. <https://doi.org/10.1038/d41586-020-01682-1>.
- Helm, D. 2020. The Environmental Impacts of the Coronavirus. Environmental and Resource Economics, 76(1), 21-38. <https://doi.org/10.1007/s10640-020-00426-z>.
- Helm, D. 2014. The European framework for energy and climate policies. Energy Policy, 64, 29-35.
- Hepburn, C., O’Callaghan, B., Stern, N., Stiglitz, J., Zenghelis, D. 2020. Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change? Oxford Review of Economic Policy, 36(20), 1-48. <https://doi.org/10.1093/oxrep/graa015>.
- Internet portal OurWorldInData.org. <https://ourworldindata.org/covid-income-support-debt-relief>; for: Hale, Angrist, Goldszmidt, Kira, Petherick, Philips, Webster, Cameron-Blake, Hallas, Majumdar, Tallow, A global panel database of pandemic Policy. Oxford Covid-19 Government Response Tracker. Nature Human Behaviour.
- Intergovernmental Panel on Climate Change, Special Report, Climate Change and Land. 2019.
- Intergovernmental Panel on Climate Change, Special Report, Global Warming of 1.5°C. 2018. An IPCC special report on the impacts of global warming of 1.5°C above pre-

- industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty, <https://www.ipcc.ch/sr15/>.
- Jackson, T. 2009. Prosperity without Growth. Economics for Finite Planet. Earthscan, London, p. 288.
- Jakubczak, R., Martowski, R.M. 2017. Powszechna obrona terytorialna w cyberobronie i agresji hybrydowej, Warsaw.
- Jakubczak, W. 2020. Condition of Cybersecurity in Poland – Selected Aspects. In: Przedsiębiorczość i Zarządzanie (17/2016), Issue No. 5.1, SAN, Warsaw.
- Jakubczak, W. 2020. The structures of the ministry of national defense for crisis situations. In: Jakubczak, R. Współczesna obrona narodowa, Warsaw.
- Janishevski, L., Santamaria, C., Gidda, S.B., Cooper, H.D., Brancalion, P.H.S. 2015. Ecosystem restoration, protected areas and biodiversity conservation. In: Unasylva, No. 245, Vol. 66, 2015/3, 19-27. <https://www.researchgate.net/publication/292643157>.
- Jänicke, M. 2011. Green Growth: From a Growing Eco-industry to a Sustainable Economy. Freie Universität Berlin, Berlin.
- Jankowska-Huflejt, H., Domański, J.P. 2008. Aktualne i możliwe kierunki wykorzystania trwałych użytków zielonych w Polsce. Woda-Śr.-Obsz. Wiej., 8, 31-49.
- Jarosz, Z. 2017. Potencjał energetyczny biomasy roślinnej i możliwości wykorzystania do celów energetycznych. Probl. Rol. Świat., 17.
- Jasiulewicz, M. 2004. Uprawa roślin energetycznych i agroturystyka jako alternatywne źródła dochodów ludności rolniczej w województwie zachodniopomorskim. Stud. Obsz. Wiej., 5, 177-183.
- Jones, P., Wynn, M., Hillier, D., Comfort, D. 2017. The Sustainable Development Goals and Information and Communication Technologies. Indonesian Journal of Sustainability Accounting and Management, 1(1), 1-15.
- Jun, E., Kim, W., Chang, S.H. 2009. The analysis of security cost for different energy sources. Appl. Energy, 86, 1894-1901.
- Kanakaraj, J., Velappan, K.C., Chandra Babu, N.K., Sadulla, S. 2006. Solid wastes generation in the leather industry and its utilization for cleaner environment – A review. Journal of Scientific and Industrial Research, 65, 541-548.
- Kehoe, L., Romero-Muñoz, A., Polaina, E., Estes, L., Kreft, H., Kuemmerle, T. 2017. Biodiversity at risk under future cropland expansion and intensification. In: Nature Ecology & Evolution, 1(8), 1129-1135. <https://doi.org/10.1038/s41559-017-0234-3>.
- Khan, N., Naseem Siddiqui, B., Khan, N., Ullah, N., Wali, A., Uddin Khan, I., Ismail, S., Ihtisham, M. 2021. Drastic impacts of COVID-19 on food, agriculture and economy. Pure and Applied Biology, Vol. 10, Issue 1, 62-68. <http://dx.doi.org/10.19045/bspab.2021.100008>.
- Kickbusch, I., Orbinski, J., Winkler, T., Schnabe, A. 2015. The Lancet, 85. [https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736\(15\)60593-1.pdf](https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(15)60593-1.pdf).
- Klugmann, E., Klugmann-Radziemska, E. 2005. Ogniwa i moduły fotowoltaiczne oraz inne niekonwencjonalne źródła energii.
- Koźmiński, C., Michalska, B., Rawa, Z. 2004. Atlas zasobów i zagrożeń klimatycznych Pomorza. PPH Zapol.
- Krzyzanowska, K., Nuszkiewicz, K. 2012. Odnawialne źródła energii w odbiorze społecznym. Roczn. Nauk. Stowarzyszenia Ekon. Rol. Agrobiznesu, 5.
- Kupczyk, A., Piechocki, J. 2010. Biogaz rolniczy. Stan i perspektywy rozwoju w Polsce na tle świata i Unii Europejskiej. Gospod. Mater. Logistyka, 2-8.

- Kuś, J., Faber, A. 2007. Alternatywne kierunki produkcji rolniczej. Stud. Rap. IUNG-PIB, 7, 139-149.
- Le Saout, S., Hoffmann, M., Shi, Y., Hughes, A., Bernard, C., Brooks, T.M., Bertzky, B., Butchart, S.H.M., Stuart, S.N., Badman, T., Rodrigues, A.S.L. 2013. Protected Areas and Effective Biodiversity Conservation. Science, 342(6160), 803-805.
<https://doi.org/10.1126/science.1239268>.
- Lenzen, M., Moran, D., Kanemoto, K., Foran, B., Lobefaro, L., Geschke, A. (2012). International trade drives biodiversity threats in developing nations (in:) "Nature", No. 486(7401), pp. 109–112. <https://doi.org/10.1038/nature11145>.
- Lewandowski, W.M. 2007. Proekologiczne odnawialne źródła energii. Wydawnictwa Naukowo-Techniczne.
- Marino, A., Bertoldi, P., Rezessy, S., Boza-Kiss, B. 2011. A snapshot of the European energy service market in 2010 and policy recommendations to foster a further market development. Energy Policy, 39, 6190-6198.
- McElwee, P., Turnout, E., Chiroleu-Assouline M., Clapp J., Isenhour C., Jackson T., Kelemen E., Miller D. C., Rusch G., Spangenberg J. H., Waldron A., Baumgartner R. J., Bleys B., Howard M. W., Mungatana E., Ngo H., Ring I., Santos R. (2020). Ensuring a Post-COVID Economic Agenda Tackles Global Biodiversity Loss (in:) "One Earth", No. 3(4), pp. 448–461. <https://doi.org/10.1016/j.oneear.2020.09.011>.
- Mittal, V. K., Sangwan, K. S. 2014. Prioritizing barriers to green manufacturing: Environmental, social and economic perspectives. Procedia, CIRP, 17, 559-564.
- Munroe, R., Roe, D., Doswald, N., Spencer, T., Möller, I., Vira, B., Reid, H., Kontoleon, A., Giuliani, A., Castelli, I., Stephens, J. 2012. Review of the evidence base for ecosystem-based approaches for adaptation to climate change. Environmental Evidence, 1(1), 1-11. <https://doi.org/10.1186/2047-2382-1-13>.
- Mystkowski, E. 2008. Alternatywne kierunki produkcji roślinnej. Wiad. Rol. Podl. Ośr. Doradz. Rol. W Szepietowie, 15-16.
- Newbold, T., Hudson, L.N., Hill, S.L.L., Contu, S., Lysenko, I., Senior, R.A., Börger, L., Bennett, D.J., Choimes, A., Collen, B., Day, J., De Palma, A., Díaz, S., Echeverria-Londoño, S., Edgar, M.J., Feldman, A., Garon, M., Harrison, M.L.K.K., Alhusseini, T., Purvis, A. 2015. Global effects of land use on local terrestrial biodiversity. Nature, 520(7545), 45-50. <https://doi.org/10.1038/nature14324>.
- Oliu-Barton, M., Pradelski, B., Aghion, P., Vanderslott, S., Artus, P., Kickbusch, I., Lazarus, J., Sridhar, D. 2021. SARS-CoV-2 elimination, not mitigation, creates best outcomes for health, the economy, and civil liberties. The Lancet, 397.
- Owczuk, M., Wardzińska, D., Zamojska-Jaroszewicz, A., Matuszewska, A. 2013. Wykorzystanie odpadów biodegradowalnych do produkcji biogazu jako alternatywnego źródła energii odnawialnej. Stud. Ecol. Bioethicae, 3, 133-144.
- Panwar, N.L., Kaushik, S.C., Kothari, S. 2011. Role of renewable energy sources in environmental protection: A review. Renewable and sustainable energy reviews, 15(3), 1513-1524.
- Pavlova-Marciniak, 2014. Światowe i unijne normatywne dokumenty a rozwój OZE w Polsce. Przegląd Elektrotechniczny, 90(7), 115-118.
- Pawilonis, J., Kupczyk, A. 2006. Biogaz jako zrodło energii odnawialnej w Polsce-potencjal produkcyjny, stan obecny oraz perspektywy rozwoju sektora. Przem. Ferment. Owocowo-Warzywny, 12, 20-22.
- Podkówka, Z. 2016. Biogaz rolniczy w Polsce. Gaz Woda Tech. Sanit., 281-284.
- Polak, R., Krzykowski, A., Dziki, D., Rudy, S. 2014. Biomasa i biogaz jako źródło energii w hybrydowych siłowniach geotermalnych. Przem. Chem., 93, 1773-1776.

- Program rozwoju. 2105. Sektora Energetycznego w Województwie Zachodniopomorskim 2015 z Częścią Prognostyczną do 2030. available online: <http://eregion.wzp.pl>.
- Prokopowicz, D. 2020a. Implementacja zasad zrównoważonego rozwoju gospodarczego jako kluczowy element proekologicznej transformacji gospodarki w kierunku green economy i circular economy, Referat wygłoszony podczas XXIV Konferencji Naukowej pt. "Filozofia zrównoważonego rozwoju", 19.11.2020 – 20.11.2020, Instytut Ekonomii i Finansów, Wydział Społeczno-Ekonomiczny, Uniwersytet Kardynała Stefana Wyszyńskiego w Warszawie, Konferencja on-line za pośrednictwem Cisco Webex Events.
- Prokopowicz, D. 2020b. Implementation of The Principles of Sustainable Economy development as a key element of Pro-ecological transformation of The Economy towards Green Economy and Circular Economy. Czasopismo Międzynarodowe Nowa Ekonomia i Nauki Społeczne – International Journal of New Economics and Social Sciences. Międzynarodowy Instytut Innowacji Nauka - Edukacja - Rozwój w Warszawie, 11(1) 417-480. ISSN 2450-2146. DOI: 10.5604/01.3001.0014.3558, GICID: 01.3001.0014.3558.
<https://ijoness.com/resources/html/article/details?id=207132>.
- Rabe, M., Streimikiene, D., Droźdż, W., Bilan, Y., Kasperowicz, R. 2020. Sustainable regional energy planning: The case of hydro. *Sustain. Dev.*
- Reichel, A., De Schoenmakere, M., Gillabel, J., Martin, J., Hoogeveen, Y. 2016. Circular economy in Europe: Developing the knowledge base. European Environment Agency Report, 2.
- Ritchie, H., Roser, M. 2017. CO₂ and other Greenhouse Gas Emissions. Internet portal “Our World in Data”. <https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions>, after: Hadley Center (HadCRUT4), after: Global Carbon Project (GCP); Carbon Dioxide Information Analysis Center (CDIAC).
- Sadowski, T., Świderski, G., Lewandowski, W. 2008. Wykorzystanie odnawialnych i nieodnawialnych źródeł energii w Polsce i w krajach UE. *Energetyka*, 289-295.
- Sałagan, P., Dobek, T.K., Wieliczko, P. 2011. Możliwości wykorzystania odnawialnych źródeł energii w gospodarstwach rolnych i gminach wiejskich. *Inż. Rol.*, 15, 207-213.
- Sarica, K., Tyner, W.E. 2013. Alternative policy impacts on US GHG emissions and energy security: a hybrid modeling approach. *Energy Econ.*, 40, 40-50.
- Sikorski, W. 2013. Internet dla każdego. Warszawa, Wydawnictwo Witkom.
- Smith, J. 2015. Global health security: a flawed SDG framework.
[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(15\)61057-1/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)61057-1/fulltext).
- Sobolewski, M. 2010. Perspektywy wykorzystania odnawialnych źródeł energii w Polsce. *Stud. Bas.*, 267-290.
- Stevenson, M.A., Moran M. 2014. Health Security and the Distortion of the Global Health Agenda. Routledge Handbook of Global Health Security.
- Szlućk, M., Sasinowski, M. 2018. Odnawialne źródła energii jako szansa na stworzenie proekologicznego wizerunku jednostki samorządu terytorialnego. *Młody Jurysta Kwart. Stud. Doktorantów Wydz. Prawa Adm. UKSW*, 67-78.
- Terlikowski, J. 2012. Biomasa z trwałych użytków zielonych jako źródł energii odnawialnej. *Probl. Inż. Rol.*, 20, 43-49.
- The energy regulatory office, 2020. <https://www.ure.gov.pl/>.
- Van Asselt, H., Biermann, F. 2007. European emissions trading and the international competitiveness of energy-intensive industries: a legal and political evaluation of possible supporting measures. *Energy Policy*, 35, 497-506.

- Vivekananda, J., Rüttinger, L. 2016. Understanding the compound risks of climate change and fragility. SIPRI Yearbook.
- Warner, K., Zommers, Z., Wreford, A., Hurlbert, M., Viner, D., Scantlan, J., Tamang, C. 2019. Characteristics of Transformational Adaptation in Climate-Land-Society Interactions. *Sustainability*, 11, 356.
- Wiśniewski, G. 2011. Określenie potencjału energetycznego regionów Polski w zakresie odnawialnych źródeł energii-wnioski dla Regionalnych Programów Operacyjnych na okres programowania 2014-2020. Ministerstwo Rozwoju Regionalnego. Departament Koordynacji i Wdrażania.
- WZ, 2020. Marshal's Office of the West Pomeranian Voivodeship, available online <http://erregion.wzp.pl/obszary/odnawialne-zrodla-energii>.
- Zabłocki, M. 2013. Determinanty wykorzystania odnawialnych źródeł energii w Polsce. *Tech. Poszuk. Geol.*, 52.