# Renewable and alternative energy sources, green energy in the aspect of socio-economic factors of labor market regulation in modern conditions and environmental greening

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**Abstract.** Mankind needs energy, and the demand for it is increasing every year. However, the reserves of traditional natural fuels (oil, coal, gas, etc.) are finite. There are two ways left: resource saving and the use of non-traditional renewable energy sources. Energy is one of the main air pollutants. Power plants using traditional fuels contribute up to 30 per cent of harmful atmospheric emissions, pollute land and water with combustion products and wastewater. The gases emitted are largely associated with the greenhouse effect, the catastrophic consequences of which the world community is trying to prevent through the mechanisms of the Kyoto Protocol.

## 1 Introduction

At the present stage, the environmental agenda is topical due to the increasing anthropogenic and technogenic impacts on the climate and environment, leading to negative changes in the ecosystem. In recent decades, industrialised countries have been able to form a pool of environmentally responsible manufacturers implementing circular business models and capable of laying the foundation for the European Union's initiative to abandon fossil fuels in favour of renewable energy sources.

The need to comply with the principles of sustainable development in its classical sense - stable social and economic development that does not destroy its natural basis and ensures continuous progress of society [1-6] - has been identified, which reflects the prospects of alternative energy sources.

## 2 Materials and methods

Theoretical and methodological basis of the study was formed by scientific works of domestic and foreign authors in the field of research of renewable and alternative energy

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sources, green energy. The methodological basis of the study was economic and mathematical methods and system analysis.

## 3 Results

The renewable energy sector in Russia is underdeveloped and its share in the Russian energy system does not exceed 1%, while in the global market the share of RES has been growing for several decades, seeking to ensure environmental friendliness, energy security, increase economic efficiency, fulfil the social factor and provide employment (Figure 1).

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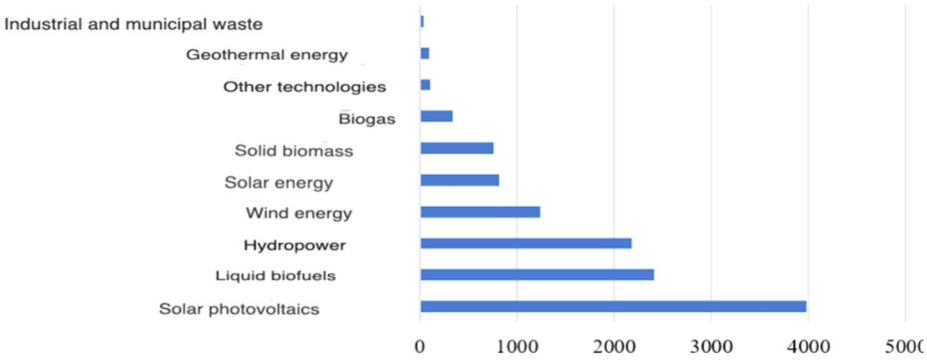


**Fig. 1.** Employment in renewable energy by technology, thousand, 2020 (Renewable energy employment by technology in 2020 // https://www.irena.org/Statistics/View-Data-by-Topic/Benefits/Renewable-Energy- Employment-by-Country).

Studies in the report "Energy for a Sustainable Future" show that "energy is paramount to development, global security, environmental protection and the Millennium Development Goals. Clean, efficient, affordable and reliable energy sources are essential for global prosperity" (Energy for Sustainable Future. Report and recommendations. The Secretary-General's Advisory group on energy and climate change (AGECC) // http://www.un.org/millenniumgoals/pdf/AGECCsummaryreport.pdf). The use of non-renewable energy sources can lead to a struggle for the remaining resources, including climate problems [7-9]. In Russia, gas-fired power plants are mainly used as sources of electric power generation (more than 50%), also 15% are NPPs and 15% HPPs, the rest are oil-fired power plants and others that emit harmful substances into the atmosphere [10].

The search for renewable energy sources has been going on for a long time. Renewable sources can replace traditional fuel fossils, reduce emissions of harmful substances into the atmosphere. There are several forms of renewable energy that are produced from sources such as solar, wind, biomass, as well as geothermal, hydropower, biogas and liquid biofuels. However, each type has its own advantages and disadvantages. The disadvantages of wind energy include the fact that they can be used not on the entire territory of the country, but only in areas where constant winds prevail, they are also capable of spreading low-frequency vibrations and oscillations, and can lead to the death of animals. And the use of water power in a large volume is also unrepresentative, as this method is very limited in use. In addition, the placement of plants in the territory of water bodies prevents the typical life of animals living in water due to the dynamic vibrations of the elements of the HPP construction.

The use of solar energy to power homes does not cause significant problems compared to other sources of renewable energy. Its disadvantage can be the inconsistency of the periods

of energy generation of its use, heating of the atmosphere within the territory of the panels use, some photovoltaic cells for solar panels produce toxic substances, so there are very strict requirements for the production of semiconductors for solar photo-electric installations, as well as for the storage, transport and disposal of harmful substances from the production [11-13]. Despite this, photovoltaic systems have a number of advantages such as quick payback, placement on any vacant area, no need to use fuel, and virtually no wear and tear effect.

However, there are possibilities to convert the sun's energy into electrical or thermal energy. For this purpose, solar panels and collectors are used to distribute solar heat. Solar energy can be converted using passive and active systems. In the first case, the technology consists in painting a special container black, as a result of which the liquid inside is heated by metal. But more common in the design of structures is the passive method, where collectors are used, which absorb the sun's rays and then convert them into thermal energy. The greatest demand is met with solar panels that convert solar energy into electrical energy. The disadvantage of solar panels is that if they overheat, a system will be needed to cool the batteries.

Let's consider the dynamics of implementation of renewable energy sources in the Russian Federation. According to data on global energy and climate, the share of renewable sources in electricity generation in 2020 was 20.3% (Figure 2).

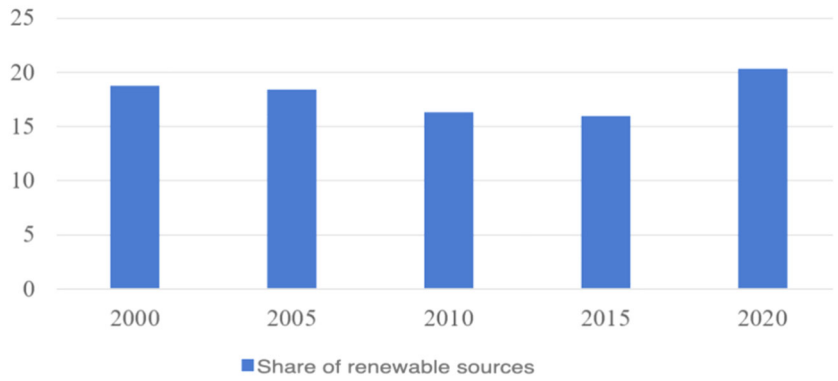


**Fig. 2.** Share of renewable sources in electricity generation in the Russian Federation, 2000-2020, % (The share of renewable energy sources in electricity production // https://yearbook.enerdata.ru/renewables/renewable-in- electricity-production-share.html).

Figure 2 shows the dynamics of the introduction and use of renewable sources in electricity generation is stable - since 2000, the indicator has changed by only 1.5%, which does not correspond to global trends in the development of alternative energy. It is necessary to highlight the leaders of renewable energy sources substitution in electricity generation (Figure 3). The presented data allow us to emphasise once again the low rates of renewable energy implementation in the domestic economy.

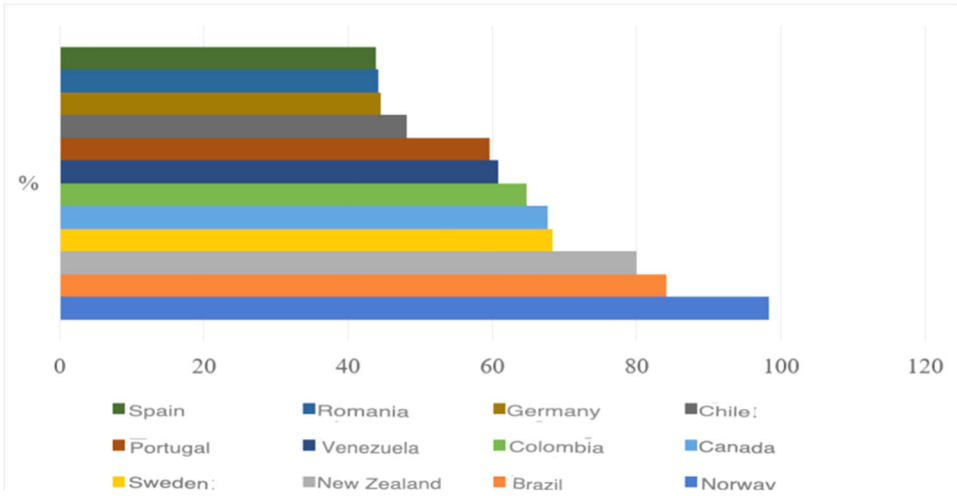


**Fig. 3.** Ranking of countries on the introduction of renewable sources in electricity generation, 2020 (The share of renewable energy sources in electricity production // https://yearbook.enerdata.ru/renewables/renewable-in- electricity-production-share.html).

In the perspective of alternative energy development in Russia for all types of sources (from geothermal energy, areas with high insolation to tidal energy). At the same time, it is especially important to provide regional support for alternative energy in the subjects with the greatest natural potential of renewable energy sources.

The leading regions in terms of installed capacity of RES generating facilities are the Orenburg Region, the Astrakhan Region, the Republic of Altai, the Ulyanovsk Region, the Samara Region and the Republic of Crimea (outside the RES incentive mechanisms). Under the current support mechanism, the Orenburg, Astrakhan, Rostov, Ulyanovsk Oblasts, Stavropol Krai, the Republic of Adygea and the Republic of Altai are the leaders in terms of commissioning.

Regional mechanisms of stimulation and formation of development strategies in the field of renewable energy sources are of high importance, determining the investment climate of the region. It is the implementation of regional development programmes that will help overcome global challenges, including crisis climate change, dependence on fossil fuels, and the depressed state of natural systems.

The green economy is an alternative vision of growth and development. It does not replace the current principles of sustainable development, but it places a new emphasis on the economy, investment, capital and infrastructure. The idea of a fair economy based on renewable energy and harmony with the world around us is attractive. At the same time, critics argue that attempts of green economy to separate economic growth from environmental impact are unsuccessful - the main economic growth of mankind in recent centuries has come from non-renewable technologies and traditional resource-intensive energy sources.

## 4 Discussion

Green Economy is an alternative vision of growth and development. It does not replace the current principles of sustainable development, but it places a new emphasis on the economy, investment, capital and infrastructure.

The structure of the green economy is illustrated in Figure 4.

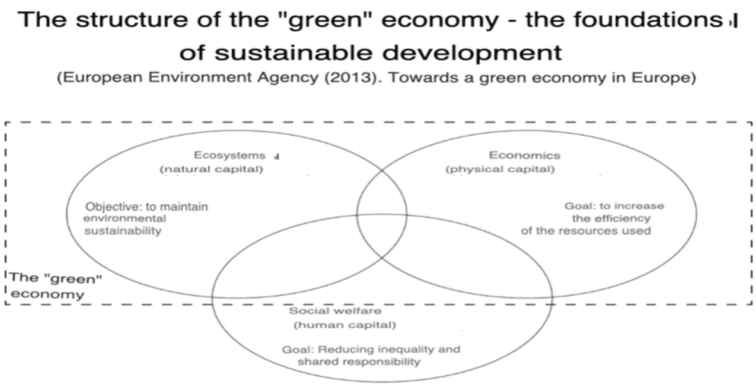


**Fig. 4.** Structure of green economy.

A green economy is a concept of economy that supports the harmonious interaction between humans and nature and attempts to meet the needs of both society and nature.

The main features by which a green economy can be described are low carbon, resource efficient and socially engaged economy. Employment and income growth should be fuelled by public and private investment primarily in those assets and infrastructure that reduce harmful carbon emissions and air pollution, improve energy and resource efficiency, and conserve our planet's biodiversity and ecosystem. These Green Investments should have public support in the form of additional spending in the budget, policy and tax reforms. The environment and nature in a green economy is a major economic asset and a source of public welfare, especially for the poor (Renewable energy employment by technology in 2020 / /www.irena.org/Statistics/View-Data-by-Topic/Benefits/Renewable-Energy- Employment-by-Country).

## 5 Conclusion

Green energy is a part of the energy production system which involves the use of alternative energy sources. Of the best known types of this energy, photovoltaic conversion of solar energy and utilisation of wind energy are most commonly used by mankind. However, currently used technologies in the field of green energy are not so developed. Their application has its own peculiarities. It will take more than one decade in terms of material embodiment to create new energy on solar installations and wind devices. The replacement of traditional coal, oil and gas power generation, which has been developed over a long period of time, will take the same amount of time.

The need for such a transition forms a number of issues in the field of determining the economic feasibility of green energy development as part of the energy production system of national enterprises. Russia has many large territories where there is an opportunity to implement alternative energy projects, in addition, there is a significant natural, economic and technical potential that remains unutilised. Modern "green" installations can compete with traditional sources in terms of production costs. As a result of fluctuations in the volume of green energy due to natural conditions, the cost of kWh may fall and the production of energy from conventional sources may become unprofitable. But at the same time, no economy can afford to completely abandon traditional sources. While an entire economy will not be able to abandon the use of traditional sources, it is possible to try to reduce their use

in specific companies. Each company will be able to individually solve the problem of using green energy technologies.

The idea of a fair economy based on renewable energy and harmony with the environment is an attractive one. At the same time, critics argue that attempts of green economy to separate economic growth from environmental impact are unsuccessful - the main economic growth of mankind over the last centuries has come from non-renewable technologies and traditional resource-intensive energy sources.

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