ORIGINAL PAPER

DOI: 10.26794/2308-944X-2022-10-2-56-90
JEL-codes: G28, G32, G38

Financing of Large Infrastructure Projects: Chinese Experience and Russian Practice

Egor Kuropyatnik

ABSTRACT

The **purpose** of this work is to research the problems of financing large infrastructure projects in Russia and abroad (on the example of China) and suggest ways to improve and develop financing in Russia. The **tasks** of this work are as follows:
Consider the theoretical aspects of financing large infrastructure projects.
Make a solution of the problem distribution of project risks of infrastructure construction in Russia.
Identify the prospects for improving the Russian practice of financing infrastructure projects based on foreign experience.
Explore and find the best financing option for major infrastructure projects.
Find new features of financial instruments in the Russian financial market that may create new condition for infrastructure projects.
In this work **methods** of scientific knowledge have been used such as induction, deduction, analysis, synthesis, generalization, description. The **object** of the research was financing of large infrastructure projects. The subject — problems of financing large infrastructure projects in Russia and abroad (on the example of China).
Keywords: infrastructure projects; Chinese experience; Russian financial market; project risks; policy of sanctions

For citation: **Kuropyatnik E. Financing of large infrastructure projects: Chinese experience and Russian practice. *Review of Business and Economics Studies*. 2022;2(10):56-90. DOI: 10.26794/2308-944X-2022-10-2-56-90**

ОРИГИНАЛЬНАЯ СТАТЬЯ

Финансирование крупных инфраструктурных проектов: китайский опыт и российская практика

Егор Куропятник

АННОТАЦИЯ

Предмет исследования — комплекс вопросов, связанных с финансированием крупных инфраструктурных проектов в России и за рубежом (на примере Китая). Основная цель исследования: выявление перспектив совершенствования российской практики финансирования инфраструктурных проектов на основе зарубежного опыта; поиск лучшего варианта финансирования для крупных инфраструктурных проектов; выявление рисков проектов инфраструктурного строительства в России; разработка теоретических аспектов финансирования крупных инфраструктурных проектов; разработка рекомендаций по совершенствованию и развитию этого вида финансирования в России; поиск финансовых инструментов на российском финансовом рынке, которые могут создать новые условия для инфраструктурных проектов. В процессе исследования были использованы индукция, дедукция, анализ, синтез, обобщение, описание и другие общенаучные методы.
Ключевые слова: инфраструктурные проекты; китайский опыт; российский финансовый рынок; риски проекта; политика санкций

Для цитирования: **Куропятник Е. Финансирование крупных инфраструктурных проектов: китайский опыт и российская практика. *Review of Business and Economics Studies*. 2022;2(10):56-90. DOI: 10.26794/2308-944X-2022-10-2-56-90**

Introduction

Infrastructure projects are beginning to become one of the most important elements in the development of the national economies of countries. Unfortunately, over the past decade, a slowdown in its growth rate has become a common feature for all world economies. The economies of developed countries often face the problem of "japanization" or "age-old stagnation" — when there is a situation of slowing down the pace of economic development in conditions of achieving results close to zero interest rates. The growth rates of developing economies show themselves in a similar way. They were also slowed down. The main factor that influences this phenomenon was the deficit of the aggregate demand of the world economy relative to the aggregate supply (according to the IMF, from 1.5% to 2% of world GDP). Consequently, the imbalance, through the imposition of sanctions, has become important for developing economies to fall in oil and commodity prices and a decrease in trade. China, which has been the most powerful driver of all economies over the past 10 years, is experiencing a slowdown in the growth rate of the national economy. As a result, today China is experiencing the formation of the planned reform of the model of economic development of the "Celestial Empire", where the main emphasis should be placed on the development of domestic infrastructure and the domestic consumer market. The construction of high-quality modern infrastructure is urgently needed, first of all, by countries with developing economies. According to the McKinsey Global Institute, the needs of the world economy in infrastructure investments in the period from 2020 to 2030 should amount to $ 57 trillion. According to OECD estimates, the annual demand for investment in infrastructure is $ 3.7 trillion, while about $ 2.7 trillion is invested. Thus, the investment deficit is $ 1 trillion. The problem of the deficit in global infrastructure investment is complex, which is due to relevance of the topic of work.

1. Theoretical Aspects of Financing Large Infrastructure Projects

1.1. The essence and methods of financing large investment projects

"Investment is the usage of financial resources for further profit. Accordingly, an investor is the current owner of funds (an individual or legal entity) who is interested in investing them in a particular object. The essence of investments is identifying the correct investment object, which in the future will be able to bring income and increase the invested capital" [1]. Investing allows for the following as shown on Fig. 1.

Investment projects allow you to make a profit, and for this it is rational to choose and invest in different investment platforms, which are studied in detail and analysed from different aspects: place of registration, term of work, financial conditions,— are selected based on reviews and those that actually pay.

"An investment project is the implementation of investments that contribute to the implementation of an investment idea. Such investments must be economically feasible and expedient, have a certain period and predetermined volumes" [ibid].

An analysis of the demand for products, which will be the result of the implementation of this project, is necessarily carried out. The staff of the enterprise are subject to mandatory assessment and analysis. Is he available in sufficient numbers and whether he has the necessary qualifications. The main point is the assessment of the financial stability of the enterprise.

Justifications are mandatory for state expertise.

The materials developed for the justification can also be used by the customer for conducting sociological research, polls, referendums. On their basis, business plans for credit institutions are developed. Justification is used when receiving subsidies and various benefits.

The larger the volume of investments financed in the project, the more detailed the justification should be. The analysis of financing terms must be thorough and comprehensive. The object of funding should also be critically analysed. The budget of the investment project is compiled and evaluated. It is necessary to clearly define the sources of financing for the investment and construction project and their structure. It is also necessary to draw up a schedule for the receipt of funds.

There is also the concept of a feasibility study for the implementation of a project, it is carried out when the project requires significant capital investments. This analysis is much deeper, it assumes the presence of a large technical part in the justifications, which provides the main technical characteristics of the object, its parameters.

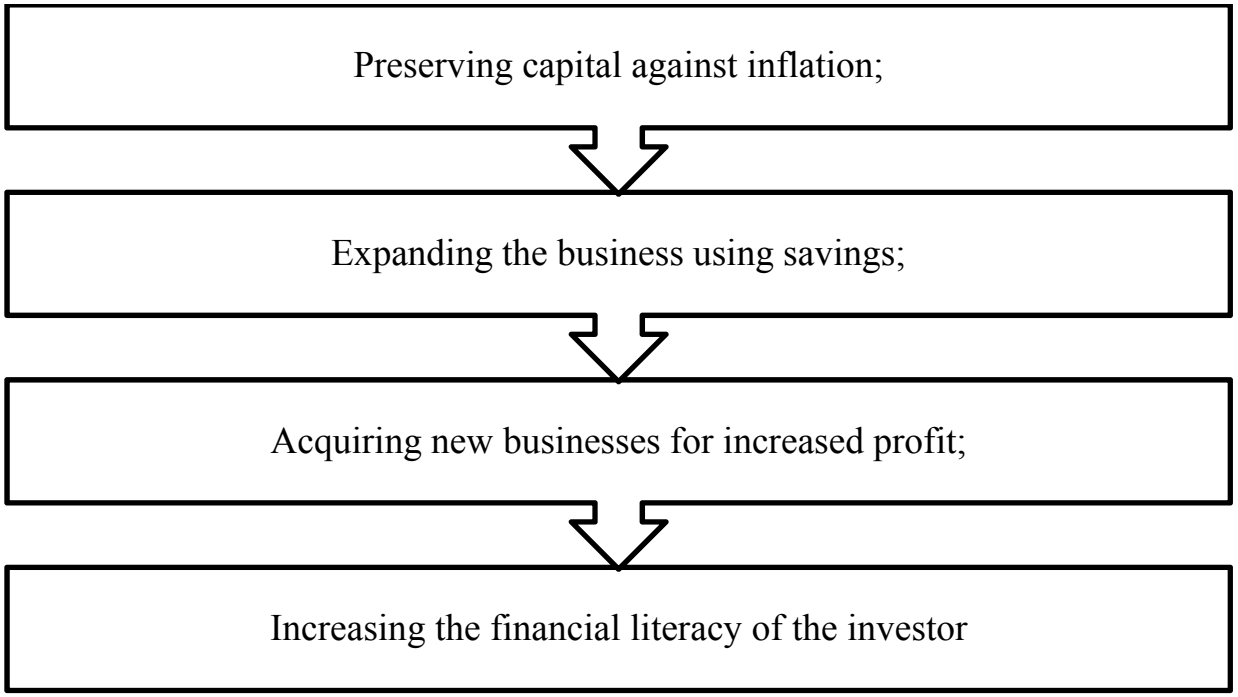

Fig. 1. **Scheme of financing large investment projects**

Source: The author.

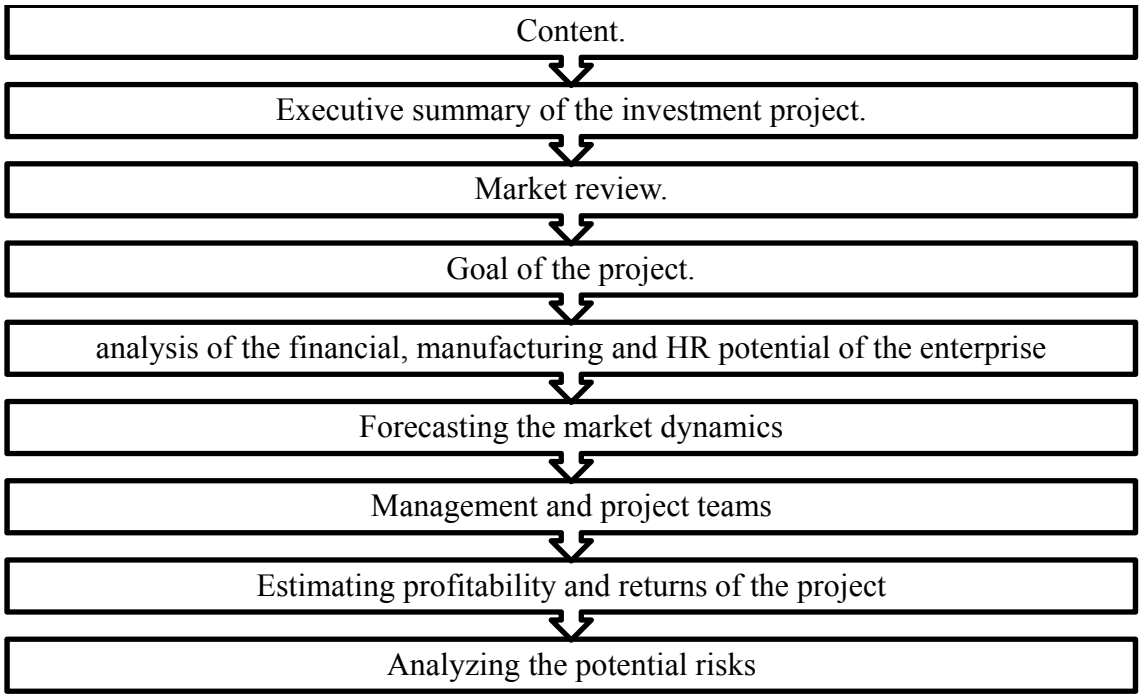

Fig. 2. **9 main stages of an investment project**

Source: Compiled by the author.

The costs that an investor needs to develop a feasibility study range from 5 to 10% of the cost of the entire project.

The resulting document should contain 9 main sections, their title may vary, we offer the following list, presented in Fig 2.

Of greatest interest from the point of view of justification is the stage where it is necessary to calculate the efficiency of investments for the project.

The methodology for assessing the effectiveness of investments contains the calculation of

four main indicators: net present value, profitability index, internal project efficiency and payback period of the project. This methodology makes it possible to assess the effectiveness of investments taking into account the time factor, that is, all cash flows received under the project are discounted, that is, their value is given as of the current date.

For projects that are less than a year old, simple performance indicators are provided: a simple rate of return on a project, a rate of return, and a payback period.

An important component of assessing the effectiveness of investments is the commercial efficiency of the project.

For these purposes, the following formula is used:

P=I/C, (1.1)

where P — is the level of profitability of the project;

I — income from project implementation;

C — project implementation costs.

The efficiency of the investment process is based on effective cooperation in investment, to substantiate such cooperation, the "Methodology for assessing the economic efficiency of investing in real estate" was created.

At the first stage, the cost per unit of housing area should be clearly defined.

It is assessed using the estimated standards that have been enacted in our country and are the basis for calculating the estimated cost of construction.

Based on the cost of one square meter of typical houses and having a conversion factor, the total estimated cost of construction is determined:

Ст=С*К*К1*К2 (1.2)

С — estimated cost of 1 m^2;

К — estimate conversion factor;

К1 — coefficient taking into account the material of the outer walls:

К1=1 — for panel houses;

К1=1,25 — for serial brick houses;

К1=1,3 — for brick houses for atypical projects;

К2 — coefficient taking into account the category of housing:

К2 = 1 — for ordinary housing;

К2 = 1,25 — for houses with improved layout, decoration.

Calculation of the construction cost for a potential investor plays a significant role.

Ci = Ст*Кз (1.3)

Кз — coefficient taking into account the costs of the investor

If the investor does not have enough own funds to implement the project, then the cost is calculated taking into account the loan:

Cik = Ci*(1 + (B*R)) (1.4)

B — a value that determines the share of credit resources from the total amount of capital investments. Practice shows that the share of credit resources should not exceed 30%;

R — average annual lending rate.

Further, if the investor is interested in assessing the level of standard income, the cost price is recalculated again. Construction costs are very high, so the investor is currently setting this level at 35%.

After the final determination of the profitability of the project, the shares of income are redistributed between the investor and the developer. The types of investment projects are described below in Table 1.

Investment projects are further divided into the following categories which is presented below in Figure 3.

It is strategically important to know what the investments in investment projects in terms of amounts are. These are small, medium, large. Small investments do not always bring small profits and too large ones more than those that are borrowed.

1.2. The concept of infrastructure projects and the specifics of their financing

"Infrastructure project — creation/operation of industrial/social infrastructure facilities necessary to ensure the activities of the state and the economy" [1].

The amount of funding for National Projects in Russia is estimated at 25.7 trillion roubles until 2024. Of these funds, about 20 trillion roubles should be directed to the development of infrastructure, including 7 trillion roubles — private investments, while there are no tools for delivering investments to infrastructure. In the world, one of the key mechanisms for the creation, reconstruction, and modernization of infrastructure facilities are infrastructure funds managed by private management companies.

Infrastructure funds can be categorized by type into Exchange-Traded Fund (ETF), Open Mutual Fund (OMF), and Private Equity Fund (PEF). Along with classical asset management companies —

Table 1
Types of investment projects

Type	Description
Short-term	"Experts clarify that the maximum term of work is 12 months, while the project can work for even less, the main thing is that it pays money profitably and stably. On average, such a project functions for 3–6 months" [2, p. 256].
Mid-term	"On average, this is a job for 1–2 years. Medium-term includes bank deposits, business investments, work with mutual funds" [2, p. 256].
Long-term	"These are investment projects that bring profit 5–7 years after the investment, and for Moscow this is a typical option for investing in real estate. Some experts argue that the maximum return on investment should not exceed 2 years. The basic principle of work: the client has a significant period of time for the situation to be corrected in the direction of his interests, or the main goal is gradually achieved" [2, p. 256].

Source: Compiled by the author.

money managers — a separate class of infrastructure management companies — Infrastructure Assets Manager — has emerged on the global market over the past 10 years. Green funds are the trend of the XXI century. According to experts, the number of green infrastructure funds in the world exceeds 500, the total amount of assets is more than $ 200 billion. The total amount of capital attracted to the infrastructure funds of the TOP-10 management companies is $ 175.5 billion, the TOP-30 — $ 303.8 billion. The volume of the 10 largest deals with the participation of infrastructure funds in 2019 exceeded $ 46 billion. The largest deal of 2019 was the purchase of assets in the US telecommunications sector by EQT Infrastructure IV and Digital Colony Partners in the amount of $ 14.3 billion [3].

The universe of infrastructure funds exists due to the fact that this ecosystem contains important institutions that monitor processes, collect information, and assess risks. Systems of external ratings, assessments, monitoring and measurements are the basis for the existence of the universe of infrastructure funds. There are a number of large players on the Russian market, but they are not enough to meet the current infrastructure financing needs. An institute for external evaluation of infrastructure projects is developing in Russia. The range of methodologies of Russian rating agencies is expanding.

The implementation of national projects in Russia is estimated at 25.7 trillion roubles from 2019 to 2024, of which 5.7 trillion roubles are in the field of human capital, 9.9 trillion roubles — a comfortable environment for life, 10.1 trillion — economic growth. Of these, about 20 trillion roubles should be directed to the development of infrastructure, of which, according to the expert assessment of NAKDI, it is necessary to attract 7.5 trillion roubles of private investment. At the same time, when speaking of a "private investor", it is important to clearly understand who it is about, because any money of a private investor, be it a retail investor, corporate or institutional, is regulated separately.

Each type of infrastructure investment requires its own pipeline and machinery to deliver. The expert community should take a proactive position, formulate an understanding of what money is waiting in the infrastructure. At the same time, as a result of comparing the estimates of the needs for investment in Russia's infrastructure in terms of national projects in Russia and the G20 analytical service for the Global Infrastructure Hub, reduced to a single format (period and currency), the difference between the estimates was about 1.5 times. The Global Infrastructure Hub estimates the need for infrastructure investments in Russia at $ 1.8 trillion from 2007 to 2040.

According to the Global Infrastructure Hub, the need for financing infrastructure in the world is estimated at $ 94 trillion by 2040. The analytical service assessed the role of the capital market in financing the infrastructure of 5 countries — the Russian Federation, the USA, the United Kingdom, Brazil, Korea and France. In particular, the availability of financial services is assessed as follows (on a scale from 1 to 7): Russia — 4.4, USA — 6.2, United Kingdom — 6.1, Brazil — 5.2, Korea — 4, France — 3. Domestic credit to the private sector

Aimed at creation, development and modernization of business
By type of participatio - direct; indirect. The investor (direct) defines the general trend, or a consultant, the fund manager (indirect).
By profitability - low, mid and high
By liquidity - low, mid, high, and illiquid
By payback period - 1 month. 2-6 months. 6-12 months. Over 5 years.
By nature of usage - primary; reinvestment; disinvestment.
Direct investment. Reinvesting capital and profit. Extracting part of the capital for further usage.
Investment territory - internal and external
Companies and projects registered in domestic jurisdiction or abroad
By forms of ownership - private; governmental; mixed; foreign; mixed.

Fig. 3. **Classification of investment projects**

Source: Compiled by author.

in% of GDP is estimated as follows: Russia — 56.4, USA — 190.4, United Kingdom — 134.5, Brazil — 67.9, Korea — 140.6, France — 95.7. Local equity financing on a scale of 1 to 7: Russia 3.1, US 5.5, United Kingdom 5.4, Brazil 3.4, Korea 3.9, France 4.7. Total value of shares in circulation in% of GDP: Russia — 7.9, USA — 224.7, United Kingdom — 78.8, Brazil — 26.7, Korea — 91, France — 41.3.

The cost of closed infrastructure transactions with foreign capital,% of GDP: Russia — 0.7, USA — 0.3, United Kingdom — 2.1, Brazil — 0.6, Korea — 0.1, France — 0.6. These countries have different strategies and scenarios, but there is a common feature in all these countries except Russia — a positive answer to the question "Do foreign or domestic institutional investors invest in infrastructure, such as pension funds or insurance companies?"

There are separate projects and cases in Russia, but no single market has been formed — the market must have common rules and attributes. In the world, the largest volume of investments in infrastructure among institutional investors falls on the sector of pension funds, in second place are insurance companies, in third — sovereign funds.

In Russia, one of the main mechanisms for the implementation of infrastructure projects with the involvement of a private partner is concession agreements. According to NAKDI [4], as of November 30, 2019, 268 concession projects are being implemented in Russia with a total volume of investment obligations of 1.87 trillion roubles. Of these, 19 concession projects are financed through bond issues with the attraction of funds from institutional investors. 11 issuers-concessionaires carried out 33 issues of concession bonds for the amount of 94.9 billion roubles.

The bulk of infrastructure financing occurs without the participation of institutional investors. In world practice, infrastructure funds are one of the main mechanisms for financing infrastructure. Infrastructure funds can be categorized by type into exchange-traded funds (ETFs), open-ended mutual funds (OMFs), and closed-end investment funds or private equity funds (PEFs). Infrastructure ETFs, with rare exceptions, are automated funds. Stock indices are used, which are created by several leading analytical services.

On their basis, the largest management companies in the world presented investors with hundreds of options for portfolios of securities, united by industry or regional principle, according to the level of capitalization or the generosity of the dividend policy. As a rule, OMFs are actively managed, and the index funds existing in this class do not have infrastructure specialization. The benchmarks are chosen as management benchmarks — either the yield on government bonds, the behaviour of indices, or the indicator specifically set by the organizers of the fund as a percentage per annum. PEF is, in fact, a project financing instrument that is actively developing in the world. The mechanism of closed infrastructure funds, which allows distributing risks among several participants and structuring a pool of projects for managing risk portfolios, made it possible for long-term conservative investors to enter the infrastructure at an early stage and claim higher profitability on projects compared to the operational stage. If you look at the investors in most large infrastructure projects, the list will include infrastructure funds. Also, consortia that organize financing of large infrastructure projects, as a rule, contain infrastructure funds inside.

As of the end of August 2019, according to NAKDI, there are: — 125 infrastructure ETF funds with assets of about $ 55 billion. Among them are funds founded by management companies BlackRock, First Trust, Invesco Investment Management, Lyxor, Asset Management, State Street Global Advisors,— 500 OMF funds with a volume of about $ 212 billion, including funds founded by management companies AMP Capital, Amundi, First State Investments, Macquarie Infrastructure and Real Assets, Valu, Trac Inv Management Limited, 1 All data on concession tenders and the implementation of concession projects have been prepared based on information from 1,500 private funds with assets over $ 1 trillion, including funds founded by management companies Macquarie Infrastructure and Real Assets, Global Infrastructure Partners, Brookfield Asset Management, AMP Capital, Allianz Group.

The constellation of private funds is actively growing: in the market for a decade of development of infrastructure investments through funds, a separate group has already been formed, a separate type of management companies, Infrastructure Managers, along with classic Money Managers. They stand out in a separate group with their TOP lists, ratings, and so on.

In particular, TOP-10 management companies in terms of capital raised to infrastructure funds over 10 years, according to Preqin, attracted $ 175.5 billion, and the TOP-30 largest management companies in the world — $ 303.8 billion. Information and analytical service IPE, which monitors the process the formation of a new type of managers, in 2018 for the first time presented the TOP-75 of the largest infrastructure management companies in the world. According to the results of the second rating, there was a trend towards a significant increase in the average volume of transactions and the consolidation of infrastructure funds. In the market, in particular, two giants of the industry are being formed with targeted fundraising of about $ 20 billion each. Asset managers Brookfield Asset Management and Global Infrastructure Partners expect to break both market records and their own accomplishments.

The FTSE Infrastructure Indexes are calculated by the British analytical company FTSE Russell, part of the FTSE Group, jointly owned by the Financial Times and the London Stock Exchange. The indices, based on stocks of companies in the basic infrastructure industries, include stocks of public companies in both developed and emerging markets, which generate 65% of their revenues from ownership of infrastructure assets.

The FTSE series consists of nine indices covering six infrastructure subsectors: telecommunications, energy, transportation, transportation, communications, materials and engineering. The indices track over 800 stocks from over 40 developed and emerging markets, including basic infrastructure and infrastructure-related sectors, allowing investors to tailor risk based on their investment goals and risk appetite. Infrastructure indexes MSCI are calculated by the international company Morgan Stanley Capital International (MSCI), which is owned by the American investment bank Morgan Stanley. All components of the index are classified in one of thirteen sub-sectors in accordance with the Global Industry Classification Standard, which are grouped into five key infrastructure sectors: telecommunications, utilities, energy, transport, and social infrastructure. Along with global and regional indices (Europe, Asia), the MSCI line includes infrastructural indices of individual countries — the USA, Japan, India, etc. [4].

S&P Infrastructure Indices are developed by one of the world's largest providers of indices and analytics — S&P Dow Jones Indices. The company has developed several real asset indices reflecting the value of stocks and fixed income companies in the energy, transportation, utilities and telecommunications industries. Dow Jones Brookfield Global Infrastructure Broad Market Corporate Bond Index, which tracks the exchange value of corporate bonds, is one of the largest indices in infrastructure with a portfolio of about 1.2 thousand companies. A distinctive feature of the infrastructure indices of the S&P family is the relatively high share of securities of the utilities sector — from 30% to 51%. The Morningstar Sustainability Rating allows investors to assess the extent to which the companies in the fund's portfolio are managing environmental, social and governance factors. The approach allows us to identify sustainable funds, even if they do not position themselves as products that support the ESG-investing approach.

For investors, the most valuable source for making decisions on projects is Databases, in which disparate information is unified and structured into formats that are convenient for analysis. The historical accumulation of information is especially valuable for rating agencies and analytical structures that develop and administer indices, benchmarks and other indicators. Among the information and analytical services on the infrastructure funds market, there are: ETF database, Preqin, Bloomberg, Infrastructure Investor, IPE (Investment & Pensions Europe), IJGlobal, Morningstar. They structure, bring together in a single database, translate the entire infrastructure market into the language of analytical products. Products and information collected in databases allow investors to assess the prospects and risks of investing in certain assets.

According to NAKDI estimates, NPFs in Russia will be ready to purchase shares of "infrastructure funds" (in the amount of no more than 5% of assets for each unit investment fund) using pension reserves and pension savings in the event that more than 80% of the mutual fund are bonds or financial liabilities (loans, deposits) having an acceptable rating level from an authorized rating agency. In addition, in order to attract NPF funds and increase the reliability of pension investments, it is necessary to organize the work of infrastructure funds on the principles of "capital call", which provide for the presence of the investor's obligations to make the next instalment on demand under the previously concluded agreement. Thanks to this scheme, the fund does not have a problem of what to do with unplaced funds, and the money is not frozen.

The most popular way of financing large infrastructure projects — public-private partnership (PPP) — is a form of cooperation between the state and business, based on pooling resources and distributing risks in order to create infrastructure or provide services to the population.

The relevance of PPP is the ability, even in tough conditions of budget financing, to implement important public projects in a short time, as well as to increase the efficiency of such projects through more mobile and innovative private business.

Indicators for the implementation of PPP in the Russian Federation in 2020:

At the beginning 2021, almost 3.1 thousand concession agreements in force of completed upon expiration

The total volume of investment liabilities is over 1.7 trillion roubles

Of which 1.2 trillion roubles (over 70%) — are off-budget investments

One third of concession agreements at the initial stage (design or construction), this is 61% of the total investment obligations

Investment liabilities account for only 1.6% of Russia''s GDP in 2019 (for comparison, in the UK 6.6%, in Australia and New Zealand — 6.9%, in Canada — 8.1% of GDP)

Concession agreements are used to attract investment in infrastructure in 81 out of 85 constituent entities of the Russian Federation

10 leading regions signed over 100 concession agreements

42% of investments within the framework of federal concessions, of which 96% — in transport infrastructure

94% of concessions are concluded at the municipal level, of which 93% are in housing and communal services

32 major agreements with investments over 10 billion roubles

93 agreements with an investment volume of 1–10 billion roubles

The average term of a concession agreement is 12 years, in the transport sector — 21 years, in the social sector — 22 years [5].

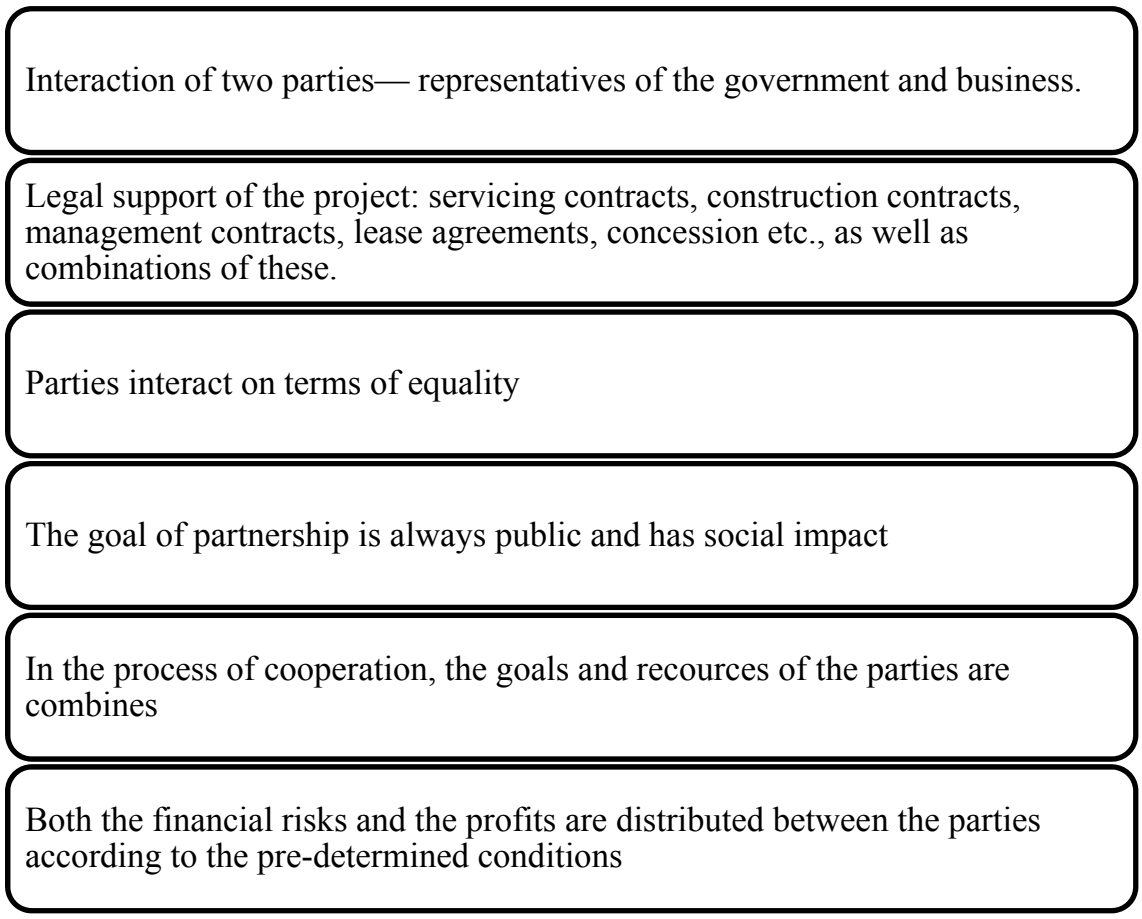

Fig. 4. **Economic indicators of public-private partnerships**

Source: Compiled by the author.

Economic indicators of public-private partnerships are presented in Fig. 4.

Problems of PPP Projects Implementation in Domestic Conditions are presented in Figure 5.

In Russia, 2769 projects worth 722 billion roubles are being implemented in the communal sector, and they are concentrated mainly in municipalities.

According to the level of development of the sphere of public-private partnership for 2020, in the top ten Samara region, Moscow, Moscow and Nizhny Novgorod regions, Perm Territory, Khanty-Mansi Autonomous Yugra Region, Sverdlovsk, Tambov, Irkutsk, Novosibirsk regions.

1.3. Problems of financing large investment projects at the present stage in the context of a pandemic

The Covid-19 crisis has significantly suppressed global economic activity. In 2020 alone, eurozone GDP dropped by 7.5%, while average global GDP showed a 4.5% contraction (OECD, 2020). Many governments have stepped in to cushion the impact on households and business. Much of the spending has been to ensure businesses are still viable once authorities can safely remove the restrictions imposed on social and economic activity to limit the spread of the virus. This will enable activity to bounce back but full economic recovery will require additional stimulus. Infrastructure investment is one path to achieve this and is widely regarded as an effective way to spur economic activity.

Infrastructure projects can become one of the economic victims of the pandemic — many of them can be rehabilitated. Reducing costs due to infrastructure looks logical: why start another megaproject, the payback of which will stretch for many years, if it can be postponed to a more favourable period, and the funds can be spent on patching holes in the budget? Moreover, not only the coronavirus, but also the strongest drop in oil prices has dealt a blow to government revenues.

"According to the forecast of the Ministry of Finance, the budget deficit in 2021 will be about 4% of GDP, experts say about 7%. The recession will

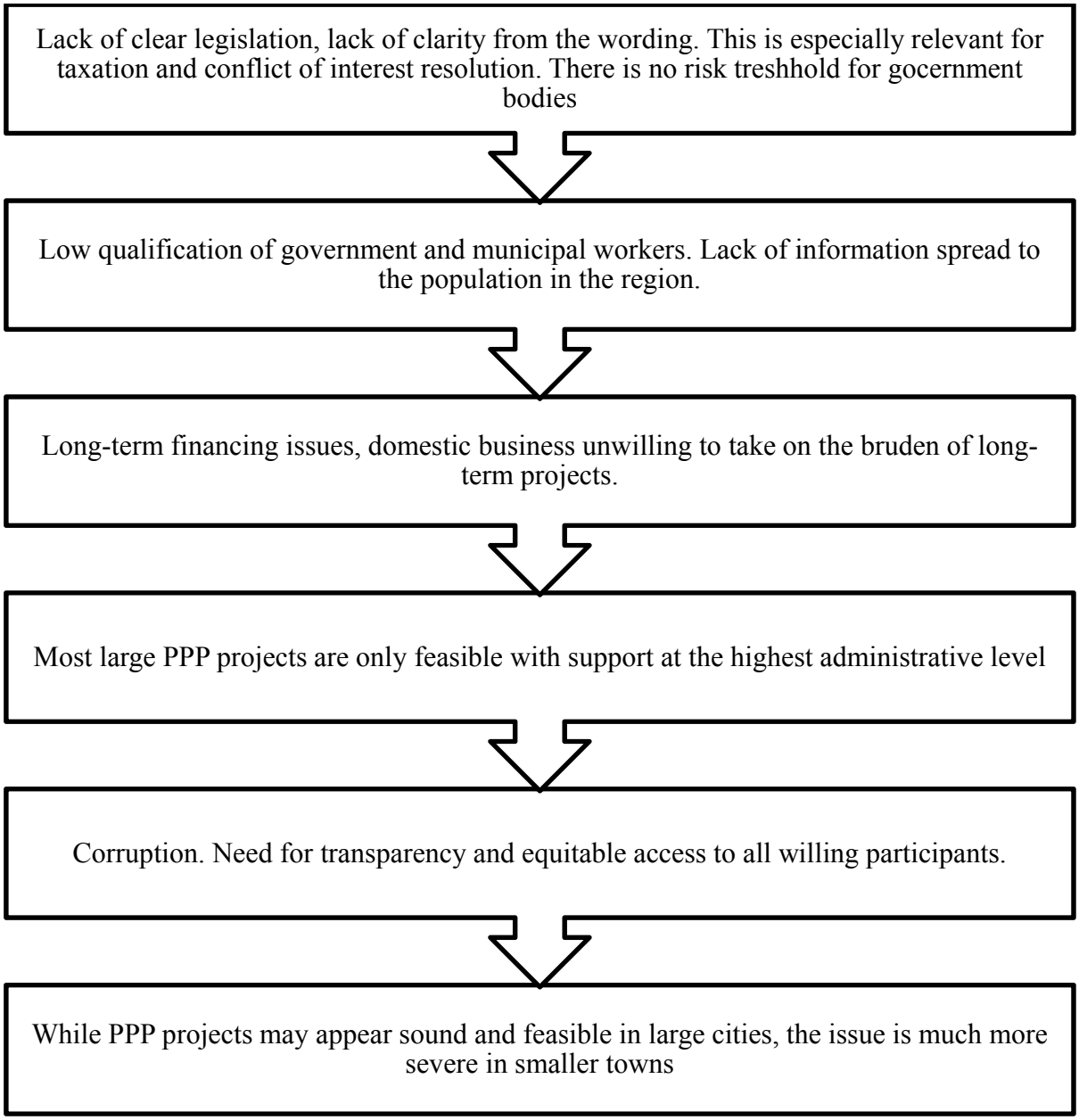

Fig. 5. **Problems of PPP Projects Implementation in Domestic Conditions**

Source: Compiled by the author.

be accompanied by an increase in unemployment, inflation and bankruptcies of small and medium-sized enterprises, a decrease in real incomes of the population. more effective methods than cutting infrastructure spending Large countries, both in the past and now, in the fight against the crisis, are betting on the accelerated development of public infrastructure — both at the expense of the budget and at the expense of private investment, reserves are unpacked, business funds are attracted on the principles of public-private partnership (PPP). And this, as practice shows, not only does not worsen the state of the economy, but, on the contrary, helps to move faster from recession to growth".

"In response to the global crisis of 2008, China allocated $ 586 billion (or 12% of GDP) for the development of transport infrastructure and projects in housing and communal services, ecology and energy. This allowed a return to GDP growth of almost 9% in 2009. In 2008, India attracted more than $ 13 billion through government bonds and loans from international financial institutions and used these funds to finance concessional lending for infrastructure projects and subsidize interest rates for loans for PPP. The measures taken allowed the Indian economy to achieve GDP growth of almost 9% as well" [5].

And now some countries have decided to overcome the consequences of the pandemic crisis in

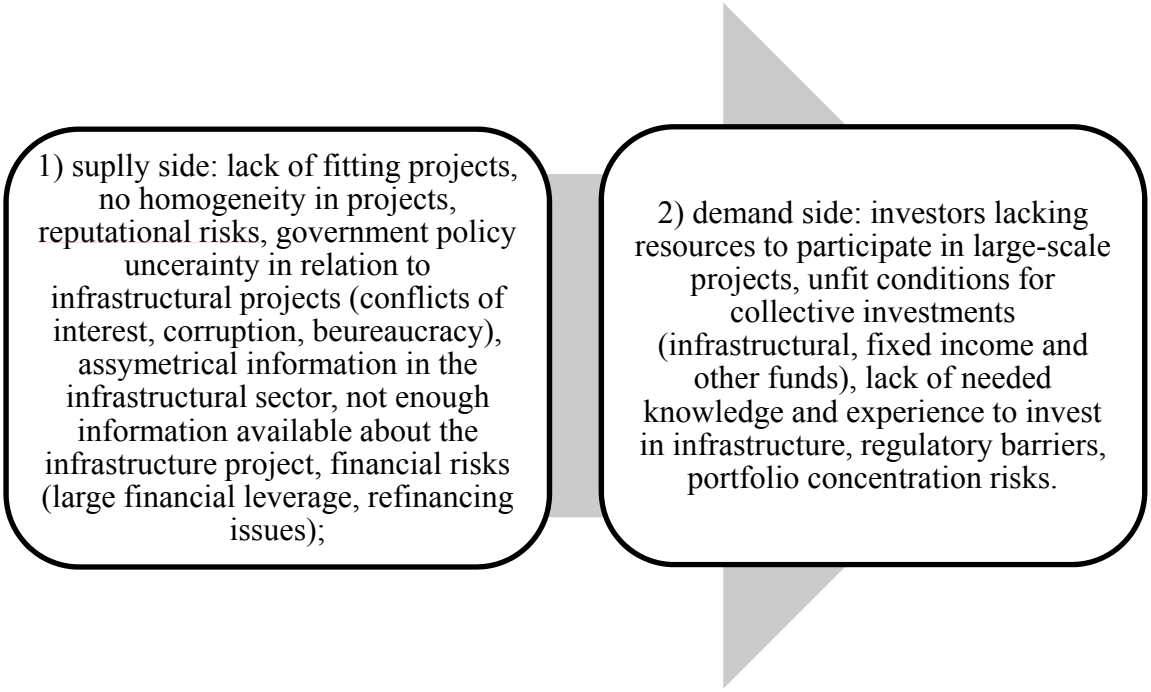

Fig. 6. **Barriers to Investment in Infrastructure Projects**

Source: Compiled by the author.

the same way. China will allocate 7.6 trillion yuan (or over $ 1 trillion) from the budget to support infrastructure projects by the end of the year; Brazil will support projects in the transport sector for more than $ 5 billion; The US is ready to inject an additional $ 2 trillion into infrastructure alone.

"Fundamental support measures are needed — co-financing from the state, load guarantees, long-term project financing. We also need systemic changes that would increase investor confidence in the state. Conceptual revision of the entire budget planning system and reorientation of part of national projects to attract private investment on a return basis, i.e., changing the rules of the game, taking into account the current realities. Now, in most national projects, expenses go through the classic state order, although it would be quite possible to organize a PPP" [6].

The barriers to investment in infrastructure projects can be divided into supply and demand barriers as shown in Figure 6.

The above barriers meaning an infrastructure investment are difficult to overcome, especially for investors in emerging markets with low liquidity and high financial risks.

Therefore, this chapter considers the various definitions of infrastructural project financing, as well as assesses the various specifics of large investment projects in general. A detailed reasoning for economic and financial cooperation in financing large investment projects is considered, and a detailed literature review of domestic and international experience in this regard is conducted.

The notion of Public-Private Partnership (PPP) is deeply discussed in various aspects, and special attention is payed to the problems of implementing such public-private cooperation initiatives in the domestic domain. It is noted that fundamental support measures are needed for the PPP sector to further develop in domestic and international. The proposed measures for such improvements are market co-financing from the state, load guarantees, long-term project financing.

Various barriers to large-scale investment and infrastructure projects both on the supply and demand sides are assessed, among which are ack of fitting projects, lack of homogeneity in projects, reputational risks, government policy uncertainty in relation to infrastructural projects, as well as investors lacking resources to participate in large-scale projects and unfit conditions for collective investments are pointed out.

The projects that are most likely to deliver the required economic stimulus are those already in the pipeline, with cleared planning and environmental approvals, awaiting only funding. Maintenance backlogs in particular are suitable targets. Attempts to bypass consultation and approval

processes for less advanced projects can be highly counterproductive, resulting in legal challenges and lengthy delays. New mega-projects cannot be expected to deliver anything in the timescale required. The necessary critical investment mass should be achieved by a large volume of smaller projects that can be initiated quickly, including maintenance projects. Distributing funds to local authorities for disbursement can enhance the speed of project delivery. The infrastructure stimulus should be publicly financed: making PPPs a major part of a stimulus package would be counterproductive. Finally, project selection should also take careful account of long-term policy priorities, especially addressing social equity, decarbonisation and the resilience of transport systems.

2. China's Experience in Financing Large Infrastructure Projects

2.1. Features of the financial and economic systems of China and the countries involved

Consider the model of the PRC's economic development under Deng Xiaoping.

"Deng Xiaoping died in China on February 19, 1997. The man who, in just a few years, turned China from a poor country that knew first hand about hunger, into one of the world's economic leaders. In terms of his historical significance, he is perhaps slightly inferior to his predecessor, Mao Zedong, nevertheless, he can confidently be called one of the main politicians in the history of the twentieth century" [7].

"Deng Wengming was born in 1904 in a small village in a fairly well-to-do family. His parents were strong middle peasants, and his father, moreover, had a university education. Therefore, from childhood, he strove to orient his son to study. Deng studied at one of the best schools in the province. he changed his surname Wengming to Xixian. The surname Xiaoping, by which he became known to the whole world, is actually a nickname that he adopted as an adult. Literally it translates as "small bottle". His height was indeed quite small, just above 150 centimeters)" [8].

After studying at school, he managed to get into the student study program in France. Together with a group of Chinese students, he left for Europe. Although Dan's parents were not poor people, they could not fully support him in Europe, and he had to earn money. The future Chinese leader had a chance to work as a worker at the Renault plant and as a waiter.

"At the same time, together with other students from Asian countries, he fell under the influence of leftist ideas. Many students from Asia studied in France, and many of them were infected with communist ideas. There he met with Zhou Enlai, one of the most influential Chinese communists in the future and the only person who had a lot of influence on Mao who did not like to listen to anyone. Under the influence of his comrades, Deng joined the newly formed Chinese Communist Party, which at that time had only a few hundred members. He spent seven years in France. The reasons for leaving the country have not yet been unequivocally established. According to one version, the French police became interested in him, according to the other, he was invited to study in Moscow" [9].

Let us present the main points of the success of the economic model laid down by Deng Xiaoping:

"Throughout his career, Deng Xiaoping has consistently and firmly insisted that the Chinese Communist Party should lead the policy of reform and opening up. This principle has been and remains a framework for reforming Chinese statehood today, guaranteeing Deng Xiaoping the position of one of the founding fathers." modern Chinese state. China is an extraordinary country in many respects. It combines such seemingly incongruous features as adherence to ancient traditions and communist ideology. Features of the Chinese economy allowed this country to break out among the states with great prospects" [10].

This country can be called one of the oldest states in the world. It occupies an area second only to the Russian Federation and Canada, equal to 9.572 million square meters. km. The Chinese are the largest nation on Earth, with a population of over 1 billion. In view of the shortage of fertile land, all even inconvenient areas are used for the needs of the population.

Since ancient times, the Chinese state has developed under the influence of Buddhist philosophy and Confucianism. Many principles laid down by Confucius himself are strictly observed today. It is safe to say that it was they who influenced the peculiarities of the development of the Chinese economy. This distinguishes this state from other Asian countries. The main differences include:

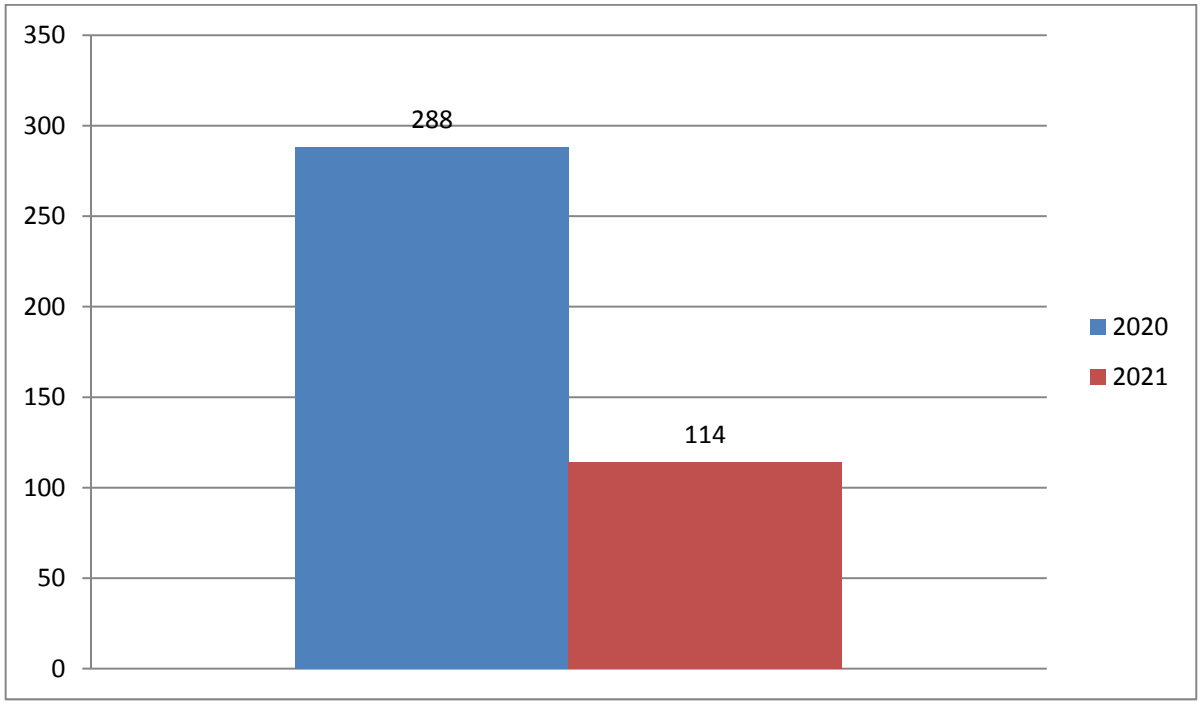

Fig. 7. **Railway investments in China, mln USD**

Source: Compiled by the author.

Ability to absorb the positive experience of other countries, adapt to new times

Simultaneously observance of religious and cultural traditions

Placement of the state at the head of the entire system, active participation of the people in its life

Using socialist norms to bring the country to the top

Strict control over the elements of power, constant checks to ensure compliance with the rules

Taking care of nature in order to protect and preserve it.

The peculiarities of China's economic development at the present stage have made it possible to achieve GDP equal to 1 trillion. dollars, which significantly exceeds Russia's GDP. At the same time, GDP per unit of population is much less than in our country. Thanks to its large reserves of minerals, China is a major industrial center.

In addition, agriculture is significantly developed in this country. China can be called one of the main producers of silk and other textile products. All these achievements took place under the sign of socialism, so the country's economy is somewhat different from similar ones in other countries. As a result of the combination of all of the above factors, the Chinese economy has acquired peculiar features. The peculiarities of China's mixed economy are such that the state actively participates in the economy, by about 60%. Apart from the state, private capital plays an important role in the economy. For China to play the role of world leader, it needs the internationalization of the yuan, and for that it needs deep financial markets.

2.2. Description of the main methods of financing infrastructure projects abroad

Beijing recently authorized large infrastructure projects to include special bonds issued by provincial governments as part of project capital, which can then be used to secure bank loans that will cover railways, highways, and energy and gas projects, among others.

China is shifting its focus to infrastructure investment, abandoning the corporate tax-cutting approach that the government has favored in previous years.

The country does not expect significant further tax cuts in 2021, although the effect of the tax cuts will continue this year. In 2021, infrastructure will be the "key beneficiary" of fiscal policy. This change is necessary because tax cuts have a weaker multiplier effect in stimulating economic growth than direct government spending.

China to invest $ 114 billion in railways in 2021. China approves a number of infrastructure projects to stimulate growth China will intensify local government bonds to support the economy The

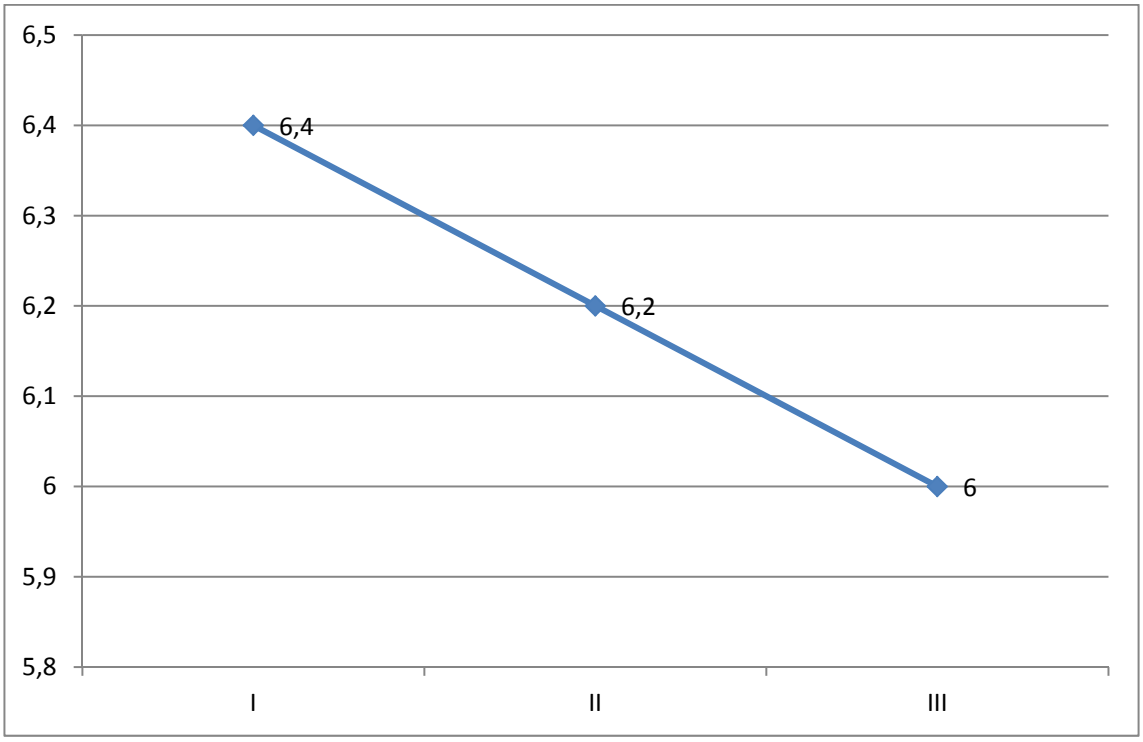

Fig. 8. **Change in China's 2020 GDP by quarters, %**

Source: Compiled by the author.

Chinese government announced this month that it has achieved its target of tax cuts for businesses and households by more than 2 trillion yuan ($ 288 billion) in 2020, boosting economic growth by about 0.8 percentage points. For instance, railway infrastructural investments in China for 2020–2021 are presented below in Figure 7.

However, growth in corporate profits and investment in manufacturing has not improved significantly, raising doubts about the effectiveness of the measures taken. The world's second largest economy has faced downward pressure amid weakening investment and consumption and a trade conflict with the United States.

In the first quarter of 2020, China's GDP grew by 6.4%, in the second quarter — by 6.2%, in the third quarter — by 6%, at the lowest rate since 1992. The Chinese GDP trend is presented below in Figure 8.

In November, the Chinese authorities moved 1 trillion yuan from the 2021 local government special bond quota to 2020 to stimulate the economy. The PRC Ministry of Finance said local governments should ensure that special purpose bonds used to finance infrastructure projects are issued and used as early as possible.

Meanwhile, China will take a focused approach to increasing investment and will not resort to massive incentives to develop infrastructure. China's investment in infrastructure projects in 2021 is likely to increase by 5% over the previous year.

The PRC expects more active financing of projects with the help of funds attracted by local authorities through the placement of special bonds, since part of the money raised last year will be used this year.

Investment in 2021 will focus on urbanization, environmental protection and transport infrastructure projects.

In 2021, China will increase investment in infrastructure.

China's investment in fixed assets in the transport sector skyrocketed in the first two months of 2021. According to the PRC Ministry of Transport, the total investment reached 271.7 billion yuan (about $ 40.44 billion), an increase of 8%.

RMB 191.1 billion was invested in road construction, up 4.9%. The fastest growth rates of investments — 27.2% — were recorded in the field of waterways.

During the next five-year plan, China is planning huge financial investments in the national technological infrastructure. Until 2025, about $ 1.6 trillion will be invested in infrastructure. The money will go to the development of 5G networks, charging stations for electric vehicles, AI and other

innovations that will help develop the economy, science and technology in China.

According to the Chinese Academy of Information and Communication Technology, technology infrastructure spending will account for approximately 10% of the country's total social infrastructure spending. In light of the global spending on IT infrastructure, Chinese investments also appear to be sub-record. So, according to Gartner forecasts, for example, this year alone, the entire world will spend $ 3.75 trillion on technological infrastructure, while China will divide $ 1.6 trillion over five years.

Nevertheless, a spurt in investment in China will still occur, as annual investment in IT infrastructure will double compared to the costs in the previous five-year period. And it will bear fruit. However, the Chinese authorities are aware that US sanctions may interfere in something and somewhere. To counter the threats, an import substitution program has been proposed, but whether it will help or not to say today is very premature.

Returning to the "new infrastructure initiative" that is starting to be implemented in China this year, we note that it is divided into seven main sectors: 5G communications, charging equipment for new energy vehicles, including hydrogen stations, data centers, AI, ultra-high voltage transmission lines to provide efficient energy supply with high capacity, high-speed long-distance rail networks and the development of industrial Internet for connected factories.

"China's new policy could add $ 13 billion to $ 19 billion in project capital from the issuance of special bonds, and while the country has pledged that the use of earmarked bond proceeds for project capital will be closely monitored, it remains a serious risk. This is because this debt is ultimately the responsibility of the government, even if it is classified as project capital. Engineering experts expect that, with the new stimulus measure, the leverage ratio of local governments will rise to 3% from 2018 levels, reaching 23% of GDP by 2020, and with that, it looks like China will again go on its old paths of accumulating debt and increasing its risk" [9].

From an econometric point of view, a panel regression with fixed effects is suitable for studying the dependence of the level of investment in PPPs in the fields of energy and transport.

Thus, the model is initially defined:

$$Inv\_T_{it} = \beta_0 + \beta_1 GNI_{it} + \beta_2 FDI_{it} + \\ + \beta_3 g\_debt_{it} + \beta_4 p\_debt_{it} + a_t + a_i + \varepsilon_{it} \quad (1)$$

$$Inv\_E_{it} = \beta_0 + \beta_1 GNI_{it} + \beta_2 FDI_{it} + \\ + \beta_3 g\_debt_{it} + \beta_4 p\_debt_{it} + a_t + a_i + \varepsilon_{it} \quad (2)$$

where,

β_0 — is a constant

GNI_{it} — is gross national income (current US$)

FDI_{it} — is foreign direct investment, net (BoP, current US$)

g_debt_{it} — is external debt stocks, public and publicly guaranteed (PPG) (DOD, current US$)

p_debt_{it} — is external debt stocks, private non-guaranteed (PNG) (DOD, current US$)

a_t — time fixed affect

a_i — country's fixed affect

ε_{it} — error

Regression was conducted on the 12 countries for which a sufficient number of values of the variable under study were presented in the database of World Bank: Turkey, Peru, Philippines, Russia, Malaysia, Mexico, India, Ecuador, Columbia, China, Brazil, Argentina.

All countries are correct comparisons to Russia and China, as they belong to the group of developing countries. In energy sector, which is presented in Table 2 the panel regression according to all countries results have shown that a higher level of PPP investment is associated with a higher level of private sector external debt.

In my opinion, this may be due to the fact that the private sector takes additional loans. If we take only China, no significant relationships were found in energy sector.

The transport sector analysis which is presented in Table 3 also has shown us that a higher level of PPP investment is associated with a higher level of private sector external debt. Moreover, we can consider here and only China's data, the panel regression showed that a higher level of PPP investment is associated with a higher level of public sector external debt.

As I can suggest, the state similarly takes out additional loans, as in the case above, or the state is so accredited that it prefers to invest in infrastructure projects in partnership with the private sector.

It all depends on the government's policy. Each year can be different. If the economy has to be

Table 2
PPP volume investments in energy

	All countries	All countries	All countries	All countries	All countries	China only
GNI	0.0003**	0.00002	−0.001***	−0.001***	−0.001***	−0.0001
	(0.0001)	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.001)
FDI		−0.027**	−0.030***	−0.025**	−0.010	0.001
		(0.011)	(0.010)	(0.011)	(0.011)	(0.011)
g_debt			−0.007	−0.023**	−0.011	0.0001
			(0.006)	(0.009)	(0.011)	(0.016)
p_debt			0.035***	0.033***	0.032***	0.003
			(0.005)	(0.007)	(0.007)	(0.019)
Constant	2,032.788***	1,855.595***	1,160.549**	2,033.512**	−1,731.708	1,923.681
	(308.420)	(312.947)	(478.292)	(946.954)	(2,766.112)	(1,313.196)
Fixed effects – Country	No	No	No	Yes	Yes	Yes
Fixed effects – Year	No	No	No	No	Yes	Yes
Observations	239	239	219	219	219	26
R^2	0.024	0.050	0.254	0.366	0.489	0.028
Adjusted R^2	0.020	0.042	0.240	0.326	0.371	−0.157
Residual Std. Error	4,224.177 (df = 237)	4,177.056 (df = 236)	3,855.390 (df = 214)	3,631.423 (df = 205)	3,508.252 (df = 177)	1,404.879 (df = 21)
F Statistic	5.891** (df = 1; 237)	6.201*** (df = 2; 236)	18.228*** (df = 4; 214)	9.107*** (df = 13; 205)	4.134*** (df = 41; 177)	0.152 (df = 4; 21)

Note: *p<0.1; **p<0.05; ***p<0.01

Dependent variable: PPP investment in energy.

supported this year, the state will prefer to spend money on it and will then ask the private sector to invest in it. A similar analysis would have been made for Russia, but no significant results were found, due to the limitations of the Data set.

China is investing heavily in the development of education. In 2020, 178 billion yuan was invested in the development of the education sector, which is 15% more than in 2019. Basically, all projects are implemented through PPP. Private investments account for about 63% of expenditures, 47% are financed from public funds. This experience should be adopted in our country as well.

We can further extend our analysis and assess another rather curious relation. It is mostly accepted in economic literature that infrastructural investments lead to an increase in labor productivity. Hence, one would expect that this is the case for China as well.

For this hypothesis, we will use the OECD data on infrastructural investments in China, in EUR [11], as well as the labor productivity data provided by the ILO and measured as output per worker (GDP constant 2011 international $ in PPP) [12].

Granger causality is a rather convenient econometric tool for this hypothesis. Formally, it is set up as two equations of the following format:

$$Y(t) = a_0 + a_1 y_{t-1} + \ldots + a_p y_{t-p} + b_1 x_{t-1} + \ldots + b_p x_{t-p} + \varepsilon_t$$

$$X(t) = c_0 + c_1 x_{t-1} + \ldots + c_p x_{t-p} + d_1 y_{t-1} + \ldots + d_p y_{t-p} + u_t$$

Where p is the lag, which we assume to be 1 for the sake of simplicity. We then have to use an F-test to test the following hypotheses for the statistical significance of coefficient significance:

$$H_0^1 : b_1 = \ldots = b_p = 0$$

$$H_0^2 : d_1 = \ldots = d_p = 0$$

Within this econometric framework, we attempt to test the notion of whether the infrastructure investment has a statistically significant impact

Table 3
PPP volume investments in transport

	All countries	All countries	All countries	All countries	All countries	China only
GNI	0.001***	0.001***	−0.0002	−0.0003	−0.0004	−0.0001
	(0.0001)	(0.0002)	(0.0003)	(0.0004)	(0.0004)	(0.001)
FDI		0.002	−0.002	−0.003	0.009	0.005
		(0.013)	(0.012)	(0.014)	(0.016)	(0.022)
g_debt			−0.009	−0.013	−0.008	0.129***
			(0.007)	(0.011)	(0.015)	(0.030)
p_debt			0.035***	0.038***	0.040***	−0.010
			(0.006)	(0.009)	(0.011)	(0.039)
Constant	1,499.598***	1,514.554***	862.332	918.563	644.369	−9,187.167***
	(368.307)	(385.711)	(592.495)	(1,383.602)	(3,551.811)	(2,589.445)
Fixed effects – Country	No	No	No	Yes	Yes	Yes
Fixed effects – Year	No	No	No	No	Yes	Yes
Observations	215	215	196	196	196	27
R^2	0.165	0.166	0.301	0.311	0.378	0.787
Adjusted R^2	0.162	0.158	0.287	0.262	0.212	0.748
Residual Std. Error	4,798.309 (df = 213)	4,809.409 (df = 212)	4,612.236 (df = 191)	4,691.131 (df = 182)	4,847.132 (df = 154)	3,181.124 (df = 22)
F Statistic	42.226*** (df = 1; 213)	21.025*** (df = 2; 212)	20.601*** (df = 4; 191)	6.330*** (df = 13; 182)	2.282*** (df = 41; 154)	20.310*** (df = 4; 22)

Note: *p<0.1; **p<0.05; ***p<0.01

Dependent variable: PPP investments in transport.

on labour productivity, i.e., if infrastructure investments "Granger cause" increases in labour productivity.

Having completed the above procedure in R using the "lmtest" package, we obtain a probability value p=0.0419, which suggests acceptable statistical significance.

While the analysis is quite obviously superficial and lacks econometric depth, it can still be a hint of importance of infrastructural incentives in terms of macroeconomic growth and long-term stability, even in major economies such as China.

2.3. Impact of the pandemic on the implementation and financing of infrastructure projects in China

The COVID-19 pandemic has negatively affected the implementation of about 60% of the projects of China's Belt and Road Initiative.

The pandemic seriously affected 20% of projects, another 40% were affected in one way or another. The remaining 40% are carried out as usual and are practically not affected.

Beijing is making active efforts to preserve international supplies and maintain close contacts with all economic partners. The Chinese government is interested in long-term cross-border projects and will make active efforts to promote them. Some projects have slowed down, but none have been abandoned.

According to official statistics, China's direct investment abroad from January to May amounted to 296.2 billion yuan ($ 42.2 billion), down 1.6% year on year. At the same time, Chinese capital investment in the economies of the Belt and Road countries continued to show growth, having increased by 16% in five months on an annualized basis, to $ 6.53 billion.

The Belt and Road Initiative is a concept proposed in 2013 by Chinese President Xi Jinping with the aim of activating international multilateral trade and investment projects with the participation of as many countries as possible and the use of Chinese and foreign capital. More than 150 countries and international organizations have already joined it.

The general concept of the Belt and Road Initiative is presented below in Figure 9.

The unexpected coronavirus pandemic has driven the global economy into a deep recession.

Fig. 9. **The geographic outlay of Belt and Road initiative**

Source: https://en.wikipedia.org/wiki/Belt_and_Road_Initiative.

As an important part of business cooperation between Russia and China, trade and economic cooperation between the Far East and China also faces unprecedented difficulties.

"At present, the movement of people between the Far East and China is largely suspended. This has directly sent the tourism industry between the Far East and China into a state of shock. Vladivostok ranks third after Moscow and St. Petersburg in the tourist destination in Russia for Chinese tourists, the number of which last year amounted to almost 400 thousand. And today we do not see Chinese tourists, sightseeing, as in previous years during this period. Freight traffic through road crossings between the Far East and China is still working, but the throughput of freight transport through the checkpoints "Pogranichny-Suifenhe", "Poltavka-Dongning", "Kraskino-Hunchun" is only 30–40 cars per day in one direction, which is significantly less compared to the period before the pandemic" [13].

Strict anti-epidemic measures and a blow to the economy led to a decrease in demand in the markets of the Far East and China. Some companies with Chinese capital in the Far East have encountered difficulties in their activities.

"The serious impact of the pandemic on economic cooperation between the Far East and China is directly reflected in the decline in bilateral foreign trade. According to Russian customs data, the total foreign trade of the Far East in the first quarter of this year amounted to about 7.315 billion US dollars, which is compared to the same period last year. 13.23% lower; imports amounted to about USD 1.564 billion, up 3.23%, and exports amounted to about USD 5.751 billion, down 16.83%. China amounted to about US $ 1.898 billion, down 20.52%, the volume of imports from China was about US $ 693 million, down 20.16%, the volume of exports to China was about US $ 1.205 billion, which lower by 20.72%" [ibid.].

"During the same period, the total volume of imports and exports in the Primorsky Territory amounted to 1.778 billion US dollars, up 2.3%. Including the total volume of exports amounted to 771 million US dollars, down 1.15%; imports amounted to US $ 1.007 billion, up 5.51%. The total trade volume of Primorsky Krai with China amounted to US $ 896 million, down 11.02% year-on-year. exports to China amounted to USD 400 million, up 1.52%; imports from China amounted to USD 496 million, down 19.09%. China is a major trading partner of Primorsky Territory, accounting for 50.6% of the total foreign trade of Primorsky Territory for the same period".

However, the impact of the pandemic is a random external factor, and the main provisions of

economic cooperation between the Far East and China have not changed. As the pandemic softens and its possible completion, the economic cooperation of the Far East with China will quickly rebound from the bottom, make a V-shaped rebound and start a new life.

"China and Russia are the largest economies in the world and will resume production at the moment or in the near future, which will lay a solid foundation for the restoration and development of economic cooperation between the Far East and China. China was the first in the world to emerge from the pandemic and resume production at full speed. Recently, Russia also developed a plan for economic recovery. It is planned to spend about 5 trillion roubles on economic recovery in three stages over two years. Despite the serious consequences of the pandemic, China is still the second largest trading partner in the Far East, the largest source of foreign investment. and the largest place of origin of enterprises-residents of ASEZ and FPV" [4].

"A number of large investment cooperation projects planned for implementation in the Far East by Chinese and Russian companies, temporarily suspended due to the epidemic, will be gradually launched after the pandemic subsides. These include a project for the production of methanol with a volume of 1.8 million tons (totaling $ 1.5 billion) jointly with the Nakhodka Mineral Fertilizer Plant, a project for the production of liquefied natural gas (totaling more than $ 2 billion) in the city of Bolshoy Kamen and the project of a grain logistics center in the Mikhailovsky district (the total cost of the project is 20 million US dollars). Large Chinese companies are also interested in participating in the project to develop the Baimsky copper deposit in Chukotka. initial advantages, economic cooperation between the Far East and China is still gaining new opportunities" [14].

During the pandemic, people's lives and working regimes have undergone major changes, and many new areas are coming to the fore. The impact of the pandemic on economic cooperation between the Far East and China is temporary and limited. Cooperation in the post-epidemic era is fully prepared to open up new ways of development and bring new prosperity to the peoples of both countries.

Therefore, this chapter is mostly dedicated to the international experience in financing of large infrastructural projects, especially to that of the People's Republic of China, where it is found in abundance. A detailed analysis of the main methods of financing infrastructure projects abroad is conducted with a special emphasis on China's approach to conducting such PPP endeavours.

The unexpected coronavirus pandemic has driven the global economy into a deep recession in virtually all of its industries and sectors. As an important part of business cooperation between Russia and China, trade and economic cooperation between the Far East and China also faces unprecedented difficulties. Evidently, the COVID-19 pandemic has had vast effects on the implementation and financing of large infrastructural projects around the world and in China as well.

3. Prospects for Improving the Russian Practice of Financing Infrastructure Projects Based on the Use of Foreign Experience

3.1. Features of the present condition of the Russian economy and their influence on the financing of investment projects

The scale of economic contraction in Russia has become one of the largest over the past 20 years. In 2020, GDP declined by 3.1%, stronger only during the 2009 global financial crisis (–7.8%) and the Russian crisis in 1998 (–5.3%). In absolute terms, the most important proposal to the fall in GDP: mining, transport, trade and services to the population, and in relative terms — public catering (–24%), culture and sports (–11.4%).

This influenced the use and sources of GDP formation: the final consumption of households decreased by 8.6%, the gross profit of the economy by 9.3%, and exports and imports — by 5.1% and 13.7%, respectively.

The fall in economic activity and the downturn in the economy directly affected the real disposable income of the population, which fell by 3.5%. The cumulative decline in revenues since 2013 was 10.6%, which pushed revenues back a decade to the level of 2009–2010.

The worsening financial situation of Russian residents is confirmed by a decrease in household consumption, an increase in unemployment (+1.3 percentage points or +960 thousand unemployed in December 2020, yoy) and poverty (+1.2 million people with benefits below the subsistence level).

minimum in Q3 2020, *yoy*). The turnover of retail trade (–4.1%) and paid services to the population (–17.3%) also significantly decreased.

Industrial production in 2020 decreased by 2.9% due to a drop in activity in the extractive industry (–7%). The oil and gas industry suffered the most (–8.1%). The manufacturing industry practically did not change compared to 2019 (+ 0.3%), while individual industries had multidirectional dynamics — from a 23% increase in the production of drugs and medicines to a 13% decrease in the automotive and leather industries.

The physical volume of agricultural production in 2020 increased by 1.5%, this was due to a high grain harvest (+ 9.8%) and an increase in meat and dairy farming (+ 3.1% — livestock and poultry, + 2.7% — milk). The harvest of fruits and vegetables, potatoes, sunflowers and sugar beets, on the contrary, significantly decreased from 3% to 40%, which negatively affected the growth of retail prices in the second half of 2020.

The construction industry remained unchanged in 2020 (+ 0.1% — the volume of construction work in constant prices), although the commissioning of residential buildings (excluding houses for gardening) decreased by 5.9%, in part due to downtime in the spring months against the background of restrictions. The decline in housing construction and preferential mortgages provoked an increase in prices for new and secondary housing by 14%, which is several times higher than official inflation (3.4% on average for the year).

The construction of large infrastructure facilities (airports, ports), as a rule, is associated with direct government funding and investments by state corporations, and is perceived as an island of stability in a situation when the markets are stormy. More than half of the funds for the construction of all infrastructure projects in the south of Russia, according to our estimates, go to roads.

In the South and North Caucasus, we counted seven major road construction projects worth 342.9 billion roubles (51% of large infrastructure projects in the Southern and the Northern Caucasus Federal Districts). The largest of them is the Tavrida highway, the reconstruction of which will cost 166 billion roubles. This is a logical continuation of the Crimean bridge. Throughout its entire length until 2017, it was a two-lane road of inadequate quality, which simply could not cope with the traffic flow from the "mainland". Today this project is at the final stage of construction, work on it is in full swing.

The share of "airport projects" in the rating is small compared to other construction projects — only 63.8 billion roubles (about 9.4). Even less in logistics (0.4%) and hydraulic engineering (3.2%).

The largest infrastructural projects in the Southern Federal District (SFD) in 2020 are presented below in Table 4.

The Transport Strategy of Russia for the period up to 2035 takes into account the need to eliminate restrictions on the network of highways, inland waterways, and ensure transport accessibility, primarily in remote and hard-to-reach regions.

Infrastructure projects by themselves do not always have a significant effect on the regional economy. Often this is almost wasted "buried" money, a serious result from the development of which only external contractors have received.

The financing of infrastructural projects in the North Caucasus Federal District (NCFD) is described in Table 5.

For a more successful implementation of infrastructure projects, new objects of influence between the government and business are required. During the pandemic, the priorities of the construction industry shifted to social and medical facilities. It was at this time that a "project" format of effective interaction between government and business was formed, when a city or region becomes the main customers and developers, and business gets the opportunity to participate in large infrastructure projects.

Let's consider financing on the example of large projects.

1. Construction of the Crimean bridge.
2. Construction of the Tavrida highway.
3. Arctic zone development.

The Crimean Bridge is a grandiose structure, created in 2 years. The overpass is 19 km long — the longest in Russia and Europe. 227.9 billion roubles were spent on the "construction of the century". R. Is it a lot or a little? How much did the Crimean bridge cost every resident of Russia? Consider the features of the project.

The idea to connect the Krasnodar Territory and Crimea was born over 100 years ago, during the time of tsarist Russia. The first structure was built by Soviet engineers in 1944. In 1945, the bridge was destroyed by an ice drift.

Table 4
Largest infrastructural projects in the SFD in 2020

№	Project	Company	Industry	Investment, RUB thousand	Time horizon	Region	Source
1	Construction of the federal highway "Tavrida" along the route Kerch-Simferopol-Sevastopol	Rosavtodor	Road construction	166 000 000	2017–2020	Crimea and Sevastopol	"Expert Yug"
2	Development and renovation of railway infrastructure on the approaches to the ports of the Azov-Black Sea basin	JSC "Russian Railways"	Railway construction	160 000 000	2011–2020	Interregional	JSC "Russian Railways"
3	Construction of infrastructure facilities for the dry cargo area of the port of Taman	Russian Railways, Rosmorport	Railway construction, hydraulic engineering	81 000 000	2020–2024	Krasnodar region	"Expert Yug"
4	Construction of the Aksai automobile bypass	GC "Avtodor"	Road construction	77 400 000	2018–2022	Rostov region	"Expert Yug"
5	Construction of the far western bypass of Krasnodar with a length of 51 km	LLC "Far Western Bypass Krasnodar" (structure "Avtodor")	Road construction	39 000 000	2020–2023	Krasnodar region	GC "Avtodor"
6	Construction of a new terminal at Krasnodar International Airport	JSC "International Airport Krasnodar" (JV "Basel Aero")	Airports	25 000 000	2020–2023	Krasnodar region	Krasnodar International Airport
7	Development of the Simferopol International Airport	Simferopol International Airport LLC	Airports	22 761 696	2016–2022	Crimea	"Expert Yug"
8	Construction of the Bagaevsky hydroelectric complex	Rosmorrechflot	Hydraulic engineering	22 000 000	2016–2020	Rostov region	"Expert Yug"
9	Reconstruction of the A-135 highway (Southern entrance to Rostov)	FKU "Department of Federal Highways" Azov	Road construction	6 877 475	2016–2020	Rostov region	Ministry of Economic Development of the Rostov Region
10	Creation of the Rostov logistic postal center FSUE "Russian Post"	FSUE "Russian Post"	Logistics	3 957 900	2014–2021	Rostov region	Ministry of Economic Development of the Rostov Region
11	Modernization of the terminal of international airlines at Anapa airport	JSC Anapa International Airport (JV Basel Aero)	Airports	418 000	2020–2021	Krasnodar region	Anapa International Airport

Source: "Expert Yug".

Table 5
Financing of infrastructural projects in the NCFD

№	Project	Company	Industry	Investment, RUB thousand	Time horizon	Region	Source
1	Construction of bypass roads of the cities of Derbent, Dagestan Ogni and Khasavyurt	Uprdor "Kavkaz"	Road construction	50 000 000	2019–2024	The Republic of Dagestan	"Expert Yug"
2	Construction of an air terminal complex, a new runway, reconstruction of the airfield infrastructure of Grozny airport	FSUE "Administration of Civil Airports"	Railway construction	15 700 000	2020–2024	Chechen Republic	"Expert Yug"
3	Construction of a highway from the Arkhyz resort to Kislyi springs	Republican State Enterprise "Directorate of Capital Construction"	Railway construction, hydraulic engineering	2 600 000	2020–2021	Karachay-Cherkess Republic	"Expert Yug"
4	Reconstruction of the railway infrastructure at the Nazran-Sleptsovskaya section and construction of a railway station at the Sleptsovskaya station	JSC "Russian Railways"	Road construction	2 500 000	2021–2024	The Republic of Ingushetia	Committee for Transport, Energy, Communications and Informatization of the Republic of Ingushetia
5	Construction of a bypass road for the city of Gudermes	Uprdor "Kavkaz"	Road construction	1 100 000	2018–2020	Chechen Republic	"Expert Yug"

Source: "Expert Yug".

The leadership of Russia and Ukraine agreed on the construction of a ferry across the Kerch Strait in 2000, in 2010, and in 2013.

In 2014, in connection with the transition of Crimea to Russia, the economic and political situation required decisive measures. In the summer of 2014, the construction plan was approved. In 2016, the overpass project was approved by Glavgosexpertiza. The work started immediately, in 2016.

Before dwelling on the final version, the specialists reviewed 74 projects of the transport crossing. Including an underwater tunnel running along the bottom of the Kerch Strait.

The choice fell on the crossing, starting on the Taman Peninsula, crossing the strait, skirting Cape Ak-Buran, and reaching the coast of Crimea.

If the crossing was built in the area of the ferry crossing, it would be shorter and cheaper. The option was rejected due to the tectonic fault and the presence of active mud volcanoes.

At the preparatory stage, the project was estimated at an amount of up to 300 billion. R. It consisted of several components:

Construction — 150 billion RUB

Preparation for construction work — 86 billion RUB

Construction of access roads — 52 billion RUB.

The difficulty lay in the installation of piles, because the construction had to be carried out in a seismically active area. In addition, the construction of roads, the arrangement of the security zone was required.

During the construction, 5,500 piles and 595 supports were installed, ranging in length from 3 to 35 m. Up to 16,000 people worked at the gigantic construction site at the same time.

As a result, the experts settled on the final cost of the construction of the facility — 227,92 billion roubles. The work was carried out at the expense of the federal budget, without attracting additional investments.

The estimate includes:

- design, survey work
- preparation of the territory
- temporary structures for construction workers
- energy supply facilities
- installation of piles
- installation of the main structures of the railway and road sections
- unexpected expenses.

The contractor was the company of billionaire Arkady Rotenberg, Stroygazmontazh. The contractor was selected out of tender due to the absence of other bidders.

The main subcontractor is Mostotrest with a contract for 96.9 billion roubles, whose share also belongs to Rotenberg.

The Kerch Bridge of Russia consists of a 4-lane highway and a railway line in both directions. The crossing is 19 km long. stretches over the water for 7.5 km., over land — 11.5 km.

According to experts, the annual maintenance of the crossing will be about 480 million roubles.

The capacity of the railway section of the structure is about 100 trains per day in both directions. The highway is designed for a load of 40,000 vehicles per day.

Construction was carried out on several sites at the same time. First, in 2016, specialists and workers strengthened the piles. The difficulty was that up to solid ground it was necessary to overcome 90 m of silt located at the bottom of the bay. As a result, the pile supports were driven to a depth of 105 m.

The grandiose construction was not without incident. In 2016, a ship from Turkey crashed into the bridge pillars. One support sank, it was cut and taken out. Neighboring supports have shifted. The consequences were corrected promptly, the incident did not affect the completion date.

In 2017, the rail and road arches were completed. The central part of the structure was left for the passage of ships.

The inauguration of the bridge for light traffic took place on May 15, 2018, 6 months ahead of schedule. Freight transport has started over the overpasses since October 1, 2018.The railway section was launched in December 2019.

The Crimean Bridge in Russia has become the largest, most technically complex and expensive overpass in the country.

Among Russian projects, it took first place in terms of construction cost. The cost of the bridge in roubles — 227.9 billion. The cost of the bridge in dollars is about 5 billion.

For comparison:

A 44 km long overpass across the Ob. cost Russia 43 billion RUB

Departure from Ufa, including a bridge, a tunnel and a road — 34 billion RUB

Bridge over the river. Chusovaya in the Perm Territory — 14 billion RUB.

When compared with world projects, the Kerch overpass is in the top three most expensive:

The Qingdao Bridge in eastern China is 42.5 km long and about 8.8 billion dollars have been spent on its construction. At the crossing, cars move in three lanes.

Bay Bridge, connecting San Francisco with Oakland, cost the Americans 6.4 billion dollars. The structure is divided into 10 car lanes, bicycle and pedestrian zones.

Kerch building worth 5 billion dollars.

From the top three, the Russian project has replaced the Great Belt overpass, built in Denmark. It took 10 years and 3.14 billion dollars to build it. The structure consists of a road and rail section in the western half and an underwater railway tunnel, accompanied by a suspension bridge, in the eastern section.

A simple mathematical calculation allows us to determine whether the grandiose construction has hit the pocket of the Russians.

If the amount of 227.9 billion RUB round up to 228 bn RUB and divide by 109 million Russians over 18 years old, you get about 2000 roubles per person.

228 bn divided into 146,793,744 people (population of the country) turns out to be 1546 roubles per person.

It should be taken into account that the money spent on construction was taken from the federal budget, part of which comes from taxes. For example, in 2018 tax revenues to the treasury amounted to 521.3 billion RUB, which exceeds the amount required for construction, more than twice.

The result of the construction of the Kerch Bridge was the renewal of the infrastructure of

the Crimean coast and the Taman Peninsula, simplification of the delivery of goods to Crimea and back. And the inhabitants of Russia now more often rest on the picturesque coast. According to official data, the tourist flow increased by 40–50%, up to about 10 million people a year.

In the early morning of May 16, 2018, convoys of cars moved towards each other from the banks of Taman and Kerch. From that day on, the Crimean bridge began to work, which was very much awaited on both sides of the Kerch Strait. During the year, five million cars drove along the crossing, and statisticians collected a lot of interesting numbers and facts about this grandiose structure.

19 km is the length of the bridge. It is the longest in Russia and Europe.

Crimean bridge — 1 year.

Only 408 km separate it from the International Space Station, pictures from which the cosmonauts published.

The volume of design documentation was 570 volumes or 30 gigabytes of data.

More than 15,000 engineers and workers were at the height of construction. There are about the same number of inhabitants in Sudak.

And the most adult builder is 70 years old.

At the base of the Crimean Bridge there are almost 7,000 piles, sunk to a depth of 12 to 105 meters, which is the height of a 35-storey building.

The wall thickness of the tubular pile is 40 mm, which is comparable to the thickness of tank armor.

The first pile was immersed in 25 days, and after the technology was worked out, it took 24 hours.

816 days were spent on the construction of the road section of the bridge.

330 km — the thread that will turn out if you fold all the tubular piles of the bridge in a line. This is more than from Kerch to Sevastopol, if you go by car.

595 supports hold 260,000 tons of span steel structures. That is the weight of the 36 Eiffel Towers.

Each railway span weighs more than 500 tons, which is 1.4 times heavier than the ISS.

Out of 13,000 km of reinforcement bars, a 4-lane road is connected. Approximately this distance is flown by a plane from Moscow to Sydney.

250 meters of rebar knitted by one builder per work shift.

10 cm / min — the speed of the overspan over the water area. The snail moves at the same speed.

10,000 tons — the weight of the two arched spans. This is the weight of 400 empty KAMAZ dump trucks.

76 km — the thread that will turn out if you fold all the rails of the bridge in a line.

227 m is the length of each arch. This is the length of two football fields.

490 tons of high strength bolts are screwed on two arches.

One high strength bolt weighs 63 grams.

100,000 liters of paint was spent on two arches, which is two railway tanks.

A total of 120 hours (5 days) lasted a sea operation to transport and install two arches on the supports.

12 million tons of materials and structures are required in total for the construction of the bridge, which is twice the weight of the Egyptian pyramid of Cheops.

20,000 cars crossed the bridge in the first day of its operation, 200,000 — in 2 weeks, 5 million — in 12 months.

More than 30,000 vehicles in 24 hours — the bridge's daily record.

117 km of road marking lines on the bridge.

Only once during the construction period there was an ice drift and this did not affect the bridge and its supports.

2,700 storm hours were recorded over the three construction winters. This is almost 113 days, or about 4 months.

The Crimean authorities announced the construction of the Tavrida highway 4.5 years ago — and then they estimated its cost at 85 billion roubles. After a couple of months, apparently, having recounted, they named the amount one and a half times larger — 128 billion. But in the end the road cost about 150 billion roubles.

Construction began in 2017, dividing the construction into eight sections, launching them as soon as they are ready. And in general, the story resembles the Crimean bridge. Handed over earlier than planned. And the track that connected Kerch and Sevastopol really turned out to be good, says the Crimean blogger Alexander Gorny, who took a ride on Tavrida a month ago.

The contractor was chosen without competition. For this, the republic changed its legislation. There is logic in this, because otherwise you would have to choose the company that will offer the lowest price. And the risk of being faced with something

that does poorly. And with Crimea, apparently, they cannot afford it. And the decision, as one might assume, was made not in Simferopol, but in Moscow.

The general contractor was the VAD company. She had previously received large government contracts for the construction of roads. Not much is known about the company: it has been working since the mid-1990s, originally from St. Petersburg. True, she moved to Vologda three years ago. As Delovoy Petersburg wrote, due to the fact that at some point there were difficulties with the city authorities and the company stopped receiving government orders. In the Spark system, only two minority shareholders are listed among the owners, these are businessmen Viktor Perevalov and Valery Abramov. VAD is not as famous as some of our construction giants, but it has proven itself well in its industry.

Soon they will build another road, but not from the Crimean bridge, but, on the contrary, to it, that is, from Krasnodar. The contract was awarded to the structure of Arkady Rotenberg, who built the bridge itself. The Kuban highway will cost the budget almost 100 billion roubles.

The businessman's company was also the only contender for the state order. But not because it was appointed by the authorities — there were simply no others willing. Which is also easily explained, such contractors are immediately subject to Western sanctions. Rothenberg and so on under them. Against the company that built "Tavrida-VAD" — they were also introduced. But on the other hand — government orders for tens of billions of roubles.

The road with a length of 250.7 km was built for almost three years. About half of the track was built from scratch in hilly terrain, plains, mountains, through existing roads, branch lines and rivers.

On June 28, 2016, the head of Crimea, Sergei Aksenov, by his order appointed the VAD company as the contractor for the construction of the Tavrida highway. The cost of the contract for the republican section of the road was 137.3 billion roubles, for the Sevastopol section — 11.96 billion roubles.

Earlier, VAD distinguished itself by repairing Nevsky Prospekt, Palace Embankment, Vyborgskoye Highway in St. Petersburg, the construction of a VIP road to Pulkovo, the Sortavala highway, sections of the Scandinavia highway and other roads in North-West Russia.

The construction of the Tavrida highway is divided into seven stages, six of which pass through the territory of Crimea, one through the territory of Sevastopol. But before that there was a so-called "stage zero" — this is the construction of 8.6 kilometers of auto approaches to the Crimean bridge, which was also carried out by the VAD company.

The history of "Tavrida", however, will not end there. The VAD company will be engaged in the construction of the eighth stage of the highway in Sevastopol, which runs from the junction of the seventh stage to the President's road to the Yalta ring.

In addition, the construction of a branch of Tavrida to Evpatoria is underway — next year the first stage of the Simferopol-Evpatoria-Mirny highway will be commissioned, which bypasses the Simferopol airport and the village of Rodnikovoe to the village of Skvortsovo, and VAD is already designing the second stage of construction roads — from Skvortsovo to Evpatoria.

In 2018, the development of the Russian Arctic, which includes more than 3.5 million sq. km of the mainland, as well as many islands with a total permanent population of 2.5 million, was declared one of the priority areas of state domestic policy. The law "Fundamentals of the state policy of the Russian Federation in the Arctic zone for the period up to 2020 and beyond" was adopted on September 18, 20; later, the content of the act was significantly expanded in the "Strategy for the development of the Arctic zone of the Russian Federation and ensuring national security for the period until 2020", approved by the President of the Russian Federation on February 8, 2013.

Offshore development in the Arctic has slowed dramatically since the fall in oil prices at the end of 2014 due to the high cost of offshore and offshore production. Also, a significant role in this was played by the US and EU sanctions, which prohibit foreign companies from participating in exploration, oil production from the Arctic shelf in our country and transferring technology for this kind of work. However, interest in the region is growing every year. It is driven by a variety of factors, from the depletion of already used deposits and large explored deposits in the northern region to a warming climate and easier access and operation. The attractiveness of the region for the Russian Federation is not limited by the Northern Sea Route; significant energy resources are especially

important. The Arctic contains about a quarter of Russia's total oil reserves and more than 70% of gas, and the continental shelf has great potential for the growth of raw materials production.

In the context of the crisis caused by the pandemic and economic sanctions from the West, the fuel, mineral resources and oil remains one of the most stable sectors of the country's economy, which makes it one of the most privileged areas to invest in the economy of Russia. On the side of the dependence of the Russian economy on the export of hydrocarbon raw materials and the need for import substitution, the need to increase competitiveness in this market is becoming more acute, and active planning and further development of the north is also associated with this.

Thus, the priority task of the country's economic policy is not only to stimulate the development of the Arctic by easing conditions for companies-residents of the special economic zone, but also to attract foreign investment into the sector, since there is a need for additional financial investments. According to the assessment of the Ministry of Economic Development of the Russian Federation, the sanctions imposed on the country for the period 2014–2018 significantly influenced the possibility of attracting capital from abroad, which is reflected in Figures 10 and 11 [5].

Based on the data in the figures, it can be seen that the inflow of investments (liabilities) suffered from the sanctions much more than investments abroad (assets). Among the companies in the oil and gas sector that lost the most foreign capital were PJSC NK Rosneft, PJSC Transneft, PJSC Gazprom Neft.

One of the possible forms of attracting investments in the fuel and energy complex of Russia and in the economy as a whole is a production sharing agreement (PSA) — a type of agreement on the establishment of a joint venture. As a rule, such an agreement is concluded between a foreign mining company — a contractor and a government party that gives the contractor the right to conduct prospecting and exploration work and exploitation within the contract area in accordance with the terms of the agreement. As a rule, such an agreement is concluded for a long term (up to fifty years) or indefinitely. In Russia, PSA is regulated by the Federal Law "On Production Sharing Agreements" dated 30.12.1995 N 225-FZ. At the moment, there are three PSA projects in operation in the Russian Federation: Sakhalin-1; Sakhalin-2; Kharyaga oil field. Table 6 provides more details on these projects:

Consider the Sakhalin-1 PSA project. Exxon-Mobil, which has become a long-term partner of Rosneft, was forced to leave a number of joint projects due to the anti-Russian sanctions introduced in 2018. production, provision and sale of licenses, know-how, machinery, equipment. Shell also continues to operate in Russia. It should be noted that the PSA also has a number of disadvantages. First of all, this concerns high bureaucracy and the risk of corruption due to the involvement of the state side. Also, in two of the above projects, one way or another among the members there were legal claims in connection with the disagreement of the parties on the distribution of profits or products.

As for the sanctions, they are an obstacle for Western companies, preventing them from participating in the Arctic PSA. Thus, investment remains through the purchase of a share in the company, as happened in the case of the new Arctic LNG-2 LNG project established by PAO NOVATEK; in 2019, the French company Total bought out from PAO NOVATEK a 10% stake in project. Another 11.6% belongs to the company due to indirect ownership through a share in the share capital of PAO NOVATEK. Thus, Total directly owns 10%, PAO NOVATEK — 60%, CNOOC (China) — 10%, CNPC (China) — 10%, Japan Arctic LNG (Japan) — 10%.

Anti-Russian sanctions tie the hands of European partners in the field of investments in the development of the Arctic. For this reason, it is worth considering cooperation with the countries of the Persian Gulf, China, Japan, not limited by the politics of the West. China, in particular, is a long-term and reliable partner of Russia in the development of the Arctic. Chinese companies own 30% of Yamal LNG and, as noted above, 20% of Arctic LNG-2. Also, China has an interest in the development of the Northern Sea Route as part of the New Silk Road — an important transport artery that can serve not only as a way of delivering goods, but also as a significant political object. Close cooperation with China in the Arctic is undoubtedly beneficial for the fuel and energy complex of Russia, but it also has certain, mainly political and environmental risks.

Attraction of investments is possible both from the west and from the east, but in different forms. When choosing partners, it is necessary to weigh the pros and cons, assess the possible risks.

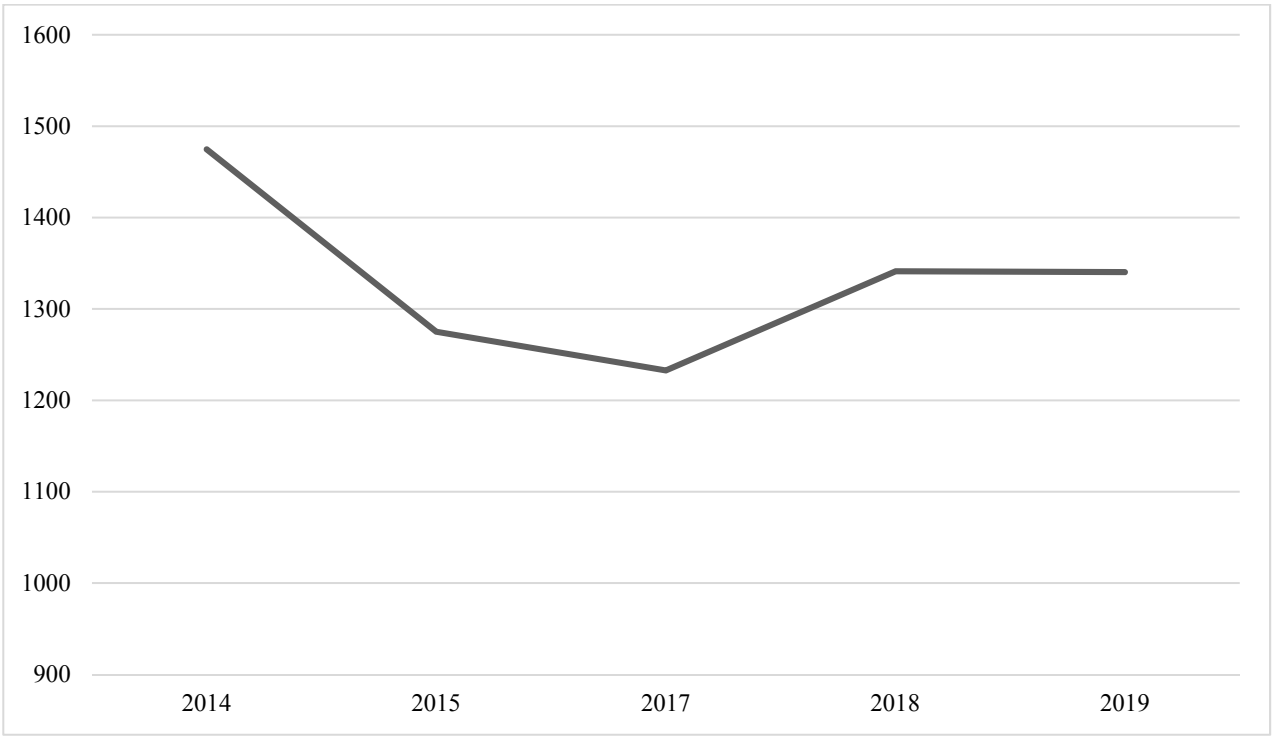

Fig. 10. **Russia's international investment position, assets in USD bln**

Source: [5].

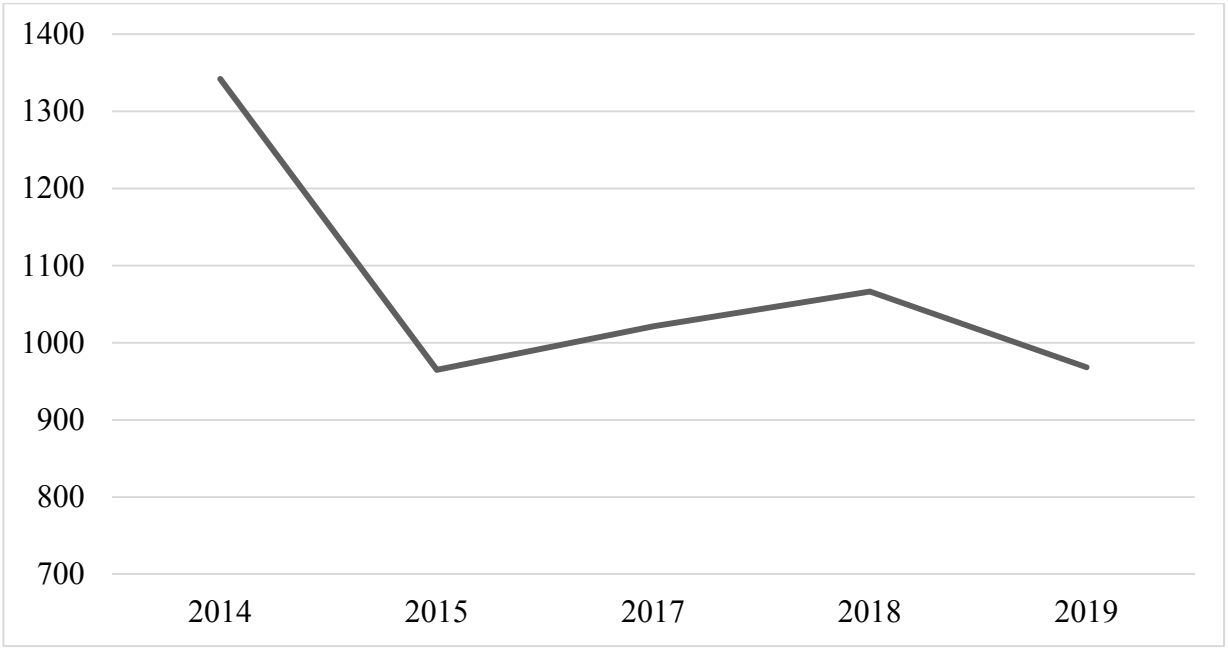

Fig. 11. **Russia's international investment position, liabilities in USD bln**

Source: [5].

3.2. The main directions of using foreign experience in financing large infrastructure projects in Russian practice

In the modern world, every country is focused on the effective management of its infrastructure facilities. PPP allows the government to involve private financial and intellectual resources and finally create profit from mutually beneficial cooperation between the public and private sectors. Some countries have accumulated a wealth of experience in implementing such projects, which would be useful for other countries, less developed in this industry. Some items can contribute to the development of the Russian PPP model.

Table 6
Structure of existing PSA agreement projects

Project	Operator	Owners
Sakhalin-1	Exxon Neftegas Limited	Exxon Neftegas Limited (USA) — 30%; ONGC (India) — 20%; SODECO (Japan) — 30%; Rosneft — 20%.
Sakhalin-2	Sakhalin Energy — established by the owners and operates on the basis of a PSA	Gazprom — 50% +1; Shell (UK, Netherlands) — 27,5% — 1; Mitsui (Japan) — 12,5%; Mitsubishi (Japan)– 10%.
Kharyaga oil field	OOO Zarubezhneft — Dobycha Kharyaga is a state-owned company	Zarubezhneft JSC — 20%; LLC Zarubezhneft — Dobycha Kharyaga — 20%; Statoil Sverige Kharyaga AB (Sweden) — 30%; Total E&P Russia (France) — 20%; Nenets Oil Company — 10%.

Source: Compiled by the author.

Thus, the subject of the article is a relationship between the partnership entities during the PPP. The object is PPP as a tool of cooperation between government and business. The process of implementing PPP projects is a particular issue in the modern economy. The problems include: the effectiveness of the PPP mechanism for improving infrastructure facilities, the selection of a suitable PPP model for project implementation, as well as the impact of factors that connected with the level of PPP development, such as the historical background and economic situation in the state, its goals, objectives and state policy that determines the priorities of PPP development in the country.

Most of the infrastructure projects in China are financed through PPPs.

In Russia, public-private partnerships have shown their application quite recently and today they are used in the construction of roads, airports, regional complexes, educational centres and water supply and sanitation systems. At a further stage, it is planned to introduce PPP projects in the field of culture, social infrastructure and many others. Today's unfavourable environment in the global capital and investment markets, as well as the constant tightening of legislation in banking in China, have significantly complicated and changed the structure of project financing.

For example, the pre-crisis growth of the public private partnership market occurred against the background of fairly cheap borrowed funds: in 2019–2020. their share reached 90% and more. And today it is forced to develop in conditions of constantly depleting financial resources).

In Figure 12 and Figure 13, which are presented below, we are able to see a number of infrastructure projects and expenditure amount on infrastructure projects in Russia compared to China.

We can see a significant difference as in the number of infrastructural projects as in the expenditure on it. China, as one of the most developed economies in the world, creates a large number of projects. Since 2004, and having made a sharp leap back then, Russia, as can be seen on the chart, was just beginning to attach importance to the financing of projects, namely PPP. It can be assumed that the huge costs and the high number of projects made in 2016 went to the construction of infrastructure facilities for the World Cup. An interesting fact is that in 2008, during the Beijing Olympics, the number of Chinese expenditures did not exceed the average value for the entire period from 2004–2019. The full explanation for this is the fact that China does take full advantage of the implementation of PPP investments. In the next step let us see the number of all PPP projects in Russia which is reflected Figure 14.

According to this schedule, starting only in 2014, the Ministry of Economic Development of the Russian Federation and the center for the development of state-owned private partnerships developed a set of methodological recommendations for the development of the PPP sector in the Russian regions. After that, there was an increase in the volume of investments and the number of projects themselves. At the moment, unfortunately, according to all known facts-pandemics, there is a decline.

The information that can be found in Chinese sources of use, especially the financing and organi-

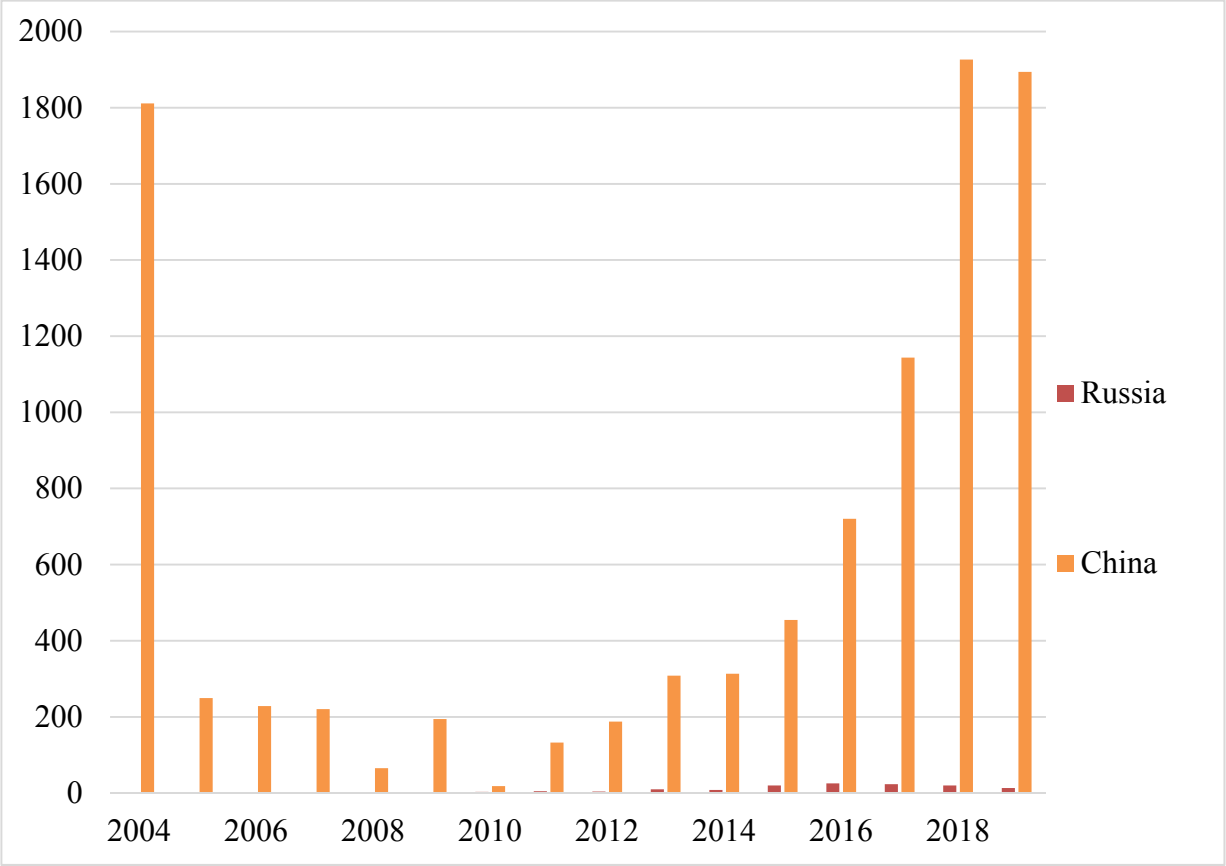

Fig. 12. **Number of infrastructure projects in Russia compared to China, 2004–2019**

Source: The author.

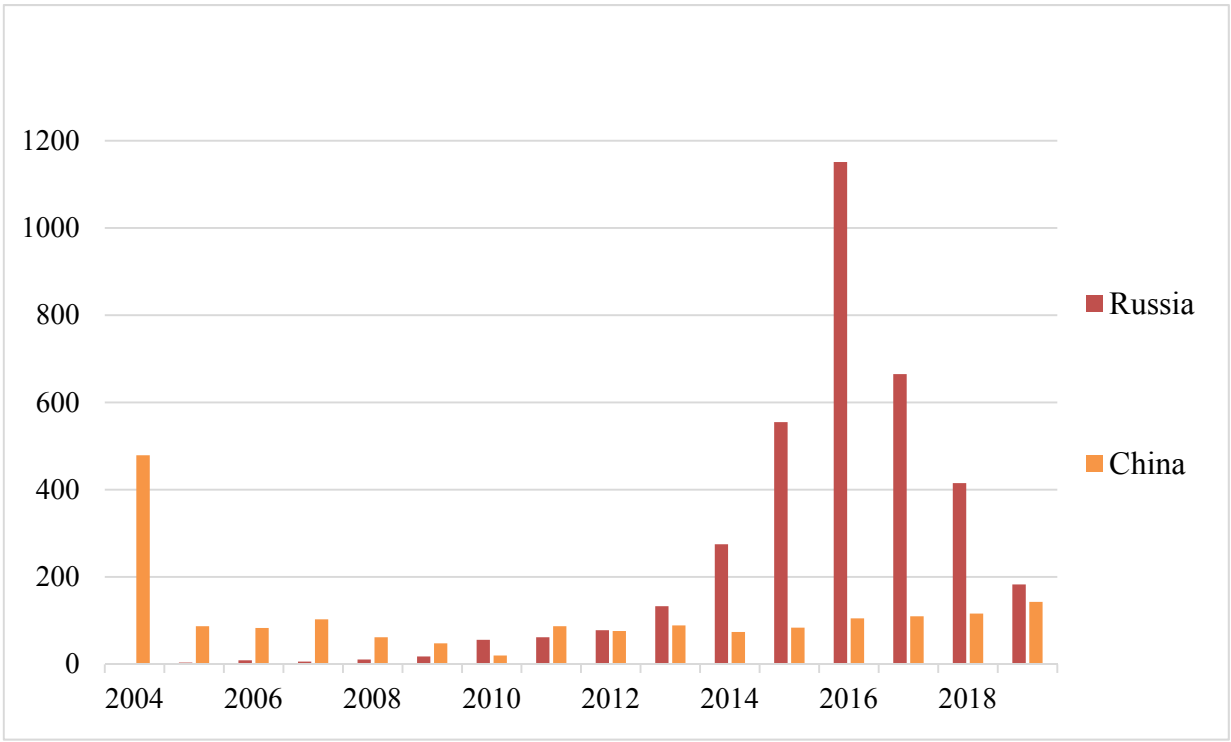

Fig. 13. **Expenditure on infrastructure projects in Russia compared to China, 2004–2019**

Source: The author.

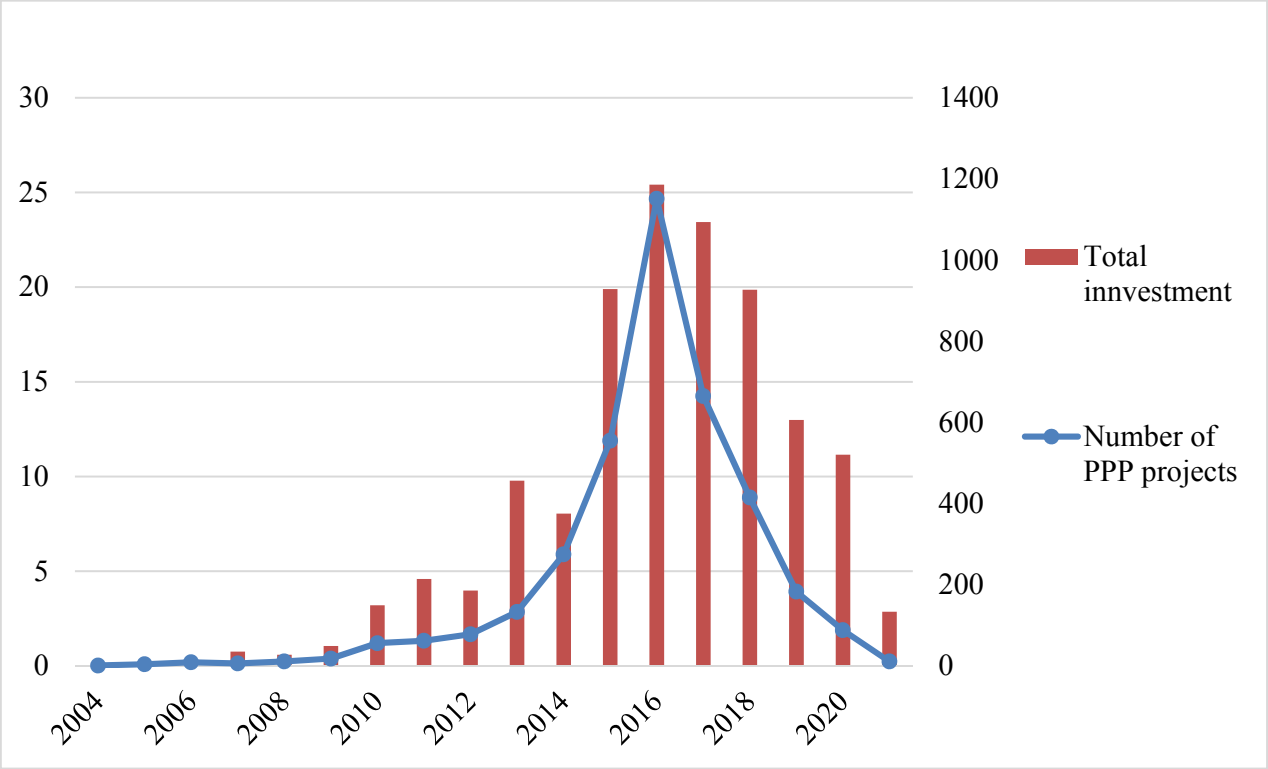

Fig. 14. **PPP projects in Russian Federation, 2004–2021**

Source: The author.

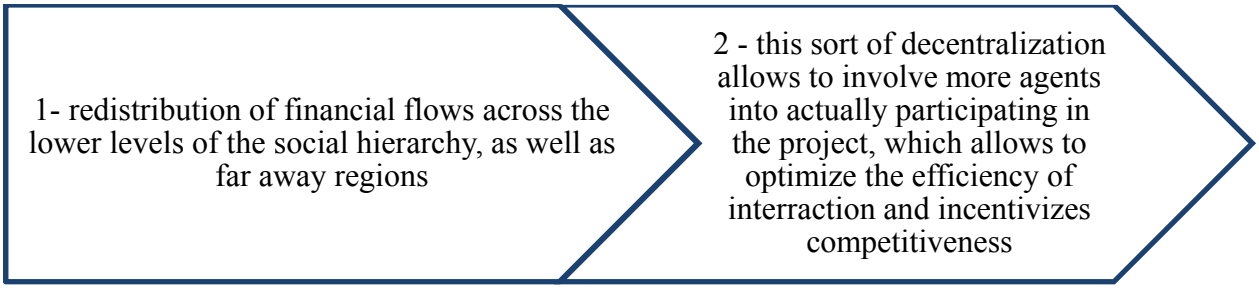

Fig. 15. **The specifics of Chinese and Russian PPP projects**

Source: The author.

zation of the state partnership of the PRC itself, they have a number of similarities with the Russian system, namely at the regional level. The specifics of Chinese PPP projects are outlined in Figure 15.

Consider, as an example of the application of the Chinese experience, the sphere of education. The extensive practice of using PPP mechanisms to modernize educational institutions in Russia has not yet developed, but more and more regions are showing interest in concluding PPP agreements in this area.

"Special attention is currently focused on schools — at the federal level, the program 'Assistance in the creation of new places in general education institutions in the constituent entities of the Russian Federation (based on the projected need)' has been approved, the purpose of which is to modernize the educational infrastructure, optimize the workload of schools and develop the non-state education sector. To achieve the goals of this program, such legally regulated PPP models as a concession agreement and a PPP agreement can be used. For example, Sberbank of Russia offers regions and investors a 'box' concession solution for the construction of schools. Its use will allow concessionaires to apply for project financing from Sberbank Russia. There are other projects that are gaining popularity" [15].

"Vnesheconombank and Prosveshchenie Group of Companies plan to launch the construction of 13 schools in the Nizhny Novgorod region, which will provide places for study for 14.9 thousand

students. This will speed up the implementation of the state program of the Nizhny Novgorod region in terms of creating a modern educational infrastructure, as well as help with solving the problem of second The project involves the creation of turnkey educational sites, envisaging not only the construction and staffing of schools with the necessary equipment, but also the development of a curriculum, where the emphasis will be on pre-professional orientation and training of schoolchildren" [4].

There are still few public-private partnership projects in the field of education in Russia. Federal Law No. 224 "On Public-Private Partnership" entered into force at the beginning of 2016, but not a single educational project has been implemented within the framework of federal funding. But in addition to 224-FZ, there is also Law 115-FZ "On Concession Agreements", within the framework of which a number of projects are already being implemented. At the same time, PPP projects are actively implemented in the regions within the framework of local regulations.

"At present, the official website of the Russian Federation for posting information on bidding has posted information on 5416 tenders for the right to conclude agreements on public-private and municipal-private partnerships, including 70 tenders in relation to educational, cultural and sports facilities. On the support platform infrastructure projects ROSINFRA contains information on 40 projects under Federal Law 224, 45 more projects are at the pre-investment stage.On a concession basis (Federal Law 115), projects for the construction of preschool institutions and several projects for the construction of schools are being implemented" [4, p. 639].

The federal law on PPP provides for a rather complicated procedure for initiating a project by a private partner: "The proposal for the implementation of a partnership project is actually a complete pre-project preparation for a potential object, which, according to current practice, amounts to approximately 5% to 10% of the total funding In addition, the private initiator of the project must have a bank guarantee in the amount of at least 5% of the total amount of financing, as well as all permits that give the entity the right to carry out the relevant type of activity (licenses, membership in SROs, etc.). Also, the private partner has the right to attract a contractor that has all the necessary licenses. All this is provided to the public partner, who at the same time has the right to decide on the impossibility of implementing the PPP project. If the public partner and the authorized state (municipal) body decide on implementation of the project, a competition is announced" [4, p. 640].

In addition, according to the law on PPP, the conclusion of an agreement is only possible in relation to real estate or movable property. "This hinders the implementation of PPP relations in the field of intellectual property, which in the digital economy also does not contribute to the stimulation of private initiative. There is also uncertainty in tax legislation in relation to PPP projects. For example, if a private partner is transferred to a private partner within the framework of a PPP project, this entails the need to pay the corresponding taxes, although the private partner has not yet received any income.With regard to the implementation of PPP projects in relation to social infrastructure facilities, in particular schools, the PPP law provides for the transfer of ownership of the partnership object to the private partner" [16].

If social infrastructure facilities are funded, this is more patronage than PPP. "In some regions of the country, 70% of the funds allocated to the regions for PPP projects are returned to the federal budget due to the poor quality of the preparation of PPP projects. there is an opportunity to take into account the specifics of the region and reflect it in regional legislation. In a number of regions over the past few years, PPP projects in the field of education have been implemented precisely thanks to regional amendments to the legislation: kindergartens or schools were built throughout Russia, in particular in St. Petersburg, Moscow, Tomsk regions, the Komi Republic, Khanty-Mansiysk Autonomous Okrug, YaNAO" [ibid.].

It is predicted that by 2025 it is necessary to build about 2 thousand schools in Russia (this will require about 2 trillion roubles) — such a number of educational institutions will make it possible to completely abandon the second shift, provide all school-age children with places in educational institutions, as well as to create a modern information and educational environment in schools.

At present, the implementation of social policy, but transferred without funding: And today there is a question for the regions, where to find resources, both internal and external, to fulfil these tasks and seriously update the material and technical base.

"An experiment to create an educational infrastructure within the framework of a public-private partnership mechanism will begin in the Nizhny Novgorod region — Prosveshchenie Group of Companies and the VER.RF state corporation will become its participants. The Nizhny Novgorod region is among the top ten in the rating of the development of Russian regions in terms of PPP, posted on the support platform infrastructure projects ROSINFRA The project to create new schools is not implemented within the framework of federal legislation There will be a regional agreement on PPP, but part of the money is allocated from the federal budget" [16].

"Within the framework of the project, which will be carried out in two stages, it is planned to create 14.9 thousand places for schoolchildren in the region by building 13 schools. During the first stage (2020–2022), six schools with 8.1 thousand places will be built. and three schools with 1.5 thousand places in Nizhny Novgorod, as well as 3.6 thousand places were created in the cities of Kstovo, Dzerzhinsk and Arzamas. During the second stage (2022–2024), it is planned to create 6.8 thousand places in the region. places in a number of settlements. In total, there are 896 educational organizations in the region, which are attended by more than 321 thousand people, while 26.6 thousand children study in the second shift. The need for places for students, according to the state program of the Nizhny Novgorod region, is estimated at more than in 36.3 thousand, there are not enough 62 educational institutions [4].

Within the framework of PPP, they begin to work with the idea of creating a meaningful infrastructure based on an analysis of the needs of the region. In order to form the pre-professional orientation of the school, the economic indicators of the region are taken into account, a profile of potential jobs is also developed and the needs of enterprises of the regional economy are analysed. As a result, the requirements for the appropriate infrastructure become the basis for the design of the school.

"The school project is being prepared on a turnkey basis: a pedagogical concept should be formed, a building design should be prepared or adjusted taking into account this concept, a pedagogical and managerial core should be formed. The pre-professional orientation of the school will be represented by the 'high school-regional university-employer' model, and this will help to solve the problem of training and retaining personnel in the region. It is assumed that the erected educational institutions will be full-time schools operating from 8:00 to 20:00. The total investment in the project is estimated at 18.4 billion roubles. The implementation of the project will allow the implementation of the state program for 35% from extrabudgetary funds" [ibid.].

This is not the first VEB project, which is planned in the Nizhny Novgorod region. In November 2018, the head of the regional ministry of property and land relations, Sergei Barinov, during a meeting at the Ministry of Education of the Russian Federation on the creation of an effective model of public-private partnership in the modernization of children's recreation and health infrastructure, announced plans to conclude an agreement between the regional government and Vnesheconombank on cooperation in the area of rehabilitation of children's camps in the region on the basis of PPP.

The Enlightenment Group came up with an initiative to create a network of camps on already existing land plots that are not used for one reason or another, but intended for the functioning of children's camps. There are about 700 such plots in the country, and the potential volume of investments with the involvement of private capital is about 140 billion roubles to recreate the system of children's summer recreation in the required volume. The main directions of the functioning of children's recreation camps will be educational, cultural-historical, patriotic and sports. As part of the development of children's recreation, a project of the largest children's year-round camp is now being considered. The idea of the project is unique in itself, according to preliminary calculations, it will be one of the largest camps in Russia, which will be able to combine the most advanced practices of organizing children's recreation at the same time with the implementation of additional education programs. and the Northwestern Federal Districts, the first should be projects in the Nizhny Novgorod and Kaliningrad regions. The problem of children's summer holidays during the vacation period is quite acute. Parents send a significant part of their children to day camps due to the psychological unpreparedness of the parents, fear for safety, quality food and child care, lack of understanding of the benefits of the child's stay

in the camp, and serious infrastructure problems.

It is crucial to consider the aspects that need to be paid attention to when preparing a PPP project in the field of education using the experience of the China.

Ownership of the object of education:

The concession agreement model provides for exclusively public ownership of the object. In contrast, the PPP agreement model obliges to transfer the object to private ownership — then it can be returned to the public partner both after a short time and by the time the project ends.

In some cases, the possibility of obtaining ownership of the educational object can significantly increase the attractiveness of the project for private investors, since it allows the object to be pledged in favour of the financing organization. Therefore, the choice of the legal model for launching the project should be carried out taking into account the given factor.

Allocation of operational obligations:

In addition to commitments to invest funds and modernize property, it is a basic element of a PPP project. Bringing a private party to target operation (implementation of educational activities) and/or maintenance of property.

Due to the absence of large operators of educational services on the market, the private party, as a rule, is assigned the obligation to maintain the property, and the involved educational institution (state or municipal) is responsible for the educational process.

The SHG agreement allows flexible distribution of operating obligations between the parties — the private operator is responsible only for maintenance, and the public partner is responsible for educational activities, that is, involves an educational institution. Within the framework of the concession model, those responsible for the target operation of the facility will always have a concessionary before the grantor, despite the fact that a municipal or state educational institution is involved for target operation. However, the correct design of the terms of the agreement will help to reduce the investor's risks associated with the targeted exploitation of the property, so the choice between a concession and a PPP agreement should be made in the context of all the advantages and disadvantages of legal models, as well as public interests.

Carrying out commercial activities:

The conditions of a PPP project may provide for the implementation by a private party of commercial activities using the facility — additional educational and sports programs, sections, catering, etc. In this case, it is important to consolidate a well-thought-out regulation of interaction between a private party (or a person involved to provide additional services) with an educational institution (distribution of hours, premises, etc.).

The implementation of commercial activities creates an additional financial flow for the private party, which allows to reduce the financial burden on the budget of the public party, at the expense of which such projects are funded. For example, this will allow using the concept of the minimum guaranteed income together with fixed budget payments — in this case, part of the payments will be paid by the public side only if the private partner does not reach a certain level of profitability.

Conclusion

Summing up the general conclusions, it can be noted with precision that in order to support the development of stable growth of investments in infrastructure projects, the first step is to solve the problem of reducing aggregate demand. Here, an increase in government spending is immediately seen, and the source of financing will be either accumulated financial assets, as in the case of China and countries — exporters of oil and minerals, or securing support from government loans, as in the case of the United States and other developed countries. economy.

As for attracting financing for the infrastructure construction of private capital, it is that states and interstate structures (the above-mentioned development banks) should take the leading positions. Their main task should be to introduce into the practice of infrastructure construction mechanisms for mitigating project risks and temporary mechanisms for accumulated savings.

A good example is the use of infrastructure bonds backed by the assets of a development bank. According to the conclusion of the World Economic Forum, which compiles an annual rating of the competitiveness of national economies, the quality of infrastructure in Russia ranks 35th in the rating, with a rating of 4.8 (scale from 1 to 7). The most problematic element of Russia's infrastructure today is the condition of highways.

The costs of the entire infrastructure, in comparison with Russia's GDP, have shown a downward trend in recent years. This is largely due to the general decline in investment demand in the country, the imposition of sanctions on our state and the situation with the coronavirus.

Naturally, not only the above-mentioned global problems have an impact on the development of infrastructure construction. In addition to them, more detailed ones can be distinguished, such as:

The presence of errors in the planning system of infrastructure construction projects and a low percentage of optimization of the existing infrastructure

Imperfection of the contracting scheme, which does not allow for effective management of project resources

It is always worth considering the human factor

Lack of personnel professionally trained for the implementation of high-tech projects

Difficulty in overcoming administrative barriers and a significant level of corruption, dragging down the development of infrastructure in Russia.

Taking into account the entire domestic history, it is necessary to note this kind of problem of infrastructure construction, as effective control over the financing of the project and the costs during its implementation. Here it would be appropriate to give an example of a megaproject from the times of the USSR, such as the Baikal-Amur Mainline, the implementation of which did not lead to the expected impetus for the economic development of our country. The reasons that have a negative impact on the multiplier effect of infrastructure projects are low quality of implementation and overstatement of projects.

The actual model of the economic development of our state involves the use of the multiplier effect from state investments in infrastructure projects. In general terms, this approach looks like correct and timely, especially in the context of such a good infrastructure in our country, its improvement will certainly increase the quality of life of the inhabitants of Russia. In this case, of course, it is worth paying attention to an important detail.

The studies carried out demonstrate that the effect of infrastructure projects, positive for the continuous development of the economy, occurs to the greatest extent during their implementation. Upon termination of the implementation, this effect begins to rapidly deteriorate.

Having studied and taken into account all the results of research aimed at providing infrastructure projects in Russia with investment resources, for the long term, first of all, it is necessary to reform the financial system.

Consequently, the reform of the financial system should be an important component of the new model of economic development in Russia. The reform should be aimed at increasing the level of competitiveness, and at strengthening the operation of market mechanisms, both in the economy as a whole and specifically in the financial sector.

1. More active use of public-private partnership mechanisms is required in order to solve the problem of distribution of project risks of infrastructure construction in Russia.

2. There is a proper need for specific regulation and control over new infrastructure PPP projects. It is logical to organize them in the form of a national public-private partnership management system. In this vein, they can actively use the innovation infrastructure model.

3. In the context of attracting private capital to infrastructure construction projects, it would be advisable to use the positive aspects of financial engineering, namely, the formation of a set of derivative financial instruments on the Russian financial market.

These instruments should be covered by infrastructure assets or the results of the implementation of infrastructure construction projects.

In general, we can once again say that public-private partnership is one of the most promising mechanisms for attracting long-term investment resources for the development of infrastructure, modernization of the national economy and ensuring the innovative development of the country. The advantages of using the resources of the state and business in the framework of PPP are determined by a number of factors:

Limited financial resources do not allow the state to successfully address the development of infrastructure and industrial sectors without the participation of private capital

More effective management and high adaptability to the changing conditions of private business compared to state structures

The instability of the economic situation, which orients private business to search for objects for stable guaranteed investment investments

High riskiness of investment projects, which makes it necessary to distribute risks between partners.

According to all mentioned above, we should pay more attention to the development of PPP and disclose real data from Russian statistics to make various assumptions for improvement.

China and Russia are quite similar in their ways of economic development. By drawing up a number of models, we have seen that the use of such a financing method as PPP has a positive impact on the Chinese economy. Therefore, it is safe to say that if the required measures and China's experience are followed, Russia will be able to use China's experience and step up infrastructure investments in PPPs.

REFERENCES

1. Nikitina T.I., Lysenko A.N. Formation of public-private partnership as a tool for the development of the region. *Vestnik AGTU. Series: Economics*. 2019. (2). URL: https://cyberleninka.ru/article/n/formirovanie-gosudarstvenno-chastnogo-partnerstva-kak-instrument-razvitiya-regiona (date of access: 03/02/2021).
2. Ryakhovskaya A.N., Schreiber A.K., Kirillova A.N. Development of financing in housing and communal services: Monograph. A.N. Ryakhovskoy, Ed. Moscow: INFRA-M; 2018.
3. Chekalin, V.S. Economy of the municipal economy. Textbook. SPb.: SPbGIEU; 2019.
4. Pikulkin A.V. System of public administration. A textbook. 4th ed. Moscow: UNITY-DANA; 2019.
5. Program "Twelfth Five-Year Plan for Economic and Social Development". [Electronic resource] URL: http://news.sina.com.cn/c/2011–03–17/055622129864.shtml.
6. Chieh-Hua Wen, Jun-Yuan H. A discrete choice model of ocean carrier choice. *Journal of the Eastern Asia Society for Transportation Studies*. 2017;7:795–807.
7. Zotov V.B.. Municipal government system. Textbook. 3rd ed. SPb.: Peter; 2017.
8. Mikheev V. Evolution of the socio-economic model of China's development. *Society and Economy*. 2019;(3–4):148–188.
9. Chin-Shan Lu. Market segment evaluation and international distribution centers. *Transportation Research*. 2019;9(E):49–60.
10. Green Paper on PPPs, Commission of the European Communities; 2018. URL: http://eur-lex.europa.eu/LexUriServ/site/en/com/2018/com2018_0327en01.pdf.
11. OECD. Infrastructure investment data, China. URL: https://data.oecd.org/transport/infrastructure-investment.htm (date of access: 17.05.2021).
12. ILO Statistics. Output per worker (GDP constant 2011 international $ in PPP). ILO modelled estimates, Nov. 2020. URL: https://www.ilo.org/shinyapps/bulkexplorer48/?lang=en&segment=ref_area&id=CHN_A (date of access: 17.05.2021)
13. Borisova V.V. Logistic management in interregional commodity exchange. Rostov-on-Don: Center RGEU "Rinh"; 2019.
14. Wumek J. Lean Manufacturing: How to get rid of losses and make your company prosper. 4th ed. Moscow; 2020. (In Russ.).
15. Kazarina L.A. Improving the efficiency of supply chain management. Izvestiya IGEA. 2019;(4):13–21.
16. Pogudaeva M. Yu., Orkusha M.A. The main forms of economic interaction between private business and the state. *Economic journal*. 2019;(25). URL: https://cyberleninka.ru/article/n/osnovnye-formy-ekonomicheskogo-vzaimodeystviya-chastnogo-biznesa-i-gosudarstva (date of access: 02/30/2021).

ABOUT THE AUTHOR

Egor Kuropyatnik — post-graduate student, Financial University, Moscow, Russia
gosha051198@mail.ru
https://orcid.org/0000-0001-5241-6751

ИНФОРМАЦИЯ ОБ АВТОРЕ

Егор Куропятник — аспирант, Финансовый университет, Москва, Россия
gosha051198@mail.ru
https://orcid.org/0000-0001-5241-6751