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**TOWARDS GREEN ECONOMY IN RUSSIA (REVIEW)**

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## Resume

The country, like the whole world, is facing new challenges nowadays. They determine the need to modernize the economy, including innovative development and energy efficiency. We should not forget that nature and the modernization are determined by its ultimate goal, which, despite the importance of economic growth, technical excellence and competitiveness is to improve the lives of everyone today and to provide enabling environment for future generations. The task is now to provide sustainable development based on the "green economy" principles.

Economic growth today is associated with an increase in pollution and environmental degradation, depletion of natural resources, the imbalance of the biosphere, climate change, which lead to deterioration of human health and narrow opportunities for further development. That means that fulfilling the extremely important task of increasing human welfare does not provide the necessary quality of life. All this define the essence of modernization as the provision of technological progress for economic development and maintaining a favourable environment (environmental safety, which is important for economic growth and for the very existence of a man).

The support of industry modernization is essential by means of win-win solutions, associated with the provision of both economic efficiency and reduction of harmful emissions, sustainable use of natural resources, low waste production. Support and dissemination of such experience are of need as well. This is the key task of the modern innovative development. And for that, in addition to awareness raising on the importance of compliance with environmental requirements, both strict environmental requirements, as well as economic interest, are necessary including all possible mechanisms - modernization should be beneficial. The shift of industry to the use of best available techniques seems promising. In order to solve the waste problem there is a need to support the recycling industry and legal norms for the collateral value of the packaging in place.

Efficient and timely measure to ensure environmentally sound production is to establish a widespread system of voluntary certification of corporate social accountability, including reporting on sustainable development, based on the growing demand for environmental goods and services in the world and domestic markets.

Basic direction for the country development is energy. It is necessary to ensure the safe use of traditional resources and energy efficiency. Realisation of great opportunities to improve energy efficiency involves introduction of urgent measures to ensure the interest in energy conservation at all levels - from the industrial development to an individual household.

Modernization should take into account the country's enormous potential for using renewable energy sources. This involves facilitating energy production from renewable energy sources and support for domestic production of necessary equipment. This way of development is not opposite to, but strengthens the current position of the country as a supplier of hydrocarbons, opening up additional possibilities for exports and ensuring national independence and the prospects for further development.

The realisation of the economic modernization of Russia should take into account the enormous possibilities of the country in terms of providing ecosystem services, including the role of global ecosystem of forests, wetlands and other natural ecosystems. It is also necessary to ensure co-operation of regions based on the assessment of natural services with access to international markets to compensate the efforts to preserve and multiply the natural wealth. This will allow to position

Russia not only as an energy state, but also as an ecological donor, which involves the capitalization, receiving benefits by the country from its ecosystems.

The on-going Rio+20 process for the UN World Summit on Sustainable Development in 2012, 20 years after the Summit in Rio de Janeiro, provides new opportunities for the country. Russia is among those countries, to which this is of great importance. In fact, there are a number of reasons, such as economic growth, rich natural resources, and the search for the optimal way of development. The country's priorities in innovation policy, energy efficiency, modernization of its economy in line with the modern requirements, determine a natural progress way towards sustainable development. Russia, together with other BRICS countries could lead the transition towards sustainable development.

All these involve the development and implementation of new policies. The environmental requirements which are nowadays known as the green economy principles determine the directions of innovative development and modernization in order to ensure the safe long-term economic growth. The green economy priorities and the environmental requirements should be included in the general development plans aimed at addressing the socio-economic issues, which are of everyone's concern in the first place. Even the provision of proper environmental protection measures (establishment of protected areas, biodiversity conservation, etc.) is appropriate to be included in the clear market mechanisms - payments for ecosystem services.

The primary measure to assess the situation and determine priorities is the establishment of a sustainable development indicators system. These, above all, are nature and energy intensity indicators of economic growth and specific indicators of pollution.

The goals of the new economy based on market mechanisms presuppose compliance with the two main conditions, defined by the level of society and its cultural maturity. First, the provision of market demands for natural goods and their related characteristics, the requirements of consumers (including population and the state), which assume the role of human factors on the basis of priority of enhancing the value of nature and man. Second, what is needed to be done is to give a chance to the competition mechanism to work. Creating the competitive environment by the state, minimizing the role of monopolies in economy will encourage businesses for innovations.

The formation of the joint action priorities requires adoption of common rules of conduct and codes of ethics accepted at the global level. Such a document could be based on the Earth Charter - worked out vision in 2000 on the principles of sustainable development essential to ensure ecological integrity, social justice, democracy, and peace. Today, this document takes on a new meaning.

Success of the implementation of the economic modernization ideas, energy efficiency, and sustainable development depend on the active position and the personal interest of everyone. This defines a need for the educational activities and for the enhancement of public awareness, consistent work of mass media, and social advertising. A key role in addressing the problems of sustainable development by society, and in raising broad public interest is played by culture (including cinema, pop art, literature), cultural and natural heritage.

The civil society should play here an important role, including mass public organizations, youth movements, and professional institutions for sustainable development. Civil society acts as an initiator of the Rio+20 process, demonstrating the interest of people and delegating authority to the state to ensure active participation of the country in shifting the international community towards sustainable development. Successful implementation of these ideas involves the formation of a broad movement in support of sustainable development as a priority activity of the civil society, considering it as a priority for the government and businesses to provide their support.

# INTRODUCTION

The country, like the whole world, is facing now new challenges. This determines the need to modernize the economy, including innovative development and energy efficiency. One should not forget that the nature and direction of modernization are determined by its ultimate goal, which, despite the importance of economic growth, technical excellence and competitiveness is to improve the lives of everyone today and to provide an enabling environment for the future generations. Ensuring sustainable development based on green economy principles is defined now as a key task. It is declared by the government as a need for environmentally sound production and consumption, basing on the fact that today environment means economy.

Ensuring the economic growth today is associated with increase in pollution and environmental degradation, depletion of natural resources, the imbalance of the biosphere, and climate change, which leads to a deterioration of human health and the limited opportunities for further development. This means that solution of extremely important task of increasing the welfare of the population does not provide the necessary quality of life. All these define the essence of modernization as provision of technological progress to economic development and maintaining a favorable environment (environmental safety, which is decisive for economic growth and the very existence of man). This task is made public in the world as the realization of the decoupling principle (to meet the growing needs while minimizing the depletion of natural capital), which involves general reduction of energy and nature intensity of economic growth, the widespread use of renewable energy, modernization of production on the basis of innovation. This direction defines the current priorities of the country's economy development.

According to the definition given in the UNEP reports the green economy is defined as an economy that increases the welfare of people and provide social justice, while significantly reduces risks to the environment and its degradation.<sup>1</sup> Important features of this economy are: efficient use of natural resources, maintaining and increasing natural capital, pollution reduction, low carbon emissions and avoid loss of the ecosystem services and biodiversity, increased income and employment. Green economy is considered in the context of global climate change and future direction of overcoming the financial crisis. The priority feature of its growth is dramatic increase of its energy efficiency. In connection with this the term "low carbon" economy is widely used. The green economy concept does not replace the concept of sustainable development. However, it is increasingly recognized nowadays that sustainability depends largely on the greening of economy.

It is proposed to mobilize and restructure global economy in the direction of increasing investments in clean technologies and natural infrastructure, promote the greening of economy, to avoid the catastrophic consequences of global climate change. Implementation of the new green deal involves reduction of use of non-renewable natural resources for power generation by investments in renewable energy, as well as binding energy saving. All these measures will reduce demand and energy costs, as well as its cost. According to UNEP only 2% of global GDP investment in the greening of 10 sectors to shift nature of the world development, reduce greenhouse gas emissions and efficient use of resources. Many countries are now implementing anti-crisis programmes on the basis of the principles of green economy.

New opportunities for the country provide the ongoing process of Rio+20 to the UN World Summit on Sustainable Development in 2012, 20 years after meeting in Rio de Janeiro in 1992. Lead in this process should be taken by the one for whom it is especially important. This implies recognition of the need of such a development way and specific economic opportunities for its implementation.

Some developed countries are actively involved in the process after the UN Rio Summit in 1992. Many other countries, wholly focused on ensuring economic growth to address the acute social problems, could not fully respond to the call of the international community. Despite the relevance of the ideas of sustainable development for any country and the need for joint efforts of the international community, serious progress in this direction can be provided by the developed countries only. Involvement of other countries is possible as they grow up and with the support of developed countries. Russia today is among the countries for which it is especially important. In fact there are a number of reasons. These are economic growth, rich natural resources, and the question raised concerning search of the optimal development direction. The country's priorities in innovation policies, energy efficiency, and economy modernization in line with the modern requirements are naturally directing the transition towards green economy and sustainable development. Russia, together with other countries of BRICS, could act as a leader in the movement towards sustainable development.

Success in spreading out the ideas of sustainable development based on green economy and ensuring active participation in the process involves specific adaptation of the ideas to each country. Their own ideas about sustainable development and green economy, and ways of its formation varies from country to country and will undoubtedly continue to change. At the international level, this involves cooperation between representatives of countries.

At the national level it is necessary to evaluate successes and challenges of the pathway to sustainable development. Regarding Russia it is very important to generalize the rich regional experience.

In this direction, the civil society could act as an initiator of the process which after conducting the necessary assessments and prioritization of actions could demonstrate the interest of people and delegate to the authorities power to ensure the active participation of Russia in the promotion of the international community towards sustainable development on the green economy base.

## I. MACROECONOMIC PROFILE

The Russian economy, despite the severe economic crisis of the 1990s., which has cut production by almost two times, and the modern crisis, keeps the lead in the world for the production of many essential commodities, especially energy, steel, iron, agricultural products, wood (Annex 1). Production of these goods is based on the use of natural resources and natural raw materials.

The main socio-economic indicators of the Russian Federation suggest that the country in 2010 was able to overcome the effects of the global financial crisis of 2008-2009 (Annex 2). Gross domestic product (GDP) increased by 4% and reached the highest amount per capita of the 2000s. The peculiarity of the Russian crisis was a significant social support of population that was expressed, in particular, in the continuous growth of real disposable income. Following the growth of unemployment in 2009 it was reduced in 2010. In general, we can say that the Russian labour market coped with the crisis and that the situation now is close to the pre-crisis one<sup>1</sup>.

An important factor in maintaining stability was a positive trade balance. During the 2000s it remained positive even in times of crisis, surpassing \$ 150 billion in 2010 (Annex 2).

Analysis of external conditions, sharp deterioration of which provided the main contribution to the decline of the Russian economy during the crisis, suggests that they have basically been recovered. The level of oil prices and capital inflows to emerging markets lost only favourable records of 2008 and 2007; the aggregate volume of demand in the Russia's trading partners even surpassed the pre-crisis level. Thus, the effect of external shock factors that caused the crisis was eliminated.

Pension reform has made social transfers a top priority of public spending during the crisis. Their growth for two years more than doubled, while total expenses increased only 1.5 times. In this role, the social expenses have replaced spending on national economy, which grew faster than others in the pre-crisis period. Past reforms have eliminated poverty among pensioners due to social co-payments up to the subsistence level. Such struggle against poverty was conducted by means of accumulated financial resources for future funds (Reserve and National Welfare).

In terms of the debt the situation in Russia is very favourable compared with the most other countries both on the level of commitment and their dynamics (Annex 3). Gross debt of the country in 2010 was only 9.9% of GDP, while, for instance, this figure in the G20 countries reached 74.5%, while in developed countries totally 97%.

At different periods of time value of certain growth factors varied. However, generalizing, we can note the important role that was played by accelerated increase in domestic demand in the growth. The latter has been designated by a number of factors. One of the key factors was the increase of oil prices across multiple channels. The direct channel was associated with the wealth effect – i.e. reassessment by the economic agents of their total long-term income. However, the rise in oil prices increased demand also by indirect channels – through increased public spending and credit expansion. Despite the fact that most of the excess profits from oil exports safeguarded in oil and gas funds, some of them still went to the rising costs. In addition, the rise in crude oil prices led to an increase in net capital inflow. According to the Economic Expert Group, in the pre-crisis period, a dollar rise in oil prices increased inflow of foreign capital approximately by 1 bn USD. This money was then used as a resource for investment and household consumption. The latter was also

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<sup>1</sup> Human Development Report in Russia. 2011 / AA Auzan and S. Bobylev (eds.). Moscow: UNDP.

one of the main drivers of growth, only slightly less than accumulation by the rate of increase (13% in average in 2005-2007).

Overall assessment of the fiscal policy during the crisis has many aspects. On the one hand, spending of funds accumulated in the oil funds during the period of favourable market conditions, significantly mitigated the impact of financial crisis. These funds were used to protect the banking system and to support industries and companies of real sector and to enhance consumer demand, and to socially protect and assist the regions, particularly hard hit by the crisis. However, analysis of the content of anti-crisis measures shows that they were mainly of defensive, conservative matter. This is evidenced, for example, by a significant share of measures aimed at supporting specific industries or even companies.

These aspects of the Russian anti-crisis policy can be described as a preference for short-term goals, compared with medium and long-term. Serious challenges arise in the long run. The main issue is to avoid the raw materials export model of the economy based on exploitation of natural capital and trade with raw materials emerged in the 2000s. As the main drivers of such shift there are modernization and innovation in the economy. The conceptual foundations of a new innovative community-oriented model were laid down in policy documents of the country until 2020 and 2030, Presidential decrees and decisions of the Government of the Russian Federation in 2008-2011. Another major challenge will be facing the sharp deterioration of the demographic situation in the coming decades in Russia: Rosstat forecasts for the year 2030 the population ratio of working age / pensioners will deteriorate more than 1.5 times (projected increase from 33% to 52%).

We can distinguish the following basic points in the future socio-economic policies at the macro level, which should be addressed in future:

1. The Russian economy has resumed growth in production, but it lags behind the growth of many other countries, such as other BRICS partners.
2. The anti-crisis policy provided mixed effects. On the one hand, it allowed to protect the population. On the other hand, the crisis was not used as an opportunity to clear the economy from the ballast of uncompetitive companies.
3. The situation in the public sector in the short term is relatively safe. However, significant effort is required to return the budget parameters to the trajectory of long-term sustainability, particularly given the future demographic challenges.
4. The new economic strategy should be aimed at avoiding the export of raw materials model, and at the transition to green economy, strengthening of sustainable development. For this purpose, in particular, the following tasks are needed to be addressed at the macro level:
  - Modernization of production. Includes an increase in the share of manufacturing sectors (and especially high-tech products) in the structure of production and exports, increased productivity to the level of leading countries, improved energy efficiency and reduced energy intensity of production, significant increase in innovative activity of companies.
  - Increase in human potential/capital. In addition to improving the quality of education at all levels there is a need to develop a system of training and further training of skilled workers and experts in popular specialties. In addition, by analogy with the problem of accumulation of physical capital, human capital formation requires a systematic effort to retain the country's most valuable professionals, i.e. reduce brain drain and return home of professionals working abroad.

- Removal of macroeconomic risks. This involves protecting the economy from affects and fluctuations of external conditions, long-term sustainability of the budget system, the maintenance of the national currency price stability.
- Modernization of the state framework. This foresees improvement of the quality of public services and expenses reduction on their production, improvement of administrative system, increase in disclosure of governments, their willingness to identify community needs and respond to their changes, elimination of corruption and “struggle for the rent”. Ultimately, this should lead to reduction of state regulation burden for businesses.
- Strengthening of market mechanisms and promoting entrepreneurial activity. Protection of property is to be increased, administrative barriers banning the access for new companies to the market and their withdrawal from it are to be removed, and incentives to improve production efficiency are to be enhanced. An important task that can provide a jump start for the economy is to shift economic resources from the low productive companies to the efficient ones. This requires, above all, cancelling the current practice of artificial direct and indirect support for uncompetitive companies. This will create conditions to ensure their redevelopment or closure with the transfer of resources to the efficient companies.

Among the macroeconomic challenges of transition to green economy the inefficiency of government regulation should be mentioned and, above all, taxation and subsidies.

Conservation of the resource model is underpinned by the budget and tax role of the energy sector. According to the Russian Government data actually half of the state budget (49.2% in 2011) is formed by the oil and gas revenues. It is planned to reduce this share to 43.5% in 2014<sup>2</sup>. Situation when the modern tax burden on the manufacturing industries with low environmental impact is higher than in raw materials and brown manufacturing industries also prevents the structural changes in the economy, which does not contribute to greening of economy. For instance, in the production of machinery and equipment that load is 11.1%, in construction - 11.3%, but in metallurgy - 3.3%, in the production of coke and petroleum products - 5%<sup>3</sup>.

The system of subsidies in the country also does not contribute to the transition to green economy. This is especially true of the energy sector. There the state support of oil and gas producers is particularly significant. According to the estimate in 2010 the subsidies to the oil and gas industry accounted for 14.4 billion dollars, exceeding 14% of the value of all tax and other payments to the federal budget for this industry<sup>4</sup>. The bulk of benefits accounted for the tax on mineral extraction (MET) and export duties: 9.8 billion USD or 68% of the total amount. Government subsidies to producers of oil and gas are directed primarily at stimulating the development of new fields, including the Arctic Circle.

Much less state support directed for improving the use of energy already involved in the economy, improvement of energy efficiency and more complete extraction of hydrocarbons from productive fields. Meanwhile, this path is cost-effective and has a much lower environmental risks. Thus, according to the International Energy Agency (IEA), if Russia uses its energy resources as efficiently as the northern developed countries (Norway, Canada, Sweden, etc.), it would save more

<sup>2</sup> From the speech of Prime Minister Vladimir Putin at the Congress of All-Russian public organization "Business Russia" (December 21, 2011) Available at <http://premier.gov.ru/events/news/17451/sobstvennost>

<sup>3</sup> Ibid.

<sup>4</sup> I. Gerasimchuk (2012) State support for oil and gas production in Russia: at what price? Moscow-Geneva, WWF Russia and IISD.

than 200 million tonnes of oil equivalent, which is about 30% of energy consumption of the country in 2008 and is 100% energy demand in the UK<sup>5</sup>.

Currently, the Russian government is making efforts to change the situation in the area of subsidies and taxes in the commodity sphere. For example, in 2010 at the G20 Summit Russia unveiled its strategy to rationalize and, in the medium term, to eliminate inefficient subsidies that encourage wasteful consumption of fossil fuels within the Energy Strategy 2030 and the Concept of Socio-Economic Development 2020. There are steps in this direction of the Government to amend the Tax Code, which was amended to increase the rate of MET tax on natural gas, produced by Gazprom in 2012 by 50% - from 237 to 509 roubles per 1 000 m<sup>3</sup>; in 2013 to 582 roubles; and in 2014 to 622 roubles. (November 2011)<sup>6</sup>.

The growth of the exploitation of natural resources and formation of the economy of raw materials was supported by favourable global pricing environment of the 2000s. For instance, the average export price of Russian oil and gas increased by 4-5 times in 1995-2010. (Annex 4)

The crisis that began in 2008, showed that the most dangerous threat to the existing raw materials export model of the Russian economy was a sharp decline in energy prices in the world markets. Now Russia's economy is substantially dependent on continued high level of oil prices.

Russia ranks fourth in the world regarding GHGs emissions (5.2%) and most likely, its share will decline. This may be due to government decisions in place, according to which the economy should be modernized and restructured, and energy intensity of the Russian economy should be reduced by 40% by 2020. In accordance with the obligations of the Kyoto Protocol, the country must generate during the first budget period of the protocol (2008-2012) GHGs not greater than in 1990. There are now only 70% carbon dioxide emissions of 1990 level in Russia.

For transition to green economy the adoption of the Climate Doctrine (2009) by the Russian Government was an important decision. It provides energy efficiency in all sectors of economy, development of energy saving measures at industrial and infrastructure facilities, including energy losses reduction at transportation, increase of the fuel efficiency of vehicles and energy efficiency of buildings, and development of renewable and alternative energy sources.

According to the National Report of the Russian Federation on the inventories of anthropogenic emissions, the anthropogenic GHG gas emissions in CO<sub>2</sub> – eq. amounted to 2,112 billion tonnes, excluding emission and sequestration of GHG associated with land use and in forestry (volume, structure and dynamics of GHGs emissions in Russia are shown in Annex 5). Among the sectors the most GHGs emissions are generated in energy (over 80%), followed by industrial processes (9%), agriculture (6%), and waste (3%).

The situation in Russia in the context of the transition to green economy and building sustainable development in comparison with other countries provide indicators of environmental sustainability (Annex 6). The index of adjusted net savings, which is calculated taking into account the correction of macroeconomic indicators for the depletion of natural capital and the damage from pollution, for Russia is negative, whereas the vast majority of countries with high human development index has a positive index. Ecological Footprint in Russia (4.4 ha) is less than that of those countries, which indicates a relatively smaller effect of a single citizen of the country on the biosphere. Russia is on the lead with the percentage of forest land and, therefore, with many of relevant ecosystem services. The country has large values of the fossil fuels share in total energy consumption, carbon dioxide

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<sup>5</sup> Ibid.

<sup>6</sup> RBC Daily newspaper. February 7, 2012

emissions per capita, urban pollution, and depletion of natural resources. Compared to most other countries the sociological indicator of satisfaction of people with the country's actions for the protection of the environment is low.

One of the objective reasons for the decline of attention to environmental issues may be the fact that a deep social and economic crisis in Russia in the 1990s led to a significant decrease in production, that had a positive impact on the nature because of the significant reduction in the extraction of natural resources and environmental pressures. The aftermath of the sharp decline in industry, agriculture, forestry and other sectors was in reduced emissions and discharges of pollutants into the air and water, significantly reduced degradation of energy resources and volumes of their extraction.

In general, during the period of 1990-2010 there has been a reduction in the environmental impact of fuel and energy sector as the result of reduction in the production of oil and coal. The harvested area decreased by 36%. For two decades, sewage discharge decreased by almost 40%, emissions into the air reduced at the same level, and freshwater withdrawals from water bodies – by 32%. However, the trend of reduction of resource use and pollution has changed since recovery started in 1999: air pollution from stationary sources, energy sources production increased, and oil demonstrated an increase of 1.6 times compared to 2000. The problem of waste is urgent, its volume increased 1.5 times after 2005 (Annex 7).

An important criterion for the transition to green economy is the decoupling effect. Russia's trend indicators of nature intensity and the intensity of contaminants (per unit) for 1990-2010 may be considered positive (Annex 8). Stabilization/reduction in use of natural resources and pollution, whilst significant growth of GDP in 2000s led to a significant reduction in the nature intensity and intensity of pollution in the country, i.e. decoupling effect had been achieved. These are important indicators for green economy. Energy intensity declined by 26% in 2010 compared to 1990. Water intensity (35%), pollution of air (42%), water (30%), and waste generation rate reduced even more significantly.

As a key positive trend especially for greening economy it is necessary to highlight the significant reduction in energy consumption in Russia (in 2010 by 69.8% compared to 2000 and 74.7% compared to 1990). After its growth in the 1990s this indicator decreased considerably in the 2000, indicating the decoupling effect in energy consumption. The rate of decline of Russian energy intensity was much higher than that in the European Community. And the task is to keep these rates in the future.

However, the current energy intensity of Russian economy is still high, and its reduction remains a priority. Russian energy intensity on average is 2-3 times higher than in developed countries. Of course, Russia is a northern country, but the performance of the Nordic countries demonstrates the huge potential of energy savings in Russia. Particularly successful were the pre-crisis years 2000-2008, when energy intensity decreased by 35%, which was largely due to the rapid growth of GDP. This is one of the best results in the world. However, the crisis has led to an increase in energy intensity in 2009 and 2010 (Annex 9). It should be also noted that Russia has already taken structural "cream" off the reduction of energy intensity, which requires significant efforts to further reduce this figure.

## 2. RESOURCE BASE

Russia has enormous resources for the transition to green economy: human, material, technological, and natural. Nature is an essential part of the country's wealth. The World Bank estimates that the share of natural capital in national wealth of Russia is about 70%, while the human capital accounts for 20%, and the physical capital (produced, manmade) - for 10% of wealth<sup>7</sup>. In developed countries – members of OECD natural capital accounts for only about 5%, human and physical capital - for 85% and 10%, correspondingly.

The huge natural resource potential of Russia is of global significance. The subsoil of the country contains a significant share of the world reserves and almost all kinds of minerals, fuel and energy (oil, gas, uranium, coal), ferrous metals (ores of iron, manganese, titanium, chromium), non-ferrous and rare metals (nickel, copper, lead, zinc, tin, aluminum (bauxite), and others); alloying metals (molybdenum, tungsten, tantalum, niobium, zirconium, vanadium), diamonds and precious metals (gold, platinum, etc.), non-metallic minerals (apatite, phosphates, potash, fluor spar, etc.), precious stones, etc. Russia is the world leader in oil and gas, which allows us to consider the country the world energy donor.

Huge reserves of fresh water, forests, pristine ecosystems, and great biodiversity make up a significant part of the natural capital of Russia and have an impact on global ecosystem services, maintaining the stability of the biosphere.

Natural capital of the country can play a dual role for the Earth. On the one hand, Russia's natural resources are a storehouse for the development of the global economy by providing resources to many countries around the world. On the other hand, the majority of stock is located on the undisturbed by economic activity areas and their large-scale development and introduction into the economic turnover could have a negative impact on the global ecological balance.

For Russia, the concept of green economy itself is new, and it is not actually used in official documents. Nevertheless, the planned country targets for the next 10-20 years largely correspond to the objectives of the transition to green economy. This is reflected in the general policy of resource utilization and environmental protection for the future, the existing legal and fiscal instruments. Perhaps the major task of Russian economy at present reflected in the basic documents of the country's medium and long-term performances, speeches of the President and Prime Minister of the Russian Federation is a shift from the raw materials model of the economy. This task is a central concept of green economy. Social and environmental goals of green economy are mostly included in the basic concept paper for the future – The Long-Term Concept of Socio-Economic Development 2020 (2008). (Now this concept is adjusted in accordance with the post-crisis situation). The major objective of green economy – the enhancement of energy efficiency - is a priority for Russia. It is reflected in the Energy Strategy 2030 of Russia (2010), in the Presidential Decree On Increasing Energy and Environmental Efficiency (2008), and in the Law on Energy (2009). Development priorities for the sectors of green economy are reflected in the available long-term programs for individual resources: for the energy resources, including renewable ones, in the above mentioned Energy Strategy 2030, for water in the Russian Water Strategy 2020 (2010), for the soil in the State Programme on Development of Agriculture and Regulation of Markets of Agricultural Products, Raw Materials and Food in 2013-2020 (2012), and for the fisheries in the concept of the federal

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<sup>7</sup>D.S. Lvov and V.I. Vidyapin (Eds.) (2008) Economics, Moscow: State Economical Plekhanov Academy publishing.

targeted programme on Efficiency Improvement and Development of the Resource Potential of the Fisheries in 2009-2013 (2008), etc.

Starting from 1990s Russia quite actively formed the environmental legal framework and policy documents. In addition to the above mentioned documents, the following regulations should be noted here The Main Provisions of the State Strategy of the Russian Federation for the Protection of the Environment and Sustainable Development (1994), Presidential Decree On the Concept of Russian Federation's Transition to Sustainable Development" (1996), the Ecological Doctrine of the Russian Federation (2002 ), the Federal Targeted Programme of the Russian Federation on Ecology and Natural Resources (2002-2010) and others. A new Federal Law On Environmental Protection was approved in 2002. The Water and Forest Codes have been adopted recently. In the near future it is planned to adopt a law on the best available techniques that could form the basis of modernization, structural and technological changes, and the greening of economy.

At present the main taxes in the sector of natural resources and environmental protection comprise six types of payments: 1) charges for environment pollution (negative impact), 2) payments for the use of natural resources, 3) payments for the use of forest resources, 4 ) water tax and charges for the freshwater use, 5) charges for the use of wildlife and aquatic biological resources, and 6) the land tax. At this point, we must distinguish two issues: payment (fees and taxes) for environmental pollution and fee for the use of natural resources. The situation with the first type of payment is now worse than in 1990s, but it is opposite as far as the collection of the fee for the use of natural resources is concerned. The government has begun to collect this type of taxes better as compared to 1990s, to assign the resource rent, and, thanks to the high (except for the crisis period) energy prices in the world market, these payments are budget forming. In 2010 the income of the consolidated budget of the Russian Federation consisting of taxes, fees and regular payments for the use of natural resources accounted for 1,441 trillion roubles or 9% of the total income<sup>8</sup>.

An important component of the natural capital of Russia is its land resources, the largest in the world. Total area of the country is more than 1.7 billion hectares (Annex 10). The most valuable part of land is the potential agricultural land, 220 million hectares, and they accounted for 13% of the total area of the country. Agricultural land in size is inferior to the forest land, which covers more than half of all Russian territory. The share of the wetlands is 13% of the total area. The most anthropogenic altered and intensively used lands of settlements and industries make up about 2%.

A large part of the country has not been included in economic development (approximately 60-65%), which allows such areas to play an important role in regulating the stability of the biosphere of the planet.

One of the most acute problems of agricultural land potential is the land degradation. Practically in all regions of the Russian Federation there is a trend to deteriorate the state of lands. Intensively developed erosion, deflation, waterlogging, salinization, desertification, flooding, overgrowing of agricultural land with bushes and low forests and other processes leading to loss of fertility of agricultural soils and further their withdrawal from economic turnover. Water erosion covers areas equal to 17.8% of total area of agricultural land, wind erosion – 8.4%, hydromorphic and wetlands occupy 12.3%, saline and alkaline lands – 20.1%. Even larger area is under the risk of degradation processes (erosion and deflation of soils, etc.) (Annex 11). Decline in the quality of agricultural land leads to a significant drop in agricultural yields.

A decline in natural fertility of the most productive agricultural land is observed due to the sustained trends of dehumification of tillage soils. The humus content in soil has reached the extreme minimal

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<sup>8</sup> Russia in figures (2011). Moscow, Rosstat (Russian Statistic Agency)

values: 1.3% - in the Non-chnozyom zone, 5% or less - in the Central Chernozyom Oblasts, where the rich chernozyom is completely lost and almost all multi-humus soils are vanished.<sup>9</sup> Now dehumufication trends continue to evolve.

In order to combat the land degradation a special federal programme on Preservation and Restoration of Soil Fertility of Agricultural Lands and Agricultural Landscapes as national heritage of Russia for the period of 2006-2010 has been adopted. It failed to be completely realized due to the economic crisis.

The Russian Federation is one of the richest countries with **freshwater resources**. Average annual renewable water resources of Russia are 10% of global river flow (2nd place in the world after Brazil) and are estimated at 4.3 thousand km<sup>3</sup> per year. The basis of water resources of the Russian Federation is the river flow, formed by 2.5 million rivers and streams, the total length of which is about 8 million km (Annex 12). The main value of runoff from the territory of Russia is formed within the country and only about 5% comes from the territories of the neighbouring states. Throughout the country, water availability is 30.2 thousand m<sup>3</sup> per person per year.

The main problem regarding the use of water resources is the considerable unevenness of their distribution throughout the country. In the developed areas of the European part of the country more than 70% of production capacity are located, and not more than 10% of freshwater resources (see Annex 12 concerning rivers of European and Asian parts of the country).

Water withdrawal from natural sources in recent years was 70-80 km<sup>3</sup> or about 2% of renewable resources, in a number of river basins it reached 50% or more (for more details of water use go to the analysis of the water sector). Water scarcity in some regions of the country occurs mainly in dry periods.

Resource potential of groundwater in the Russian Federation is about 400 km<sup>3</sup> annually. The total amount of groundwater that is suitable for use (drinking and domestic, industrial process water supply, irrigation of land and pastures) is about 34 km<sup>3</sup> per year.

The Russian Federation has a functioning water management system, which is one of the largest in the world and includes over 30 thousand water reservoirs and ponds<sup>10</sup>, the total volume of which is over 800 km<sup>3</sup> and the useful volume is about 342 km<sup>3</sup>. Network of canals for inter basin and internal basin redistribution of runoff, and water systems designated for water transportation with total length of over 3,000 km allow transferring the runoff in a volume up to 17 km<sup>3</sup> annually.

The volume of water loss during transportation in the Russian Federation is up to 8 km<sup>3</sup> per year. More than 4.8 km<sup>3</sup> of water per year is lost in irrigated agriculture because of the low technical level and high level of depreciation of the drainage systems and the hydraulic structures, and about 3 km<sup>3</sup> per year (over 20%) of the total network tap water is lost in the centralized water supply systems due to their poor technical condition.

About 17 km<sup>3</sup> of contaminated wastewater goes into the water bodies of the Russian Federation annually. The main sources of polluted wastewater are utilities, industry and agriculture, which account for over 90% of the total volume of wastewater discharge.

The range of estimated indicators of water demand in the light of scenarios for development and economic growth envisaged in the Concept of Socio-Economic Development 2020, and the impact on the economy of the Russian Federation by the global economic crisis will be determined by the

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<sup>9</sup> The State Report On the State and Protection of the Environment of the Russian Federation in 2003 (2004).

<sup>10</sup> Water Strategy of the Russian Federation 2020 (2009).

actual growth rate of industrial and agricultural production, and energy generation and is projected to be 90-100 km<sup>3</sup> by 2020.<sup>11</sup>

Regarding the land covered by **forests** Russia ranked first in the world, having more than 20% of the world's forest and timber reserves, and as for the deciduous and coniferous forests Russia is a true monopoly, having two thirds of world reserves.

According to the official figures the area of forest land for the period from January 1st, 1993 to January 1st, 2009 was increased by 34.3 million hectares or about 5%. Total timber reserves in Russia over the same years increased by 4% (Annex 13).

By their economic and environmental values in terms of forest management Russian forests could be divided into 3 groups.

The 1st group consists of forests that provide protection, water conservation or recreational functions (forest green areas of cities, anti-erosion forests, forest shelter-belts, forest protected areas, etc.). They account for just over 22% of the total forest area. In the forests of the 1<sup>st</sup> group the forest exploitation does not take place.

The 2<sup>nd</sup> group (about 6% of forest lands) consists of the forests with limited operational value due to the exhaustion as a result of logging in the previous years. Usually they are located in areas with high population density and extensive network of land transport routes, in areas that require restoration of forest resources near industrial centres and have predominantly protective functions. In these forests the harvesting is allowed, but limited in scale, not to undermine the ability of their continuous reproduction.

Almost 72% forest land are covered with forests of the 3rd group. They are the main source of wood for economic development and are classified into undeveloped and redundant groups.

In general, the total timber reserves in Russia exceed 83 billion m<sup>3</sup>, including over 50% of mature and over mature wood (Annex 14). In the general stock of wood more than 75% are coniferous species (larch, pine, spruce). Timber reserves spread unevenly across Russia (Annex 14). The leaders in the forest area are Eastern Siberian, Far East, and West Siberian economic regions of Russia, where more than 70% of the reserves are located. This creates a problem for harvesting due to the lack of appropriate transport and procurement infrastructures in these regions, and their considerable remoteness from places of processing and consumption. (The issues associated with timber harvesting and logging will be discussed here below when analyzing the forestry sector).

Destruction of forest plantations, which annually amounts to about 3 million hectares, affects the magnitude of wood stockpiles. Forest fires account for the vast forest destruction – over 78% of the area in 2010.<sup>12</sup> The number of fires constitutes a significant figure - about 34.8 million cases (Annex 14). It is the population to be blamed for those 22.2 thousand fires, which were caused by irresponsible behaviour of citizens.

For the reforestation and for the compensation of losses due to deforestation and forest destruction the state takes steps to protect forests (Annex 15). The reforestation area is small and in average equals to 845 hectares per year in 2006-2010. This is 2.2 times less than in 1990. The proportion of reforestation in the total area under the reforestation activities is over 20%.

Russian mineral wealth contains a significant part of the world's hydrocarbon **energy resources**: oil - 13%, gas - 34%, coal - 12%. Russia is among the world leaders in the extraction of oil and gas,

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<sup>11</sup> Water Strategy of the Russian Federation 2020 (2009).

<sup>12</sup> The main indicators of environmental protection (2011). Statistical Bulletin. Moscow, Statistics Service.

which makes the country one of the worldwide energy donors. The country produces 505 million tons of oil and 649 billion m<sup>3</sup> of natural gas and 317 million tons of coal (Annex 7). Energy sector significantly increased the production of energy resources in 2000s in comparison with the 1990s crisis years. However, only the natural gas production in 2010 managed to surpass the rate of 1990, while oil and coal production is less than the rates of 1990.

In 2010 the energy export amounted to 273 billion dollars or about 70% of total exports of the country (Annex 16). Thanks to the huge rise in prices the volume of energy export increased more than 8 times, and its share in total export increased by 26.3 per cent in comparison with the 1995 figures.

The exploitation of the vast natural potential of Russia is limited due to the difficulty of the extraction of many types of resources, the need of enormous investments for their involvement in economic turnover, and significant risks of volatility in the world markets. Along with this, the cost-effective resources are gradually depleted. For Russia, the threat of exhaustion of available and proven oil reserves in the next 20-30 years has become real. The time of the full exhaustion of profitable exploited stocks of many minerals is nearing. Mineral resources (primarily oil and gas) of the Volga-Urals and West Siberian regions are depleted. Thus, the depletion of stocks of major oil and gas provinces in the North Caucasus is 70-80%, in the regions of the Ural-Volga region 50-70% and in Western Siberia the depletion is over 45%. This occurs mainly due to the low level of exploration during the decade and the complexity of production conditions and the necessity to work in the inaccessible and remote areas. Even during the recovery period from 2002 to 2008 time horizon of depletion of oil reserves declined from 26.3 to 21.9 years. The process of oil reserves recover is going on at a low rate, and the crisis is making it clearly worse. The situation with natural gas is better, mainly due to its substantial reserves (the horizon is about 70 years of production). And then everything will be very expensive - the shelves of Barents Sea, Sakhalin, and the permafrost of Siberia. Even now the development of these fields requires tens of billions of dollars of investments and a sufficiently long period of time.

Huge reserves of energy associated resources are linked with an increase in extraction of raw materials from existing fields. In accordance with the General Development Scheme of the oil industry in Russia an increase of the projected oil recovery by 5% (from 37% to 42%) would augment the initially recoverable reserves by more than 4 billion tons. For comparison, the reserves of the Arctic Prirazlomnoye shelf in the Pechora Sea, extracted with the great economic and environmental risks, are of 72 million tons of oil only.

The **ecosystem services** of the country and its living natural capital are very important for Russia and the whole world. During past few years much attention in the world is paid to the ecosystem services, biodiversity conservation, and their economic benefits. The ecosystem services represent benefits that people receive from ecosystems. The problem of payment for these services is increasingly being discussed. The economic benefits of ecosystem services of the country, Russia's interactions with the global ecosystem are determined primarily by its size and the significant part of its territory preserved in its pristine state. It is mostly occupied by highly productive ecosystems and wetlands, which play an important role in stabilizing the environment. The rest of the country is occupied by tundra, steppe, and semi-desert landscapes.

There are a number of factors enabling the important role of Russia in the global ecosystem management, biodiversity conservation, and economic benefits to the world:

- Russia has the world's largest area without economic activities, covering about 60-65% of the country's territory. This area is much larger than the remaining natural ecosystems in other major countries: Brazil, Canada, Australia, the US and others. It is much more

powerful natural regulator of the global environment than, for instance, vast undisturbed desert areas of Australia. The area of natural ecosystems worldwide is sharply reduced; at the beginning of the twentieth century, they were destroyed by 20% of land, now, they are destroyed by 61-63% of the territory.

- The world's largest tract of forests, comprising 22% of the planet forest area belongs to Russia. This tract has a significant impact on the sources and sinks of carbon dioxide and methane on the planet, continental water cycle in Eurasia, radioactive characteristics of surface, and species diversity.
- An important feature of Russia's territory is a large area of wetlands – marshes, wetlands, and hydromorphic areas. These lands represent approximately 60% of all such areas of the northern hemisphere. Wetlands serve as cool temperate traps for carbon, which is very important in stabilizing the climate. In boreal wetlands, including the Arctic tundra, fixed carbon quantity is higher than in the tropical forests, due to a very slow process of decomposition of organic matter compared with the tropical forests.
- In Russia there are unique ecosystems that preserve rare species of flora and fauna, which are the planetary domain. Some of them are included by the international community in the List of World Natural Heritage, and have the status of World Biosphere Reserves. As of 2010 Russia was represented in the UNESCO List with 24 sites, including 15 cultural heritage sites and 9 of natural heritage<sup>13</sup>.
- Russia has huge reserves of freshwater. Lake Baikal alone contains about 20% of the world's fresh water. For the world the water shortage and its sharp aggravation in the near future is an acute global problem.

To maintain ecosystem services and biodiversity a system of Specially Protected Areas (SPAs) is traditionally used. In Russia, only state nature reserves and national parks represent 141 objects of which 37 have the status of Biosphere Reserves (Annex 17). The area of these state protected areas covers 2.4% of the country's territory. Their number has grown significantly over the past 30 years: for instance, in 1980 there were 46 state nature reserves, and in 2010 there were already 101.

Totally, in the country there were 11,937 specially protected areas of federal, regional and local importance, which total area was 207.3 million hectares or 11.5% of the total territory of Russia in 2010.<sup>14</sup> Protected areas can be found in all regions of the country. The structure of Russian SPAs constitutes the bulk of the protected areas of regional level, which accounts for 84% of the total number of SPAs and 58% of the total area. For protected areas on local level, the figures are 13% and 14% correspondingly.

In recent years, the cost of maintaining protected areas substantially increased. Total funding for state nature reserves and national parks has increased from 1.311 billion roubles in 2005 to 2.911 billion roubles in 2010 or by 2.2 times.<sup>15</sup>

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<sup>13</sup> Ministry of Natural Resources of Russia (2011) "On state and protection of the environment of the Russian Federation in 2010." The State Report, Moscow.

<sup>14</sup> Ministry of Natural Resources of Russia (2011) "On state and protection of the environment of the Russian Federation in 2010." The State Report, Moscow.

<sup>15</sup> Calculated from: "Key indicators of the environment". Statistical Bulletin. Statistics Service, Moscow, 2011.

### 3. SECTORS OF ECONOMY

Alongside with the accumulated economic and social problems, the need for transition to green economy is caused and by development of environmentally adverse trends that are largely related to the natural intensity of economy restructuring in 1990s as a result of the crisis focused at raw materials and the polluting sectors, which brought about the degradation of resource saving and high-tech industries. After 1990 the share of the energy sector increased by 3 times and now it comprises one-third of the entire economy. If we take into account metallurgical sector (ferrous and nonferrous metals), the Russian economy consists by more than a half of energy and metals, i.e. sectors that have the greatest among other industries impact on the environment. In general, the economy has witnessed a significant shift towards nature intensive industries. Russian economy now is increasingly becoming raw material economy, as it was demonstrated by the crisis.

In this regard, a major environmental hazard of the crisis and post-crisis period is a further consolidation of existing raw materials export model of development, which has already exhausted itself. In these economic conditions, the policy of transition to green economy can be ineffective and only try to mitigate the impact of man-induced and unsustainable development. The way for radical changes of the development model, modernization of the economy, and innovation are outlined in the policy documents for the country development (in particular Concept and Strategy of Socio-Economic Development 2020), speeches of the President and the Prime Minister of Russia. But for the real change take place it is essential to make great efforts, because the inertia of the raw materials mode of development is very strong.

In the present structure of the sector impact on the environment the leading position take sectors and activities primarily related to energy: mining, generation and distribution of electricity, natural gas and water. They are leaders in environmental pollution (Annex 18). The energy sector accounts for about 50% of emissions of harmful substances into the atmosphere from stationary sources, over 60% of polluted waste water, approximately 90% of production and consumption waste, and four-fifths of total GHGs emissions. Significant impact on environment pollution also has the second biggest industrial sector – metallurgy (ferrous and nonferrous).

For greening the economy, UNEP identified ten sectors for the foremost investments (Annex 19). In our view the key to Russia's economy is a transformation and development priorities shift in the energy sector. It is responsible for the largest contribution to the pollution of the environment in Russia, natural resource depletion and degradation of pristine areas. This situation is not typical for the vast majority of countries, where energy reserves are low, or none at all. In this regard, in Russia, the critical importance for the transition to green economy is the energy sector modernization, which is a key sector for the country. This is due to the leading role of this sector of Russian economy in GDP and taxes, revenues, employment, and export revenues. In future the role of the energy sector in the economy will be the same in view of plans to increase production of energy. It is also necessary to mention a significant negative impact of energy on public health. In this regard, it is advisable to include the energy sector in the list of key sectors (Sector 11), which should be considered in the transition to green economy (Annex 19).

The importance of the energy problems is determined by their cross sector role in transition to green economy. Among the UNEP objectives for the sectors the enhancement in energy efficiency is necessary for heating and lighting in buildings, energy supply, industry, and transport (Annex 19)

The **energy sector** is one of the most dynamic sectors in the Russian economy. The country ranks first in the world regarding production of oil, second in natural gas, third in coal. Compared to 1995

there was a significant increase in the production of energy resources, especially oil - by 1.6 times, natural gas production increased by 9%, coal by 21% (Annex 7). Such situation also contributed to establishing higher energy prices in the 2000s. (Annex 4)

In the energy sector, it is necessary to ensure both the safe use of traditional resources and energy efficiency. On this route, it is possible to realize the huge reserves: Russia can save 45% of its total primary energy consumption, which equals the annual consumption of primary energy in a country like France.<sup>16</sup> This is due to low efficiency, which because of the technological backwardness is 2-4 times lower than in developed countries.

It is also important to define clearly how to provide the energy basis for country's further development and to keep its position as an energy donor. From a theoretical point of view, there are at least two answers, 1) to increase the gross production of energy, or 2) to use the energy reserves. At this point, the state should strictly define development priorities because investments from the government and different companies are not sufficient to satisfy both of these relatively expensive variants. In transforming Russian economy there is obvious need for energy development with the orientation at the final, not the intermediate results in the form of energy production and energy generation and heat production. Is there a need to produce more? Energy intensive and backward structure of Russian economy by itself is a great alternative energy deposit from which they can take hundreds of millions of tonnes annually. We can say that the main energy reserves of the country are in the European part of the country where the formal reserves of oil, natural gas, and coal are minimal. However, there are the vast majority of industrial, energy, utility, and transport facilities which due to the outdated technologies, over consuming and waste of hundreds of millions of tonnes of valuable raw materials. Namely from this source the country can take energy resources for its development and export profits to support the budget during next 10-15 years.

The priority feature of the green economy growth is radical increase in energy efficiency. For Russia, this problem is extremely challenging. The problem of the huge reserves and loss of energy was highlighted in the Presidential Decree (2008), Russian Energy Strategy 2030, and the latest research in Russia by the World Bank, McKinsey Company, the Russian Centre for Energy Efficiency, etc.<sup>17</sup> The economic logic of approaches represented in these documents is clear enough. In a country with relatively simple technology it is possible to save almost half the energy consumed. This will require three times less investment compared to a gross increase of energy production: 320 billion dollars against more than one trillion dollars to scale the production. Investments in energy efficiency will benefit approximately 120-150 billion dollars a year and can be paid back within 2-4 years. This is a very effective indicator, which is 3-4 times lower than average.

Implementation of the numerous opportunities for improving energy efficiency involves introduction of the measures to ensure the economic interest in energy conservation at all levels - from the industrial development to the household activities (including the installation of water and heat meters in houses and introduction of incentives for energy efficiency in enterprises). Catalytic, regulatory, and even coercive role of the government to improve energy efficiency is difficult to overestimate. Now the gross increase in energy production is supported by many lobbies (oil, gas, nuclear, power generation, etc.), the energy efficiency has no real support groups in businesses, government, and society.

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<sup>16</sup> Estimates of the Energy Strategy of Russia 2030, in the World Bank "Energy Efficiency in Russia: Untapped Reserves". (2009) The World Bank, CENEf,

<sup>17</sup> McKinsey Company (2010) "Energy Efficient Russia. Ways to reduce energy consumption and greenhouse gas emissions" and The World Bank, (2008) Energy Efficiency in Russia: Untapped Reserves.

Reducing energy consumption also may save up to 240 billion m<sup>3</sup> of natural gas, which is more than a third of its annual production in our country,<sup>18</sup> and may ensure gas demand both domestically and abroad.

A striking example of the need for strict state regulation in Russia is the enormous reserve of energy resources associated with the utilization of associated petroleum gas (APG), which can be utilized with relatively simple technologies. According to the World Bank in Russia today up to 50 billion m<sup>3</sup> of APG are burned up per year, or more than half of the total produced volume (for comparison, France consumes annually 47 billion m<sup>3</sup>). In the developed countries and energy export countries, the rate of loss of APG by 2-3% is considered to be a norm. The valuation of the Russian losses exceeds \$10 billion a year. Emissions of particular matter in combustion processes varying from 322 to 400 thousand tonnes are extremely dangerous for the environment and human health.<sup>19</sup> Up to 80 million tonnes of carbon dioxide are emitted as well, being detrimental to the climate system. An example of a positive approach to solving the problem of APG is a Lukoil company, which recycling rate of APG exceeds 80%. In accordance with the decisions of the Government of the Russian Federation amounts of flaring gas in the coming years should be reduced to 5% of its production.

Under the restructure of the “project portfolio” financed with the public funds, it seems reasonable to give up large-scale energy and nature intensive infrastructure projects with high environmental and price risks. Huge reserves of energy savings cannot force companies to develop new fields in the far North and off-shore, as those fields require tens of billions of dollars of investment and at current fluctuations in energy prices are at high risk of non-profitability; environmental risks of such production are significant under conditions of climate change (the need to increase investment in infrastructure in terms of melting permafrost), the probability of accidents, as it was demonstrated by the disaster at the BP platform in the Gulf of Mexico. At the same time geological exploration in promising areas should be continued.

The stabilization of the volume of nature exploration, ecologically expedient reduction in the share of raw materials in total export do not automatically reduce the economic benefits from the use of nature capital, natural advantages and export position of the country. It is important both from foreign policy and foreign economy view. Moreover, there are two possible ways of additional export gains. First, only increase of energy efficiency and realization of energy saving potential in the country will allow to export an additional energy resources amounting to about \$100 billion annually.<sup>20</sup> In course with this trend is a widespread dissemination of renewable energy sources. Secondly, modernization and technological restructure of the Russian economy, increasing share of processing and manufacturing sectors, increase in refining depth of raw materials, infrastructure development, in particular, could yield additional tens of billions of dollars from trading abroad with products of deeper level of processing of primary natural resources and more added value. According to the Ministry of Finance of the Russian Federation and Economic Expert Group, due to the low depth of refining the country is losing up to 3% of GDP.<sup>21</sup>

As far as the accumulation of the country budgets and these of the energy companies are concerned it is important to note that with possible overall stabilization/reduction of energy production by

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<sup>18</sup> The World Bank, CENef, (2009) Energy Efficiency in Russia: Untapped Reserves. Available at [www.cenef.ru/file/FINAL\\_EE\\_report\\_rus.pdf](http://www.cenef.ru/file/FINAL_EE_report_rus.pdf)

<sup>19</sup> Financial News February 25, 2010.

<sup>20</sup> The World Bank, CENef, (2009) Energy Efficiency in Russia: Untapped Reserves. Available at [www.cenef.ru/file/FINAL\\_EE\\_report\\_rus.pdf](http://www.cenef.ru/file/FINAL_EE_report_rus.pdf)

<sup>21</sup> <http://www.mk.ru/economics/article/2010/11/14/544000-rossiyskiy-tek-sedaet-sam-sebya.html>

improving energy efficiency and domestic energy supply income of the country and individual companies may increase significantly due to increase in energy resources export, increase in depth of refining and in diversified production. Thus, according to the existing estimate the cost of crude oil converted into petrochemical products, increases by 6-10 times.<sup>22</sup> The paradoxical thesis to earn more without digging more is quite relevant to contemporary economic policy. For Russian energy companies this way does not require radical changes in their structure and management, as they are already vertically-integrated and own the entire chain from resources digging to trade with final products. The state should form a new type of the material sector development and should oblige companies to adopt it, because it reflects the interests of the whole modern society and future generations.

An important area of transition to green economy is greening the **agriculture**.

At present, Russia is one of the largest agricultural producers in the world (Annex 1). The country ranks third in the world in potato production, the fourth in the production of cereals, sugar beet and milk; fifth place - for livestock and poultry production. Regarding the grain export Russia occupies one of the leading positions in the world.

The crisis of the 1990s significantly affected the reduction of agricultural land area involved in the agrarian turnover. For instance, the crop area declined from 117.7 million hectares in 1990 to 75.2 million hectares in 2010, or more than by one third. At the same time, the increase in productivity allowed to compensate at a large extent the reduction in cultivated land. Gross average grain yield in 1991-1995 amounted to 87.9 million tonnes and in 2006-2010 it amounted to 85.2 million tonnes (Annex 20).

Over the past two decades, the structure of ownership in agriculture has radically changed. In 1990, the vast majority of agricultural products was produced by agricultural organizations (collective and state farms), now there is an increasing contribution to agricultural production made by farmers and small farms owned by individuals. Thus, in 1990 practically the whole volume of grain was produced in the agricultural organizations, but now they account only for 77%, and the share of farmers is 22%, and it is growing (4.7% in 1995, 8.4% in 2000, and 18.3% in 2005). Similar trends of reducing the share in agricultural production by agricultural organizations, while the increase of the share of households and farmers' production have formed all types of agricultural products. Such change in the proportions is particularly evident in the production of potatoes, vegetables, fruits and berries, and milk.

The important environmental problems of the land potential of the agriculture are already mentioned above. More than 190 million ha of agricultural land have degraded, including 115 million ha of arable land, the most valuable agricultural land, largely due to wind and water erosion. For greening the agriculture, increased use of organic fertilizers can play an important role. Now their use is still low (Annex 21). For comparison, in 1990 per 1 ha of crop area 3.5 tonnes of organic matter were fertilized, which is more than three times of the current rate (1.1 ton in 2010). However, since 2000, the fertilized area has increased by 3.4 times.

Russia can obtain substantial economic and social benefits from the transformation of the agricultural sector that should be based on the transition from business as usual intensive agricultural production to ecological (organic) one. Feasibility of such transition for the whole world is noted in the report of the three world leading organizations: FAO (Food and Agriculture Organization of the United Nations), WHO (World Health Organization) and the World Bank. They

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<sup>22</sup> Spartak AN (2004) Russia in the international division of labor: choice of competitive strategy capable of. Moscow, MAX Press, p. 324.

conducted a long-term study on the comparison of ecological (organic) and traditional land use (2009). The result of this report was the resolution, which stresses that organic agriculture contributes to improvement of the human population, fixes the environmental issues and addresses the food crisis.

Organic farming allows simultaneous achievement of three socially and economically significant results: it provides increase in the employment of the rural population, provides high benefits for the agricultural sector in 3-10 times more profitable than the traditional agricultural production, due to higher product prices and lower production costs, conserves both the environment and traditional values of society.

The organic farming abroad is the most intensively growing sector of the global agriculture and market of commodity production, reaching the growth rate of 20-30% per year. The demand for organic agricultural products is growing rapidly worldwide. The value of global organic food market is up to \$30 billion annually. Currently the main markets are Germany, Italy, Britain, France, USA, Canada, and Japan. Many countries have special programs for organic agriculture. Thus, the National Organic Program (NOP) is in place in the U.S. market of organic products, which entered into force in November 2002. A key success factor of the program according to the experts of the U.S. Department of Agriculture are high demand for such products, active work of the private sector in agricultural production, as well as the established trust between producers and consumers. The main consumers of such goods are people with average income, as well as those who are concerned about their future and the future of their children, as well as the environmental situation on the planet. In addition, the development of organic agriculture contributes to the conservation of biodiversity, could harmonise the relationship between man and nature, and solves issues of preservation of healthy natural environment and human health.

Positioning of Russia as a country with good and clean lands for the production of food with rich genetic resources, and good environmental situation in many agricultural regions would help to create a favourable investment climate in such sectors as organic farming, production of organic products, development of ecological, agricultural and gastronomic tourism, service and restaurant sectors. Providing the priority to greening the agriculture would help to solve such challenges as increase of soil fertility by soil-forming organisms, preserve biodiversity of plants and animals, increase the sustainability of agro-and biocoenosis and, ultimately, would lead to the restoration and preservation of human health.

According to the classification of UNEP for the sector of **heating and lighting of buildings**, the main goal is to implement energy efficiency opportunities (Annex 19). In Russia, the share of housing and communal services accounted for more than one third of all primary energy consumption - 144.5 million tonnes of oil equivalent. And there the greatest country potential for savings is concentrated, as 68.6 million tonnes of oil equivalent, over 80% of which could be realized through cost-effective investments.

Over the past 15 years, upgrade of housing associated with the provision of energy has been improved (Annex 22). Especially it is true for heating, the share of the urban households having it increased from 68% in 1995 to 83% in 2010. Provision of the natural gas for households now is 69-70%.

At present a number of incentives for energy efficiency in buildings is being developed. Requirements for energy efficiency are prepared, as well as regulatory parameters describing the specific value of energy consumption in buildings. The introduction of these mechanisms should allow to exclude the improper use of energy during construction and renovation processes. Other possibilities for the energy efficiency development in the sector include the requirements of

implementing energy saving measures as a prerequisite for providing financial support to carry out renovation as well. Establishing the special guarantee fund could present one more mechanism to provide loans for major and current repairs.

It is also necessary to provide incentives for the population to use more massively different measurement systems. National experience shows that use of meters makes it possible to save between 10% to 33% of the cost of water consumption. Energy efficiency standards and labelling of lighting and appliances are also need to be in place. In Europe standards for refrigerators, combined with labelling programmes have led to an increase in sales of refrigerators of highest energy efficiency class from 5% in 1995 to 61% in 2005.

The numerous opportunities are provided by the implementation of mechanisms for improving energy efficiency in buildings of public sector, which accounts for about 9% of total final energy consumption in the country. The potential for reducing energy consumption according to the projections there could be up to 80%.

Important measures to stimulate energy efficiency in this area that are planned for implementation should be requirements on reduction in energy consumption by 3% annually. According to the current experience, setting limits for energy consumption is a productive measure. For instance, in the Chelyabinsk Oblast during 1999-2004 two-fold reduction of energy consumption was reached by use of that mechanism. In other countries, this approach also proved to be successful. In addition to that, provision of autonomous status to the public institutions could be also effective, which involves, first, the allocation of budget funds without any specific guidance on their use, and secondly, makes it possible to optimize the gained extra income by themselves.

The result of savings from increased efficiencies of electricity and water supplies for the state budget should reach 3-5 billion dollars a year; only investments in federal property buildings could benefit \$1.2 billion annually.

For consumers of electricity, the main driver of energy saving could be savings of expenses. The use of simple measures such as improving the natural lighting, more efficient use of lights, home appliances, installation of measuring equipment, insulation of windows and doors, balconies glazing, installation of double-glazed windows could save up to a half, and sometimes even more, of the electricity, heating and water expenses.

Promotion of energy efficiency for end-users plays an important role abroad. For instance, in 1970s in the United States during the development of the energy saving programmes it was the consumer and reliable, convenient and cheap energy supply at the forefront, while other areas were assigned a secondary role. In particular, one of the requirements for the generation companies was not only to use the business opportunities, but, primarily, to promote reduction of energy consumption by consumers. Those companies that wished to enhance their capacities needed to prove that it was associated with lower economic costs at the macro level than enhancing the energy efficiency among consumers. This approach is called programme for management of energy consumption.<sup>23</sup>

Increase of economic and environmental efficiency of energy supply sector in the transition to green economy must take into account the country's vast opportunities for the use of renewable energy sources (RES). The economic potential of the RES, development of which is advantageous even at the present level of technological development and under the current market conditions, is about 300 million tonnes of oil equivalent per year. This corresponds to 30% of the annual primary energy

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<sup>23</sup> Sergei Chernavsky. Energy efficiency in anticipation of the analysis. Expert Channel "Open economy." Available at <http://www.opec.ru/1240774.html>

consumption in Russia. (In particular, the country occupies the leading position in the world regarding the wind energy potential). According to the existing target indicators in the Energy Strategy the share of the RES should be increased to 4.5% by 2020.

This potential suggests stimulating the generation of energy from the RES and support for domestic production of the necessary equipment. Minimum support of its development is needed, as evidenced by the modern experience from Western Europe that after start of the process, it develops with increasing acceleration, like a snowball, surpassing all expectations. This direction of development does not oppose to, but strengthens the current position of the country as a supplier of hydrocarbons, freeing up additional opportunities for exports and ensuring national independence and prospects for further development.

That is primarily provision of domestic needs, including sparsely populated areas (up to 70% of the territory of the country), providing the population with incentives to use the RES as additional auxiliary sources in industry, and at production of hydrocarbons (recent experience of Yamal).

The **fisheries sector** in Russia is a complex interrelated industrial and economic centre with advanced cross sector co-operation and international links, deeply integrated into Russian economy and in world fisheries. Its condition is largely determined by the development of the country's economy and the world economic situation. Until 1980s, fisheries were among the fastest growing sectors of the country's economy. By the volume of fish catch, the USSR was the leader of the world's fisheries. However, since the early 1990s as the result of the system-wide crisis in the fisheries an unfortunate situation was developed. In recent years, fish catch in Russia has decreased and stabilized at slightly more than 3 million tonnes.

In Russia, the main fishing regions are coastal areas (Primorsky Krai territory), Kamchatka, Sakhalin, Murmansk and Astrakhan Oblast. Of particular importance is the nature of the industry in the Far North, where the fishing is quite often the main vital source for local population, including minorities and indigenous people. The basis of the fisheries is bio resources of inland waters including rivers, lakes, ponds, territorial waters, 200-mile economic zone, continental shelf of the Russian Federation, 200-mile zones of foreign countries (by contracts and agreements) and the open waters. Russian fisheries have three main subsectors: marine fisheries, inland fisheries and aquaculture. Marine fishing is actively carried out on 12 seas surrounding Russia and the Caspian Sea, as well as the economic zones outside Russia. Fish production, both food and technical is carried out mainly by fleet (fishing and processing). Commercial areas outside the 12-mile economic zones of the country, including the open waters and the economic zones of foreign countries provide almost 80% of the fish catch and marine products.<sup>24</sup>

Significant threat to the sustainable reproduction of fish resources is placed by degradation of natural ecosystems (both globally and locally) due to the expansion of fishing and economic activities. Government policy is to revitalize the natural resource base and artificial reservoirs with valuable commercial species of aquatic biological resources. Due to the artificial reproduction more than 90% of stocks of sturgeon are provided for basins of the Caspian and Azov seas and about 60% of stocks of Pacific salmon.<sup>25</sup> Release of juveniles of valuable fish species by fishery organizations into the natural ponds and reservoirs during 2005-2010 increased by 1.5 times (Annex 23). Particularly rapid growth was observed for the release of juvenile salmon and whitefish species.

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<sup>24</sup> Report on State and Prospects of Fisheries of the PABSEC Member States at the Twenty-eighth Session of the PABSEC Economic, Commercial, Technological and Environmental Affairs Committee (*Athens, March 14, 2007*). Available at <http://www.pabsec.org/pabsec/aksisnet/file/rus/8GA29EC28Report1RUS.doc>

<sup>25</sup> The Concept of the Federal Target Programme on Improving the Efficiency and Development of the Resource Potential of the Fisheries Industry for 2009-2013.

A significant problem for the fisheries is poaching. The state bears huge financial losses both of the shortfall in taxes and fees to the budgets of all levels and shortage of the foreign currency earnings and associated with the reduction or almost complete destruction of the most valuable stocks of aquatic biological resources. Experts estimate that Russia loses annually due to illegal fishing and export of fish products abroad up to \$1 billion.<sup>26</sup>

To address the problems of the fisheries in the Russian Federation the Government approved the Concept of the Federal Target Programme on "Improving the Efficiency and Development of the Resource Potential of the Fisheries industry in 2009-2013" (2008).

The promising areas include: development of material-technical base for fisheries, including development of onshore fish processing facilities; development of infrastructure at seaports in Russia and reduction of administrative barriers for import and export of fish and fish products; development of fishing in the ocean areas and exclusive economic zones of foreign countries, including aquaculture development; reconstruction and modernization of fish hatcheries; upgrade of basic production assets of the sector in both main and auxiliary productions to dramatically reduce their level of physical deterioration and progressive obsolescence, improve competitiveness of their production, etc.

For Russia, among the green economy goals for the **forestry sector** better use of harvested wood, deepening of its processing to produce products with high added value are of a paramount importance.

Throughout the country, the problem of over harvesting does not exist, as volume of timber harvested is less than the grown one. On average, every year it is harvested more than 150 million m<sup>3</sup> of wood and more than 600 million m<sup>3</sup> of timber, while its annual growth is estimated on a scale of more than 900 million m<sup>3</sup>. Using such general terms, it is formally found that forest reserves in Russia are increasing every year. However, more detailed analysis suggests that these resources are also affected by the process of exhaustion, but it is mainly structural in nature.

First, the forests, as well as many other types of resources, cover the territory unevenly. Most of them (80%) are concentrated to the east of the Ural Mountains, i.e. in the Asian part of Russia. At the same time, the main logging region for decades has been concentrated in the European part of Russia - in the Arkhangelsk Oblast, and Komi and Karelia Republics. Today, the timber resources in these areas make up about 8% of total Russian resources and are so depleted that the logging companies require relocation, carried out to remote and undeveloped areas. A similar situation is forming in Siberia and the Far East of Russia, where the shift of logging is also going on to the north and east of the previously utilized, but depleted stocks, initially located near populated territories with established infrastructure and primary processing of wood. These processes increase costs of the timber extraction.

The second issue is the structure of the forest resources. The volume of stocks of the most valuable species in terms of technology (spruce and pine) is reducing in absolute and relative terms. The share of small-leaved deciduous species forests increases due to their faster growth and less demand for timber products of them in the market that in some regions of Russia creates the problem of aging and deterioration of the total health of small-leaved forests. While every year, it can be harvested over 230 million m<sup>3</sup> of hardwood without prejudice to the forests of Russia.

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<sup>26</sup> Ibid.

In the nineties of the XX century, the rate of timber harvesting in Russia decreased sharply (by 2-4 times). Further indicators of the volume of harvested wood in comparison with the end of 1990-2000's has grown by more than 1.5 times and in 2007 reached its maximum volume.

Since 2008, once again the Russian logging industry experienced serious recession. In 2009 the volume of timber harvested decreased by 12% in comparison with that of 2008; and revenue from sales of timber industry decreased by 19%. Since 2010 there has been a major increase in performance of forestry.

At present, there is a radical plan of almost 5 times reduction of the share of timber in the structure of export. Simultaneously it will dramatically increase the share of timber processing and wood products and pulp and paper products as well. By 2020, an increase of paper and paperboard consumption per capita by the 25-30 kg according to innovative scenario is projected. Currently, the production of paper and paperboard per capita in Russia is lower than in the U.S. more than 5 times, than in Austria 12 times, than in Germany 5 times, etc. Even in countries with economies in transit, like Bulgaria, Poland, and China this indicator is higher (Annex 24).

**Industry** is the main sector of Russian economy. In 2010 the value of the shipped goods of own production, works and services fulfilled amounted to 28.115 trillion roubles, an increase of over 2 times in comparison with 2005 (at current prices) (Annex 25). The decline of 2009 occurred due to the crisis was offset in 2010.

According to the Russian Classification of Economic Activities (OKVED) there are three areas of activity in the industry: mining, manufacturing, production and distribution of electricity, natural gas and water. The share of these three areas in the total volume of produced goods and services is correspondingly as follows: 22%: 65%: 13%. Thus, the leading position in the industry takes manufacturing. In terms of volumes of the natural resources used and environmental pollution it is generally considered that this ratio is favourable for the formation of green economy, as the share of nature intensive extractive industries in the country is 3 times less than the share of manufacturing industry. However, if one analyses the structure of manufacture, the leading places in it will be occupied by quite brown industries related to ferrous and nonferrous metallurgy, and the production of petroleum products and coke. They account for 37% of the total volume of goods and services of the manufacture, even without taking into account not so environmentally friendly chemical and pulp and paper industries. For comparison, the share of machine-building industry, determining and diversifying the economy (production of machinery, equipment, electrical equipment, vehicles, etc.), representing a relatively neutral regarding negative impacts on the environment production, is only 20%. In general, the share of sectors with significant adverse environmental impacts (energy, mining, metallurgy, production and distribution of electricity, natural gas, etc.) is about 60% of the industry in total.

Thus, the priority tasks are those of the structural and technological shifts in the industry to move from material brown economy model to the green one in the direction of increasing the share of hi-tech industries with high added values, conducting high-level processing of raw materials with little environmental impact. All the recent decisions of the President and the Government of the Russian Federation, and concept papers of the country development are focused on this area.

To move towards green economy is a priority goal for the industry, nominated by UNEP experts is increase of energy efficiency. In Russia, among all companies the largest energy consumption is observed at manufacturing companies, which account for 25% of total final energy consumption. To save one tonne of oil equivalent in this sector it is required to spend about \$300, while the increase of primary energy production during the period from 2010 to 2020 require from 1990 to 2740 USD. Potential of reduction of energy intensity in manufacturing is distributed as follows. The share of

iron and steel industry accounts for up to 44% of the total energy consumption, while 99% of reduction capacity is cost-effective investment. The opportunity for savings at the pulp and paper industry accounts for 50%, at cement production - 43%, and at power generating plants - 31%.

Specific steps towards improving energy efficiency in industry have already been made. In 2008 a Reference Document on Best Available Techniques for Energy Efficiency was prepared. It is planned to implement the requirements of the mandatory inclusion of information on energy efficiency class of commodities in their accompanying documentation, labelling and labels. These events are among the most effective methods of improving energy efficiency in industrial plants.

Another way of stimulating business activities is to encourage loans for energy efficiency projects. At present, domestic banks perceive the energy-saving projects as risky and are not always inclined to provide loans for their implementation. The Russian government by use of special development banks can encourage more active participation of financial institutions in providing access to long-term loans. This model has proved effective in several countries and has been successful.

One more tool for improving energy efficiency for business is the provision of tax incentives. There are three main types of tax incentives. Accelerated depreciation improves the financial performance of the project, allowing fast write off the cost of the equipment for tax purposes. In this case, additional resources provided for the companies at the expense of its application later return to the state budget. In the early years of fixed assets it is assumed a greater amount of deductions for depreciation, which reduces the base for income tax. In the second half of the lifetime the opposite picture is observed - deductions for depreciation account for significantly less value or are absent, that therefore results in the increase of the tax base. Tax deductions provide possibility to deduct the portion of the cost of the equipment from profit. The third tool – reduction of taxes and fees generally involves reduction or exemption from customs duties when purchasing energy-efficient equipment.

Mechanisms of tax incentives require detailed analysis of the possible consequences. This is due to the fact that they do not contribute to the implementation of small projects and do not encourage behavioural changes that can lead to significant energy savings. By some estimates, many investors could implement their projects even without any tax incentives. It should be noted that Russia will soon introduce a number of financial incentive mechanisms. For instance, the principle of a three-year exemption from property tax. Also under preparation is a list of facilities and technologies with high energy efficiency to provide an investment tax credit, measures for amortization payments, instalments, cost recovery on the payment of loan interest.

One of the major incentives to reduce energy consumption for companies is the ability to reduce costs and increase profits. According to the study conducted in Russia by the International Finance Corporation for a number of companies of manufacturing and consumer industry, potential savings of energy efficiency measures could be up to 10% of annual revenue.<sup>27</sup> Another incentive to reduce costs and increase profitability may be improvement of indicators of competitiveness. Now Russia is among the 25 most energy-intensive countries in the major seven sectors of economic activity, including agriculture, hunting and forestry, construction, manufacturing, transport and communications, wholesale and retail trade, restaurant and hotel businesses. Projected increase in energy tariffs would reduce the profits of Russian enterprises by at least 15%, significantly reducing their competitiveness.<sup>28</sup> In future, in some countries restrictions for the carbon intensive products

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<sup>27</sup> International Finance Corporation. Towards Energy Efficiency: Experiences and Perspectives. The study of energy saving practices in Russian enterprises. Available at <http://www.ifc.org/russia/energyefficiency>

<sup>28</sup> The Economics of Ecosystems and Biodiversity (TEEB) (2009) The Economics of Ecosystems and Biodiversity for national and International Policy Makers. Summary: Responding to the Value of Nature. TEEB.

might be introduced, which are characterized by a significant amount of GHG emissions at their production. The main reason for that is the high energy intensity.

One more incentive for companies to improve energy efficiency is the ability to gain competitive advantage by improving their image. In developed countries, consumers tend to choose products of environmentally responsible companies. As already noted, in Russia the issue of energy efficiency is tightly linked with the environment. Therefore the more energy-efficient companies will try to use it as a competitive advantage in the future.

The **tourist sector** can play an important role in the transition to green economy through support of the development of regions with underdeveloped economies, addressing the social-economy issues, employment growth, and use of local resources in the regions. At the same time it is necessary to raise awareness on the possible aggravation of environmental issues caused by the growth of tourist travel, such as: increase of pressure on local ecosystems and biodiversity, increase of food and water consumption, generation of waste and pollution in the destinations; and increase of GHGs emissions due to enhancing transport activities, etc.

In Russia, the tourist sector is developing dynamically, it is reflected both in the growth of tourism expenditures of population and in the number of tourists. From 2004 to 2010 the cost of the purchased package tours increased by 5.7 times, reaching a turnover of 170 billion roubles, the number of waybills increased by 2.2 times (Annex 26). This trend of growth of costs per trip reflects – along with the inflation, general increases in the cost of services and of transportation costs – growing public demand for quality services and distance of routes that is connected with a general increase of wealth in the country. This is demonstrated, in particular, by a significant difference in the growth rate of expenditures of Russians in favour of international travel compared to the domestic travel expenses. During 2004-2010 the expenses for domestic travel increased by 2.8 times, while the expenses for international travel increased by 8 times. The share of domestic trips expenditures accounted for 37% in 2004, there was a significant (3 times) drop in the share of expenditures for domestic travel in 2010 down to 13%. In addition to the above mentioned reasons, this trend reflects the fact that tourists do not make full use of domestic tourism potential in Russia.

The eco-tourism is increasingly important and its share in the tourist sector structure is growing. It is based on travel to places with relatively untouched nature, in order to get an idea of natural, cultural, and ethnographic characteristics of the given area. Ecotourism does not violate the integrity of ecosystems and creates economic conditions under which protection of environment and natural resources is beneficial to the local population. This type of tourism is growing worldwide by 20% annually, which is 6 times faster than the tourism industry as a whole.<sup>29</sup>

Russia has enormous potential in the field of eco-tourism, based on the unique and pristine ecosystems. It is sufficient only to mention such world's natural gems as Altai, Lake Baikal, Kamchatka. Unfortunately, this potential at present is used minimally. Having protected natural areas occupying 11.5% of its territory, Russia could receive huge economic benefits from ecotourism. Along with the lack of tourism infrastructure development in the country as a whole, the limitation factor for eco-tourism is the significant remoteness of many places of unique natural habitat from the main part of the population: the main consumers of tourist services reside in the European part of the country, and many unique natural areas are located in Siberia and in the Far East. The distance factor is multiplied by significant price for transportation, which serves as an additional barrier to the development of ecotourism. At present for the residents of the European

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<sup>29</sup> The Economics of Ecosystems and Biodiversity (TEEB) (2009) The Economics of Ecosystems and Biodiversity for national and International Policy Makers. Summary: Responding to the Value of Nature. TEEB.

part of Russia it is often cheaper to visit a European country than its Siberian and Far Eastern regions.

Currently there is no adequate statistics on eco-tourism in Russia. However there is indirect evidence that can be used as the initial approximation to the real value of ecotourism in the country. These data are contained in the statements of the State Nature Reserves and National Parks. The statements include the statistics on a number of visits to nature trails and routes, and museums and visitor centres, as well (Annex 27). If one takes only the number of visitors to nature trails and routes (including by water, by horse, and by foot), in 2010 the number of tourists to the Federal Nature Reserves and Parks constitutes a very respectable figure of about 2 million visitors (Annex 27). This figure shows a rise by 2.4 times, when compared to 2005. Given the number of visits to regional and local protected areas, and unattended tourism the total number of eco-tourists in the country could be several times larger.

The important mechanisms of state regulation and support of tourism development, including environmental one, are republican and developed on their basis municipal target programmes for tourism development. The integral parts of design in this area are the development of tourism education systems and regulation of tourist activities in the territory, scientific and personnel support for the sector, development of new tourist products and their advertising and promotion, formation of unified information space and establishment of a network of tourist information centres as well as development of tourism infrastructure.

Optimization of tourism in the region should be based on the preferential development of those types and forms of tourism that allow to maximize the use of available resources. A distinctive feature of this process at this stage is the focus on running a network of small projects aimed at the establishment of branches in cities and districts. Projects should be designed to support the work of district and municipal administrations on tourism development, designing of tourist routes, training, elaboration and issuing information and marketing materials and training manuals, promotion of tourist products, construction of small tourist infrastructure units, renovation of rural houses, and introduction of new information technologies. These small project budgets could provide significant economic, social and environmental benefits.

For the **transportation sector** as a goal of transition to green economy, UNEP identifies energy efficiency targets for energy consumption and emissions, as well as scaling up the use of public transport. In recent years, the structure of public transport has seen some changes (Annex 28). There was a sharp increase in the share and number of passengers transported by air: its passenger traffic rose by 1.7 times in 2005-2010, and overbid the identical indicator of railroad transport that led in 2005. There was little change in the passenger bus and subway transportation.

In this sector, there are significant opportunities for energy savings. Transportation is the fifth largest in terms of energy consumption in Russia. It accounts for a quarter of final energy use. It has been calculated that by the actual measures, most of which are financially attractive, it is possible to reduce energy consumption in this sector by 41%.

The following incentives for transportation could be highlighted: introduction of a fuel tax and increase of vehicle tax, tightening fuel efficiency and emission standards, reward drivers who choose more efficient vehicles. If the first measures are often considered as possible in our country, the drivers encouragement in Russia is a relatively new mechanism. However, according to the foreign practice, this incentive can be quite effective. In the U.S., in California, hybrid cars can use the traffic lane dedicated to vehicles with several passengers, regardless the actual number of passengers in them. This measure allowed increases in the sales of hybrid cars.

It should be noted that the charging of additional fees to rational organization of urban traffic could also significantly reduce the financial and time costs of drivers. For instance, residents of Moscow spend in congestions 40-45 hours per month in average. If we assume that a car consumes 1 litre of fuel per hour of idle engine operation then the total cost of downtime in the congestions is more than \$1.85 billion a year.

For the introduction of green economy problem of **waste** is one of the most acute. This problem is extremely urgent for the world and for Russia. The total accumulated amount of undisposed waste is estimated at about 82 billion tonnes; there are about 11 thousand landfills and dumps in the country.<sup>30</sup> The rate of waste recycling is 35% for industrial, and for municipal solid waste - 3-4%. Accumulated waste and landfills and disposal of highly toxic waste and toxic substances in the country, indicate the severity of the problem of the environmental damage accumulated over many decades.

The rates of production and consumption waste are high. To present their exact amounts in the dynamics is very difficult due to changes in statistical reporting. Prior to 2005 toxic waste was accounted, and since 2005 only production and consumption waste (Annex 29). Nevertheless, even such information indicates that in 2005-2010 only volume of production and consumption waste increased by 1.5 times.

An important indicator of progress in this area is the proportion of utilization and disposal in the total amount of waste. Now this figure is significantly higher than in 2005 (56% vs. 42%).

The sector structure of the economy significantly affects the generation, utilization, and disposal of production and consumption waste. Large proportion in the economy of primary industries and industries with large impact on the environment determines the structure of generation and disposal of waste. In this aspect the industry for the extraction of energy minerals takes the lead, which accounts for the largest volume of waste – 2,972 million tonnes in 2010 (Annex 30); utilization and disposal volumes in that industry are also high (1,974 million tonnes), however, this figure is only 66% of the generated waste. At the second place is the sphere of activities also associated with the extraction of minerals (excluding fuel and power): the amount of waste there is 1.13 billion tons (by 2.6 times less than at extraction of fuel resources), and the waste utilization is 32%. Then, with a significant lag the activities, related to steel production and manufacturing of metal products are positioned: they generate 194 million tonnes of waste, at the share of their utilization of 41%.

Arrangements for waste disposal are carried out on the basis of the Federal Law On Production and Consumption Waste (1998), which defines the objectives and basic principles of state policy in the field of waste management. In particular, under its Article 13 organization of separate collection of waste is a responsibility of the local authorities. Now the vast majority of waste is disposed in landfills or illegal dumps, which are a source of the negative impact on the environment themselves.

The priority areas in the field of waste management should be prevention of waste generation and recycling of waste in industrial processes. A few years ago, ideas to reduce volume of waste by incineration and, hence, construction of incineration plants were popular in the country. But now high environmental and social risks of incineration are more widely recognized (primarily the impact on public health). A more promising direction is collection and recycling of wastes, and production new products of waste. Recycling of waste creates more jobs and products from recycled materials have less impact on the environment by saving energy, water and primary resources. There is also a reduction of harmful emissions, including GHG.

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<sup>30</sup> The State Report «On state and protection of the environment of the Russian Federation in 2009." Moscow: Ministry of Natural Resources, 2010.

Among the simplest and the most effective economic instruments are deposit rates for all types of packaging, as well as many types of dangerous for the environment goods (batteries, cells, etc.) and encouragement of consumers to return the packaging to the seller or manufacturer.

At present, the main document regulating the **water sector** development is the Water Strategy 2020 of the Russian Federation, approved by the Federal Government on August 27, 2009. The strategy aims to ensure the demand of the population and economic sectors in water resources on the basis of a comprehensive (integrated) approach to managing the use and protection of water bodies, based on the identification of the objective resource and environmental constraints, accounting all available resources of surface and ground water within river basins and their variability, giving absolute priority to ensure drinking water and domestic water supply, transparency and involvement into the management and protection of water bodies of local governments, watershed councils, water consumer associations and other civil society organizations. Important tasks for the water sector are also promoting innovation, ensuring resource conservation, formation of real prerequisites for the realization of competitive advantages of Russian water supply capacity.

The schemes of complex use and protection of water resources development of which is projected to be completed by 2015, could be treated as the main tool to achieve the integrated management of water bodies. At the first stage the development of the schemes for the integrated use and protection of water bodies for those basins that have strained water balance is foreseen.

Key indicators of the impact of economic activities on water resources are presented in Annex 31. In general, a significant reduction in water intake from natural sources during past 20 years should be noted: from 106 km<sup>3</sup> in 1990 to 87 km<sup>3</sup> in 2000 and 73 km<sup>3</sup> in 2010 (reduction almost by one third by 1990). Discharge of polluted wastewater also significantly decreased: in 1990 27.8 km<sup>3</sup> were discharged, and in 2010 - 16.9 km<sup>3</sup> or by 1.6 times less. The improvement of water use and its savings are illustrated by the average daily release of water per one urban resident, it was reduced to 50 litres a day or by 20% during 2005-2010.

In accordance with the objectives of green economy and the Water Strategy of Russia for the water sector the important task is to ensure access to safe potable water and sanitation for the people. This task of providing the population with quality potable water is planned to be carried out under the State Pure Water Programme.

In Russia, over the past two decades, the households upgrade contributed to the elimination of these challenges (Annex 32). Throughout the country, centralised water supply and sanitary services are provided to 74-78% of the area of housing, bath (shower) and hot water are provided to 65-67% of housing area. In these sectors of water supply, the significant progress has been achieved: since 1995 the provision of housing with water supply increased by 7%, with sanitary services - by 8%. Much higher availability of those services is in the urban housing stock, compared with the rural. Despite the problems in the agricultural sector, improvement of rural settlements over the past two decades has expanded.

The saving and rational use of water resources receive great contribution from the reduction of specific consumption of water (water intensity) in production processes, which is achieved through increased use of closed loop and re-consistent water supply, and from the introduction of water saving technologies in industry and agriculture. At present, the volume of reused and recycled fresh water is about 140 billion m<sup>3</sup> (Annex 32). To encourage water conservation the Russian Government is supposed to establish a progressive payment scale for the water intake in excess of the water consumption norms; to introduce reduced rates of payment for the water intake for the operation of recycling and re-consistent water supply systems; to provide soft loans for certain

activities for the construction, modernisation and upgrading of water infrastructure, etc. The planned actions would allow to reduce the water-intensity of GDP by about 40% by 2020.

Given the high capital intensity of the water sector, as well as long payback periods of the investment projects, development of water and wastewater systems in the medium and small towns and rural areas is supposed to be financed through public investments in the form of co-financing of regional programs. According to the preliminary estimates, the total cost for the implementation of the Water Strategy 2020 of Russia would amount to 662.4 billion roubles, including federal funds - 480.9 billion roubles, budget funds of subjects of the Russian Federation and local budgets - 114.6 billion roubles, and non-budget sources - 66.9 billion roubles.<sup>31</sup>

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<sup>31</sup> Water Strategy 2020 of the Russian Federation, approved by Decree of the Government of the Russian Federation No 1235-r dated August 27, 2009.

## 4. CHALLENGES AND OPPORTUNITIES OF GREEN ECONOMY

Prospects for Russia's development towards realization of the green economy ideas in the first place are determined by the fact that Russia is the country with the richest natural resources and considerable human potential. Today that identifies both the strengths and weaknesses of the country concerning the prospects of development of green economy. Natural wealth offers unlimited opportunities for the country's development, growth of wealth and quality of life, positioning the country in the world not only as an energy, but also as an ecological donor, which implies capitalization and receiving benefits by the country from its ecosystem. Realization of those advantages may allow Russia to become one of the leaders of green economy. At the same time an emerging now resource vector of development implies significant risk associated with the reliance on conditions of natural resource market, loss of competitiveness, depletion and degradation of natural wealth.

The main challenge, and environmental risks of post-crisis period in the near future for Russia is the environmental weighting and simplification of economic structure. Support and rescue of large export-oriented nature exploration production companies by the state, which took large loans abroad (especially energy and metallurgy), promote the consolidation of the material nature of the economy, and its polluting nature and monopoly. The economy might see the further reduction in the share of hi-tech industries (machinery, various types of manufacturing, etc.). All this could result in an increase of the environmental impacts and in the amount of non-rational use of natural resources after the crisis. Preliminary analysis of the post-crisis situation confirms the reality of this prediction - the structure of the economy as a result of the crisis is becoming heavier, which means avoiding the trajectory of transition to green economy. Obviously, there is a need for breaking up the current export-material model, for ensuring modernization of the economy and the radical structural and technological changes. To do this, change in the proportions between investments in the manufacturing and nature exploitation sectors is needed, as well as strengthening of economic and legal mechanisms of state regulation in order to overcome the enormous inertia of the material way of development. Deadlocks of the material way of development and the need to change the economic trajectory are understood by the government authorities in Russia. The theses on the necessary shift from the material-based economy, its modernization and diversification, and transition to innovative knowledge-based economy in the last few years are increasingly repeated in Russian policy documents, by the President of the Russian Federation, members of the Russian Government. For instance in 2009 in his address to the Federal Assembly the President of the Russian Federation noted that "...if we can't allocate the necessary funds for the reconstruction of production, we will not be able to invest in agriculture, then we will remain only with raw materials. Moreover, this is the way to nowhere. Moreover, in the world every 50 years there is an energy revolution, and no one knows what will happen in 2050, maybe, there would not be demand in oil and natural gas in such volumes."<sup>32</sup>

The crisis that began in 2008, showed that the most dangerous threat to the existing material export model of the Russian economy was a sharp drop in energy prices in the world markets. Now the economy of Russia as in the USSR earlier is becoming greatly dependent on lasting high oil prices. Meanwhile, as shown by the analysis of the dynamics of oil prices over the past twenty years, these prices are highly volatile and their dynamics is not an obvious trend. In this situation, in future we

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<sup>32</sup> Izvestia Newspaper, November 9, 2009.

can expect repeated sharp fluctuations in prices, which can lead to the very adverse economic and financial consequences for the country. The fluctuation of prices in the global energy market and export-material development of Russia could be under impact of growth of production of natural resources in the countries, which are now major importers of raw materials. The bright example in the energy sphere can be presented by the United States. In 2009, the global gas market witnessed a peculiar, previously unexpected revolution resulted in shifting Russia from the first rank in the list of main gas producers in the world. This was done by the USA due to a sharp growth in American gas production over the past three years, allowing the country to abandon future imports and to provide gas for their domestic needs from their own fields. China and the EU are trying to replicate the American way. China has discovered huge reserves of shale gas, and hopes to increase the share of shale gas up to 30% of the total gas production by 2030.<sup>33</sup> Huge deposits of shale gas have been discovered in Poland. In case of success of European countries in the shale gas development Russia could lose its role as a leading gas exporter to Europe (by some estimates, exports may drop by 25-30%), which will negatively affect the country's gas industry, especially in marginal areas of production. The U.S. are acting in the same way increasing Russian export problems; in order to ensure their energy security perspective they can start exploration of their Atlantic shelf, which would reduce U.S. oil imports and increase competition of the sellers in the world energy market. The answer to these new changes in the global energy market is extremely important for Russia, because of the need for enormous investments in the new complex and marginal oil fields. The extremely difficult for the country could be the environmental consequences of falling prices: under conditions of extremely high - by 3-5 times higher than in the OPEC countries - cost of energy production, the self-freezing of unprofitable deposits and of the entire infrastructure could occur, and conservation of large areas of environmentally degraded territories and marine shelves.

The indefinite environmental consequences could be caused by a possible consolidation of the material nature of the Russian economy because of WTO accession. For the Russian export nature intensive companies the conditions of international competition would be improved, it is true for energy, metallurgy, and fertilizers sectors, etc. It is obvious that for multinational and foreign companies in Russia, the most attractive is nature exploitation industries and, above all, energy resources - a competitive product; investments in oil and gas provide a predictable return. According to existing forecasts industries oriented at the domestic market would be losers of WTO accession, many of which do not have significant impact on the environment, such as production with high degree of processing, consumer goods, insurance and financial services, construction, etc. It is obvious that in accordance with this scenario the processes of modernization in the country could be negatively affected.

The growing environmental protectionist practices might become a strong barrier to country's material exports. For instance, in the United States in accordance with the Lacey Act imports of variety of goods that do not have clear "environmental origin" could be banned. Climate change mitigation could also create additional barriers by means of the introduction of taxes broadly discussed by many developed countries (mainly the EU and the U.S.) or other forms of "border carbon adjustment" for goods that are imported from countries with less stringent regulatory requirements for GHGs emissions. All this could adversely affect the production and export of many raw materials. For instance, up to two thirds of the direct and indirect exports of timber products from Russia to the United States cannot meet the new requirements of U.S. law,<sup>34</sup> which would have a negative impact on the forestry sector of Russia. In connection with the prospects of strengthening the environmental protectionist practices the Russian business world need to take steps toward

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<sup>33</sup> Izvestia Newspaper, March 15, 2010.

<sup>34</sup> Social Sciences and the present, № 4, 2009.

greater transparency in its environmental activities. In particular, the revitalization of activities for improving environmental management and environmental responsibility of businesses based on the certification standards for environmental management could be of help. Russia now is ranked 50 in the world regarding such certification. Despite the general inertia of the struggle for world markets basing on the environmental transparency, there are positive examples of certification in Russia. In particular, it is confirmed by the successful development of forest certification on the principles of the Forest Stewardship Council as an indicator of the beginning of Russian forest sector transition to the standards of sustainable forest management. In 2006-2007 Russia became the second in the world and the first in Europe regarding total area of FSC-certified forests. The development of voluntary forest certification has become an important tool for checking the stability of forest management.

Underestimation of the impact of environmental factor can lead to significant damage. Thus, the restructuring of the fuel balance by reducing the share of natural gas for domestic use for the production of electricity and its replacement with coal and fuel oil would lead to an increase in urban air pollution, increase morbidity and mortality (due to the high toxicity of the combustion products of fuel oil and coal). This indicates a need to consider environmental factors when choosing vectors of economic development.

Existing studies, including reports of RosHydromet (Russian Hydrometeorology Service), indicate that Russia may face serious problems due to global climate change.<sup>35</sup> According to experts of the World Bank, Russia could become the most vulnerable country in Eastern Europe and Central Asia in result of global climate change.<sup>36</sup> According to the estimates in few decades, the total damage from climate change to Russia's economy could reach \$10 billion. It would be connected with the increasing number of natural disasters and catastrophes in the country. The territory of Russia covers different climatic zones, so the list of weather events that cause disasters on their parts, is very large. Most of the country needs varying degrees of protection against natural hazards. Melting permafrost could lead to disasters in the energy sector, infrastructure, settlements, which is especially important for Russia, where the total area of permafrost reaches two-thirds of the country. The main facilities of the energy sector and the productive agricultural regions are located in the zone of potential climate deformation. It is necessary to internalize the climate factor in the process of long-term socio-economic decision making, to design programmes to adapt to climate change. For a long time Russia has not taken an active part in international economic and political cooperation to prevent climate change and to address the problems of adaptation. In recent years, climate issues have been given much attention: the speech of President of the Russian Federation, Climate Doctrine, etc. President of the Russian Federation identified the following national targets to reduce emissions of greenhouse gases by 10-15% in 2020 and by 50% in 2050 compared to 1990 levels. To achieve the identified indicators it is necessary to reduce the GDP energy intensity by 40% in 2020 relative to 2007 levels. Due to its size, number of population, high energy intensity of economy, as well as the presence of outdated and relatively inefficient production capacities, Russia could play a key role in the implementation of international programs on emission reduction, and without prejudice on the economic development, effectively and relatively at low cost implement measures to improve energy efficiency and reduce emissions. According to the experts of the McKinsey company, our country has the greatest relative potential for emissions reduction by using cost-effective measures

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<sup>35</sup> RosHydromet, (2008). Assessment Report on Climate Change and Its Impact on the Territory of the Russian Federation: General Resume. Available at <http://climate2008.igce.ru>

<sup>36</sup> World Bank, (2009). Adopting Climate Change in Eastern Europe and Central Asia.

in comparison with Brazil, India or China.<sup>37</sup> Potentially, Russia is the largest player in carbon credits market, but because of delays in carrying out the necessary procedures, the country actually has not used the benefits of trade of hundreds of millions of dollars. It is characterized by a comparison with the Ukraine, which was able to sell its quota by almost at half a billion euros. At the global level the post-Kyoto upgrade of the system of regulation of carbon emissions could be an important factor in determining the pace and scale of the transition to green economy.

To move towards green economy Russia would need a long period of transformation and modernization of its economy, structural and technological changes, formation of new economic model. And during this transitional period the energy sector will remain the main driver of the economy in any case. In connection with this, an important task is to reduce the costs of such transition, and to radically increase the efficiency of use of natural resources. First, it is necessary to strengthen the effectiveness of state regulation in the sphere of extraction and production of resources. With the assistance of economic and legal instruments (taxes, fees, tariff policy, penalties, compliance with regulations and standards, etc.) it is essential to make public and private monopoly companies to improve their efficiency of resource use, aiming at the prevention of their losses; to adequately compensate the external costs and environmental damage, applied to society and nature. “The polluter pays” principle should be put into practice. Second, an important positive role during the transition period could be played by creation of the competitive environment, increased competition among producers, shifting from the now dominant monopolism in energy and economy. These factors may affect the reduction of costs, encourage businesses to implement innovations, diversification of production, high-level processing of raw materials, which would increase efficiency and reduce nature intensity of production through the introduction of new technologies.

For macro policy the ecological-economic priority could be reformulated as follows - no need in increased use of natural resources, since they are limited and their additional exploitation leads to additional pressure on ecosystems, depletion of natural capital and environmental pollution. Available backward resource intensive technologies also lead to the excess consumption (over consumption) and loss of natural resources, and increased pollution, as well. It is necessary to invest in better use of already exploited natural resources and environmental protection basing on the modernization of the economy, support of innovations, replacement of nature intensive technologies for energy saving and energy-efficient, best available techniques, increased level and diversifying raw materials processing, etc. These would increase the GDP by 2-3 times at the current level of extraction of raw materials and natural capital exploitation, and reduce environmental pollution. An important objective of macroeconomic policy should be economic support for greening economy, the green growth, including taxes, loans, subsidies, tariffs, duties, and insurance. The trends of greening economy are under possible pressure by green public procurement. They account for a significant proportion of total government spending in both developed and developing countries. Using the techniques of sustainable public procurement, the state can generate a high and long-term demand for green products and services. This practice encourages the private and public companies to make more long-term investments in innovation, and manufacturers – to get economies of scale by reducing costs. In turn, this may contribute to the broader commercialization of green goods and services, creating conditions for sustainable consumption.

New opportunities for Russia open the worldwide growing awareness of the importance of economic value of the natural wealth, and ecosystem services. Russia is playing a leading role in the world in saving global environmental public goods and provides essential ecosystem services

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<sup>37</sup> McKinsey Company (2010) “Energy Efficient Russia. Ways to reduce energy consumption and greenhouse gas emissions”

throughout the world (Annex 33). Russia provides almost 10% of this sustainability, surpassing other countries by this indicator. In this regard, the identification of ecosystem services and their economic evaluation should be moved from the field of theoretical research into practice and become profitable for Russia, since the country is obviously a global environmental donor and could claim for economic compensation for the support of its ecological services. From the economic point of view, it is clear that the contribution of Russian ecosystems, bringing economic benefits to other countries all over the world, must be compensated. Accounting is necessary for at least three types of expenses and compensations for the conservation of ecosystem services – for non-use, protection, and care. The country contributes to the stabilization of the biosphere, climate regulation, biodiversity conservation at the expense of natural ecosystems, not affected by human activities, which allows Russia to be the environmental donor to the world. It bears the costs of maintaining the natural capacity and has the right to apply for economic compensation from the international community.

## 5. GREEN ECONOMY FOR THE COUNTRY

The purpose of the transition to green economy is an increase of the welfare and quality of life while minimizing the extraction and degradation of natural wealth. Depletion of natural capital involves compensation by the increase in human and physical capital. This is provided through investment in science, education, culture, health care, innovation development, establishment of the future generations funds.

The transition to green economy and environmentally sustainable development in Russia involves transition from an extensive raw material export model of economic development to modernization. The principles of green economy must not be submitted as a separate policy document, strategy or program, but as the basis for long-term successful development of the country, addressing socio-economic issues, providing necessary quality of life, national security and competitiveness. Key indicators of such development are the indicators of sustainable development, including indicators of nature and energy intensity, human development indices, adjusted net savings, and Millennium Development Goals (Annex 34). The main areas of this strategy include:

Upgrading through innovation aimed at meeting the growing needs, while minimizing the depletion of natural capital (the decoupling effect). This involves reduction of energy consumption and nature intensity, increased use of renewable energy sources, ensuring the market demand for green goods and services, and consumers' demand (including society and the state).

Reducing the negative impact on nature, including pollution and landscape degradation, especially of those related to mining and processing of oil and gas and other minerals, and waste disposal. Providing the transition to the policy of using the best available techniques.

Ensuring modernization in accordance with the requirements of green economy based on economic interest, including greening of the tax system, subsidies, and investments.

Providing mechanisms for compensation of the efforts to preserve and increase the natural wealth both in the domestic and global markets.

The success of the modernization on the basis of the green economy determines the awareness and interest of all sectors, including government, business and the society. This determines the need for economic development incentives from the development of sectors to the household, educational and outreach activities, targeted mass media work, and public service advertising. The key role in society shift towards sustainable development through green economy is played by culture, objects of cultural and natural heritage, code of ethics for sustainable development (based on The Earth Charter). An important role is to be played by the civil society structures and the expert community by initiating the process and ensuring development of a broad movement in support of sustainable development.

Ensuring the implementation of green economy involves the assessment and distribution of rich regional experience, start the process in model regions and adapting the green growth model according to each region. It also involves partnerships of the international community and especially with the CIS and other former Soviet republics, and countries of BRICS.

## 6. RECOMMENDATIONS

Russia is among the countries for which ensuring sustainable development based on green economy is particularly relevant. In fact, there are a number of reasons. These are the economic growth, rich natural resources, and the search for the optimal way of development. The country's priorities in innovation policy, energy efficiency, modernization of the economy in line with modern requirements, quite naturally determine the movement towards sustainable development. Given the characteristics of modern Russia, the priority areas for progress in this direction are as follows:

- The support for the modernization of production by means of a so-called win-win situation is needed, associated with the provision of both economic efficiency and reduction of harmful emissions, sustainable use of natural resources, low waste production. The world and Russian experiences of such production modernization show that this approach leads not only to better economic performance, but also significantly improve people's lives. There is a need in support and dissemination of such experience. This is the central task of the modern innovation development. And for that, in addition to awareness of the importance of compliance with the environmental requirements, both stringent environmental requirements, as well as economic interest are necessary, including all possible mechanisms, since the modernization should be beneficial. Promising in this direction looks the shift to the policy of using the best available techniques (but even taking into account the attractiveness of this approach, it requires careful evaluation of new technologies and the possible consequences of their use). This approach has worked well in developed countries, but, as evidenced by the same experience, the introduction of this mechanism requires a significant amount of time. Therefore, even now, there is a need in a number of urgent actions: to adopt a law on charges for the negative impact on the environment, to provide monitoring, to eliminate the practice of temporary agreed emission permits, to use the mechanism of the state ecological expertise of projects, to begin work on the elimination of the past environmental damage, to adopt a law on areas of environmental disadvantage. To solve the problem of waste there is a need to get a support from production for waste recycling, and the law on the container deposit.
- Efficient and timely measure to ensure green production is a widespread system of voluntary certification, social and non-financial business reporting, including reporting on sustainable development, based on the growing demand for green goods and services both in the world and domestic markets.
- The important direction for the development of the country is energy. It is necessary to ensure the safe use of traditional resources and energy efficiency. Implementation of the multiple opportunities for improving energy efficiency involves the introduction of urgent measures to ensure the interest in energy conservation at all levels - from the industrial development to a household (including installation of water and heat meters in houses and introduction of incentives for energy efficiency in companies).
- Upgrading should take into account the country's vast opportunities for renewable energy (Russia holds the leading position in the world for the potential of wind energy development). This involves stimulating of energy generation from renewable energy sources and support for domestic production of the necessary equipment. According to the modern experience of Western Europe, with minimal support essential to trigger the process, it is developing with increasing speed. This line of development is not contrary to, and

strengthens, the current position of the country as a supplier of hydrocarbons, freeing up additional opportunities for exports and ensuring national independence and the prospects for further development. The most important and promising use of renewable energy for domestic use including, above all, under populated areas (up to 70 per cent of the country), providing the interest to the population in use of renewable energy as an additional source of energy, using renewable energy as an auxiliary power supply in industry, and at production of hydrocarbons.

- The solution of the economic modernization task in Russia should take into account the enormous possibilities of the country in terms of ecosystem services, including the role of the global ecosystem of forests, wetlands and other natural ecosystems. Ecosystem services mean the benefits people receive from ecosystems. There are great opportunities for the development of markets for ecosystem services and environmental investments both internationally and domestically. It is necessary to ensure the co-operation of regions based on the valuation of natural services (increasing the value of natural wealth and the commodification of those things, which have not been considered as goods before, including a wide range of ecosystem services) with access to international markets to compensate the efforts to preserve and increase the natural wealth. This position will allow to place Russia not only as an energy, but also as an ecological donor, which involves the capitalization and receiving benefits of its ecosystems by the country.
- New opportunities for the country provides the on-going world Rio+20 process to the UN World Summit on Sustainable Development in 2012, 20 years after meeting in Rio de Janeiro. Russia is among those countries, for which this is especially important. In fact, there are a number of reasons. These are the economic growth, rich natural resources, and the search for the optimal development vector. The country's priorities in innovation policy, energy efficiency, modernization of the economy in line with modern requirements, quite naturally determine the movement towards sustainable development. Russia, together with other countries of BRICS (Brazil, India, China and South Africa), could take the lead in the movement towards sustainable development.
- All of this involves the development and implementation of new policies. To further proceed with this it is needed to follow the fact that environment today is equal to economy. Exactly environmental requirements, which are now announced as the principles of green economy, determine the direction of innovation development and modernization in order to ensure the safe long-term economic development. Despite the importance of innovation policy – this is a long-term task, and natural resource policy is needed now, because natural resources and our attitude towards them determine the development of the country today and in the short term. But the policy is in need now not of declarations - they have already been made and for a long time are declared in the Environmental Doctrine, but of a purposeful activity, the sequence of steps, based on current realities, and vision for the desired development. Despite the importance of a coherent policy in this regard, its implementation should not be divorced from the mainstream of development and should be incorporated into policies, plans, programmes and mechanisms of the country development. In case there are separate programmes for environmental policy, they are still, in spite of any declaration of their importance, will be treated as additional and funded on the leftover principle. Priorities of green economy, environmental requirements should be included in the general development plans aimed at addressing the socio-economic challenges, which in the first place concern everybody. Even provision of proper environmental protection measures (organization of protected areas, biodiversity conservation, etc.) is appropriate to include the clear to all

market mechanisms – in the form of payments for ecosystem services. The same applies to other aspects of environmental policy, including legislation, education, culture, and civil society development. Otherwise, the current practice of non-compliance with environmental laws, lack of real support for the environmental movement, failure of declaring the importance of environmental education and the formation of ecological culture would continue.

- The primary measure to assess the situation and to determine priorities for action is an introduction of a system of indicators of sustainable development. These are, first of all, indicators of nature intensity and of energy intensity of economic growth, and specific indicators of pollution. In addition, it is necessary to account for accumulated environmental damage (including pollution and waste), depletion of resources (in the long run does not offset the exploration of new reserves), degradation of landscapes, impact of pollution on human health. Fundamentally important is an assessment (especially for determining the prospects for development) of RES, and of ecosystem services (including forest, water, wetlands, biological resources, biodiversity, area of protected territories). The beginning of the transition to the modern form of accountability was initiated by the Presidential decree on improving energy and environmental efficiency (2008), and mandatory reporting by the regions on indicators of energy efficiency (2010). It is necessary to scale it up to other areas of activity.
- Fulfilment of the new economy goals based on the market mechanisms presupposes respect for the two main conditions determined by the level of development of society and its culture. First, the provision of market demands for natural goods and related characteristics of the goods, consumer demand (including society and the state), which assumes the role of human factor on the basis of the priority of enhancing the value of nature and man. Second, there is a need to give to the mechanism of competition an opportunity to work. The creation by the state of the competitive environment, shift from the monopoly in the economy would encourage businesses to innovate.
- Mankind comes to a realization of the fact that all of the growing social and natural anomalies are consequences of our wrong behaviour, wrong understanding of the responsibility for the future of the planet. Prioritization of the joint actions requires common rules of conduct, code of ethics adopted on the level of the global community. The importance of adoption of such a document was stressed even at the UN World Summit in Rio de Janeiro in 1992. The basis of the document could be The Earth Charter, worked out in 2000 due to the joint efforts and the common view on the principles of sustainable development necessary to ensure the ecological integrity, social justice, democracy, and peace. Today, this document takes on a new meaning.
- Success of the implementation of economic modernization ideas, energy efficiency, and sustainable development depend on the active position and the personal interest of everyone. This defines the need of educational and outreach activities, consistent mass media work, public advertising. It is also necessary to immediately provide ecological knowledge – starting with a compulsory topic in secondary school and teaching the basic concepts of sustainable development in higher education to the general environmental education activities with obligatory coverage in the mass media, including provision of mandatory limits for social advertising. A key role in turning society towards sustainable development and the formation of broad public interest is culture (including cinema, pop art, literature), as well as cultural and natural heritage objects.

- An important role is to be played by the civil society structures, including both mass organizations and youth movements, and professional institutions for sustainable development (such as institutions for public policy, working in contact with the public chambers). Development of such institutions, both in the centre and in the regions would help to consolidate efforts of the expert community and to provide involvement of civil society to identify ways to meet specific tasks of the modernization of the economy to achieve sustainable development. Civil society acts as an initiator of the Rio+20 process, demonstrating the interest of people and delegating power to the authorities to ensure the active participation of the country in the international community transition towards sustainable development. Ensuring successful implementation of these ideas involves development of a broad movement in support of sustainable development as a priority activity of civil society, and definition of this topic as a priority direction to get support from the government and businesses.

## Appendices

### Appendix 1

#### Annex #1. Ranking of Russia in the world regarding production of selected products.

Types of industrial and agricultural products	Rank of Russia
Crude oil	1
Natural Gas	2
Cast iron, potatoes are	3
Electricity, steel, grains and legumes, sugar beet, milk	4
Iron ore, coal, cattle and poultry (slaughter weight), untreated wood, cotton cloth	5
Cement, ready-ferrous metals	6
Paper and paperboard	14
Cars (including assembly)	16

Source: Statistical Yearbook of Russia 2011. Moscow: Rosstat, 2011.

#### Annex 2. Main socio-economic indicators of the Russian Federation for 2000-2010.

	2000	2005	2006	2007	2008	2009	2010
Gross domestic product							
total, billions of rubles. <sup>1)</sup>	7306	21,610	26,917	33,248	41,277	38,786	44,939
rubles per capita. <sup>2)</sup>	49,835	150 997	188 909	233 948	290 771	273 318	314 395
Gross domestic product (% to previous year) <sup>4)</sup>	110.0	106.4	108.2	108.5	105.2	92.2	104.0
Per capita income, <sup>2)</sup> rubles per month	2281	8112	10,196	12,603	14,941	16,838	18,553
Tangible disposable incomes of people (% to previous year)	112.0	112.4	113.5	112.1	102.3	102.0	104.2
Unemployment, <sup>3)</sup> thousands	7700	5263	5312	4589	4792	6373	5645
Number of registered unemployed with state employment services (% to previous year)	82.1	95.3	95.2	89.2	98.0	141.1	74.0
Investments in equity, billions of rubles.	1165	3611	4730	6716	8782	7976	9151
Investments in equity (% to	117.4	110.9	116.7	122.7	109.9	84.3	106.0

previous year) <sup>3)</sup>							
Foreign trade turnover, US\$ bn	149.9	369.2	467.8	577.9	763.5	495.2	648.9
including:							
Exports	105.0	243.8	303.6	354.4	471.6	303.4	400.1
Import	44.9	125.4	164.3	223.5	291.9	191.8	248.7
International reserves of the Russian Federation, including gold (end of year), US\$ bn	28.0	182.2	303.7	478.8	426.3	439.5	479.4

<sup>1)</sup> The data are presented in terms of value at current prices

<sup>2)</sup> During 2005-2009 figures are calculated using the population without regard to the results of WH-2010, and for 2010 with regard to the preliminary results of the WH-2010.

<sup>3)</sup> At constant prices.

<sup>4)</sup> According to sample survey on employment (ILO methodology): 1992, 1995 – for the end of October, 2000-2010 - the average for the year. Since 2006 - including data on Chechen Republic.

Source: Rosstat

### Annex 3. Gross debt of selected countries (% of GDP).

Country (country group)	2007	2008	2009	2010
All countries	57.6	60.8	68.5	71.2
Developed	73.1	79.2	91.3	96.6
Emerging	36.1	35.3	37.0	36.0
G20	60.6	64.0	71.9	74.5
Great Britain	43.9	52.0	68.3	77.2
USA	62.2	71.2	84.6	91.6
Japan	187.7	195.0	216.3	220.3
Brazil	65.2	70.7	67.9	66.1
India	75.8	74.4	75.8	72.2
China	6.19	17.0	17.7	17.7
Russia	8.5	7.9	11.0	9.9

*Gross debt is treated as gross general government debt, which is the difference between public debt and fiscal reserves.*

**Annex 4. Average export prices of major Russian resources (US\$ per tonne).**

	1995	2000	2005	2007	2008	2009	2010
Crude	107	175	330	470	663	407	546
Oil products	105	174	348	465	676	387	529
Natural gas, 1000 m <sup>3</sup>	63.1	85.9	151	234	354	249	273
Coal	34.3.	26.3	47.2	54.7	79.6	70.1	79.4
Iron ores and concentrates	23.1	15.8	47.7	51.0	89.2	44.5	83.4
Rough wood, m <sup>3</sup>	57.7	43.4	59.6	83.9	95.1	84.6	87.1
Pig iron	132	83.7	264	317	489	277	369
Copper	2,539	1,677	3,447	6,638	6,047	4,894	7,216
Untreated nickel	8,059	8,641	13,563	33,855	19,546	14,548	21,790
Untreated aluminium	1,520	1,298	1,316	2,153	2,164	1,444	1,817
Wheat and meslin	137	117	110	250	245	164	175
Barley	77.2	87.2	115	224	220	126	128
Fish, fresh and frozen	973	1,081	1,197	1,503	1,621	1,426	1,513

**Annex 5. Total greenhouse gas emissions (million tonnes of CO<sub>2</sub> - equivalent per year).**

	2005).	2006	2007	2008	2009
Carbon dioxide (CO <sub>2</sub> )	1,524.77	1,581.85	1,578.88	1,609.16	1,526.75
Methane (CH <sub>4</sub> )	466.05	476.71	482.55	484.68	459.98
Nitrous oxide (N <sub>2</sub> O)	104.24	103.42	106.50	111.21	111.06
Hydrofluorocarbons (HFC)	15.69	14.28	13.83	14.73	10.47
Perfluorocarbons (PFC)	4.72	4.18.	3.80	3.73	2.45
Sulphur hexafluoride (SF <sub>6</sub> )	1.34	1.36	1.39	0.83	0.79

*Source: National report of the Russian Federation on the inventories of anthropogenic emissions by sources and absorption of greenhouse gases not controlled by the Montreal Protocol, for 1990-2009, issued by the Institute of Global Climate and Ecology, Federal Service for Hydrometeorology and Environmental Monitoring, and the Russian Academy of Sciences (Key indicators of environmental protection. Statistical Bulletin. Moscow, Statistics Service Publishing, 2011).*

## Annex 6. Indicators of environmental sustainability in selected countries (Human Development Report, 2011, UNDP).

Countries	Adjusted net savings (% of GNI)	Ecological footprint (hectares per capita)	Index of environmental performance (value 0-100)	Share of fossil fuel (% of total) *	The share of renewable energy sources (% of total) *	Carbon dioxide emissions per capita (tonnes)	Urban pollution (mg/m3)	Depletion of natural resources (% of GNI)	Forest area (% of total area)	Overall satisfaction with life (values 0-10)	Satisfaction with the actions for environment protection (% satisfied)	HDI rating
Norway	12.8	5.6	81.1	58.6	45.3	10.5	16	10.6	32.4	7.5	51.5	1
Australia	1.7	6.8	65.7	94.6	5.4	19.0	14	5.1	19.7	7.5	63.8	2
The Netherlands	11.6	6.2	66.4	92.5	4.4	10.5	31	0.8	10.8	7.5	66.1	3
USA	-0.8	8.0	63.5	85.0	5.4	17.3	19	0.7	33.2	7.2	57.8	4
Canada	5.8	7.0	66.4	74.9	17.0	16.4	15	2.3	34.1	7.7	61.7	6
Germany	11.4	5.1	73.2	80.1	8.9	9.6	16	0.1	31.8	6.7	61.8	9
Sweden	16.0	5.9	86.0	33.1	32.4	5.3	11	0.2	68.7	7.5	62.9	10
Japan	12.1	4.7	72.5	83.0	3.4	9.5	27	0.0	68.5	6.1	46.8	12
Denmark	10.7	8.3	69.2	80.4	18.9	8.4	16	1.5	12.7	7.8	64.3	16
France	7.0	5.0	78.2	51.0	7.5	6.1	13	0.0	29.0	6.8	57.5	20
Finland	8.1	6.2	74.7	48.0	26.1	10.7	15	0.1	72.9	7.4	57.3	22
Czech Republic	11.3	5.7	71.6	81.2	5.4	11.3	18	0.3	34.3	6.2	56.6	27
UK	2.2	4.9	74.2	90.2	2.8	8.5	13	1.2	11.8	7.0	66.8	28
Estonia	14.4	7.9	63.8	88.3	12.0	13.6	13	0.7	52.6	5.1	45.2	34
Poland	9.7	4.3	63.1	93.8	6.3	8.3	35	1	30.5	5.8	43.6	39
Lithuania	6.0	4.7	68.3	60.8	9.3	4.5	17	0.2	34.2	5.1	29.9	40
Romania	18.8	2.7	67.0	79.4	14.1	4.4	12	1.3	28.3	4.9	14.3	50
Cuba	.....	1.9	78.1	89.9	10.1	2.8	21	.....	26.3	5.4	54.5	51
Bulgaria	6.1	4.1	62.5	76.2	5.3	6.7	51	1.1	35.1	4.2	19.4	55
Belarus	16.9	3.8	65.4	92.1	5.5	6.5	7	0.9	42.2	5.5	50.6	65
<b>Russia</b>	<b>-0.8</b>	<b>4.4</b>	<b>61.2</b>	<b>90.9</b>	<b>3.0</b>	<b>12.1</b>	<b>16</b>	<b>14.5</b>	<b>49.4</b>	<b>5.4</b>	<b>18.3</b>	<b>66</b>
Kazakhstan	-1.2	4.5	57.3	98.8	1.1	15.3	15	22.0	1.2	5.5	37.4	68
Ukraine	5.6	2.9	58.2	81.8	1.4	7.0	18	3.8	16.7	5.1	8.8	76
Brazil	4.6	2.9	63.4	52.6	44.5	2.1	21	3.1	61.9	6.8	48.2	84
China	39.7	2.2	49.0	86.9	12.3	5.2	66	3.1	21.6	4.7	73.0	101
India	24.1	0.9	48.3	71.1	28.1	1.5	59	4.2	22.9	5.0	45.4	134

Source: Adopted from Human Development Report 2011(2011). Sustainability and Equity: A Better Future for All. UNDP, NY

\* Share of primary energy supply

**Annex 7 Main indicators of natural resource use and environmental impact in Russia (1990-2010)**

	1990	1995	2000	2005	2008	2009	2010
Crude oil, mil t	516	307	324	470	488	494	505
Natural Gas, bn. m <sup>3</sup>	641	595	584	641	664	583	649
Coal (mil t)	395	263	258	299	326	301	317
Water extraction for use of natural water bodies, bn. m <sup>3</sup>	106.1	86.6	75.9	69.3	69.5	64.7	72.6
The area under crops in agriculture, million hectares	117.7	102.6	84.7	75.8	76.9	77.8	75.2
Wood production, mil m <sup>3</sup>	...	116	94.8	113	108	97.1	...
Emissions of pollutants into the air, mil tonnes, including:	55.1	32.3	32.3	35.8	37.4	32.5	32.3
- From stationary sources	34.1	21.3	18.8	20	20.1	19.0	19.1
- From vehicles	21.0	11.0	13.5	15.4	17.3	13.5	13.2
Polluted wastewater, bn. m <sup>3</sup>	27.8	24.5	20.3	17.7	17.1	15.9	16.9
Disturbed lands due to non-agricultural activities, thou. ha	119.3	83.4	54.6	35.1	46.2 *	...	...
Waste generated, mil tonnes **	...	83.3	127.5	3,035.5	3,876.9	3,505.0	4,502.2

**NOTES:**

\* Data for 2007

\*\*Up to 2002 - toxic waste, from 2002 - production and consumption waste (Class I to IV of hazard to the environment)

Sources: Statistical Yearbook of Russia, and bulletins for the relevant years. Moscow: Rosstat.

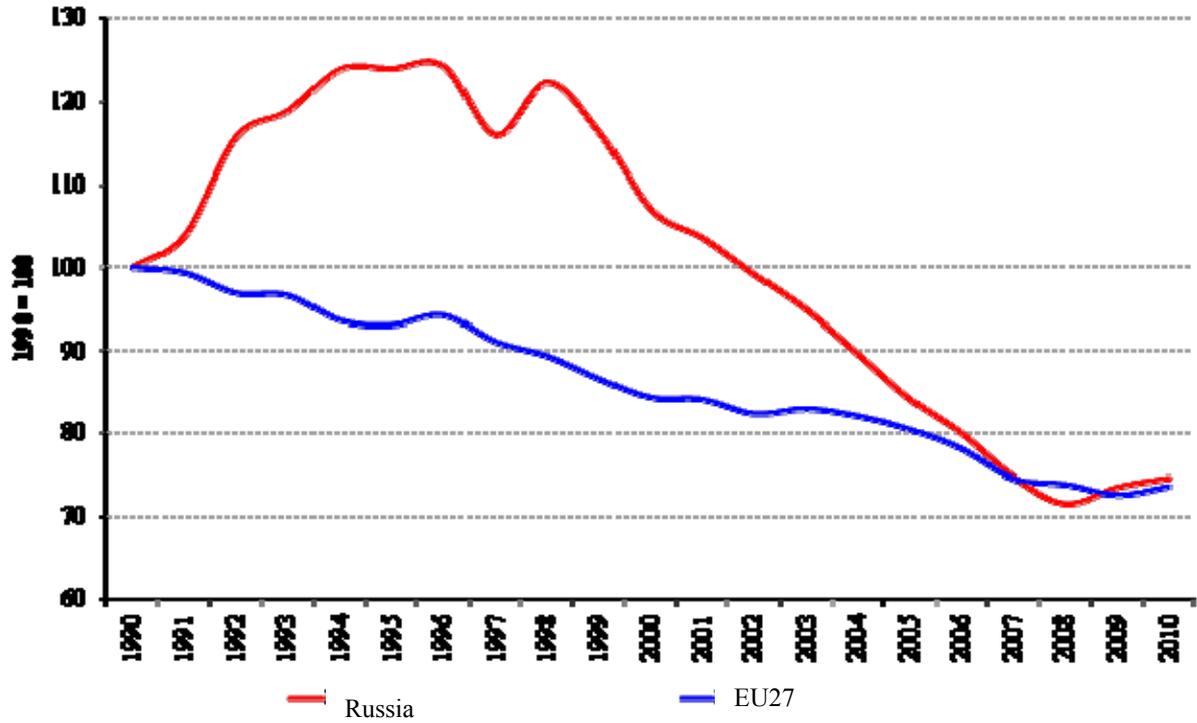
**Annex 8 Indicators nature intensity and the intensity of pollution.**

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2010 to 1990 (%)
Energy intensity	0.4	0.57	0.49	0.38	0.37	0.34	0.33	0.34	0.34	74
Water intensity	0.17	0.22	0.19	0.13	0.12	0.11	0.10	0.11	0.11	65
Air pollution intensity (from stationary sources and motor vehicles)	0.086	0.081	0.081	0.67	0.06	0.06	0.05	0.05	0.05	58
Water pollution intensity	0.043	0.061	0.051	0.33	0.03	0.03	0.03	0.03	0.03	70
Waste generation intensity *	...	0.21	0.32	...	0.24	0.4	0.18	0.23	0.18	56

\* Ratio of 2010 to 2000

Sources: Author's calculations based on: *The World Bank (World Development Indicators Online Database)*, *British Petroleum (BP Statistical Review of World Energy, June 2011)*. *The Russian statistical yearbooks and bulletins for the relevant years. Moscow: Rosstat.*

Annex 9 Dynamics of energy intensity in Russia and the EU27 (1990 = 100%).



Source: *The World Bank (World Development Indicators Online Database), British Petroleum (BP Statistical Review of World Energy, June 2011)*

**Annex 10. Land area (in the beginning of the year).**

	<b>2001</b>	<b>2005</b>	<b>2010</b>	<b>2011</b>
Total land, mil hectares	1,709.8	1,709.8	1,709.8	1,709.8
including:				
Agricultural land, mln. ha	221.1	220.7	220.5	220.4
as percentage of the total area	12.9	12.9	12.9	12.9
Forest land, mln. ha	871.5	870.5	870.8	871.0
as percentage of the total area	51.0	50.9	50.9	50.9
Surface waters, including wetlands, mln. ha	219.0	225.2	225.0	225.1
as percentage of the total area	12.8	13.2	13.2	13.2
Other lands, mln. ha	398.2	393.4	393.5	393.3
as a percentage of the total area	23.3	23.0	23.0	23.0

*Source: Statistical Yearbook of Russia. Moscow: Rosstat, 2011.*

**Annex 11 The area of agricultural land within the agricultural land affected by degradation (ha).**

	Total	including:				
		Tillage	deposit	perennial plants	hay	pastures
<b>The total area</b>	<b>194,377</b>	<b>115,267</b>	<b>3,922</b>	<b>1,186</b>	<b>18,405</b>	<b>55,597</b>
of which:						
Erosion endangered	54,297	37,877	686	267	2,190	13,276
Eroded	34,476	23,295	437	144	1,234	9,367
including:						
medium	8,227	5,259	97	33	293	2,546
heavy	4,160	839	23	6,0	2,011	3,091
Deflation endangered	53,901	38,047	509	165	1,088	14,091
Deflated	16,251	10,853	336	53	383	4,627
including:						
medium	5,515	3,700	72	23	130	1,591
heavy	1,197	549	17	2.0	43	586
Exposed to both water and wind erosion	6,116	4,432	116	21	166	1,381
including:						
medium	2,428	1791	73	1.2	72	480
heavy	602	260	19	0.7	21	303
Hydromorphic	14,578	5,664	680	456	3,432	4,346
Wetlands	8,555	2,199	195	160	2,942	3,059
Salinized	15,692	4,213	413	479	2,024	8,563
Solonized and solonetzic complex	22,171	9,088	515	537	1,654	10,378
Stony	9,771	3,596	300	27	718	5,131

*Source: Key Indicators of environmental protection. Statistical Bulletin. Moscow, Statistics Service, 2011.*

**Annex 12 Water resources (km<sup>3</sup> per year).**

	<b>2010</b>	<b>Average annual volume</b>
Total for rivers	4,331.7	4,259.8
Volga River	234	238
Don River	18.3	25.5
Amur River	432	378
Lena River	549	537
Yenisei River	683	635
Ob River	366	405
Northern Dvina	97.4	101
Pechora	151	129

Source: Statistical Yearbook of Russia, (2011). Moscow: Rosstat, 2011.

**Annex 13 Forest resources**

	2003	2008	2009	2010
<b>Total area, mil ha</b>	<b>1,179.0</b>	<b>1,181.9</b>	<b>1,182.9</b>	<b>1,183.7</b>
including: Forest land	883.0	890.8	891.9	892.0
of it covered by forests	776.1	796.2	797.0	797.5
Total timber reserves, bn. m <sup>3</sup>	82.1	83.3	83.6	83.5
Area of forest cover, per cent	45.4	46.6	46.6	46.6

Source: According to the Federal Forestry Agency (Russian Statistical Yearbook, (2011). Moscow: Rosstat, 2011)

**Annex 14 Distribution of timber resources among the regions of Russia.**

Region	Total timber reserves (%)		
	<b>2001</b>	<b>2009</b>	<b>2010</b>
Russia as a whole	100		
Including:			
Northern region	10	10.1	10.2
North-West region	2	2.1	2.1
Central region	4	4.4	4.4
Volga-Vyatka region	3	2.7	2.7
Central Black Earth region	0.2	0.3	0.3
Povolzhskiy region	0.8	0.8	0.9
North Caucasus region	1	0.9	0.9
Urals region	6	6.7	6.7
West-Siberian region	13	14.8	14.9
East-Siberian region	34	32.5	32.4
Far East region	26	24.7	24.5

Source: Statistical Yearbook of Russia. 2011. Moscow: Rosstat, 2011

### Annex 15 Conservation and protection of forests.

	1990	1995	2000	2005	2006	2007	2008	2009	2010
Reforestation, thou. ha	1831	1454	973	812	877	872	828	837	812
including artificial (creation of forestry crops)	566	367	263	187	194	202	191	181	171
Area of forest biological protection, thou. ha	480	618	538	511	520	420	317	150	227
Dying of forest plantations, thou. ha	...	172	777	988	311	319	273	447	805
of them from forest fires	...	57	710	465	175	200	171	346	626
The number of forest fires, thou. cases	18.3	26.0	22.4	19.2	32.5	17.8	26.3	23.2	34.8

Source: *Statistical Yearbook of Russia. 2011. Moscow: Rosstat, 2011.*

### Annex 16 Export of energy resources and its share in total exports (current prices).

	1995		2000		2005		2007		2008		2009		2010	
	(mil US\$)	Per cent of total												
Total Export	78,217	100	103,093	100	241,473	100	351,928	100	467,581	100	301,667	100	396,644	100
Energy resources	33,278	42.5	55,488	53.8	156,372	64.8	228,436	64.9	326,314	69.8	203,408	67.4	272,840	68.8

### Annex 17. The state natural reserves and national parks.

	1980	1990	1995	2000	2005	2006	2007	2008	2009	2010
Number of State Nature Reserves	46	72	94	100	100	100	101	101	101	101
Area, mil ha	8.1	19.6	30.2	33.3	33.7	33.7	33.8	33.8	33.8	33.8
Number of National Parks	-	12	30	35	35	35	35	39	40	40
Area, mil ha	-	1.8	6.3	6.8	6.9	6.9	6.9	7.3	7.8	7.8

Source: *Statistical Yearbook of Russia. 2011. Moscow: Rosstat, 2011*

### Annex 18 Sectors' impact on the environment (2006-2010).

Type of economic activity	Atmosphere, thou. t (*)					Surface water, m. m <sup>3</sup> (**)					Waste, m. t (***)				
	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
Russian Federation, total	20,568.4	20,636.9	20,103.3	19,021.2	19,115.6	17,488.77	17,176.25	17,119.48	15,853.56	-	3,519.43	3,899.28	3,817.68	3,505.0	4,502.2
<i>Agriculture, hunting and forestry</i>	129.3	118.2	124.8	127.5	136.6	1,137.20	1,039.23	1,037.69	875.91	862	17.32	26.60	67.65	77.4	24
<i>Mining</i>	6,027.1	6,244.8	5,567.2	5,238.6	5,200.3	963.60	1,074.87	1,083.86	1,016.59	995	2,923.49	2,785.16	3,351.07	3,066.4	4,102
<i>Manufacturing</i>	7,167.9	7,205.1	6,829.4	6,353.5	6,431.0	3,572.97	3,295.31	3,269.91	2,732.80	2,692	284.01	243.86	276.64	252.01	280.1
<i>Production and distribution of electricity, natural gas and water</i>	4,352.9	4,206.0	4,462.2	4,140.7	4,327.2	9,256.59	9,013.81	9,059.89	8,817.23	8,684	73.54	70.80	67.61	65.3	68
<i>Transportation and communication</i>	2,150.2	2,211.1	2,475.2	2,605.9	2,426.4	107.09	103.85	83.79	41.18	40.5	4.03	7.49	3.17	5.3	4.9
<i>Real estate, rent and services</i>	390.2	283.7	286.3	169.6	200.5	346.55	324.06	322.88	276.29	-	50.86	386.31	17.19	4.4	4.7
<i>Other communal, social and personal services</i>	59.1	55.2	67.9	89.9	108	1,884.41	2,111.98	2,050.13	1,887.42	1,888	3.05	4.30	4.70	5.4	2.3.

(\*) Emissions of pollutants into the air from stationary sources by economic activity, thou. t

(\*\*) Volume of wastewater discharge into surface waters by economic activity, m. m<sup>3</sup>

(\*\*\*) Volume of production and consumption waste by economic activity, m. t

Source: State Reports on State of the Environment of the Russian Federation for 2009 Moscow: Ministry of Natural Resources, 2010.

**Annex 19 The main sectors in the green economy, according to the classification of UNEP and their goals.**

	SECTOR	Goals:
1.	Agriculture	The increase in nutrition to 2800-3000 kcal/day by 2030 (and keep at this level)
2.	Heating and lighting of buildings	Improving energy efficiency in order to achieve the levels of energy consumption and emissions, set in the IEA BLUE Map scenario
3.	Energy supply;	<ul style="list-style-type: none"> <li>• Expanding the use of renewable sources for electricity generation and primary consumption to achieve a minimum performance specified in the IEA BLUE Map scenario</li> <li>• Generate electricity with low carbon emissions (supply side) and energy efficiency and energy management (demand side) required to build the energy market with low carbon emissions by 2020</li> </ul>
4.	Fisheries	To achieve the maximum sustainable catch by reducing the total world catch by 50% through the decommissioning of vessels, redirecting labour and fisheries management
5.	Forestry	<ul style="list-style-type: none"> <li>• 50% reduction in deforestation by 2030 and an increase in forest plantations to ensure sustainable production of forest products</li> <li>• Effective management of the existing network of protected forests</li> </ul>
6.	Industry	Increase of energy efficiency to achieve the targets of energy consumption and emissions scenarios set out in the IEA BLUE Map scenario
7.	Tourism	
8.	Transportation	Increasing energy efficiency to achieve the targets of energy consumption and emissions scenarios set out in the IEA BLUE Map scenario, scaling up the use of public transport
9.	Waste	Reduce waste disposal by at least 70%
10.	Water	To achieve the Millennium Development Goal - to halve the number of people without access to water and sanitary by 2015 and reduce specific water consumption (quantity indicator is not set)
11.	Energy sector	Improving the use and saving of energy resources, a gradual improvement of energy efficiency, reduction of environmental impact and improve security

*Source: Table constructed and adapted for Russia on the basis of UNEP report "Towards a" green economy ": the path to sustainable development and poverty eradication." UNEP, 2011, p.39-40*

**Annex 20 Production of main agricultural products by categories of facilities (thousand tonnes).**

	1970	1980	1990	1995	2000	2005)	2006	2007	2008	2009	2010
	<b>Agricultural organizations</b>										
Grain (weight after processing)	106,940	96,882	116,334	59,835	59,418	62,727	61,754	64,191	84,545	75,920	46,985
Sugar beet (industrial)	23,903	24,130	32,325	18,285	13,271	18,813	26,773	25,342	25,854	22,218	19,735
Sunflower seeds	3,022	1,954	3,380	3,623	3,303	4,668	4,725	3,965	5,199	4,565	3,900
Potato	18,847	12,787	10,464	3,661	2,222	2,354	2,704	2,733	3,301	4,066	2,213
Vegetable	5,972	7,465	7,223	2,847	2,475	2,119	2,284	2,174	2,488	2,462	2,069
Fruits and berries	1,233	1,051	1,180	499	424	498	317	527	464	483	322
Livestock and poultry (slaughter weight)	4,191	5,215	7,604	2,891	1,787	2,305	2,567	2,963	3,403	3,864	4,342
Milk	30,147	34,240	42,452	22,413	15,271	14,001	14,135	14,163	14,247	14,495	14,313
Eggs, million pieces.	12,287	28,937	37,195	23,471	24,143	27,359	28,537	28,427	28,396	29,858	31,316
Wool (in bulk weight)	165	172	171	50	15	1.2	11	11	10	11	11
Honey, tonnes	28,793	19,848	14,102	8,217	5,237	2,903	2,921	2,705	2,643	2,200	1,749
	<b>Households <sup>1)</sup></b>										
Grain (weight after processing)	424	350	335	567	489	804	816	812	930	871	636
Sugar beet (industrial)	0.0	0.0	0.1	118	90	231	232	217	287	230	102
Sunflower seeds	44	41	47	58	49	30	24	25	28	27	32
Potato	35,086	24,184	20,381	35,885	26,868	24,980	24,410	23,253	24,077	25,246	17,753
Vegetable	4,094	3,636	3,105	8,280	8,084	8,448	8,092	8,338	9,158	9,554	8,668
Fruits and berries	1,088	899	1,205	1,719	2,261	1,885	1,606	1,950	1,898	2,247	1,778
Livestock and poultry (slaughter weight)	2,022	2,212	2,507	2,817	2,579	2,565	2,573	2,659	2,674	2,654	2,615
Milk	15,224	12,583	13,261	16,252	16,420	16,088	16,081	16,542	16,737	16,650	16,050
Eggs, million pieces.	11,307	10,603	10,275	10,230	9,801	9,521	9,405	9,467	9,325	9,261	8,980
Wool (in bulk weight)	44	41	56	40	23	27	27	29	29	29	29
Honey, tonnes	30,469	27,069	31,989	48,304	47,827	48,062	51,118	49,144	52,869	49,606	48,063
	<b>The peasant (farmer) economy <sup>2)</sup></b>										
Grain (weight after processing)	-	-	6	3,001	5,513	14,272	15,658	16,469	22,703	20,320	13,339
Sugar beet (industrial)	-	-	1.5	669	690	2,232	3,668	3,277	2,855	2,444	2,419
Sunflower seeds	-	-	0.1	519	567	1,772	1,994	1,681	2,123	1,862	1,413
Potato	-	-	2	363	375	802	1,146	1,209	1,468	1,822	1,175
Vegetable	-	-	0.1	148	263	781	994	997	1,314	1,385	1,388
Fruits and berries	-	-	-	3	5	21	17	27	39	38	48
Livestock and poultry (slaughter weight)	-	-	A	88	80	120	138	168	191	2,011	210
Milk	-	-	2	576	568	981	1,123	1,283	1,379	1,425	1,484
Eggs, million pieces.	-	-	-	129	141	260	274	314	337	310	303
Wool (in bulk weight)	-	-	0	4	2	10	12	12	14	15	14
Honey, tonnes	-	-	-	1,227	1,184	1,504	1,640	1,821	1,928	1,792	1,723

**Annex 21 Application of mineral and organic fertilizers for crops in agricultural organizations.**

	1990	1995	2000	2005	2010
Total mineral fertilizers (of 100% of nutrients), mil t	9.9	1.5	1.4	1.4	1.9
The share of areas with mineral fertilizers in the total planting acreage, per cent	66	25	27	32.0	42.0
Total organic fertilizers, mil t	389.5	127.4	66.0	50.4	53.3
The share of areas with organic fertilizers in the total planting acreage, per cent	7.4	3.2	2.2	3.4	7.5

*Source: compiled by the "Russian Statistical Yearbook 2011". Moscow: Rosstat, 2011.*

**Annex 22 Energy supply of housing stock (% of total stock).**

	Heating	Natural Gas (mains, LPG)
<b>1995</b>	68	69
<b>2000</b>	73	70
<b>2005</b>	80	70
<b>2006</b>	80	70
<b>2007</b>	81	70
<b>2008</b>	82	69
<b>2009</b>	83	69
<b>2010</b>	83	69

*Source: Russian Statistical Yearbook 2011. Moscow: Rosstat, 2011.*

**Annex 23 Intake of juveniles of valuable fish species by fishery organizations into the natural ponds and reservoirs (mil pcs).**

	2005	2006	2007	2008	2009	2010
<b>Release of juveniles of valuable species of fish – in total</b>	<b>6,939</b>	<b>7,419</b>	<b>7,654</b>	<b>7,908</b>	<b>9,432</b>	<b>10,057</b>
of which:						
Sturgeon	59.6	72.1	70.7	57.2	37.9	51.3
Salmon	682.5	694.9	759.5	930.9	813.2	1,110.0
Whitefish	45.4	34.5	59.9	86.4	96.5	109.2
Herbivorous fishes	83.3	77.1	68.5	40.7	27.4	24.0
Ordinary fish	6,065.9	6,533.6	6,689.5	6,788.6	8,451.4	8,757.1
Release of juveniles of valuable fish species as a percentage of previous year	107	106.9	103.2	103.3	119.3	106.6

Source: According to the Federal Fishery Agency (Basic indicators of the environment. Statistical Bulletin. M. Rosstat, 2011).

**Annex 24 Manufacture of paper and paperboard per capita, kg.**

<b>Countries</b>	<b>Production</b>
Russia	54
USA	278
Japan	226
France	160
Italy	170
Austria	625
GER	282
Bulgaria	58
Poland	79
China	59

Source: Russian Statistical Yearbook 2009. Moscow: Rosstat, 2009.

**Annex 25 Selected indicators of economic activity in industry.**

	<b>Sales of own-produced goods, works and services on their own (in current prices), bn. rub</b>				
	<b>2005</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
Mining operations	3,062	4,489	5,272	5,091	6,212
including:					
Mining of fuel and energy materials	2,686	3,984	4,651	4,538	5,464
Mining, except fuel and energy materials	376	505	621	553	748
Manufacturing	8,872	13,978	16,864	14,352	18,287
including:					
Manufacture of food products, beverages and tobacco	1,486	2,143	2,656	2,822	3,195
Textile and textile products	101	137	157	156	180
Manufacture of leather, leather products and footwear	19.7	29.5	34.4	34.8	42.9
Wood and wood products	145	221	245	214.	254
Pulp and paper production, publishing and printing	315	498	550	499	588
Coke and petroleum production	1,438	2,277	2,984	2,662	3,485
Chemical production	672	945	1,312	1,062	1,409
Manufacture of rubber and plastic products	199	357	405	375	479
Production of other non-metallic mineral products	426	853	1010	683	805
Metallurgy and fabricated metal product manufacturing	1,903	2,953	3,295	2,393	3,357
Manufacture of machinery and equipment	477	796	1,001	802	939
Manufacture of electrical and optical equipment	452	829	910	817	1,032
Manufacture of transport equipment	833	1,284	1,513	1,119	1,645
Other manufacturing	223	376	457	304	414

Production and distribution of electricity, gas and water	1,691	2,146	2,573	3,030	3,616
including:					
Production, transmission and distribution of electricity, gas, steam and hot water	1,588	2,007	2,413	2,849	3,412
Collection, purification and distribution of water	103	139	160	181	204
TOTAL	13,625	20,613	247 092	22,473	28,115

*Source: Table compiled and calculated by: Statistical Yearbook of Russia. 2011. Moscow: Rosstat, 2011.*

#### **Annex 26 Main indicators of tourism sector.**

	<b>2004</b>	<b>2005</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
Number of sold tourist waybills to the population - total, thousand	2,034	4,326	4,305	3,696	4,389
Of them for citizens of Russia:					
For the territory of Russia	739	1378	1030	830	991
For the territory of foreign countries	1,140	2,748	3,183	2,802	3,397
The cost of sold tourist waybills to the population - total, mil rubles	29,846	76,301	117,811	129,557	169,669
Of them to the citizens of Russia:					
For the territory of Russia	7,030	13,757	17,736	15,558	19,785
For the territory of foreign countries	18,843	52,727	98,940	112,958	149,883
The number of tourist companies (end-year) - total	4,010	5,079	6,477	6,897	9,133

## Annex 27 Tourist and educational activities in the State Nature Reserves and National Parks.

	2005	2006	2007	2008	2009	2010
	<b>State Nature Preserves</b>					
Number of museums, pcs.	60	62	61	60	63	66
Number of visitors, thousands of people.	344	364	365	413	376	391
Number of visitor centres, pcs.	74	81	84	104	107	108
Number of visitors, thousands of people.	159	172	180	389	315	405
Number of nature trails and routes <sup>1)</sup> – in total, pcs.	487	506	501	517	393	409
of which:						
water	74	73	63	63	63	67
ranger	15	11	11	13	8	8
walking	337	371	369	375	266	277
Number of visitors, thousands of people.	398	247	385	632	444	617
	<b>National Parks</b>					
Number of museums, pcs.	27	33	34	50	45	48
Number of visitors, thousands of people.	45	85	86	158	130	104
Number of visitor centres, pcs.	48	58	64	74	79	95
Number of visitors, thousands of people.	101	141	237	158	154	177
Number of nature trails and routes <sup>1)</sup> - all units.	393	406	435	455	665	736
of which:						
water	69	64	65	61	67	69
ranger	30	36	46	53	41	45
walking	196	208.	219	216	229	277
Number of visitors, thousands of people.	403	1199	1472	1489	840	1303

<sup>1)</sup> Including environmental pathways and routes in the buffer zone.

*Source: Table compiled and calculated by the "Bulletin of Environmental Protection." 2011. Moscow: Rosstat, 2011*

**Annex 28. Passenger traffic on the modes of public transport (Billions of passenger-kilometres).**

	2005	2006	2007	2008	2009	2010
<b>Transport – in total</b>	473.3	476.5	497.3	512.2	461.8	483.9
<b>including:</b>						
<b>railroad</b>	172.2	177.8	174.1	175.9	151.5	139.0
<b>bus</b>	142.3	136.0	149.9	152.1	139.1	140.6
<b>taxi</b>	0.1	0.1	0.1	0.1	0.1	0.1
tram	13.5	11.1	8.7	8	7.1	6.7
<b>trolleybus</b>	15.0	12.4	9.8	9.0	7.9	7.1
<b>subway</b>	43.4	44.2	42.6	43.4	42.7	42.4
<b>sea</b>	0.09	0.06	0.07	0.07	0.06	0.06
<b>inland waterway</b>	0.9	0.9	1	0.8	0.8	0.8
<b>air</b>	85.8	93.9	111.0	122.6	112.5	147.1

**Annex 29. Generation and utilisation of waste.**

	1995	2000	2005	2006	2007	2008	2009	2010
Generated production and consumption waste *), Mt	83.3	127.5	3,035.5	3,519.4	3,899.3	3,876.9	3,505.0	4,502.2
including hazardous **)	83.3	127.5	142.5	140.0	287.7	122.9	141.0	114.4
Utilisation and disposal of production and consumption waste *), mil t	40.5	46.0	1,265.7	1,395.8	2,257.4	1,960.7	1,661.4	2,505.7
The share of utilised and neutralized production and consumption waste in total generated waste (%)	49	36	42	40	58	51	46	56

\*) 1995, 2000 - toxic waste, since 2005 - production and consumption waste, since 2005 - according to the Rostekhnadzor, 2010 - according to Rosprirodnadzor.

\*\* ) since 2005 - production and consumption waste (I to Class IV of environment hazard).

Source: Table compiled and calculated by: Statistical Yearbook of Russia. 2011. Moscow: Rosstat, 2011.

**Annex 30 Generation, utilisation and disposal of production and consumption waste in 2010 (mil t). (According to the Federal Service for Supervision in Nature Management).**

	Generated	Utilised and disposed
Mining of energy producing materials	2,972	1,974
Mining of materials, except of energy	1,130	356
Chemicals and chemical products	26	4
Metallurgy and fabricated metal products manufacturing	194	80
Production and distribution of electricity, gas and water	68	10

**Annex 31 Key indicators of the impact of economic activities on water resources.**

	2005	2006	2007	2008	2009	2010
Water extraction from natural water sources for use, bn. m <sup>3</sup>	69	70	70	69	65	73
Water losses during transportation, bn. m <sup>3</sup>	8.0	8.0	7.9	7.8	7,5	...
Reuse and recycling of fresh water, bn. m <sup>3</sup>	135	143	144	144	137	137
The average daily consumption of water by population and budget entities per urban resident, l	244	224	218	214	203	194
Polluted wastewater discharge, bn. m <sup>3</sup>	17.7	17.5	17.2	17.1	15.9	16.9

**Annex 32. Provision of housing with water services (the share of the total area,%).**

	Water supply system	Wastewater (sanitary)	Bath (shower)	Hot water
<b>1995</b>	71	66	61	55
<b>2000</b>	73	69	64	59
<b>2005</b>	76	71	65	63
<b>2006</b>	76	72	66	63
<b>2007</b>	76	72	66	64
<b>2008</b>	77	73	66	64
<b>2009</b>	77	73	66	65

<b>2010</b>	78	74	67	65
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**Annex 33 The contributions of individual ecosystems to the conservation of terrestrial biota sustainability** (calculated according to the UN, FAO, the World Resources Institute, the International Biological Program, Russian project Biodiversity Conservation GEF)

	<b>Contribution of ecosystems to conserve the stability of terrestrial biota</b>
<b>Russia</b>	9.6
<b>Brazil</b>	7.06
<b>Australia</b>	6.52
<b>Canada</b>	5.25
<b>USA</b>	5.22
<b>China</b>	4.93
<b>Rest of the world</b>	61.42

**Annex 34. MDG Goal 7 "Ensure environmental sustainability" for Russia**

MDG targets for Russia	MDG performance indicators for Russia	Current indication	Target for 2015	Target for 2020
Task 1. Integrate the principles of sustainable development into country policies and programs and to prevent the loss of natural resources	1. Percentage of area covered by forest;	47	At least 47%	At least 47%
	2. The percentage of protected area to maintain terrestrial biodiversity;	13%	18-20%	22-25%
	3. Power consumption;	0, 324 Mtoe / \$ Thousand	not more than 78% compared to 2005	not more than 57% compared to 2005
	4. Carbon dioxide emissions (tonnes)	2,193 billion tons of CO <sub>2</sub> – eq. (about 70% of 1990 emissions)	Reduction by 27-28% compared to 1990	Reduction by 25% compared to 1990
	5. Number of people living in very polluted cities	56.3 million.	28 million.	14 million.
Task 2. Provision of clean potable water	6. The share of housing, equipped with water supply system (city, village)	89% of the urban housing stock; 46% of the rural housing stock	95% of the urban housing stock; 53-54% of the rural housing stock	100% of the urban housing stock; 61-63% of the rural housing stock
Task 3. To improve the quality of housing conditions	7. The share of urban and rural housing stock, equipped with sanitation;	87% of the urban housing stock; 37% of the rural housing stock	95% of the urban housing stock; 44-45% of the rural housing stock	100% of the urban housing stock; 51-53% of the rural housing stock

	8. The share of old and failing housing stock	3.2.	1.5-1.6%	0
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*Source: Bobylev S. N. (ed.) ( 2011) Report on Human Development in the Russian Federation in 2010. The Millennium Development Goals: A Look to the Future. Moscow: UNDP.*

## **Appendix 2. Proposals for a green economy pilot regional project for Tomsk Oblast**

At present in Tomsk Oblast there are conditions for the implementation of a pilot project to test the mechanisms of green growth and to form an innovative research and production cluster on their basis, which could have a significant impact on the region economy sustainable development:

- Since 2011 there has been an on-going project of the Federal Centre for Research, Science and Education INO-Tomsk 2020 (Order of the Government of the Russian Federation, October 6, 2011, No 1756-r).
- At the end of 2011 a Tomsk Consortium of Scientific-Educational and Scientific Organizations was established (Agreement, November 16, 2011).
- In Tomsk Oblast operates a special economic zone of technical-promotional type (Decree of the Government of the Russian Federation, December 21, 2005, No783).
- There has been established a unique system of governance in the field of environmental protection and natural resources, which includes regional (under the governor of Tomsk oblast administration) and municipal environmental steering groups (Order of the Governor of Tomsk Oblast. February 29, 2008, No 58-r).
- Universities in Tomsk provide educational services to a significant number of qualified personnel.

In 1992 Tomsk Oblast was the first in Russia to adopt a concept of region sustainable development. Today in Tomsk region, an innovative system is formed and operates focusing on the rational use and high-level processing of natural resources. It includes the following elements:

- The unique scientific and educational complex (10 entities that implement programmes of higher education, 6 state universities (there are 17 departments, training specialists for the environment protection) and 6 institutes of the Tomsk Scientific Centre, Siberian Branch of the Russian Academy of Sciences, and 7 institutes of the Tomsk Scientific Centre, Siberian Branch of Russian Academy of Medical Sciences, 76 subjects of scientific activity), which were amalgamated in 2011 in Tomsk Consortium of Scientific-Educational and Scientific Organizations.
- Tomsk universities are leaders of Russian higher education system and provide training for more than 300 disciplines, 60 of which are linked with the priorities of modernization and technological development of Russia, including environmental management, resource saving and environmental protection. In the educational institutes of higher education in Tomsk there are about 86,000 students (every 5th inhabitant of Tomsk), more than 50 per cent of the students – are non-residents, of which 9 per cent are foreign students from 30 countries worldwide. Due to the concentration of highly qualified scientists Tomsk is one of the leading cities in Russia (more than 5,000 doctors of sciences and PhD).
- A regional regulatory framework that defines the basic concepts and provides incentives for innovation activities of companies, including the possibility of

providing tax incentives on regional taxes, subsidies from the regional budget and the state guarantees at taking loans, comprises more than ten legal acts.

- Developed innovative infrastructure in Tomsk Oblast, comprising 39 different elements (13 offices for commercialization, 7 business incubators, including ones in all universities, 4 innovation and technology centres, 4 centres for technology transfer, including the Centre for transfer of environment resource-saving technologies NI TPU, Interdepartmental Centre for Nanotechnologies "Tomsknanoteh", Tomsk venture fund, a network of venture financing, consulting companies in the field of innovation, etc.).
- In 2011, a long-term project INO-Tomsk 2020 was launched as an incentive of the Centre for education, research and development, one of the seven key areas of which is the rational use and high-level processing of natural resources.

During 15 years the Innovation Forum INNOVUS is held in Tomsk annually (2600 participants from 20 countries and 46 regions of Russia attended the Forum in 2011), which during the last three years has a key focus on the inculcation of green technologies and practical use of sustainable development tools (<http://innovus.biz/>). The existing negotiation platform for innovative development provides a regional model presentation on national and international levels, utilizing the best expertise in this area. A mutually beneficial partnership is developing between the region and the Technology Platform "Environmental Technology Development" as part of the planned cooperation agreement, including the promising areas of research and development, having significant socio-economic importance for Tomsk Oblast, Siberian Federal District and Russia in general.

The implementation of the pilot project associated with the formation in Tomsk region of the scientific and industrial cluster for green technologies development would provide support for priority development of the region's economy and maintain a supportive environment, taking into account the strategic priorities of the international community development (in particular development of the green economy) and of the Russian Federation, would also create additional opportunities to foster innovation activities, entering new domestic and international markets and jobs in high-tech sector, would improve performance and would maximize the efficient use of resources in terms of economic modernization.

The project will be the basis for strengthening inter-regional cooperation (in the framework of existing and planned agreements) with the regions of Siberia:

- Regarding joint scientific and practical development to develop cooperation with Novosibirsk Oblast and Krasnoyarsk Krai.
- Regarding scientific potential of Tomsk Oblast for the development and modernization of the productive base of the regions (especially mining and manufacturing industries) to develop cooperation with Kuzbass, Khanty-Mansi and Yamalo-Nenets Autonomous Districts, Krasnoyarsk Krai, Novosibirsk and Irkutsk Oblasts, Republics of Sakha-Yakutia and Buryatia.

Summing up the systematic environmental management over 20 years in Tomsk Oblast, the following results have been achieved:

- Atmosphere: The air in the city of Tomsk is cleaner than in other cities of Siberia (the index of air pollution in Tomsk is 7.8 (in 2006 it was 14), in the city of Kemerovo - 9.2, in the city

of Novosibirsk 11.2, in the city of Barnaul 12.3). Totally on the whole territory of Tomsk Oblast the amount of excess emissions decreased by 3 times over 1991-2012.

- Protection of water bodies: The indicator of untreated sewage discharge Tomsk Oblast is not a big polluter of rivers, compared to other regions: the share of untreated wastewater discharge in the Oblast is 11%, compares to the Siberian Federal Region – 82%, and to the RF – 89.8%. 8 new sewage treatment plants have been built with total capacity of more than 50 million cubic meters. Discharge of untreated sewage into the rivers of the Oblast has been decreased by 6.3 times.
- Production and consumption waste management: on the territory of Tomsk Oblast, solid waste landfills have been built in all Oblast centres and urban areas (Phase 1), 236 authorized waste disposal sites have been equipped in sparsely populated areas, in 2010 a new landfill was put into operation in the city of Tomsk. New advanced technologies for waste processing have been introduced as well. Small business in the Oblast is processing more than 4,000 tonnes of waste annually.

Priorities for implementation of innovative projects in the field of resource saving and environmental protection in Tomsk Oblast are as follows:

- Utilization of renewable and alternative energy sources, including design and construction of wind-solar, biogas, biogas-generating plants, utilization of peat, processing of associated natural gas: only about 60% of energy needs are covered by own generation. At that, the potential of utilization of renewable energy sources of the region increases energy demand at least 1.5 times. At present, industrial and pilot-scale power plants utilizing renewable and alternative energy sources have been designed and built in the region.
- Design and construction of wastewater treatment plants of industrial and domestic wastewater, including local treatment facilities: Tomsk NOK is conducting a unique scientific and practical development of wastewater treatment technologies, an experimental platform for the simulation of different modes of biological treatment on an industrial scale has been built (it is functioning at the existing facilities of the public infrastructure of Tomsk Oblast), and the industrial base for treatment facilities has been formed.
- Development of technologies for processing production and consumption wastes: on the territory of the region scientific and practical development for more than 10 directions is under way, small innovative companies have been established, some of which are residents of special technical-promotional economic zone Tomsk.
- Improve energy efficiency of buildings and constructions: research and development are conducted to create new building materials, technologies for their production, design of buildings and constructions, and development and introduction of new technologies in construction and renovation.
- Development and implementation of technologies for environmental monitoring: Tomsk universities in collaboration with the Institute of Monitoring of Climatic and Ecological Systems SB RAS are conducting R&D up to high international standards.
- Fuel shift of road transport to natural gas and hydrogen fuel: within a regional program, more than 50% of public transport in the city of Tomsk have been shifted to natural gas, and scientists from the Tomsk National Research Polytechnic University are implementing an international Russian-Icelandic project on an automobile engine manufacture, using hydrogen as fuel to be used in the light of the climate conditions of the northern regions.

- Cleaning of natural fresh water for potable purposes: industrial installations are produced that are based on the results of the original works of the Tomsk NOK and are traded in many regions of Russia

### **Appendix 3. Proposals for a pilot regional green economy project in Krasnodar Krai**

The high value of the Krasnodar Krai territory for a priority project to test the mechanism of green growth and the formation of an innovative green cluster of the regional economy on its basis are due to its role at the federal level in Russia, new powerful impulses to the environmentally oriented development appearing there in preparation for the Winter Olympic Games in Sochi 2014 and the necessary resource base availability.

The local growth poles in the Krasnodar Krai are agriculture, tourism and recreation, transport and logistics complexes that are important for the economic security of the country as a whole. High population density, traditional specialization in sectors that are most sensitive to the qualitative parameters of the environment, rapid development of transport and port facilities create a high cross-sector externalities, lead to a conflict of interests in utilization of ecosystem services and in the near future could be the cause of the area investment attractiveness decrease. At the same time gradually reinforced over the recent years pressure from industry, transportation, utilities, and agriculture is often affects most valuable landscapes. Sustainable long-term economic development of Krasnodar Krai region could only be achieved through the introduction of innovative environmental technologies and environmental management systems, environmental marketing, and implementation of measures to eliminate the accumulated environmental damage, allowing the interaction between economic development and environmental protection.

There are general trends of the green economy development, such as waste recycling, introduction of resource and energy efficient technologies, renewable energy. For the Krasnodar Krai region most of these areas are extremely important and bring about powerful incentives for their implementation and the subsequent dissemination of positive experiences and results at all-Russia scale.

In particular, the critical situation formed in the region regarding waste disposal is caused by intense environmental conditions in several resort areas, and creates a real risk of reducing attractiveness for tourism. Only 3% of household waste are subject to processing and the rest of waste is disposed in the open landfills without any separation, 80% of which do not comply with current environmental and health legislation, with the alienation of land in the suburbs of cities. Industrial waste, including toxic, so far is stockpiled and stored in different storage facilities, quite often without complying with relevant environmental laws and regulations. As a result, soil, groundwater and surface water of settlements are subject to intense pollution. According to the expert estimates, the economic damage for the Krasnodar Krai territory from waste disposal on the territories occupied by landfills in 2008 was not less than 22.14 bn. roubles (excluding the cost of the remediation works). More than 12.2 million tonnes of production and consumption waste are accumulated on the territory of Krasnodar Krai, including 0.5 million tonnes of toxic waste, demonstrating trend of annual increases. Design of an effective control mechanism in this regard, introduction of resource-saving technologies and recycling facilities, working out of economic incentives for recycling businesses and secondary utilisation of waste is of primordial importance.

The next major direction in the development of green economy in the region could be energy-saving technologies and development of renewable energy sources. The Krasnodar Krai territory is on the one hand, energy-deficient region (own generation covers only about 38% of energy demand), on the other hand it has the potential of renewable energy (estimated in 2.5 million tonnes of fuel oil

equivalent per year). Under the given natural climate conditions the contribution of renewables to energy supply can be provided on the level already achieved in developed countries.

Powerful impulse that laid the foundation for a green start-up in the region was made by realization of the Environment Strategy Sochi-2014, which contains the commitment not only to preserve the unique ecosystem of Sochi in preparation for the 2014 Winter Olympics, but also to set targets to improve environmental conditions in the region. At this the program of implementation of innovative technologies, minimization of adverse impacts on the environment, and conducting well-proportioned environmental protection measures are all defined as the priority areas. At present, the pre-Olympic city of Sochi is almost unique in the scale of the whole Russian territory, due to the internalization of the green standards in any construction project and the practical approbation of the mechanism for implementing green construction which is under way in the region. This experience, which could become a real part of the Olympic legacy, could be made use in future and could serve as the foundation for the development of green economy in the Krasnodar Krai region.

The implementation of the pilot project linked to the formation of green economic cluster in the Krasnodar Krai region, would address a significant part of the accumulated environmental problems, prevent the consequences of over-exploitation of natural resources and ecosystems depletion, improve the environmental image of the Winter Olympic Sochi 2014, identify the strengths and weaknesses of individual management tools, optimize the existing cross-sector interactions, and reduce the gravity of environmental conflicts and social tension.

Creating a new regional growth point on the green base would increase the potential of the regional economic system, as it would create additional opportunities to stimulate innovations, new markets and innovative jobs, and would enhance productivity and maximize the efficient use of resources in terms of economic modernization.

Interdisciplinary green cluster core could be energy efficiency, alternative energy development and waste management, as there are in place all necessary conditions, incentives and pre-requisites for their development in the region.

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