Green finance

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Abstract. Many countries are currently forming and developing a green financial system focused on economic growth, social security and environmental protection. The paper provides a rationale for the term green finance and proves the need for reorganization of the financial system with regard to environmental problems that pose significant risks for the financial sector. Systematization and analysis of green stimulus policies used in global and Russian practice with account of the economic crisis of 2020, and assessment of the state of the environmental segment of the financial market made it possible to single out green bonds and loans as the most promising financial instruments, as well as to formulate the main tasks faced by the governments of most countries for development of green finance and to justify the need for standardized approaches to assessing the effectiveness of environmental projects, to improve green financial products, and to attract a wide variety of investors, including the population, for funding regional and municipal green projects.

1. Introduction
The modern world is faced with a large number of economic, social and environmental problems, the solution of which requires active involvement of governments, business representatives and citizens. The so-called concept of sustainable development has been formed in the world community. It assumes interrelation of stable economic growth, social security and minimization of adverse environmental effects.

An expressive and vivid term green refers to many processes and phenomena of ecological orientation. The term green economy is used to indicate a sustainable economy that improves the quality of life for everyone within the environmental constraints of our planet (Green Economy Coalition, 2011) [1]. Green projects are being implemented to protect the environment, reduce pollution and improve the resource efficiency. Investment in environmentally friendly and resource-saving technologies is conventionally called green investments, and financing of activities that provide society with environmental benefits is referred to as green financing [2]. Thus, it is possible to use a general term green finance as a set of relations aimed at formation of funds and their use in order to ensure environmentally sustainable development.

2. Materials
Global development concepts currently imply formation and support of a green financial system to pool public and private financial resources to stimulate economic activities aimed at environmental protection, climate change mitigation and more efficient use of resources. For example, at the end of 2019, the European Green Deal was announced to be a new development strategy in Europe, which involves reduction of harmful emissions into the atmosphere while creating jobs and improving the quality of life. To implement the measures of this deal, it is planned to attract 100 billion euros of
private investment by 2026 and over the next ten years to send 1 trillion euros to the European Investment Bank referred to as the EU climate bank [3].

In recent years, the Russian Federation has taken on increased obligations to minimize the harmful impact on the environment, but it is still one of the states to produce the largest amount of greenhouse gas emissions and the third largest energy consumer in the world. Deterioration of the ecological situation, climate change and associated risks to human health annually lead to economic losses in the amount of 4–6% of GDP, and in the Russian Federation this indicator is much higher than that in developed countries [2]. In 2018, Russia ranked 105th out of 130 countries on the Global Green Economy Index (GGEI) [4], which shows the effectiveness of government measures to protect the environment and counter the depletion of natural resources. Environmental issues threaten Russia’s competitiveness and pose risks to financial sustainability.

The economic crisis of 2020 caused by the pandemic decreased the volume of green investments in the world; however, the authorities of many European countries announced the need for a green recovery of the economy. This means that there is no need to restore production that does not use advanced environmental technologies, but, on the contrary, advisable measures imply adoption of clean technologies in industry, increased investment in renewable energy, and the use of environmentally friendly transport. All countries, including Russia, need to mobilize significant financial resources to replace inefficient and carbon-intensive technologies with greener ones. Such large-scale investments require reorganization of the financial system, and establishment of new international green investment standards. The European Union has embarked on an economic reform program aimed at combating climate change and improving the environmental situation. One of the goals of this program is to halve carbon dioxide emissions by 2030 and complete decarbonization (zero carbon dioxide emissions) by 2050. For this purpose, they plan to completely stop the use of hydrocarbon raw materials (gas, oil and products of its processing).

In Russia, a legal basis has been laid for creating green economy, and a number of regulatory legal acts have been adopted to ensure transition from the export of raw materials to an innovative model of economic growth. The main regulatory legal acts are the Federal Law On Environmental Protection (2002), Climate Doctrine (2009), Fundamentals of State Policy in the Field of Environmental Development of the Russian Federation for the Period up to 2030 (2012), Comprehensive Action Plan to Improve the Energy Efficiency of the Russian Economy (2018). A large-scale national project Ecology is underway in Russia. It includes 5 main areas: Waste, Water, Air, Biodiversity, Technologies. The structure of funding sources for the project is presented in Table 1.

Table 1. Financing of the national project Ecology.

| Sources of financing       | 2019 (%) | 2020 (%) | 2021 (%) | 2022 (%) | 2023 (%) | 2024 (%) | Total % Bln RUB |
|---------------------------|----------|----------|----------|----------|----------|----------|-----------------|
| Federal budget            | 27       | 17       | 19       | 16       | 17       | 14       | 18 701          |
| Budgets of RF subjects    | 7        | 4        | 4        | 3        | 3        | 3        | 3 134           |
| Extra-budgetary fund      | 66       | 79       | 77       | 81       | 80       | 83       | 79 3 206        |

More than 4 trillion rubles are expected to be attracted to finance the activities planned by the national project in 2019–2024, including 2.5 trillion rubles of green investments, most of which are extra-budgetary funds.

3. Results

The potential of the project in terms of profitability is of decisive importance for investors. Green investments are typically characterized by significant initial capital costs, long payback periods and strong dependence on legal restrictions. Such projects, especially in the sphere of public infrastructure, are not always economically attractive and often do not provide the expected rate of return. Therefore, national measures are being developed to support green projects. The green stimulus policies most used in the world and in Russian practice are shown in Figure 1.
Measures of State support for green investments

| Economic measures                                                                 | Administrative measures                                      |
|----------------------------------------------------------------------------------|--------------------------------------------------------------|
| ✓ environmental taxes                                                             | ✓ legislative consolidation of the requirements for compliance with environmental parameters |
| ✓ tax relief                                                                      | ✓ legislative regulation of the green finance market          |
| ✓ preferential tariffs for using renewable energy sources                          | ✓ creation of development institutions                        |
| ✓ government guarantees                                                            | ✓ formation of green project portfolio                        |
| ✓ green state procurements                                                         | ✓ information and consulting assistance                       |
| ✓ reimbursement of part of the project costs                                       | ✓ human resource development                                  |
| ✓ risk management                                                                  |                                                              |
| ✓ initiation of public-private partnership projects                                |                                                              |

**Figure 1.** Classification of Measures of State support for green investments.

Environmental taxes are used not only to compensate for the environmental damage caused by emissions of pollutants, but are also a component of corrective pricing (e.g., the tax on carbon emissions should correspond to the value of the social costs caused by these emissions). The Paris Agreement of the UN Framework Convention on Climate Change proposes to adopt a tax on carbon dioxide emissions, and all countries that have signed the agreement (including Russia) are considering its adoption. If the tax is adopted, industries such as metallurgy, chemical industry, transport and energy will bear a significant additional tax burden. The proceeds of the carbon tax should be spent on development of renewable energy and energy efficiency.

Tax preferences are provided to investors in different forms: lowering the tax rate, investment tax credit, tax relief, tax holiday for a certain period, etc. In Russia, only an increasing factor of depreciation value has been applied so far to calculate corporate income tax relative to fixed assets, operated in case of using advanced technologies (i.e., technologies based on scientific and engineering advances and consistent with the objectives of environmental protection).

Feed-in tariffs for the use of renewable energy sources are typically offered to consumers of energy obtained from natural resources such as sunlight, water flows, wind, tides, geothermal heat, etc. In Russia, suppliers of renewable energy purchased from its producers offer increased (relative to general) energy tariffs. Tariffs are calculated to provide the energy producer with the rate of return needed for return on investment over 15 years.

State guarantees are given to creditors of those who invest in green technologies, and they imply that if the investor fails to fulfill his obligation to the creditor, budget support will be provided to pay the debt. In Russia, state guarantees are ensured for loans or bonded loans attracted for implementation of investment projects related to energy saving and energy efficiency in the field of housing and communal services and in industry.

*Green public procurement* is an informal term applied to purchasing goods, works and services for public needs, which takes into account not only price, quality and availability, but also environmental
characteristics of the purchased product, work or service. Thus, priority is given to manufacturers of greener products or those who employ environmental technology. In Russia, the volume of the public procurement market is about 30% of GDP, so the positive impact can be significant. The system of green public procurement in Russia is just in its infancy: additional eco-requirements for purchased products are legally established, but these requirements have not yet been clearly defined.

Reimbursement of part of the project costs implies that the state covers some of the investor’s costs for implementation of a green project, for example, the cost of an independent assessment of projects to obtain the green status, the cost of purchasing new eco-equipment. In Russia, subsidies are paid from the federal budget to Russian companies to reimburse part of the coupon yield on bonds issued for implementation of investment projects to adopt the best available technologies at facilities that have a significant negative environmental effect. The state reimburses 70% and 90% of the paid income if foreign or Russian equipment is purchased, respectively. The federal budget allocates 15 billion rubles for these purposes for the period of 2020–2022.

Reducing risks means that the state seeks to reduce the risks inherent in any investment to high-risk green projects. Risks are mitigated in different ways, including scaling up green projects and securitizing loans at the design stage. In Russia, the state can assume some of the investor’s risks as part of public-private partnership agreements.

Initiation of public-private partnership projects implies state proposals to potential investors for joint implementation of an investment project in the area that is a priority, for example, environmentally friendly technologies in industry. In accordance with the Russian legislation, one of the areas of implementation of agreements on public-private partnerships is processing, utilization, neutralization, and disposal of solid municipal waste. A private investor can build a facility, operate it for a long period of time, and register ownership, while receiving financial support from the state.

Administrative measures to support green projects are based on enforcement mechanisms of state authority. Legislative consolidation of requirements for compliance with environmental parameters implies that regulatory legal acts by authorities at all levels can establish permitting, protecting or enforcing environmental requirements to comply with certain regulations, for example, obligatory assessment of the environmental impact of industrial processes. An extensive legislative base has been created in Russia, which is constantly being supplemented with new environmental requirements. For example, in accordance with the national project Ecology, 300 enterprises with a high level of pollution, whose negative environmental impact is at least 60% of the total impact, are obligated to perform environmental upgrades by 2023, including installation of automated emission control systems.

In addition to general regulatory goals, such as maintaining systemic stability, security and sustainability of financial institutions, legislative regulation of the green finance market aims at ensuring high quality services of financial institutions to achieve green goals and create a favorable investment climate that allows investors to be more decisive with green investments. The Main Directions for Development of the Russian Financial Market in 2019–2021 developed by the Bank of Russia reflects the need to form a national system of financial instruments for sustainable development, and to organize a methodological system for responsible financing instruments.

Development institutions are established to stimulate innovation processes, ensure sustainable economic growth, and diversify the economy. Development institutions act as catalysts for private investment in priority sectors of the economy, since they can be co-investors in projects, issue guarantees for investor’s debt obligations, support the project with long-term loans, and use other means to promote implementation of projects that cannot be fully financed by private business, but are important to society. To date, a number of large development institutions operate in Russia, which includes, for example, Vnesheconombank, the State Corporation Fund for Assistance to HCS Reforms, etc. More than 200 organizations have been established in the constituent entities of the Russian Federation to perform the functions of development institutions to support green projects among other things.
The authorities should form a portfolio of green projects to overcome the barriers that restrain investments. The novelty of such projects, lack of understanding of risks and profitability by investors, blurred criteria for classifying investment initiatives as green lead to low loan ratings of green projects and low interest of potential investors. Compiling a register of green projects, the state guarantees reliable information and declares measures to support these, which has a stimulating effect on investors. Russia has developed a *Concept for Organizing a Methodological System for the Development of Green Financial Instruments and Responsible Investment Projects*. The integrated methodological center should be established to create a portfolio of green projects.

Information and consulting assistance to green investors on the issues of legislation application, the choice of financial instruments, etc., as well as the development of human resources for environmental initiatives through training employees and assistance in selection of qualified personnel, are also an important area of the state support for potential investors in the green project market.

The green investment support system differs from country to country and includes not only the listed measures. In Russia, the financial system started to realize the environmentally sustainable development strategy. Thus, green investments in Russia make up less than 1% of investments in fixed assets [5], but this recently emerged sector of the economy is growing rapidly. A separate environmental segment is created in the national financing system to employ appropriate green financial instruments, which include green bonds and green loans.

Green bonds are a novel financial instrument designed to fund environmental programs and projects. The structure, risks and recurrency of green bonds are similar to those of conventional bonds, but the proceeds are spent exclusively on green project implementation. Issuers of green bonds can be not only corporations and financial institutions, but also the state, which provides a strategic issue of bonds to ensure liquidity in the market and attract investors. For these purposes, green sovereign, municipal bonds, and bonds of development institutions can be issued.

The World Bank was the first to issue green bonds in 2007. As this segment of the financial market develops, the Green Bond Principles have been developed, which are the accepted standards followed in most countries. Compliance with these principles guarantees investors that the issuer meets certain standards and directs funds from the issue of bonds to environmental projects. In addition, there are national rules to enshrine in law the criteria for green bonds classification.

The green bond market is a rapidly growing and promising segment of the global financial market. Thus, its volume at the end of 2019 amounted to 690 billion US dollars, and the number of issuers was 702 [6]. In 2019, green bonds worth 255 billion US dollars were placed in the world; in total, green bonds have already been issued in 34 currencies. According to the forecast by Climate Bonds Initiative, the emission volume in 2020 will amount to 350–400 billion US dollars [7]. In Russia, green bonds were first issued in December 2018 with a total par value of 1.1 billion rubles [8]. In 2019, the Moscow Exchange, which is in line with global trends, created a specialized sector for sustainable development, which consists of three independent segments: the green bond segment, the social bond segment and the national project segment. In 2020, green bonds of three issuers with a total par value of 6 billion 450 million rubles were available (Table 2) [9].

| Issuer                  | Issue volume (mln rubles) | Coupon rate (%) | Placement date      | Maturity date       |
|------------------------|---------------------------|-----------------|---------------------|---------------------|
| PJSC CB Center-invest  | 250                       | 8               | November 2019       | November 2019       |
| FPC Garant-Invest      | 500                       | 11.5            | December 2019       | December 2022       |
| LLC SFO Rusol 1        | 4700                      | 9.516           | February 2020       | February 2031       |
| LLC SFO Rusol 1        | 900                       | 13.516          | February 2020       | February 2031       |
| LLC SFO Rusol 1        | 100                       | 16.016          | February 2020       | February 2031       |
This segment can include bonds of Russian and foreign issuers if the issue (issuer, investment project) complies with the principles of green financing of such international organizations as International Capital Market Association (ICMA) or Climate Bonds Initiative (CBI). Experts note great potential of Russia in this sector of the financial market.

The development of the green bond market has resulted in the emergence of another special financial instrument – green loan, which is a loan of any type provided to finance eligible green projects. The Loan Market Association has developed the Green Loan Principles, which aim to create a unified system of standards to maintain the integrity of the green loan market. Green loans imply not only loans to corporations to make green investments. They also include mortgages, car loans, issuing and servicing green credit cards, and green leasing.

In Russia, the need to create a mechanism for green loans is obvious, since loans are one of the simplest ways to obtain borrowed funds. Green projects with a small cost volume can be easily financed by opening a credit line, rather than by issuing bonds. However, the lack of an approved methodology for assessing green projects in terms of risks and possibilities of achieving the declared environmental goals by the borrower hinders the development of green bank loans. To support this area, a mechanism has been developed for subsidizing green loans, i.e. compensation of part of the paid bank interest on loans for environmental projects.

4. Conclusion
Green financing has become common throughout the world, and now it extensively provides investments in projects that facilitate greening and decarbonization of the economy. The main issues to be solved by the governments for development of green finance are standardization of approaches used to assess the effectiveness of environmental projects, improvement of green financial products, attraction of a wide range of investors, including the population, to finance regional and municipal green projects, and establishment of criteria to define the green finance concept.

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