



GREEN ECONOMY: REALITIES, PROSPECTS, AND LIMITS TO GROWTH

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AND LIMITS TO GROWTH**

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Contents

Summary	1
Economic Modernization and “Green” Growth	3
The “Green” Economy – Possible Definitions	3
Energy Sector Modernization as the Foundation for Green Growth; Alternative Energy as the Core of the Green Economy	4
The Scale and Dynamics of Production and Employment	5
The Pace and Trends of Development of the Global Green Economy	6
Factors Influencing the Accelerated Development of the Global Green Economy	8
The Projected Development of the Global Green Economy	9
“Green Shoots” in the Russian Economy and the Development of Alternative Energy Sources: Prospects and Major Courses of Action	10
The Prospects for the Green Economy: Realized Expectations and Limits to Growth	12
Recommendations for Developing the Green Economy in Russia, with Alternative Energy as Its Core	14

Notes	19
About the Author	21
Carnegie Moscow Center	23

Summary

In official documents on developing a green economy, different states emphasize different aspects. The developed countries stress competition and jobs, while the developing ones accentuate sustainable development, solutions to the problems of poverty, and the issues of social justice and public participation. The BRICS countries (Brazil, Russia, India, China, and South Africa), for their part, focus on the effective use of resources. Actual ecological problems, primarily the limits to ecological development, are conspicuously absent from any of the above-mentioned documents, which proves that the economy itself and socioeconomic components are the most important parts of a green economy.

Key Themes

- The modernization and transition of the global economy toward the new technological order are the main vehicles of globalization. Along with tangible technological progress and increased production efficiency and competitive ability, the new structure is intended to improve quality of life and the living environment.
- At this time, the green sector of the global economy is relatively small, but it is characterized by exceptionally rapid growth, especially relative to the general economic slow-down of 2008-2012.
- Ensuring energy security for the countries that import fossil fuel, who are also the global economic leaders, is one of the major factors that contributes to the impressive development of the green economy and its alternative energy segment.
- In the short- and medium-term (until 2020), the green sector of the economy and particularly its clean energy component may become increasingly important.
- The prospects for the green industry and for Russia's general economic development are closely related to progress in the energy sector, especially to the development of alternative energy technologies.

Recommendations

Taking into consideration global energy diversification and decarbonization trends, as well as Russia's natural and socioeconomic characteristics, the following

innovations that stimulate further development of alternative energy can be recommended:

- Using energy efficiency and energy conservation technologies in building construction and reconstruction.
- Emphasizing energy conservation programs in the state-financed sphere as the most promising, specifically in the public area, and the housing and utility sector.
- Updating state procurement rules and procedures to conform to high standards of energy efficiency.
- Promoting energy-saving programs in the real sector, particularly a program that reduces energy consumption by major industrial producers.
- In order to develop renewable energy sources, replacing obsolete local production facilities and expanding them, using less expensive installations based on renewable energy sources, which would provide more flexibility in site selection, while not stopping work on nuclear power plants currently under construction and continuing to replace coal with cleaner gas.
- Adopting a system of differential electricity pricing based on its sources, with subsidies for alternative energy.
- The importance of changes in the field of the informal economy should not be underestimated. Rediscovering and practically applying traditional knowledge and cultural aspects that include behavioral patterns, skills, and technological know-how directed at natural resource and energy conservation.
- Developing institutional foundations as well as investing in the technological modernization of the “traditional” energy industry, which should be undertaken in addition to the measures outlined above.

Economic Modernization and “Green” Growth

The modernization and transition of the global economy toward the new technological order are the main vehicles of globalization. Along with tangible technological progress and increased production efficiency and competitive ability, the new structure is intended to improve quality of life and the living environment. In 2009 all of the members of the Organization for Economic Co-operation and Development (OECD) officially adopted the green growth economic policy as its long-term strategic course until the years 2030 and 2050.

In Russia, the importance of green growth is documented in “Strategy 2020: New Growth Model – New Social Policy,” a government-commissioned report compiled at the end of March 2012 by a large group of experts.¹ The report indicates that the federal policy on ecological development should be based on a green growth strategy that integrates socioeconomic and ecological development to create a green economy.

This integration concept received global exposure at the 2012 G20 summit in Los Cabos, Mexico, and was later discussed at the B20 summit, the gathering of the G20’s largest corporations.

The “Green” Economy – Possible Definitions

There is no generally accepted definition of the concept. The United Nations Environmental Programme (UNEP) experts offer the broadest definition by looking at the green economy as economic activity that “presents a potential to alleviate environmental risks and generate health co-benefits.”² This definition of the green economy is practically identical to that of sustainable development, which is well-known and legally defined in Russia, although it is somewhat inadequately applied in economic programs and environmental management.

Under a much narrower definition, the green economy is understood as developing, producing, and using technology and equipment that reduces the emission of pollutants and greenhouse gases; monitoring and forecasting climate change; and creating resource conservation and renewable energy technologies. Some other aspects of the green economy also include designing and using technology and materials that protect buildings from wide temperature fluctuations, humidity, and wind load and manufacturing environmentally-friendly products, specifically consumer goods (for instance, medicine and household essentials that contain no chemical additives) and agricultural products (foodstuffs and natural fibers).

In other words, the green economy encompasses the forms and products of economic activity that contribute to improving quality of life and the living environment while also modernizing the production process and making it more efficient. Notably, in the official documents on developing a green economy, different states emphasize its different aspects. The developed countries stress competition and jobs, while the developing ones accentuate sustainable development, solutions to the problems of poverty, and the issues of social justice and public participation. The BRICS countries (Brazil, Russia, India, China, and South Africa), for their part, focus on the effective use of resources. Actual ecological problems, primarily the limits to ecological development, are conspicuously absent from any of the above-mentioned documents, which proves that the economy itself and socioeconomic components are the most important parts of the green economy.

Energy Sector Modernization as the Foundation for Green Growth; Alternative Energy as the Core of the Green Economy

Modernizing the energy sector lays the foundation for green growth. There are at least three reasons for the importance of the energy sector:

- The enduring strategic role of the energy sector in economic development and in ensuring regional, national, and international security throughout the modern era. This role is especially important for modern Russia.
- The increasing tendency to deplete the most accessible and profitable traditional energy sources (primarily oil) and the increase in their prices. This will translate into growing energy security risks for importers, while Russia will face growing concerns as an energy exporter, since it receives significant revenues from energy exports.
- The high concentration of greenhouse gases in the atmosphere, which causes global climate change, has been directly linked by the international community of climatologists to the emissions from industrial development, particularly from the energy sector.

Russia's economic policies still fail to grasp the significance of the climate factor and the need for reducing greenhouse gas emissions. They focus primarily on ways to make Russia's economy more competitive and efficient by reducing industrial energy consumption and promoting energy conservation. These policies have been quite successful, reducing industrial energy consumption in the post-crisis period by 40 percent. This reduction has also led to a decrease in greenhouse gas emissions by more than a third in the last twenty years. However, the situation is going to change significantly in the next decade in the following three ways:

- In the foreseeable future, macrostructural transformations that contribute to the growth of an energy-efficient economy will be limited (these transformations were responsible for the aforementioned significant reduction in GDP energy consumption). Priority must be given to technological modernization in the real sector of the economy. So far, it has accounted for only 20-25 percent of the decrease in energy consumption.
- The real sector must become the focal point of Russia's innovation policy, with first priority given to industrial and energy sector enterprises. This will offset the current policy's excessive focus on high technology in the information and communication sectors.
- Climate change will play an increasingly important role as a real reason or, more likely, a convincing justification and a catalyst for material economic change, as well as a restraint on counterparts, and will provide domestic producers with an incentive in the competitive struggle to accelerate their transition to the new technological order.

The development of alternative energy (also referred to as nontraditional, clean, or green energy) is the main thrust of energy modernization. Broadly interpreted, the term includes energy efficient technologies, as well as environmentally friendly, low-carbon energy sources (both renewable energy sources and nuclear power plants) that progressively replace hydrocarbon fuel. This fuel, in turn, also becomes more eco-friendly as the replacement of oil (heavy diesel) and coal with natural gas accelerates. Diversification and decarbonization are thus at the forefront of energy modernization. Given the fundamental role the energy sector plays in economic development, these two processes create the foundation for green growth.

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The Scale and Dynamics of Production and Employment

The green sector of the global economy is still relatively small in scale, justifying the occasional use of the term “green shoots” to describe this phenomenon. Indeed, in 2010 the estimated value of products and services in the green economy sector amounted to \$2 trillion (2.7 percent of global GDP), while profit reached \$530 billion, and approximately 10 million people were employed in this field. However, the contribution of the green sector to the development of the national economy is much higher in a number of countries that heavily invest in it:

- In the United States, the green economy generates more than \$600 billion (4.2 percent of GDP) in products and services and employs 3 million people.

- In Japan, the same indicators are 3.4 percent of GDP and approximately 1.5 million employees.
- In the EU countries, the green economy accounted for a 2.5 percent share of GDP overall and created over 3.4 million jobs. Some EU members boast even higher indicators:
 - 4.8 percent of Germany's GDP comes from its green sector. The country is a world leader in exporting eco-friendly goods and services (for instance, it sells 12 percent of the world's climate control equipment).
 - Great Britain's green sector accounted for \$240 billion (8.8 percent of the country's GDP) in 2009, making it number one in the world in this category. The green sector also occupies a prominent place in the country's exports and workforce – 5 percent and 3 percent, respectively.

The Pace and Trends of Development of the Global Green Economy

Despite the current rather modest indicators, the green sector of the economy is characterized by exceptionally rapid growth, especially relative to the general economic slow-down of 2008-2012. Two factors account for the fast growth rates:

- The institutional factor: by the middle of 2011, 89 states had established targets for developing renewable energy: 73 of them had adopted biofuel regulations, and 81 had instituted discount rates on utilizing renewable energy (so-called “feed-in-tariffs”). Japan was the latest among the developed countries to codify these tariffs in 2011 and make them effective in 2012.
- The investment factor: largely thanks to the intense growth of investments by the G20 countries, in just seven years the investments in renewable energy sources alone had increased from \$52 billion in 2004 to \$260 billion in 2011.

Moreover, a five-time increase was achieved despite the recession of late 2007-2009, which also had a negative impact on the rate of investments in research and development in the green energy sector in 2010-2012.

The 2010 increase is of note: the total investments in the green sector had grown 30 percent (almost \$60 billion) since 2009, including R&D investments (both state and corporate), which had gone up by 24 percent (from \$28.6 billion to \$35.5 billion). The lion's share of the funds was invested in wind and solar energy projects, such as constructing large offshore wind turbines in Western Europe and China. In 2010, China had taken the global lead in developing clean energy, generating 40 percent of total investments in this sphere. However, the United States took over first place in 2011, when the growth rate of China's investments in renewable energy sources dropped to 7 percent.

The sustained and significant increase in investments has led to acceleration in alternative energy production worldwide. Japan, the EU countries, Canada, and Russia's BRICS partners (Brazil, India, and China) have been producing tens of billions of kilowatt-hours in alternative energy; the annual alternative energy production of the United States has surpassed the 100-billion kilowatt-hour mark. Virtually all leading world powers expect their renewable energy production to reach 20 percent of the total produced by the year 2020. The alternative energy equipment market has been growing accordingly; its projected growth for the next decade is exceptionally high, and the scope of such projects is impressive.

In addition to alternative energy, the rapid increase in institutionalization and investment has also provided a powerful stimulus to the growth of other green economy sectors. For instance, excluding the energy segment, the market for environmentally-efficient technology and equipment generated \$500 billion at the start of the 21st century. If energy is to be included, the number reaches \$1.2 trillion, which in terms of growth is way ahead of other global economy sectors, even factoring in the impact of the 2008-2009 crisis.

The world sales of organic food and beverages (produced without chemical additives) increased threefold from 1999 through 2007, reaching \$46 billion. From April 2008 through March 2009, the sales of eco-friendly seafood products grew by 50 percent, reaching \$1.2 billion in retail sales.

In 2008 in the United States alone, sales of organic food increased by 15.8 percent, outpacing the rest of the food sector by three times, and amounted to 3.5 percent of the total food market. Job growth in the U.S. organic food and beverage industry registered an average 19 percent increase in the 2000s (until 2009). In 2010, the numbers were more modest – approximately 8 percent for both sales increases and job growth – but the rest of the food industry returned even lower numbers – 1 percent and 6 percent, respectively. Another boost to the growth of the organic food market came from the Organic Equivalence Arrangement signed by the European Union and the United States on February 15, 2012. According to the arrangement, both sides will mutually recognize organic product certification, which will remove trade barriers and facilitate the sales of products with organic certification in both the United States and the European Union.

The eco-friendly certification now appears on a broad spectrum of consumer goods, for instance on furniture and other products made from wood. The sales of such eco-friendly certified products grew four times in the pre-crisis years of 2005-2007. Also, since 2007 Great Britain, and subsequently other European countries, the United States, and Japan, started using carbon footprint labeling on foodstuffs and other consumer goods, indicating the amount (in grams) of greenhouse emissions associated with producing and transporting a particular item. Although this label does not yet enjoy the wide recognition accorded to its 30-year-old eco-friendly (organic) counterpart, in 2010 the sales of products bearing the carbon footprint label already exceeded the sales of organic products

in Great Britain (the former fetched £ 2 billion, as opposed to £ 1.5 billion for organic products).

Factors Influencing an Accelerated Development of the Global Green Economy

A number of factors can explain the rapid development of the green economy and its alternative energy segment, especially during the crisis of 2008-2009. The most important one is ensuring energy security for the countries that import fossil fuel, who are also the key global economic players. Energy prices soared from 2003 to 2008 due to the decline in cheap oil deposits and greater demand for gas. The 2011 turmoil in North Africa and the Middle East threatened to disrupt gas and oil supplies from the region, thus causing another round of price increases, which erased the lower recession prices of 2008 and 2009. In this context, major oil and gas importing countries have been expressing growing interest in alternative energy sources.

The powerful roles of the multiplier and anti-crisis effects of the green economy are also important. In terms of the multiplier effect, ecological innovations play a special linking and stimulating role. In their development strategies, the leading economic powers, especially Germany and Japan (in “Becoming a Leading Environmental Nation Strategy in the 21st Century – Japan’s Strategy For A Sustainable Society,” 2007; “The Third Basic Plan for the Development of Science and Technology Information,” 2007; and particularly “The New Growth Strategy,” 2009/2010), view these innovations as the principal link between economic, industrial, and environmental policies, and investing in them is a crucial component in increasing their competitive ability. One example is Japan’s “3R” (reduce, reuse, recycle) public-private partnership initiative.

In terms of their anti-crisis potential, ecological innovations and the green economy on the whole lead to job growth and the reduction of unemployment, greater economic activity in other industries, and a faster economic recovery. For example, 12 percent of funds in the U.S. economic stimulus package were allocated to the green economy sector, while in Germany and Japan this figure was 13 percent (up to 16 percent after adjustment), in France – 21 percent, in China – 38 percent, and in South Korea – over 80 percent. Notably, Japan’s current stimulus package allocates most funds to investments in and operating expenses for energy efficiency measures, research and development, and renewable energy development, in contrast to a similar 2001-2002 package that mostly focused on investments in infrastructure. The current expenditures are proving more effective on the road to economic recovery and also create more jobs and high-tech enterprises.

There are three additional important factors that affect accelerated development in this sphere. Two of them – a clean and safe environment and the reduction

of the risks of climate change – are closely interconnected. The connection comes from the fact that all things being equal, green technologies pose fewer risks and are smaller in scale than 20th century industrial technologies. Green technologies reduce the emissions of greenhouse gases and environmental pollutants and lower the risks of nuclear disasters on the scale of Chernobyl (Soviet Union, 1986) and Fukushima (Japan, 2011), and the industrial/environmental catastrophe in the Gulf of Mexico (the United States, 2010).

The third factor that propels the green economy is the intensity of scientific research and the high level of technological development of green enterprises that facilitate the accelerated transition to the new (sixth) wave of innovation. This wave is likely to play a crucial role in the global economy and affect the competitive abilities of national economies by the middle of this century.

The integrating role of ecological innovations was mentioned above. In addition, many ecological innovations are on the cutting edge of science and technology, as evidenced by projects completed by Japan, Germany, some other European countries, the United States, South Korea, and Russia's BRICS partners. The investments in R&D in energy efficiency and renewable sources of energy are growing with an especially big lead, while the share of R&D expenditures in nuclear energy and fossil fuels is diminishing. The developed countries expect green (particularly energy) innovations to produce a multiplier effect: increasing production and employment while reducing energy imports and greenhouse gas emissions.

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The Projected Development of the Global Green Economy

Despite the restraining influence of the consequences of the global economic crisis in the short and medium terms (until 2020), the significance of the green sector may increase. According to all projections, in the next twenty to twenty-five years the vast majority of the G20 countries will experience rapid growth and a noticeable increase of the green energy sector in general and its clean energy segment in particular.

Some estimates project the world eco-friendly equipment market alone to generate €4.4 trillion (about \$6 trillion) by 2025, which translates into a 30 percent annual growth and a 6-7 percent share in global GDP for the green sector. As early as 2020, one might expect a nearly twofold expansion of the global green technology market (as well as a threefold expansion of the low-carbon technology market); green sector jobs are projected to grow four times, and the green economy's share of global GDP is expected to reach at least 5 percent.

“Green Shoots” in the Russian Economy and the Development of Alternative Energy Sources: Prospects and Major Courses of Action

Favorable preconditions for Russia’s green sector expansion exist in a number of economic spheres, such as agriculture, forestry, and tourism, which have a bright future in Russia. The prospective green development of these areas and of the economy as a whole is in large measure contingent upon progress in the energy sphere, particularly in the development of alternative energy sources.

As far as energy supply goes, the main challenges for Russia in the area of the green economy are ensuring reliability and fully satisfying the demands of consumers, including those in remote regions and agricultural areas. The following should be taken into consideration: (a) only one third of Russia’s territory has a centralized energy supply, while the other two thirds of the territory, which is home to 20 million people, has a decentralized or autonomous energy supply; (b) the regions with centralized power delivery, let alone all of the others, face frequent problems with the reliability of power lines and regular energy supply; and (c) there are also problems with getting connected to the power grid and lack of cooperation with energy monopolists, which force many consumers to rely on autonomous energy delivery by building their own boiler rooms and power stations.

Under these circumstances, the use of more widespread and environmentally friendly alternative energy sources seems promising.

This energy, particularly renewable energy sources, along with energy conservation and energy efficiency, have an enormous potential in Russia. The economic capacity of renewable energy sources is up to about a third of all extractable fossil fuels, but their technological capacity is 25 times higher. Renewable energy sources could comprise at least 25 percent of Russia’s energy mix if only their economic capacity were tapped. This would free up additional volumes of oil and gas for exports and domestic refining (mostly for the needs of chemical industry).

But as of now, the use of renewable energy sources is far from sufficient. They generate up to 8.5 billion kWh (excluding hydroelectric stations with capacities of over 25 mWh), which comprises less than 1 percent of the country’s electricity production. The number increases to 18.5 percent (2 percent in heating supply) if the hydroelectric stations are included. Russia’s total share of renewable energy sources in primary energy production amounts to only 3.2 percent, even with the inclusion of large hydroelectric stations. Thus, the country is noticeably trailing not only the leading global powers but also the Eastern European countries in terms of alternative energy production and development.

The new regulations adopted in 2008-2010 are intended to promote the development of alternative energy in Russia. They set targets for reducing GDP energy

consumption and increasing the share of renewable energy sources in gross energy production and consumption for the period until 2020. Specifically, GDP energy consumption is to be reduced by 40 percent by 2020, and the share of renewable energy sources is to increase to 1.5 percent in 2010, 2.5 percent in 2015, and 4.5 percent in 2020. Provided that the development of renewable energy sources is supported by guaranteed investment returns, tax credits, and favorable tariffs, this number could realistically be at least 1.5 times higher. Moreover, if energy conservation technologies are adopted on a large scale (see below), renewable energy sources could comprise 13 percent of the total energy balance.

While not stopping work on nuclear power plants currently under construction and continuing to replace coal with cleaner gas (increases in the share of which in the domestic energy supply are also required as part of gasification projects in some localities to improve living conditions), the appropriate course of action would entail replacing obsolete local production facilities and expanding them, using less expensive installations based on renewable energy sources, which would provide more flexibility in site selection.

In the near future, small hydroelectric stations and biomass-based power stations will have a bearing on Russia's renewable energy prospects. According to some estimates, in the long run, Russia is capable of becoming a large second- and third-generation biofuel exporter. Additionally, wind turbines located primarily in coastal regions have a lot of potential. After all, Russia has the highest wind energy capacity in the world, followed by the United States and China. There are growth prospects for solar energy as well, especially in Buryatia and the Krasnodar Region.

The effective use of energy resources is essential for maintaining the profitability and competitive ability of the energy industry and energy consumers in other industries. Factoring in Russia's socioeconomic and natural characteristics, it is the most promising area of green growth; nevertheless, Russia is far behind there, although its large potential is yet untapped. Data from the Institute for Energy Strategy suggest that the volume of energy conservation in Russia may equal that of the energy consumption in France and Great Britain combined, and the economic gain from fuel conservation and the resulting increase in gas exports may total \$120-150 billion annually.

The development of the alternative energy industry and green economics as a whole are key issues on the developed and transition states' agendas. While being net energy importers, these countries also experience labor surpluses (their unemployment problems become especially severe during economic crises). Therefore, using alternative energy as a means of import substitution and reducing unemployment is actually more important to them than resource conservation and lowering environmental pollution (including greenhouse gas emissions).

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Russia's priorities are the opposite. The labor and import substitution functions of the alternative energy sector are of secondary importance for the development and competitiveness of its economy in the short- and medium-term (until 2020), while ensuring energy efficiency takes precedence. Priority should be given to less labor-intensive projects, such as research and development in clean energy. When it comes to large-scale projects in this sphere, the primary focus should be on plants for recycling secondary gases, as well as biomass and geothermal energy production, rather than on solar plants and carbon capture and storage facilities, which are also very capital-intensive.

Of particular importance are the technologies that provide a double dividend in the form of negative marginal costs for resource conservation and reduced greenhouse gas emissions. These technologies are capable of accomplishing both goals with substantial savings. They are most commonly used in the housing and utilities sector (heat insulation, lighting, water heating). Besides, small-sized combined heat and power plants can be effectively used in the regions of Siberia, the Far East, and the Far North, where the power supply is decentralized. Using renewable energy sources such as biomass, water (small hydroelectric stations), sun, wind, and geothermal energy is also effective in these areas.

The Prospects for the Green Economy: Realized Expectations and Limits to Growth

Given significant investments and fast growth rates, many analysts and politicians expect the green economy to continue its triumphant march in the next few decades. Such are the conclusions of numerous reports and projections prepared by international experts, government bodies (including U.N. specialized agencies), and scientific institutions in both developed and developing countries.³

The reports outline the transformation of the global economic system into a low-carbon, resource-efficient economy by 2050. To ensure that this vision will come to fruition, \$1.3 trillion dollars (about 2 percent of global GDP in 2010) should be invested annually from 2012 to 2050 in ten key sectors: agriculture, forestry, fisheries, water, energy, housing and utilities, manufacturing, tourism, transportation, and recycling. The reports recommend that 25 percent of green investments (\$325 billion or 0.5 percent of global GDP) be allocated to the first four sectors, the development of which depends most on the availability of natural resources and is subject to weather and climate risks.

However, the reports emphasize that despite large projected investment totals, they are significantly lower than the average totals for annual global investments (22 percent of global GDP in 2009). Thus, it may be possible to attract the necessary investment funds in conjunction with thoroughly developed state policies and financial innovations, which may include the trading of greenhouse gas emissions and microfinancing.

Under the above scenario, green investments are expected to yield higher economic growth than traditional investments in five to ten years with no negative effects for the environment. Moreover, the waste/carrying capacity ratio (the so-called ecological footprint) is expected to decrease from the current 1.5 to 1.2 by 2050, approaching the level of sustainable development expressed by the coefficient of 1 (under the ordinary scenario, the ratio may exceed 2). In addition, thanks to a significant increase in energy efficiency as a return on green investments, by 2050 the global demand for energy is projected to be reduced by 40 percent when contrasted with the inertial development scenario (i.e. if energy consumption remains at 2011 levels). Greenhouse gas emissions are projected to fall by one third of the current levels.

One may agree with the authors and proponents that the green scenario puts forward a progressive vision of the future. It affects global socioeconomic development positively and reduces ecological and climate risks. Nevertheless, well-grounded expectations need to be differentiated from the factors and conditions that may substantially limit the scope and effectiveness of the projected global transformations. This will allow for a more objective assessment of the green economy as a new segment of the global economy, including its basic components, which include the Russian economy.

The major limiting factors are:

- Institutional and technological inertia in economic development that does not allow the global economy to adapt production processes to a lower demand as quickly as it would adapt them to a higher demand. As the data provided by the International Energy Agency indicate, the decline in corporate sector revenues and production growth in 2008-2010 did not result in a corresponding decline in emissions. Thus, as the situation in Russia also suggests, economic growth contributes to the decrease in specific carbon emissions while a recession increases them, amplifying the risks of climate change caused by industry.
- Significant disparities in the development of the green economy among different countries and industrial sectors, as well as disparities in the impact of green investments on economic growth. The disparities are related to:
 - Differences in the scale and effectiveness of political and institutional support for the green economy and clean energy in particular on the national level (on the part of states on the global economic level) by all of the key components of the international community.
 - Various sectors and areas of production of the green economy, which certainly do not always surpass competitors in productivity and efficiency. Specific technologies, companies, industries, regions, and countries perform differently. Some receive triple benefit (for instance, while reducing pollution and greenhouse gas emissions along with production costs, they also create new jobs and increase profit), but others end up

on the losing end: their costs exceed earnings, giving them losses instead of profit, often leading to layoffs and business liquidations.

- Differences in the extent green production and technologies actually benefit the environment. Not all green enterprises are in fact clean and environmentally friendly. Biofuel is a clear example.
- Different impacts of green investments on the growth of productivity and employment in various industrial and non-industrial sectors.
- Different impacts of subsidy reforms proposed by proponents of the green scenario for developing the global economy that are intended to spur state green investments and spending.

The development of the green economy should not be halted due to these limitations, nor should there be unhesitating attempts to force its growth, accompanied by ecological slogans such as saving the earth from climate change. Instead, its development should be well thought out, varied, and gradual and must take into account production and technological, socioeconomic, and natural geographic aspects of various regions and states.

Recommendations For Developing the Green Economy in Russia, with Alternative Energy as Its Core

Taking into consideration energy diversification and decarbonization trends by the leading countries, as well as Russia's natural and socioeconomic characteristics, a number of institutional innovations, particularly the establishment of standards and legal measures, that stimulate further development of alternative energy, facilitating an increase in energy efficiency and the development of renewable energy sources, can be recommended.

In terms of **energy efficiency**, *new construction and the reconstruction of old buildings should utilize energy efficiency and conservation standards*. The so-called “low-energy” or “passive” houses feature a comfortable inside microclimate without using traditional heating and cooling systems. A wide array of such standards (BREEAM, “Green Globes,” LEED, SBTTool, CASBEE, HK-BEAM, NABERS, LEnSE, etc.) is used around the world and can be and is already being adopted in Russia. The first green building in Moscow was built according to the British BREEAM system specifications. Another building located in Barnaul (Altai Region) contains nineteen apartment units and utilizes a broad spectrum of energy efficient and conservation technologies: it features solar roof panels, a small geothermal station on the ground floor, nanotech-coated wooden window frames, and a weather-proof thermally-insulated “wet” façade. At a cost of 44,000 rubles per square meter (less than € 1,100 or \$1,400), these innovations reduce heat consumption by 50 percent

and alleviate serious housing problems (the building was built to replace dilapidated housing).

Another institutional innovation relates to adopting *special energy conservation programs*. These programs are especially effective in the service sector and the heavily subsidized public and housing and utilities sectors (as a reminder, Moscow accounts for 10 percent of Russia's housing and utilities sector). Federal Law No. 261, adopted in 2009, mandates a 15 percent minimum reduction in public sector fuel consumption within five years (2010-2015), which means Russia's public sector should become the leader in Russia's quest for energy efficiency and conservation.

However, *updating state procurement rules and procedures* is perhaps the most effective institutional mechanism to stimulate the development of the green economy by incorporating progressive innovations from around the world. Most European states, as well as many countries in other parts of the world, have included energy efficiency and greenhouse gas emissions standards in their state procurement rules and regulations.

Energy conservation programs in the real sector also have potential. One such program seeks to reduce energy consumption by the largest industrial enterprises (for example, the top one hundred), concentrating on manufacturing. The program should become part of a long-term energy strategy to increase the energy efficiency of production and can be implemented as a public-private partnership. India's energy conservation certificate trading mechanism initiated by the government in August 2009 provides an illustration of a possible solution. A similar mechanism that concerns trading quotas for greenhouse gas emissions, known as the Emissions Trading Scheme (ETS), was adopted by the EU.

In terms of developing renewable energy sources, the appropriate course of action would be preserving the nuclear power plants currently under construction (in contrast to Germany and Japan) and replacing coal with cleaner gas energy. At the same time, obsolete local production facilities should be replaced and expanded, using less expensive installations based on renewable energy sources, which would provide more flexibility in site selection. Here, Russia's short-term prospects for development focus on energy generated by *small hydroelectric stations* and *biomass power stations*. Incidentally, China also concentrates on hydroelectric energy, while the United States and the EU focus on biomass energy in addition to wind power for developing renewable energy sources; Brazil also stresses biomass energy production as a renewable energy source. Many Russian regions are capable of constructing biomass power stations that utilize wood waste. There is also the potential for building biogas units that utilize farm animal waste, for instance in Belgorod and some other regions. On the whole,

The development of the green economy should not be halted, nor should there be unhesitating attempts to force its growth, accompanied by ecological slogans such as saving the earth from climate change. Instead, its development should be well thought out, varied, and gradual and must take into account production and technological, socioeconomic, and natural geographic aspects of various regions and states.

biomass energy-generating potential for the period until 2020 is estimated to be 20 GW, according to the council experts of the State Duma Energy Committee. The transportation biofuel component could be developed by mandating the blending of biofuel and traditional fuel (gasoline and diesel for ground transportation and kerosene for air traffic), as it is done overseas.

Besides, Russia is in a very good position to develop *geothermal energy* (i.e. thermal energy stored five to ten km deep inside the Earth). This advantageous position is the result of prioritizing the development of cost-efficient domestic drilling technology, which in effect determines heating energy prices. Russian

drilling rigs have much higher penetration rates than their foreign counterparts, thus reducing drilling costs. Also, geothermal energy sources capable of generating approximately 400 million Gcals of heat can be found in virtually every region of the country. At the same time, Russian regions' unsatisfied demand for energy production is about 16.7 GW. The heat obtained from geothermal energy is also much less expensive: 80 rubles per Gcal as opposed to the 400 rubles per Gcal that consumers paid in 2010. In addition, *wind turbines* located primarily in coastal regions have a lot of potential. Russia has the highest wind energy capacity in the world, followed by the United States and China. There are also growth prospects for *solar energy* in the Krasnodar

Region and beyond; after all, the Scandinavian countries and Canada have no more sunlight than Russia does.

For progress in alternative energy, aside from these innovations, there is a need for a number of additional changes that would stimulate energy efficiency and facilitate the development of renewable energy sources. The Federal Law on Energy Conservation and Energy Efficiency (No. 261-FZ) establishes *a system of differentiated electricity tariffs, depending on its production technology*, that would subsidize alternative energy technologies. This system, known as feed-in tariffs (FIT), has proven successful in 80 countries, especially in Europe, for hooking up to a network of renewable energy electricity producers. In Germany, which provides the most powerful illustration of the tariff's success, the share of renewable energy in the total energy mix had gone up from 6.3 percent in 2000 to over 16 percent in 2010. In the long term, the system can be expanded to differentiate tariffs to reflect different sources of renewable energy and the location where it is produced, which is already done in Germany and almost twenty other countries.

One more innovation concerns *tax reform*. It is another sphere where international experience can prove useful. In 2007 Germany passed the Biofuels Quota Act, which provides tax exemptions until 2015 to the producers of second-generation biofuels obtained from wood waste (biobutanol) and agricultural crop waste, which reduces greenhouse gas emissions by 80-90 percent. In turn,

While stressing the importance of innovations in formal institutions (primarily their standards and legal measures), one cannot neglect the significance of changes in informal institutions (traditions and behavioral patterns), as well as the traditional knowledge and experience directly related to them.

first-generation biofuels (those obtained directly from wood and agricultural crops) are to be taxed under the new law.

While stressing the importance of innovations in *formal institutions (primarily their standards and legal measures)*, one cannot neglect the significance of changes in *informal institutions (traditions and behavioral patterns) as well as the traditional knowledge and experience directly related to them*. In essence, so-called traditional culture and knowledge need to be rediscovered and put to practical use. Many of these centuries-old traditions, skills, and technologies are based on natural resource and energy conservation as well as on adaptation to complex natural, and particularly climatic, conditions. For instance, the indigenous peoples of some Russian regions and foreign countries have been using logs, deerskin, or snow in their construction. So far, these unique skills and technologies have found little or no reflection in modern standards. However, if effectively applied, they would substantially reduce the costs of the transition to a new, more diversified, decarbonized, and energy-efficient economy and renewable energy sources.

Incorporating this category of knowledge into modern scientific research is quite complicated. First, it involves its fullest possible discovery, careful documentation, and expert evaluation. Second, the gap between the people with this knowledge and the scientific community has to be bridged so that an exchange of information can take place. To accomplish this, the former have to overcome their isolation and alienation, while the latter need to stop treating traditional knowledge and culture as something insignificant and inferior to “big” science and industry and eliminate the impression (often arrogant) of the inarguable superiority of modern specialists and the newest technologies. Thus, strict value judgments toward knowledge should give way to the unbiased analysis of information to determine its contribution to economic development, security, and social progress.

While all of these changes are taking place, *the traditional energy sector must develop institutionally, with financing for technical refitting*. For the foreseeable future, this sector will continue to dominate the energy balance for Russia and the vast majority of countries. Both economic and ecological criteria (including industrial and environmental safety) will make natural gas the leading energy resource in the global and Russian energy sectors. As the process of energy generation modernizes, the situation in Russia must change. Currently, almost 40 percent of Russian power plants are over 40 years old and have a combustion capacity of less than 40 percent (28 percent of those in the United States are such plants; in Japan, the figure is 12 percent, and in China – 3 percent). The technical potential of simultaneously replacing existing technologies and equipment, which is evenly distributed between energy production and consumption, is estimated to save 400 million tons of fuel equivalent, which amounts to about 40 percent of current energy consumption. Approximately 25 percent of potential energy savings will go to the service sector (particularly housing and utilities, which are capable of reducing consumption by 1.5 times).

Notes

- 1 “Strategia-2020: Novaya model’ rosta – novaya sotsial’naya politika” [Strategy 2020: New Growth Model – New Social Policy] (Final Report on the Work of the Group of Experts on Pressing Issues Concerning the Social and Economic Strategy of the Russian Federation until 2020, March 13, 2012), <http://2020strategy.ru/data/2012/03/14/1214585998/1itog.pdf>.
- 2 United Nations Environmental Programme: Green Economy, <http://www.unep.org/greeneconomy/Portals/88/HEALTH.pdf>, P. 2.
- 3 “Navstrechu ‘zelenoy’ ekonomike: puti k ustoychivomu razvitiu i iskoreneniu bednosti” [Toward a Green Economy: Routes to Sustainable Development and Poverty Eradication] (A Concise Report for Policy Makers. Summary, Nairobi: UNEP, 2011); *World Economic and Social Survey 2011: The Great Green Technological Transformation*, Department of Economic and Social Affairs of the United Nations Secretariat (DESA) (New York: United Nations, 2011), E/2011/50/Rev. 1 ST/ESA/333.

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