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Problems of sustainable development worldwide and public policies for green economy

Abstract
Introduction. Conducting economic activity in modern conditions is often connected with a negative impact on ecology. Today, economic activity has reached such a scale that it can be considered to be a geological and climate-forming factor which can significantly change living conditions of man. This trend is a serious cause for concern and leads numerous initiatives realized at both the international and the national levels and contributing to the development of green economy. Many countries are developing and implementing special measures of public policies for green economy to level undesirable effects. Therefore, a consideration of the main challenges in the area of social, economic and environmental development, as well as structurisation of public policies for green economy is a particular concern.
The purpose of this article is to systematise the main challenges in the area of social, economic and environmental development taking into account their specific features and provide recommendations relevant to the guidelines for public policies related to the reduction of the impact of economic activity on the environment.
Methods. Theoretical and empirical methods such as literature review, retrospective analysis, logical and system analysis, and graphic-analytical methods of visualisation of system analysis are used in this research.
Results. This article presents an analysis of social, economic and environmental development worldwide and particularly in Switzerland, The United Kingdom, Sweden, Singapore, Finland, The Netherlands, The United States of America, Denmark, Luxembourg, and Hong-Kong, in the modern period in relation to the measures of public regulation aimed at levelling the negative impact of the economic system on ecology and promoting the concept of sustainable development adopted at the UNO Conference on environment and development. Special attention is paid to the analysis of the present situation in Russia, as well as to its ecological and power-oriented problems. The article reveals high importance of the development of green economy for ensuring economy stability. The authors have structured the main areas of green and provided empirical data reflecting the current trends.
Conclusions. This research proves that environmental problems are global in nature and the development of green economy is in the current interest across countries. It is possible to say that efforts made in Russia to reduce negative impact of economic activity on the environment are successful. They are in line with global trends in sustainable development policies. The involvement of both activists and civil society institutions in the relevant processes is considered to be a sign of the greening of the economy. The proposed guidelines for public policies in the area of green economy may become part of sustainable development programmes worldwide.
Keywords: Green Economy; Public Policy; Sustainable Development
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Проблеми сталого розвитку країн світу та заходи державної політики розвитку «зеленої» економіки

Анотація
Для боротьби з небажаними ефектами багато країн світу розробляють і реалізують спеціальні заходи «зеленої» державної політики. Відповідно, актуальним завданням є розгляд основних проблем і напрямків державної політики «зеленої» економіки. У статті представлено результати аналізу економо-еколого-соціального розвитку країн світу в сучасний період у поєднанні із заходами державного регулювання, спрямованими на елімінування негативного впливу розвитку господарської системи на екологію та реалізацію концепції сталого розвитку. Дослідження довело, що екологічні проблеми носять глобальний характер, а розвиток «зеленої» економіки відповідає загальним інтересам усіх країн. Запропоновані заходи державної політики розвитку «зеленої» економіки можуть бути включені в програми довгострокового розвитку різних країн світу.
Ключові слова: «зелена» економіка; державна політика; сталий розвиток.

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Проблемы устойчивого развития стран мира и меры государственной политики развития «зеленой» экономики

Аннотация
Для борьбы с нежелательными эффектами многие страны мира разрабатывают и реализуют специальные меры «зеленой» государственной политики. Соответственно, актуальной задачей является рассмотрение основных проблем и направлений государственной политики «зеленой» экономики. В статье представлены результаты анализа экономо-эколого-социального развития стран мира в современный период в увязке с мерами государственного регулирования, направленными на элиминирование негативного влияния развития хозяйственной системы на экологию и реализацию концепции устойчивого развития.
В результате исследования подтверждено, что экологические проблемы носят глобальный характер, а развитие «зеленой» экономики отвечает общим интересам всех стран. Предложенные меры государственной политики развития «зеленой» экономики могут быть включены в программы долгосрочного развития разных стран мира.
Ключевые слова: «зеленая» экономика; государственная политика; устойчивое развитие.

1. Introduction

Economic activity is progressing. It becomes more large-scale and diverse. Emergence of environmental problems is a result of an economic expansion which is often limited to natural factors. Hence, it is required to take this fact into account while implementing social and economic policies at both the international and the national levels.

One of the responses to the global natural and economic global transformation was formulated at the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, when representatives of the participating countries elaborated and adopted a strategy for sustainable development. The essence of sustainable development is in ensuring economic growth which makes it possible to harmonise the human-nature relations and to safeguard the environment for present and future generations. A number of long-term programs within the framework of the sustainable development concept are being implemented worldwide. Thereby, the most pressing task is to detect problems related to urban development, energy security, water supply, food security, as well as functioning of ecosystems, and to elaborate guidelines and methods to ensure both government and supranational regulation of the related processes.

Nowadays, the development of green economy is one of the major thrusts of the regulation of economic activity in order to ensure sustainable development. The role of the state in this process is increasing rapidly worldwide. A reduction in the impact of economic activity on the environment is viewed to be one of the main steps toward the development of green economy.

Today, economic activity has reached such a scale that it can be considered to be a geological and climate-forming factor which can significantly change living conditions of man. This trend is a serious cause for concern and leads numerous initiatives realized at both the international and the national levels and contributing to the development of green economy, i.e. restrictions concerning emissions of both carbon dioxide and sulfur dioxide, the cessation of production of substances destroying the ozone layer, implementation of protection programmes related to breeding of endangered species, etc. Therefore, a consideration of the main challenges in the area of social, economic and environmental development, as well as structurisation of public policies for green economy related to the reduction of the impact of economic activity on the environment is a particular concern.

2. Brief Literature Review

Considerable attention has been paid to various issues related to sustainable development in a number of international and national studies since the last third of the 20th century. Such studies are attributed to the increased anthropogenic load on the environment, which has caused environmental degradation and negative ecological impacts on society [2-3; 7; 10; 13]. At the same time, environmental problems are of international nature and dimension if we take into account the transboundary aspect. In this regard, their solution requires international efforts, which was stressed at the UNO Conference on environment and development.

Implementation of green economy models is an effective way to solve social, economic and environmental problems. These models are gaining popularity worldwide due to strengthening of government regulation in this area [8; 17-18; 23].

There is a proven positive correlation between the CO_2 emissions and economic growth on energy consumption proven on panel data of 58 countries (K. Saidi and S. Hammami, 2015) [34] as well as in many other researches. Such a correlation contributes to an issue of deep interdependence between economic and ecologic environment as a result of human action, which requires intensified efforts to generalise experience from across the world, as well as recommendations related to its introduction into national policies for sustainable development.

3. Systematisation of social, economic and environmental problems of development in the world

Green economy is a new global course of anticrisis development for the world economy with its internationally agreed strategic goals. The analysis shows that the so called green policies worldwide are directly related to both the urgent environmental problems, which are most relevant for selected countries, and the level of social, economic, technological and innovative development.

As world experience shows, even a range of grave environmental problems does not guarantee a responsible approach of national governments to its solution. Usually, it is determined by scarcity of resources placed at their disposal. At the same time, a high level of innovative and technological development allows governments to solve environmental problems effectively and not only within a specific country but also globally, giving support to less developed countries. In this regard, we have reviewed key environmental problems of the world's top ten countries according to the Global Innovation Index[1] taking into account the main ecological problems in the Russian Federation.

The results of the analysis of social, economic and environmental development of selected countries along with the identification of the relevant guidelines for public policies related to the reduction of the impact of economic activity on the environment are shown in Table 1. Basically, this analysis is focused on the assessment of success in the implementation of the concept of sustainable development adopted at the UNO Conference on environment and development. However, it is impossible to consider all countries and to assess their performance in one article. This is rather a comprehensive task. Therefore, we have analysed only some countries.

Results in Table 1 show that countries who are leaders of innovative development with a high level of economic and social development are implementing policies for the development of green economy. Positive dynamics of the carbon emissions economic intensity index under fulfilment of the government policy measures is an indicator of the efficiency

[1] Dutta, S., Lanvin, B., & Wunsch-Vincent, S. (Eds.). (2015). The Global Innovation Index 2015: Effective Innovation Policies for Development. Cornell University, INSEAD, WIPO. Retrieved from https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII-2015-v5.pdf

Tab. 1: **Key environmental problems and regulatory measures in the leading countries in terms of innovative development**

Country	Environmental problems	Regulatory measures	CO_2 emissions (kg per PPP USD of GDP)[1]	
			1990	2013
Switzerland	• Disposal of solid waste	Framing new environmental policies due to which the country has become one of the most environmentally friendly countries.	0.1	0.1
The United Kingdom	• Environmental pollution: - air pollution in cities and urban agglomerations; - marine pollution (until now the total emissions and the amount of pollutants in the sea exceed the maximum values set by the European Union; - agricultural fertilisers and pesticides pollution of inland waters • Excessive use of pesticides in agriculture; hormonal feeding for animals and intensive cultivation which negatively affect the environment.	Adoption of the Clean Air Acts (1950s-1960s) which regulate industrial emissions and car exhaust fumes. Quantifying the emissions from oil and gas derricks in the North Sea in harmony with the European Union standards. Prohibition of pesticides toxic for honey bees. Development of actions within the country to reduce the use of harmful chemicals in agriculture.	0.6	0.2
Sweden	• Emission of greenhouse gases. • Harm resulting from production of substances of very high concern and persistent chemical agents. • Wastewater discharge into the sea.	Using biofuel instead of oil fuel to heat houses through heat pumps. Phasing out production of mercury-containing goods mercury industrial production. Financing of maritime activities (Over SEK 1.3 million was spent for this purpose in the period of 2010-2012). Possibility of free waste washout for all ships at the ports of Stockholm. Complete solid waste disposal and/or recycling.	0.3	0.1
Singapore	• High level of air pollution. • Freshwater scarcity. • Increasing anthropogenic disturbance caused by rapid population growth and geographical limitations. • Scarcity of landfill sites for industrial waste. • Industrial pollution from refinery plants and manufacturing industries.	Restriction of the use of personal vehicles use and promotion of cycling. Implementation of the project on intensive improvement of the Singapore River conditions. Creation of an effective waste management system based on reuse. Establishment of the environment monitoring service.	0.7	0.1
Finland	• Significant amount of primary energy resource consumption and under-utilisation of secondary energy resources. • Large amounts of industrial waste. • Pollution of aquatic environments.	Promotion of renewable energy (38.7% of the total energy consumption). Investments in the «full cycle economy»; this economy requires both recycling and the use of by-products as raw materials. Establishment of requirements aimed at the replacement of chemical fertilizers with organic fertilizers in agriculture. Implementation of both national and international projects to reduce hazardous emissions into water bodies. Continuous monitoring of the ecological state of aquatic environments.	0.6	0.2
The Netherlands	• Environmental pollution in areas with dense population (air pollution, water and soil contamination, greenhouse effect and a high level of noise). • Ensuring protection of special natural zones.	Elaboration of «green» policies due to which the environmental load in densely populated areas of the Netherlands has considerably decreased regarding air, water and soil or stabilised including noise pollution and the greenhouse effect. Introduction of legal restrictions concerning land use and the consent to implement environmental measures. Creation of unique natural. Provision of public financial support to private investors in terms of acquisition and management of such zones.	0.6	0.2
The United States of America	• Air pollution. • Accumulation of municipal solid waste caused by remoteness of waste storage and disposal sites from major cities and large metropolitan areas.	Shift to renewable energy sources (the sun, wind, water, the Earth's internal heat). Availability of cleaner fuels for vehicles (for example, hydrogen). Separate waste collection and acceptance of recyclables for their subsequent processing (for example, 30% of garbage is used as secondary raw materials without removing it from agglomerations; 60% of steel and 20% of glass and paper is produced from secondary raw materials.	0.8	0.3
Denmark	• Substantial amounts of waste and extreme toxicity of processed products. • Increasing air pollution.	Assistance in construction and launch of new generation waste incineration plants (waste is incinerated to produce thermal and electric energy; high-temperature incineration and a large number of filters collection harmful substances make it possible to minimize damage to the natural environment). Integration of into municipal systems of heat and electricity supply (waste processing plants can provide about 20% of heat and from 3% to 5% of electric power). Promotion of cycling to reduce air pollution.	0.5	0.1
Luxembourg	• Increasing air pollution (car exhausts, emissions from household fuel combustion). • Insufficient quality of drinking water. • Accumulation of industrial waste. • High incidence of respiratory and cardiovascular diseases caused by air pollution.	Support to the development of eco-companies promoting renewable energy resources, recycling of waste, water conservation and ecological construction. Their activity is supported by government organisations and research institutes. Establishment of an enterprise which is responsible for emissions trading and investments in production capacities of the CIS countries and Eastern Europe which are aimed at decreasing carbon emissions.	0.8	0.2
Hong-Kong	• High level of air pollution. • Increasing anthropogenic disturbance caused by rapid population growth and geographical limitations. • The «wall effect» which prevents normal air circulation in areas with dense multi-storey building.	Prohibition on transport with a high level of emissions. Facilitation of measures aimed at decontamination of rivers. Construction of a new gas pipeline allowing one half of Hong Kong power plants to use natural gas for their operation. Strengthening of building regulations.	0.3	0.1

Note: [1] - World Bank Open Data (2017). CO_2 emissions (kg per PPP $ of GDP) in 1990-2013.
Retrieved from http://data.worldbank.org/indicator/EN.ATM.CO2E.PP.GD?end=2013&start=1990
Source: Compiled by the authors based at the latest data available in May 2017 from the World Bank and national environmental agencies and organisations, in particular: https://www.esa.org; http://www.britishecologicalsociety.org; http://www.foei.org etc.

of economy (the last column in Table 1). In that connection, it would be useful to draw a comparison between the Russian Federation and the leading countries. According to the World Bank, the carbon emissions economic intensity index for the Russian Federation is 0.5. This roughly corresponds to indicators of some leading countries of a quarter of a century ago. At the same time, Russia faces typical environmental problems which are common for most industrialised countries.

Let us provide a brief overview of the relevant problems in Russia without focusing on their scale and prevalence. These are air pollution (mainly industrial and vehicular in its origin); poorly controlled deforestation (especially in the northwest of the country and in Siberia); water and soil contamination by industrial and household wastes, agricultural chemicals, oil products, as well as lack of an efficient recycling system of household waste. On average, 400 kg of municipal solid waste for every Russian citizen per year, the largest part of which is stored without adequate recycling. This, in turn, generates technological and environmental risks in areas of the most intensive economic development), which leads to the destruction of natural biocenoses (destruction of reserved zones, poaching, etc.

It appears from the abovementioned list made by the authors of the analysis on the basis of government documents, analyses of non-governmental ecological organisations and publications in scientific and business literature, the list of Russian environmental problems is quite typical. It has no fundamental differences from those problems which other countries have; and the ways to solve these problems are known and successfully put into practice. As experience shows, these problems are solvable. The successful resolution of the relevant problems is determined by allocated resources and attention to the problems from the part of government organisations, business community and the general public, as well as by their joint activity.

On a positive note, it should be pointed out that there is a federal managing body in the Russian Federation, which establishes environmental policies. This body is the Ministry of Natural Resources and Environment of the Russian Federation. This ministry implements government programs on environmental protection, reproduction and use of natural resources and forestry development. These programs should be implemented no later than in 2020. At the same time, the analysis of activities related to the process of sustainable development shows that the systemisation of such activities is insufficient. The relevant policies are often controversial and inconsistent. The abovepresented prompted the authors of the article to develop guidelines for public policies related to the reduction of the impact of economic activity on the environment.

4. The proposed directions of public policy to support green economy and sustainable development

A number of international conferences have been held on sustainable development and the conceptual problems of green economy. In particular, in 2012, at the United Nations conference on sustainable development, it was offered to speed up work on the following directions: fight against poverty, taking measures to neutralise destruction of the marine ecosystem, green urbanisation, active use of renewable energy sources, increased control over carbon dioxide emission, forest protection and reforestation, fight against desertification, increase in effective management of water resources.

There are also other priorities in the formation and stimulation of green economy. They are stated in both national and international documents, as well as in research publications [21; 23; 25; 28-30]. A comparison shows that these priorities are often created rather eclectically. This creates difficulties in attaining such priorities. It is therefore proposed to structure and systematise main directions of green economic activity in order to find adequate solutions to environmental problems and to ensure sustainable development of the economy (Figure 1).

These trends can be a structural basis for the development and realisation of relevant public policies. Let us consider them in more detail.

To begin with, we should mention utilisation activities and safe processing of pollutants, and neutralisation of other harmful effects of human economic activity on the environment.

According to available data, nearly one half (47.8%) of production and consumption waste is processed and neutralised in the Russian Federation annually (Figure 2).

It should be mentioned that despite crisis phenomena in the Russian economy, reported expenditures on environmental protection in the national currency have been increasing. Due to rouble inflation in the period of time under investigation, the tendency shown in US dollars looks in another way. According to official statistics, expenditures on environmental protection accounted for USD 14.34 billion in 2012, USD 15.05 billion in 2013, USD 15.05 billion in 2014, USD 9.21 billion in 2015. On average, between 2003 and 2016, expenditures on environmental protection in the Russian Federation were 0.9% of GDP. This is a very large portion of overall spending. It is comparable to the level of public spending on research and development, which according to the UNESCO Institute for Statistics (2012) makes up 1.16% of GDP in Russia.

It is possible to say that efforts made in the Russia Federation to decrease negative impacts of economic activity on the environment are successful. According to the Report on Human Development in the Russian Federation, GDP growth rates of in the Russian Federation considerably exceeded growth rates of greenhouse gas emissions at the beginning of the 21st century, and the carbon intensity of GDP had been steadily decreasing since 1999; the implementation of specific measures to reduce carbon dioxide emissions allowed Russia to become the world leader in terms of decreasing greenhouse gas emissions among the major emitting countries (S. N. Bobylev, 2013). In this regard, the task of decreasing the gap between Russia and developed countries in terms of reduction of carbon intensity of the economy is solvable.

There have been extensive efforts to decrease anthropogenic impact on the environment in other countries. In this regard, the leadership of economically developed countries is undoubted.

Such leadership is due to two main factors. Firstly, it is conditioned by their more considerable technological and financial capabilities. Secondly, it stems from a high level of economic and social development, which generates higher pollution of various types. The first circumstance is usually the focus of attention of researchers, whereas the other is often neglected. Yet, the latter has indisputable statistical confirmations. In OECD countries, carbon emissions per capita account for 9.6 tons per year (2013), whereas the similar average world indicator is 3.4 tons per year[2]. Thus, a higher performance of environmental protection activities in developed countries is in many respects determined by the need for neutralisation of environmental pollution.

Also, it is necessary to point out the development of methods of beneficial use of pollutants, not only in terms of recycling but also in view of the development of new types of production and economic activity.

This trend in green economic activity is closely connected with innovative activity because it is related to the development of new technologies and products, as well as their advance in real economic activities. Institutional incentives for waste recycling production also play an important role to provide effective environmental regulations to business practice.

Recycling of dumps at mining and processing plants is a particular case illustrating these ideas. For example, the dumps at mining and processing plants (MPPs) of Kursk Magnetic Anomaly exceeds 320,000 thousand tons. Gold, uranium and rare-earth elements are dumped into tailings together with non-magnetic fractions (haematite). According to the state-owned enterprise «Nevskgeologia», no less than 1.5 tons of gold and 2 tons of uranium per year have been taken into tailings of Mikhailovsky MPP for the last 30 years. In general, expected resources of gold in wastes of four MPPs are no less than 3 tons per year at the total gross of 0.5-0.6 g/t. According to the research by Tula Central Geological Research Institute for Nonferrous and Precious Metals conducted in 1977-1979 at Lebedinsk and Mikhailovsky MPPs, as well as at the concentration plant of Gubkin mine, gold content is 0.2-9 g/t. (V. N. Anisimov, 2009).

[2] OECD Indicators (2015). *Environment at a Glance 2015.* Paris: OECD Publishing. doi: https://doi.org/10.1787/9789264235199-en

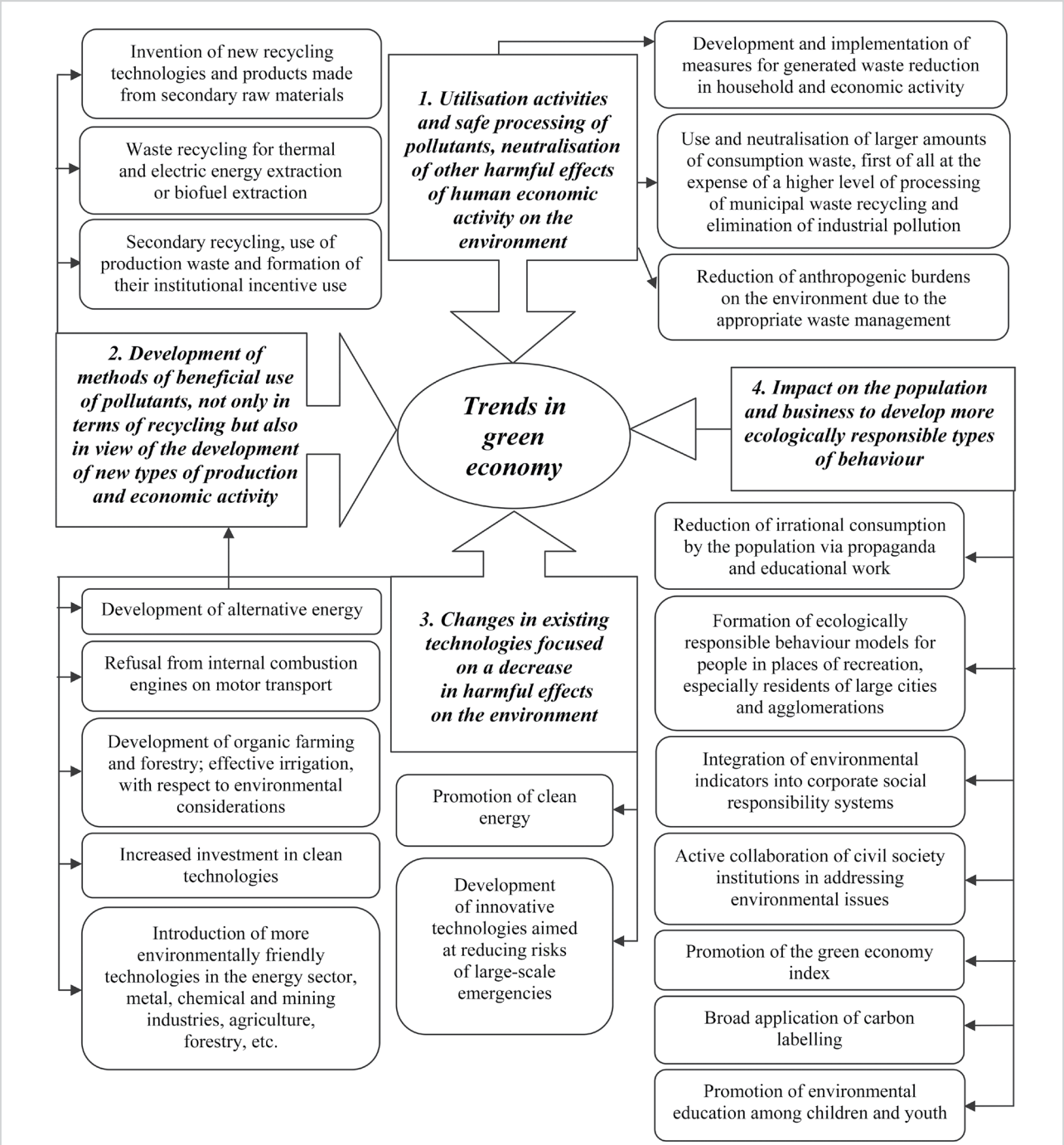

Fig. 1: **Main trends in the development of green economy implemented through public policy**
Source: Compiled by the authors

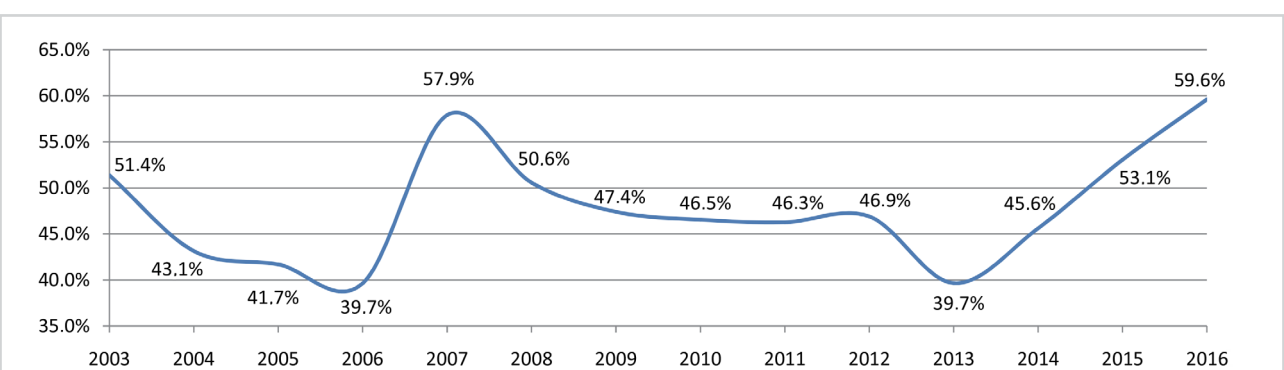

Fig. 2: **Share of processed and neutralised production and consumption waste in the Russian Federation, %**
Source: Compiled by the authors based on data from the Federal Statistics Service of the Russian Federation

According to experts, gold concentration in mining dumps of Kursk Magnetic Anomaly is at a level allowing its commercial mining. The same concerns other valuable minerals. Yet, there is no institutional basis for commercial use of specified dumps to decrease the technogenic impact on the environment. It demands changes in the development and realisation of public economic policy (D. S. Nadymov, 2015).

Production of thermal and electric energy from garbage is another example showing the development of green economy. Sweden is the world leader in this field. A. A. Nikulin (2013) says that 98.6% of waste undergoes processing to produce electricity; there are 31 waste treatment plants and 57 enterprises recycling solid domestic waste. Due to the country's integrated waste management, the removal of waste to landfills has decreased to 1.4% during the last 15 years. The amount of energy received from wastes has grown to 48.4%. Ash resulting from processing of waste into heat and electricity is further sent to waste landfills (A. A. Nikulin, 2013).

There are similar developments in Russia. For example, in 2016 scientists and engineers of Southwest State University received a patent for technological complex and ecologically and economically effective waste recycling[3]. Professor Yu. V. Vertakova is one of the co-authors of the development. Effective recycling, as well as considerable amounts of biofuel, is a result of the introduction of this innovative technology. Obtained biofuel can be used for both household and production purposes. The implementation of the abovementioned development is, however, being delayed because of a number of problems related to public regulation and promotion of environmentally friendly technologies in Russia.

Changes in existing technologies focused on a decrease in harmful effects on the environment, development and introduction of more environmentally friendly technological processes, including closed cycle technologies and environmentally friendly products, are important elements of «greening» of modern economy.

Refusal from internal combustion engines on motor transport is another example of «green». Production and sales volumes of electric vehicles are steadily growing in the world. According to the analytical agency *Avtostat* (https://www.autostat.ru/news/23599), the volumes of production and sales exceeded 400,000 thousand units in 2015, an increase of 30% if compared with the year 2014. China is the largest market of electric vehicles in the world. 100,000 electric vehicles were sold on that market during the 9 months in 2015. The USA, where 82,000 electrically driven cars were sold over the same period, is the second largest market. At the same time, in some European countries sales of electric vehicles are so great that it can be said already that there occur qualitative changes in this sector. In this respect, Norway is the European leader with its 22% in 2015, compared to 14% in 2014 and the Netherlands coming second with its 6% and 4%, respectively.

Also, hard work on introduction of ecologically safer technologies reducing harmful effects on the environment is being carried out in power industry, metallurgical, chemical and mining industries, agriculture, etc. A decrease in harmful effects of economic activity on the environment is a result of such efforts. Naturally, this decrease in the negative impact is unequally distributed across branches, regions and countries. Nevertheless, this is the most important trend in the development of green economy which is supported both publicly and in private and fostered by specially designed taxation and subsidy systems.

In particular, recent years have seen rapid progress in the development of alternative energy. Its relevance is determined by not only its environmental friendliness, but also by a possibility to provide the energy security of fossil fuel importing countries who are the world leaders, e.g. Japan, Germany, etc. The growth in world energy prices in 2003-2008 caused by lower volumes of production of cheap oil at established fields, as well as by a growth in demand for gas and crisis situations in North Africa and in Middle East in 2011, which increased the risks related to oil supplies and triggered a new round of the rise in prices in 2008-2009, stimulates the growing interest of oil and gas importers in alternative energy sources (B. N. Porfiriev, 2013). Despite the fact that from the midpoint of the second decade of the 20th century world oil prices have significantly decreased, according to forecasts of the IEA, OPEC and other organisations, oil will continue to rise in price in the long term, which necessitates the need for alternative sources of energy.

The issues mentioned above are institutionalised worldwide. The Renewable Energy Directive was adopted in the EU in 2008. It should provide a growth in electric power obtained from renewable sources of energy in the total production of electric power from present 7.8% to 20% by 2020. The American Recovery and Reinvestment Act of 2009 provides growth from 3.1% in 2007 to 10% in 2012 and to 25% in 2020. In Brazil, biomass plants used to produce ethanol provide 2/3 of renewable power which covers up to 40% of demand for motor fuel, whereas 1/3 of power is produced by hydroelectric power plants which are the basis of the national electric power industry with approximately 76% of electricity production. The Law No. 12187 institutes Brazilian National Policy on Climate Change (Law 12.187/2009) provides further accelerated development of low-carbon power and economy for the period till 2030, including increasing production of ethanol and its export. India has removed taxes on components of environmentally friendly technologies and announced its intention to establish penalties for delays in installation of helio-equipment. Such steps have increased interest of business in green energy projects. China has achieved development at the expense of renewable energy sources (excluding hydroelectric power plants) which accounted for 3% of electric power in 2010. The Chinese government has set the goal of increasing the indicator to 8% by 2020. According to XII Five-year national development plan, the country's energy intensity of GDP is to decrease by 40%-45% in 2020 and by 60-68% in 2050.

Further, it is necessary to point out Australia's and Mexico's experience, taking into account a certain degree of similarity between the economies of the above countries and the Russian economy in terms of the economic contribution of the mineral and raw material, and energy sectors to GDP production. In 2000, Australia adopted an Act which introduced the amount of the obligatory use of renewable energy sources with the share of its consumption up to 10% by 2010. The trigger was reached in 2009 due to the country's high pace of development. Simultaneously, a new law was adopted in addition to the Renewable Energy (Electricity) Act of 2000, setting binding rules that will increase the aforementioned share to 20% by 2020, which is common for the EU member-states as well. As for Mexico, one of the world leading oil exporters, in recent years the country has been developing renewable energies, especially wind energy. The country assumed the obligation to produce no less than 26% of electric power by using renewable sources of energy by 2012, which had been achieved by that time.

It is worth mentioning that the formation of ecologically responsible behaviour models for the population and business is essential. This will reduce both unsustainable production and negative impacts on the environment. Such advocacy can be done as day-to-day activities (social advertising, studying ecologically responsible behaviour in schools, etc.) or as socially significant campaigns. For example, according to Moscow Department of Fuel and Energy, the load on the energy grid of the city of Moscow decreased by 241 megawatts during the «Earth Hour» (from 20:30 till 21:30 on 19 March 2016). The city authorities turned off the architectural lighting on 1,500 buildings and constructions. However, the estimated savings from these actions were only about 9% of total electricity saving. The rest is the result of the inhabitants' social and environmental activity.

One more example of similar impacts on the population is the formation of ecologically responsible behaviour models for people in places of recreation, which is especially important for those who live in large cities and agglomerations. For example, 360 minutes for Baikal, a large-scale environmental event, has been held annually since 2011 with the support of the Ministry of Natural Resources and Environmental Protection of the Russian Federation and the Russian Geographical Society. In 2013 about one thousand people took part in the event;

[3] Emelyanov, S. G. et al (2013). Patent RU 2478169 «Plasma-chemical method for processing solid household and industrial waste». Retrieved from http://www.findpatent.ru/patent/247/2478169.html (in Russ.)

they collected and removed for disposal more than 2 thousand 130-litre bags with garbage. There are many more similar instances in Russia and in other countries from year to year.

It is necessary to add that the so-called carbon labelling of food and other products, which determines the amount of carbon dioxide emitted to bring a product to market, has been widely used in the United Kingdom since 2007, and in other European countries and the USA in succeeding years. Although, the awareness of such labelling is substantially lower than environmental or eco-labelling, for example in the United Kingdom the comparable figure was 20% to 54%, the sales of carbon-labelled products in 2010 exceeded the sales of products with environmental or eco-labelling (GBP 2 billion to GBP 1.5 billion, respectively) [1].

Special indexes introduced by large banks and exchange groups can serve as an effective tool for the implementation of green economy, in particular, the Global Green Economy Index developed by the Nasdaq OMX Group in September 2010 with the purpose of attracting investors. It is a global reference point for institutional and individual investors and covers 350 exchanges from 13 economic sectors, including new materials production, energy efficiency, renewable energy, biofuel, equipment to control environmental pollution, waste recycling and green building) in which 460 large companies are involved a level of capitalisation no less than USD 50 million [3].

In our opinion, active collaboration of civil society institutions in addressing environmental issues is one of the most important trends. In modern conditions, the development of green economy is impossible without raising the awareness of members of society and their concerned attitude to problems of social, economic and environmental development.

5. Conclusions

This research has proved that environmental problems are global in nature and the development of green economy is in the current interest across countries. To solve problems considered in the present article, we have highlighted several milestone trends in the development of green economy, which should become an integral part of public policy. These trends correspond to the following:

- utilisation activities and safe processing of pollutants, as well as neutralisation of other harmful effects of human economic activity on the environment;
- development of methods of beneficial use of pollutants, not only in terms of recycling but also in view of the development of new types of production and economic activity;
- changes in existing technologies focused on a decrease in harmful effects on the environment;
- development and introduction of more environmentally friendly technological processes, including closed cycle technologies and environmentally friendly products;
- impact on the population and business to develop more ecologically responsible types of behaviour;

Efforts undertaken by various countries, including Russia, to reduce the negative impact of economic activities on the natural environment can be considered successful and they correspond to global trends in the implementation of sustainable development policies. The involvement of both activists and civil society institutions in the relevant processes is considered to be a sign of the greening of the economy. The proposed guidelines for public policies in the area of green economy may become part of sustainable development programmes worldwide.

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