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METHODOLOGY FOR ASSESSMENT OF THE ECONOMIC AND NATURAL COMPONENTS OF GREEN GROWTH OF UZBEKISTAN

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Abstract

The present research article provides an assessment of the economic and natural components for green growth of the economy for a single state, in our case the Republic of Uzbekistan was used. Indicators of sustainable development must reflect the economic, social and environmental aspects of meeting the needs of the present generation without limiting the needs of future generations to meet their own needs. Based on the eco-economic analysis, the main indicators of green economy have been developed, consisting of general indicators of economic development, water resources, agriculture, electric power and energy efficiency. With their help, it is possible to implement the eco-economic development directions of the "green" economy of the country.

Key words: Indicators, Economic aspects, Natural aspects, Green economy, Water availability, Water resources, Elimination of water scarcity, Electric power and Energy efficiency.

1. Introduction

Actuality of Problem

As a result of global warming in Central Asia over the past 50 - 60 years, the area of glaciers has decreased by about 30 %. The analysis showed that with an increase in temperature of 20 °C, the volume of glaciers will decrease by 50 %, and with a warming of 40 °C by 78 %. According to scientists, by 2050, water resources are expected to decrease by 5 % in the Syrdarya basin, and by 15 % in the Amudarya basin. According to experts' calculations, the total water deficit in Uzbekistan for the period up to 2015 amounted to more than 3 billion m^3, by 2030 it may amount to 7 billion m^3 and by 2050 - 15 billion m^3.

The economy of Uzbekistan is among the top ten countries in the world in terms of energy and carbon intensity of GDP. Energy consumption for the production of a unit of GDP in the world in 1990-2019 decreased from 0.170 kg to 0.110 kg AD, this indicator in Uzbekistan decreased accordingly from 0.689 kg AD. up to 0.150 kg AD Consequently, the energy intensity of GDP in Uzbekistan is still above the world average. This figure is twice as high as the level in the UK, Italy, Turkey, Spain, Germany. Despite the fact that the carbon intensity of the economy has dropped sharply in Uzbekistan, it is 1.5 times higher than the global average.

Over the past decade, humanity has simultaneously experienced several crises: the climate crisis, the biodiversity crisis, the fuel, food, water, and in recent years, the crisis of the financial system and the economy as a whole. The increase in global climate-changing emissions points to the growing threat of rapid climate change, which could lead to catastrophic consequences for humanity. The spike in fuel prices in 2008 and the associated rise in food and commodity prices point to structural weaknesses and risks that remain unaddressed. Growing demand predicted by the International Energy Agency (IEA) and others suggests continued dependence on oil and other fossil fuels and significant increases in energy prices at a time

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when the global economy is looking to recover and grow.

On the issue of food security, we are seeing a lack of public understanding of the nature of the problem, as well as a lack of global cooperative solutions to feed the 9 billion people who will inhabit the Earth in 2050. Fresh water scarcity is already a global problem, and, by 2030, there will be a growing gap between the annual demand for fresh water and its supply from renewable sources. Probability of improved sanitation for more than 2.6 billion people still remains low; 884 million people still lack access to clean drinking water. Together, these crises are drastically reducing humanity's ability to maintain the achieved standard of living worldwide and achieve the Millennium Development Goals to reduce extreme poverty. They exacerbate persistent social problems associated with job loss, socioeconomic insecurity and poverty, and threaten social stability.

Legal framework for "Green economy"

Climate change and its consequences are priority challenges and threats to the global sustainable development of the world economy and the well-being of the world's population. This problem affects important sectors of the economy, such as agriculture, energy, infrastructure and healthcare, which in turn negatively affects the growth rate of GDP production, modernization of the economy and, ultimately, the environmental and national security of the country. According to a Swiss Re Institute report, the global economy could shrink by 18 % over the next 30 years. In particular, under a worst-case scenario of a 3.2 °C rise in temperature, China could lose almost a quarter of its GDP (24 %) by mid-century. In the US, Canada and the UK, losses will be about 10 %.

Europe will be affected slightly more (11 %), while countries such as Finland or Switzerland are less at risk (6 %) than, for example, France or Greece (13 %).

To achieve green and sustainable economic growth, the world community is actively implementing strategies and measures to combat climate change and its negative consequences.

i) Paris Agreement. Within the framework of the 21st session of the Conference of the Parties to the UN Framework Convention on Climate Change on December 12, 2015 in Paris, 196 countries adopted an agreement on climate change, the task of which is to keep the increase in global average temperature to 1.5 degrees Celsius. The entry into force of the Agreement took place on November 4, 2016.
ii) The 2030 Agenda for Sustainable Development. In 2015, world leaders of all countries approved the 17 2030 Sustainable Development Goals proposed by the United Nations.

The program includes: 17 goals, 169 targets and 230 indicators aimed at eradicating poverty, reducing inequality and protecting the planet (Pearce, 1992). The program is viewed through the prism of three main elements: social inclusion, economic growth and environmental protection; and is based on five major aspects: people (people), prosperity (prosperity), planet (planet), partnership (partnership) and peace (peace), also known as 5Ps.

Most countries of the world are gradually making the transition to a green economy, where ecology is the engine of progress. The concept of the green economy emerged in the last two decades and is closely related to the concept of sustainable development. Practice proves that sustainable economic growth is the only source of increasing incomes and, accordingly, investments to eliminate accumulated environmental damage, "green" modernization of production, which increases the productivity of primary resources and, consequently, reduces the resource intensity of the economy and the load on life-supporting environmental ecosystems (Kennet, 2006). The term "green" economy itself was first introduced into scientific circulation in 1989. Although there is no single definition of the green economy, there

is a general understanding that it means an economy that improves human well-being and social equity, significantly reducing environmental risks and scarcity of environmental resources, and is aimed at sustainable development without environmental degradation (Clapp and Dauvergne, 2011).

At the end of 2019, the EU launched the European Green Deal, which aims to achieve carbon neutrality by 2050. Achieving this goal will require concerted action by all sectors of the EU economy, including

- Investing in clean technologies.
- Support for industry to innovate.
- Introduction of cleaner, cheaper and healthier modes of private and public transport.
- Decarbonization of the energy sector.
- Improving the energy efficiency of buildings.
- Working with international partners to improve global environmental standards.

The European Green Dea1 also provides for an intermediate goal of reducing greenhouse gas emissions from 40 % to at least 55% by 2030 (compared to 1990) (Hallegatte, 2011).

For this, a roadmap was adopted - the main document that defines the main directions and actions of the EU for the transition to climate neutrality. It outlines the necessary investments and available financing instruments and explains how to ensure a just and inclusive transition to help those most affected by the transition to a green economy. The Green Deal covers all sectors of the economy, especially transport, energy, agriculture, and construction.
In countries where public funding, dependent on tax revenue and the government's ability to leverage capital markets, is limited, subsidy reform and tax policies can be used to increase green investment. For example, energy, water, fisheries and agriculture subsidies drive down prices and encourage overconsumption of the associated natural capital. At the same time, they place a heavy burden on the state budget. The phasing out of such subsidies and the imposition of taxes on the use of energy and natural resources will improve efficiency while strengthening public finances and freeing up resources for green investment. The elimination of subsidies only in these four sectors, for example, would save 1 – 2 % of world GDP annually (Hallegatte, 2011).

2. Literature Review

Foreign scientific school for "Green economy"

Among the foreign scientists whose works are devoted to the problems of "green" economy (in earlier years called the ecological economy) can be distinguished Pearce (1992), Kennet (2006), Clapp and Dauvergne (2011), Haegatte (2011), Zomonov (2015), Bobylev (2018), Bulgakov and Nabok (2017).

Researchers for "Green economy" in local area

The materials of national authors related to the transition of Uzbekistan to a "green" economy, the use of energy potential and the development of renewable energy sources were also used, including Eshov *et al.* (2022), Mentel *et al.* (2022), Parpiev (2016), Tsoy (2022).

3. Methodology

World practice shows that the principles of green economy should be based on the well-being and socio-economic development of the country and the region, as well as ensuring economic security and quality of life of the population.

Indicators are the main indicators of sustainable development, including indicators of environmental and energy efficiency, agriculture, the definition of which should be consistent with the natural and geographical and socio-economic conditions of the country, which are necessary to assess and predict its development. As a result, the following main indicators were identified:

- General, which are territory (thousand sq. m.), population (million people), GDP per capita.

- Water resources: eliminating water scarcity at the national level, integrated use of water resources for hydropower and irrigation.
- Agriculture: agricultural lands (%), irrigated land (mln ha), forest area (thousand hectares).
- Electricity: renewable energy potential (GW), total installed capacity of power plants (MW), hydropower plant output (%), share of electricity generated by coal (in %).
- Energy efficiency: reducing the energy intensity of GDP, useful power supply (GWh), dioxide emissions per capita (million tons), energy transmission and distribution losses (%). These indicators are not new and are cited by many authors in studies.

The development of a green economy in emergency circumstances corresponds to a guaranteed minimum-necessary supply. The minimum-necessary (guaranteed) volume of supply must prevent problems. These include: serious deterioration of life and health of the population; emergence of serious social conflicts; failure of large vital industries; escalation into cascading (chain) accidents; unacceptable large economic damage; instability of the political situation, civil peace, harmony and territorial integrity. (Fig.1)

"Green" economy should be provided by a set of economic, regulatory, organizational, scientific, technical and other measures that form the following:

- First, opportunities for survival when a crisis arises.
- Secondly, the protection of vital interests in terms of resource potential.
- Third, the means and methods of protection against destabilizing influences.
- Fourth, the competitiveness of products; a normal standard of living for the population and sustainable personal prospects for residents.

Indicators are mainly needed for planning and forecasting of specific areas, policy development, etc. For an objective assessment, it is not enough to show general indicators, such as GDP growth, etc. It is also necessary to take into account efficiency, resource conservation, preservation of the natural environment. To analyze and assess the economic and natural components of the "green" growth of Uzbekistan and the prospects for green economy in Uzbekistan, we used information from official sources, data from statistical reporting of the State Committee of the Republic of Uzbekistan on Energy Development for 2010 - 2020, and also used the Strategy for the transition of the Republic of Uzbekistan to a green economy for 2019-2030 from 4.10.2019.

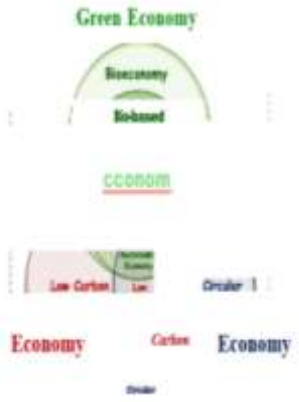

Figure – 1: Various economies in green economy

4. Analysis and Results

Data collection

In order to carry out a comparative analysis of stable-sustainable economic growth, the environmental-economic-social factors are selected, which can correspond to and take into account the main directions of the country's development (Table - 1). The data in this table shows that GDP per capita in the country in 2020 was 16949.1 thousand UZS. Another important indicator of green economy is exclusion of water resources deficit. As can be seen from the table, Uzbekistan's own flow is 13 km3 per year, and water availability of own water resources per capita is equal to 383 thousand m^3.

Another important indicator is the development of the hydropower sector, where the use of water resources for hydropower accounts for 47 %, and the use of water resources for irrigation accounts for 53 %. The renewable energy potential in Central Asia is equal to 13747 GW, where the potential of Uzbekistan today is only 13.4 % (1844 GW). As mentioned earlier, one of the principles and mechanisms for the development of a "green" economy depends, firstly, on the maximum use of renewable energy sources, and, secondly, the minimum dioxide emissions. As can be seen from the table, the level of renewable energy use in the country is 21%, and dioxide emissions in CO_2 equivalent is 96 mln.t.

As part of the definition of the country's green growth opportunities, its indicators are outlined.

Using the formula, let us determine the indicator of water resources availability:

Cw = Vf / P , (1)

where: Cw is a coefficient of water resources availability; Vf is a volume of own flow formed on the territory of the country, km3/year; P is a population, million people. There are additional possibilities for the availability of water resources (Iw). We will define the following coefficients:

Iw = 1 - significant; Iw = 0 - insignificant; Iw = - 1 - deficit state, where:

Iw=l if Cw > 1.7 Iw = 0 if lñ Cw < 1.7

Iw= -1 if Cw < 1 (2)

For irrigation, the indicator of total water resources use at the pool level and RES is determined by the formula:

lawr = Vres/ Vwu , (3)

where: Iawr- indicator of aggregate water resources use, %; Vres - volume of RES use, %; Vwu - volume of water use for irrigation, %.

Let us use the following formula to determine the following indicator of RES development: Ires = Nhpg/ Nc, (4)

where: Ires - RES development indicator, in %; Nhpg - hydro power generation, MW; Nc - total installed capacity of power plants, MW.

There are also additional categories of renewable energy sources (Ires) use. We denoted the coefficients:

Ires = 1 - high, Ires= 0 - baseline and Ires = -1 - low state, where:

Ires=1 if Cu 70 Ires = 0 if 35 S Cu

Ires= -1 if Cu >20 (5)

The dioxide equivalent share of total national emissions has additional dioxide emission indicator (Id) use categories. We labeled the coefficients:

Id = 1 - high, Id = 0 - baseline, and Id = - 1 - low state, where:

Id=1 if Cd < 15 Id = 0 if 15 < Cd

Id= -1 if Cd >50 (6)

Energy efficiency indicator of transmission and distribution losses. It has additional categories of use of the energy transmission and distribution loss (Ie) indicator. We labeled the coefficients:

Ie = I - high, Ie = 0 - baseline and Ie = - 1 - low state, where:

Ie=1 if Ce < 10%.

Approbation for Methodology

On this basis, we have identified the result of the level of use of the "green" economy by the indicator in the country. X is the result of each indicator by country. It is determined by the formula:

$$X — \sum I, \qquad (8)$$

Only two values are chosen as the value - X: 1 and -1 (for any negative and zero value). A value of 1 is a high level of indicator use, and a value of -1 is a low level.

Further, the coefficient of "green economy" is determined by the formula:

Cge = Iw+Ia+Ires+Id+ie, (9)

Only two values are chosen as the Green Economy Coefficient: 1 and -1 (for any negative and zero value), where: 1, the green economy coefficient is at a high level; -1, the green economy coefficient is at a low level.

For Uzbekistan (i=4) the level of green economy coefficient by value is equal to 1, because:

Cge = (-1)+1+(-1)+(-1)+l=1

Thus, in the country, as of 01.01.2020, the level of use of green economy was at a low level according to the analyzed data. Of the five main indicators, only such indicators as integrated use of water resources at the pool level and energy efficiency losses in the transmission and distribution of energy have a positive value. However, with the adoption in 2019 of the Strategy [4], the situation with the use of natural resources in the basic industries has changed for the better.

Based on the above, we can conclude that in the future the strategic direction of "green" economy development is the rational use of renewable energy sources. In our opinion, in order to further develop a "green" economy in the republic it is advisable to analyze and forecast changes in the most important socio-economic and environmental indicators. Thus, further steps to develop and use the indicators of "green" economic development should be aimed at their improvement. However, they should be interpreted depending on the specific country and its socio-economic conditions.

The interpretation of indicators is complicated by all sorts of trade-offs, different interpretations of problems related to transboundary or local level of environmental protection, short-term or long-term perspective. For demand indicators (e.g., CO2 intensity), the policy implications are complicated by multiple factors, including problems related to international trade and transport, trade and environmental policy coherence. Many of these problems can be overcome by adequate and timely reporting and interpretation of the indicators in the appropriate context, and by taking into account the specific environmentalgeographic, social, economic, structural, and institutional characteristics of countries.

If indicators are clear, they must be based on publicly available data and have a clear definition and methodology for data collection. Such requirements are very difficult to develop composite indicators (e.g., ratios, scores, or aggregation) in cases where interpretation is difficult or uncertain. Baseline data and assumptions (especially for aggregation) must be clear and accessible.

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Table – 1: Indicators of green economy for Uzbekistan

No. n/a	**Title**	**Indicator**
1	*Overall indicators*	
1.1	Territory, thousand sq. m.	33,9
1.2	Population, mln. people (as of 01.01.2021)	34,6
1.3	GDP per capita, thousand soums (2020)	16949,1
2	*Water resources*	
2.1	Elimination of water resources deficit at the national Level	
	Own flow formed on the territory of the country, km3/year	13
	Water availability of own water resources per capita, thousand m3/person	383
2.2	Integrated water resources use at the pool level	
	Volume of water resources use for hydropower, %	47
	Volume of water resources use for irrigation, %	53
3	*Agriculture*	
3.1	Agricultural land, (mln ha)	45
3.2	Irrigated land (mln ha)	4,4
3.3	Forest area (mln ha)	3,5
4	*Electricity*	
4.1	Diversification of the energy sector (share of own hydro	
	energy resources in the consumption on the territory)	
	Renewable energy potential, GW	1844
	Total installed capacity of electric plants, MW	12755
	Hydro power generation, %	21
	Hydro power generation, %	4
5	*Energy Efficiency*	
5.1	Reduction of energy intensity of GDP	10
5.2	Useful power supply, GWh	54081
5.3	Losses during transmission and distribution (%)	9
5.4	CO2 equivalent dioxide emissions, mln. tn	96

Source: compiled by the author based on official data

Thus, in the country, as of 01.01.2020, the level of use of green economy was at a low level according to the analyzed data. Of the five main indicators, only such indicators as integrated use of water resources at the pool level and energy efficiency losses in the transmission and distribution of energy have a positive value. However, with the adoption in 2019 of the Strategy, the situation with the use of natural resources in the basic industries has changed for the better.

Based on the above, we can conclude that in the future the strategic direction of "green" economy development is the rational use of renewable energy sources. In our opinion, in order to further develop a "green" economy in the republic it is advisable to analyze and forecast changes in the most important socio-economic and environmental indicators. Thus, further steps to develop and use the indicators of "green" economic development should be aimed at their improvement. However, they should be interpreted depending on the specific country and its socio-economic conditions.

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If indicators are clear, they must be based on publicly available data and have a clear definition and methodology for data collection. Such requirements are very difficult to develop composite indicators (e.g., ratios, scores, or aggregation) in cases where interpretation is difficult or uncertain. Baseline data and assumptions (especially for aggregation) must be clear and accessible. In this regard, there is a need to improve the conceptual approaches to justify indicators of green growth and the economy, the valuation of natural assets or environmental services. In this, the most obvious gap in the measurement of the components underlying the indicators of green growth and the economy is their lack of study. We adhere to the opinion of Zomonova (2015) that such components include the following:

a) Physical data: on key stocks and flows of natural resources and their quality. Such information includes: land and land use, natural resource use and wealth accounting, fish stocks, and groundwater resources; availability of waste absorption sinks to qualitatively describe critical resource use limits; and material flows. Such data can be improved by analyzing material flows and raw material consumption in the country at a more detailed level.
b) Valuation of natural resources. This assessment is necessary to account for welfare and economic growth, and to determine aggregation weights in the composite indicators. It can also help prioritize green growth and economic actions.
c) Data related to the environment about the drivers of innovation.
d) Data on biodiversity, especially species and ecosystems.
e) Value estimates of protected areas to account for well-being, as currently used by indicators based on the value of agricultural land.
f) Objective and subjective environmental quality of life indicators: health risks, public perceptions of quality of life and the environment.
g) Assessment of green growth and the economy related to their opportunities and transformation.

h) Assessment of environmental policy and the need to supplement the indicators of economic instruments with indicators of environmental regulation (e.g., standards).

5. Conclusion

In sum, the ideas and practical methods of transition to green growth (economy), supported by most countries of the world, make it necessary to develop methods of economic evaluation of natural capital and accounting of the environmental factor in the system of basic socio-economic indicators of development. General economic indicators usually do not take into account the contribution of the natural ecological environment to production for two reasons. First, the environment is not accounted for as a factor of production, and second, the existing traditional systems of growth accounting do not take into account the environmental "anti-benefits" (pollution and degradation) generated by production.

An integrated environmental and economic accounting system helps further break down the national indicators that are needed to focus on a selected problem or to understand the broader context of green growth and development.

A spatial breakdown helps to understand the relationship between the location of natural resource stocks, settlements, and economic activity. An industry (sectoral) breakdown helps to reflect structural changes over time, to analyze the environmental pressures of different sectors of production. In addition, it allows us to identify the effects of government actions, which include policies regarding incentives or limiting choices from the actions of the business sector or households. For example, these are policies that are caused by behavioral and voluntary reasons.
A key issue in developing and interpreting many indicators of green economic development is determining the extent to which one type of asset can be substituted for another. This applies both to the substitutability of natural capital with other types of capital (e.g., human or manufactured) and to the substitutability within natural capital itself. Substitutability can be dynamic and time-varying. Among the main areas of development of the green economy in the Republic of Uzbekistan, which need to be paid attention first of all, are:

- Introduction of clean technology. The concept of "clean technologies" includes five groups of technologies.
- Renewable energy sources (photovoltaics, wind energy, biomass, biofuels, biogas, solar thermal energy) and alternative energy.
- Environmentally friendly transport (alternative fuels, hybrids and electric vehicles).
- Electrical energy management systems (energy saving, smart energy systems, energy efficiency).
- Management of emissions, waste, transportation, collection, waste disposal and recycling.
- Innovative modern materials and technologies (biological technologies, nanotechnologies, eco-friendly materials). The use of affordable low-cost green technologies in energy, water and land use is an urgent task on the way to creating a green economy.

The spread of green technologies will significantly simplify government programs for the sustainable use of water resources, reduce the burden on natural ecosystems, reduce public spending and improve the quality of life of the population. Application of green investments. Although green finance as a segment of the financial market is still in its infancy, financial instruments such as green loans, green bonds, green investment funds and green stock indices are showing rapid development. According to expert estimates, by 2030 around 93 trillion dollars will be directed to the implementation of "green" projects in the world, which requires the widespread use of appropriate financial instruments.

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