Università
Ca'Foscari
Venezia

Master's Degree

in Global Development
and Entrepreneurship

Final Thesis

Financing infrastructure in developing countries: framework and challenges

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Academic Year
2019 / 2020

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INTRODUCTION

Infrastructure development has been gaining more and more attention on a global scale due to its undisputable effect on various dimensions of countries' economic growth. The issue of underdevelopment of infrastructure is common for most nation states; however, it is particularly critical for developing countries where poor level of infrastructure not only hinders economic growth in the face of globalization but also significantly decreases the quality of life. Thus, numerous less developed countries (LDCs) often lack hard infrastructure which is essential for satisfying basic human needs, like water and energy supply networks, not saying anything about soft infrastructure, such as schools and hospitals, which is essential for the development of human capital. Hence, greater infrastructure investment may serve as a big push to unleash the potential for economic growth of developing economies and significantly improve the quality of life. In addition, the renovation of existing and creation of modern and high technology infrastructure contributes notably to sustainability of economy.

However, there is a big issue of underinvestment in most countries, since capital expenditure on infrastructure is usually the first to be cut in the face of macroeconomic crises. Therefore, the gap arises: while the global infrastructure needs are rising, the investments have been massively shrinking, notably decreasing the opportunities for citizens, businesses and country overall to develop and grow.

In this view, it is necessary for countries to search for different sources of capital to finance infrastructure and boost their development, while analyzing the major benefits and difficulties related as well as taking into account financial and political consequences of each of them (i.e. debt burden, political and financial dependency, level of bureaucracy and corruption etc.). The systematic features of developing countries largely determine the effectiveness of deciding on the model of infrastructure financing due to various factors such as high level of public debt, insufficient development of local business, political instability, underdeveloped capital markets and so on. The choice of proper financing mechanism may radically enhance economic growth in developing countries, while using an inappropriate framework would only toughen existing problems.

In this paper, the main sources of infrastructure financing are summarized and reviewed, with a particular focus on developing countries. The first chapter recaps the key findings on how

infrastructure development impacts economic growth in developed and developing countries, particularly through enhancement of productivity, development of labor market, increased quality of life, mobility of people, capital etc. In the second chapter, the main frameworks of infrastructure investment are described and compared, starting from classic ones, like public investments, international banks and public-private partnerships, to more modern mechanisms (for example, value capturing, life cycle contracts and crowdfunding). The chapter also studies the dependency between the level of development of the country, infrastructure sector, type of project and the mechanism of infrastructure financing. Finally, the third chapter analyses few cases of infrastructure investment of the European Bank of Reconstruction and Development in Ukraine in transport and energy sectors and their impact on the economic development of the country, and defines advantages and key issues and challenges of this financing mechanism for developing countries in the Eurasian region.

CHAPTER 1
The impact of infrastructure on economic growth

1.1. Introduction

Given the impending global economic crisis ripening for the last few years and accelerated by the current situation with COVID-19, when countries face unprecedented measures restricting economic activity in favor of sanitary safety, the issue of economic growth has been recently gaining more and more attention from both scholars and policymakers. It is also strengthened by the fact that over 700 million people still live in extreme poverty (Koh, 2019).

Sustainable Development Goals (SDGs), declared by the United Nations (UN) in The 2030 Agenda for Sustainable Development in 2015, define infrastructure as one of the most important pillars for sustainable growth. Goal 9 "Industry, innovation and infrastructure" defines, among others, a target 9.1: "Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all" (UN, 2015). However, good provision of infrastructure is indirectly related to the quality achievement of other goals, such as poverty alleviation, good healthcare, quality education, water and sanitation, affordable and clean energy, urbanization, and economic growth.

1.2. Macroeconomic impact of infrastructure: literature overview

Economic growth has been a major concern in terms of poverty reduction considering the fact that almost half of the world population lives on less than $5.50 a day, while half of this proportion is concentrated in Sub-Saharan Africa (World Bank, 2020). Thus, less developed countries (LDCs) require progress even more as three quarters are estimated to live in poverty. Bad infrastructure cuts economic growth by 2% annually and reduces productivity by 40% (Zamfir, 2016). It is also stated that twenty percent of diseases in LDCs is related to environmental factors caused by inadequate infrastructure (Watson et al, 2010). Improved access to basic infrastructure services reduce inequality, enhance inclusion and facilitate poverty reduction measures (Calderon and Chong, 2004; Calderon and Serven, 2010). In Bangladesh, road

improvement had positive impact on output and poverty reduction, while the poorest households used to benefit the most (Khandker et al., 2009). Infrastructure improvement also shows more effect on the poor in Georgia and Vietnam (Lokshin and Yemtsov 2005; Mu and van de Walle 2011). Geographical factor also matters − transportation investments in Africa seem to have the strongest positive impact on small and remote cities (Jedwab and Storeygard, 2016). Therefore, infrastructure plays a significant role for poverty reduction primarily on the micro-level by providing households with clean water and energy and therefore improving health and freeing time for work. Evidence from Peru displays income growth by 45% higher for the households with access to all infrastructure services compared to other households without it (Chong and Hentschell, 2000). However, poor households excluded from infrastructure services usually pay higher price to satisfy basic needs. For example, in Guatemala people without access to electricity services had to pay more than 60 times more to light their houses with kerosene lamps and candles (Foster and Tre, 2000). Same is true for water supply in Haiti − households lacking water infrastructure connections had to pay from five to sixteen times more per cubic meter due to dependence on private vendors (World Water Council, 2000). Numerous health issues can be reduced by infrastructure improvement as it is proven by evidences from India and many other developing countries, where a significant share of population dies from diseases caused by lack of energy and water infrastructure (World Health Organization, 2001; Smith, 1999).

Physical and institutional infrastructure should reduce transaction costs (communication, transportation, information), as well as contribute to the growth of productivity and economic efficiency. Thus, macroeconomic impact of infrastructure development has gained a lot of attention of scholars. Firstly, Rosenstein-Rodan (1943) claimed that a “big push” of investment-led growth enables country to loosen various constraints, benefit from economies of scale, and generate the needed demand. Aushauer (1989) proved that during the implementation of infrastructure projects, output increases not only in the construction industry, but also in related industries (metallurgy, production of building materials and structures, chemical and woodworking industries, services). Hausmann, Klinger and Wagner (2008) claim that lack of physical infrastructure may affect labor productivity, investment attractiveness of the country, rate of return on investment. Nadiri, Mamuneas (1994) and Morrison, Schwartz (1996) confirmed the presence of a significant effect on the increase in labor productivity in industry as a result of the growth of infrastructure capital. Inefficiencies caused by inadequate infrastructure deduct from ten

to fifteen percent from the country's GDP (Credit Suisse, 2013). Positive effect of infrastructure spending on economic growth has been found in works of Deno (1991), Cantos, Gumbau, Maudos (2005), Buffie et al. (2012); IMF (2014); Abiad et al. (2015); Aruajo et al. (2016); Melina et al. (2016).

Thus, the links between infrastructure investment and economic growth have been well-studied in literature; however, they often show ambiguous results. It happens due to several reasons. Firstly, the positive effect of infrastructure is realized in a favorable macroeconomic situation, which contributes to the efficient allocation of resources and eliminates inflationary and speculative distortions. Secondly, since the infrastructure alone does not create economic potential, but only contributes to the growth of labor productivity and private capital, the deficit of the latter does not allow to assess the effect of infrastructure. The balance between factors of production and the distribution of investments between production and infrastructure capital is a requirement for optimizing long-term economic growth (Kolomak, 2011). Another reason is a different focus of studies: some of them give an emphasis on an investment rate (a percentage of GDP) and show mostly negative and neutral effects, while the majority of them, which focuses on increase in capital stock, tend to show positive results (Arslanalp, Bornhorst, Gupta, 2011). The reason for it is that public investment and capital can grow at different rates, depending on the initial level of capital stock. Existing infrastructure stock requires some amortization and maintenance costs, like deterioration of the road or bridge as a result of the movement of cars and trucks. Thus, public investment in infrastructure can only have a positive effect on growth if it exceeds the necessary costs of maintaining existing capital. The second limitation is restricted budget which pushes countries to find additional funds by increasing taxes, borrowing or reducing other expenses. Thus, raising taxes to finance government spending can distort the economy and reduce productivity growth from public investment. Additionally, studies often describe the relationship between them as a bilateral phenomenon − infrastructure development leads to economic growth which in turn leads to further infrastructure expansion. Fast progress leads to infrastructure constraints that make improvements crucial while enlarging supply of resources to be used. Thus, infrastructure investment and economic growth tend to complement each other; this is supported by the evidence for energy investment and road investment in developing countries (Park et al., 2011). Contrariwise, infrastructure investment tends to decrease in times of economic downturn due to a lack of resources. With a decrease in government investment and capital stock, real GDP growth

slows down. When the capital stock reached its peak, average real growth rates in both advanced and developing economies fell by almost one percentage point (Arslanalp, Bornhorst and Gupta, 2011).

Consistent with economic theory, the level of output is determined by the stock of capital used in production. In the Cobb-Douglas function, the level of output depends on labor and capital, as well as available technology (Douglas, 1967). Arslanalp, Bornhorst and Gupta (2011) have changed the production function, allowing the possibility of fluctuations in the productivity of public investment depending on the initial stock of public capital. By expanding the basic function, they have divided the capital into private (provided by firms) and public (such as infrastructure provided by the state), and evaluated the importance of the latter for output. Evidence proves that the annual growth in capital stock has much more significant impact on economic growth than the percentage of GDP invested annually. Although developing countries have invested in public capital only a slightly larger share of their GDP than advanced economies, capital stock growth has been significantly higher in developing countries.

According to the study, from 1960 to 2000, average government investment accounted for 3.6 percent of GDP in advanced economies and 3.9 percent in developing countries (Arslanalp, Bornhorst and Gupta, 2011). The stock of capital grew almost twice as fast in developing countries than in countries with developed economies, where a significant part of the investment went to replace worn-out capital. This difference in the accumulation of capital stocks can largely explain the long-term difference in the rates of economic growth between countries. This evidence is supported by Estache, Speciale and Veredas (2005): after accounting for the impact of physical and human capital in an augmented Solow growth model, infrastructure explains from eight to twenty percent of total variance across sectors and countries. Thus, net capital stock is a key determinant of productivity, while information on investment flows does not allow us to determine the share of investments needed to replace the depreciable capital stock.

Intensification of public infrastructure investments increases output in short- and long-term perspective which is strengthened by reserve capacity in the economy and high investment efficiency (World Bank, 1994). In the middle-term perspective infrastructure investment stimulates output volume, since infrastructure capital accumulation tends to increase production capacity (Rosenstein-Rodan, 1943). A 10% increase in public investment in infrastructure projects has a positive effect on capital productivity in the private sector in the form of 3-5% growth

(Kazakova, Pospelova, 2017). This effect is explained by the involvement of industries related to the construction of infrastructure, which contributes to the employment growth and industries workload. Thus, LDCs need to consider a rise of infrastructure investments since they usually have bottlenecks in this field.

The reaction of GDP growth to an increase in public capital depends on the initial stock of public capital. In countries where the stock is estimated at less than 60 percent of GDP, an increase in social capital has the greatest impact on growth (Kularatne, 2006). Then this effect decreases, and in the case of countries with a very high stock of public capital, the growth impact is close to zero, which may reflect the inefficiency caused by financing public capital, for example, by raising taxes (Arslanalp, Bornhorst and Gupta, 2011). Any big investment shock is associated with current account balanced and fiscal deficits; thus, tax revenues, growth and infrastructure investments are linked (Park et al., 2011). Domestic savings should expand with no changes in current account where the countries can rely on domestic savings to finance infrastructure projects without calling for external resources (Park et al., 2011). This is proved by the case of India, where investment did not rise higher than domestic savings with no changes in the current account deficit during electricity investment booms. Contrariwise, in the case of usage of foreign borrowings, the current account deficit increases while domestic savings do not change. For example, since highway construction is usually financed by foreign funds or reallocation of domestic investment, there is no effect on domestic savings.

Annual indicators often do not show the long-term impact of the accumulation of public capital on growth, since it takes more than one year (often 5–20 years) to complete infrastructure investments, and their benefits may appear after a longer time. Consequently, longer time horizons, such as five-year intervals, may be better suited to reflect large investments and lags in their effectiveness. Cross-country data in 1950-1992 proved that infrastructure enhancement has a positive impact on economic growth in the long run (Canning and Pedroni, 2008). In advanced economies, the impact of public capital on growth is significant in the short term, but decreases with longer time horizons. In the case of developing countries, the effect intensifies with the lengthening of the time horizon and reaches the highest values for five-year intervals.

Developing countries may not be able to immediately provide significantly high investments due to their limited investment development potential or slow implementation of investment projects. Advanced economies often use public investment to manage demand, in

contrast to emerging and developing economies, which use them to accelerate long-term growth taxes (Arslanalp, Bornhorst and Gupta, 2011).

Hence, increase in public capital stock results in catalysis of economic growth. The short-term effect tends to be stronger in LDCs and emerging economies, while developed countries benefit more in the long term. The impact of public infrastructure investment is often weaker where the initial public capital stock to GDP has been high. Next, budget constraints may wipe out the benefits of enlarged capital stock; LDCs tend to gain more from non-preferential external borrowing. Government revenue tends to increase in the period of shock. Bond markets and bank credit rise along with GDP growth, thus enabling more funds to be invested in infrastructure projects.

Accumulation of capital in private sector requires public infrastructure investment (Jha, 2005). According to IMF, one dollar invested in basic infrastructure returns one and a half dollar into the real economy. It is also stated that a one percent permanent increase in public infrastructure investment results in output growth by around two and a half percent after ten years (IMF, 2014). As a result, a ten percent increase in infrastructure provision surges output by one percent in a long run (Calderon et al., 2015). Twenty years before, the World Bank concluded that one percent increase in infrastructure stocks corresponds to a one percent GDP growth (World Development Report, 1994). Public investment in infrastructure, education and healthcare tends to positively impact economic growth (World Bank, 2007).

Infrastructure improvement tends to attract private investment due to the largely complementary nature of infrastructure services (Cavallo and Duade, 2011). By investing in certain infrastructure projects, the state encourages private representatives to take part in this process. Thus, the construction of a road in rural areas can stimulate the process of integration of this area into the regional economic environment, attract private sector investment and accelerate the economic growth of the region as a whole. The degree of infrastructure development affects the adoption of investment decisions, in which the return on investment plays a fundamental role. The return on investment depends on both the effectiveness of the selected business model and the availability of markets. The mobility of capital, labor, manufactured products is one of the key factors affecting investment decisions. Within the country, barriers to the movement of factors of production are reduced along with the development of infrastructure. Thus, when deciding on the location of production, an important factor is the quality and availability of transport infrastructure,

since the difficult transport accessibility of sales markets may make the cost of the product may become uncompetitive, or the distance from the raw material markets will increase the process time and the final cost of the product. The quality and availability of seaports, railway infrastructure, the logistics development of border areas, as well as their infrastructure, largely determine the investment attractiveness for many industries. For example, seaports and railway infrastructure are adapted for the delivery of bulk and liquid cargo, and not for the transport of containers. Accordingly, the entire logistics system will have a raw material orientation and will not be designed for the transportation of high-tech goods or equipment (Kazakova, Pospelova, 2017).

Trade facilitation and competitiveness enhancement is one of the most evident ways through which infrastructure impacts economic growth (OECD, 2005). Infrastructure enables movement of goods and services, financial and human capital in an efficient way leading to enhanced productivity and growing GDP (Bougheas et al., 1999; Esfahani and Ramirez, 2003; Agenor, 2010; Calderon and Serven, 2010). Physical infrastructure development results in faster total factor productivity growth in manufacturing (Mohommad, 2010). Transport accessibility raises consumer demand for products manufactured by local producers (Kazakova, Pospelova, 2017). World Bank estimates that a 10% reduction in transport costs adds trade flows by 25%, thus making road infrastructure improvement one of the main engines of growth, particularly in LDCs (World Bank, 2001). Alternatively, the increase in the distance in the transportation of goods leads to a decrease in trade volumes by half (Head K., 2000). An increase in the length of the route leads to an upsurge in transportation costs, which ultimately hinders the development of trade. Transport impacts positively on stimulation of economic development, diversification of production and reduction of inter-regional inequality (Kazakova, Pospelova, 2017). In LDCs, infrastructure gap plays a significant role in their lag of global integration because of trade barriers caused by low competitiveness and high transport costs (World Bank 2001). Historical data from India (1870-1930) proves that railroad infrastructure improvement tends to reduce trade costs, reinforce trade and increase real income (Donaldson, 2010). Landlocked less developed countries, which make up a third of all LDCs, suffer from transport problems the most: for instance, freight expenses absorb around 40% of the value of traded goods in landlocked African countries in comparison to 4% in developed countries (World Bank, 2001).

Regional development relies heavily on accumulated infrastructure, with a particular focus on transport and energy infrastructure. Martin, Rogers (1995) and Rietveld (1995) concluded that infrastructural security explains inter-regional differences. Improving transport accessibility contributes to the convergence process (when some regions are developing dynamically due to access to global transport arteries (port, airport), and other regions are lagging behind in the absence of access), which in turn reduces income inequality both between countries and between regions within a single country (Kazakova, Pospelova, 2017). Numerous evidence shows that international competitiveness necessary for export-led growth and urbanization leading to productive economic activity are the main two drivers of long-standing economic growth (Garcia-Escribano et al., 2015). Firstly, efficient infrastructure empowers export operations by shortening the international supply chain and therefore gives local private enterprises opportunities to compete at higher levels of the product value chain (Biller, Nabi, 2013). Market integration was facilitated by developed railroad network in the USA which has led to economic development (Donaldson and Hornbeck, 2016). In colonial India, railroads accelerated interregional and international trade by decreasing trade costs which resulted in higher income level (Donaldson, 2017). Evidence from Africa proves that increased market access positively affects city growth, in turn enhancing urbanization (Jedwab and Storeygard, 2016). Secondly, while urbanization has been a development trend for the last few decades, and more than 68% of people are expected to live in cities by the year 2050 (UN, 2018), transformation of rural areas into urban spaces necessitates infrastructure creation and improvement. Evidence from China proves that the extensive highway network helped large cities in the center of it to develop faster and specialize in manufacturing and business services; in the same time, neighborhoods tend to grow slower and specialize in agriculture (Baum-Snow et al., 2017).

Migration from rural to urban areas affects all types of capital: man-made (factories and infrastructure), natural (water, airsheds and land), social (firms and communities), and human (skills of labor force). Different factors such as technological progress may impact the degree of substitutability between these forms of capital (Biller, Nabi, 2013). Urbanization also leads to several issues to be solved such as stable and clean energy supply, water and sanitation and waste management. Thus, efficient city infrastructure is becoming a greater concern of local authorities.

In addition to enabling an access to country's productive resources, basic infrastructure impacts on the ability to deliver goods and services, while reducing costs of it: by increasing the

availability of the market, time and material costs for the transportation of goods are reduced, favorably affecting the competitiveness of goods which is specifically crucial for developing countries (Ravn, Mazzenga, 2004). With increasing transport accessibility, labor mobility is also growing: more qualified personnel are moving to regions where there is a demand for high-quality human capital. In the same time, the high mobility of production factors can lead to an increase in regional inequality, since entities with high labor productivity will not only produce goods with higher added value, but will also attract labor and financial resources from less developed regions with a low level of welfare. At the same time, as the development of transport infrastructure facilitates the flow of labor and capital from less prosperous regions to more profitable ones, at the national level, the effect of investments in transport infrastructure will be more significant than at the level of a single region (Cook, Munnel, 1990; Kazakova, Pospelova, 2017).

For instance, a "hub concept" is based on benefits of agglomeration and creation of so-called commercial, knowledge and infrastructure hubs which in turn stimulate economic progress. These "agglomeration dividends" enable growth in condition of a "principle of connectivity", thus linking hubs into one well-functioning system. Infrastructure underlies the industrial agglomeration process, in which new industries are concentrated around already existing industrial clusters (Mayer, 2003; Redding, Venables, 2004).

Telecommunication is an essential pillar for procuring of state and local knowledge hubs. Evidence from 21 OECD countries for over twenty years shows significant positive link between telecommunication infrastructure and economic growth (Roller and Waverman, 2001). Cross-country differences in per capita GNP growth are related, inter alia, to telecommunications infrastructure (Norton, 1992). While services sector has gained the greatest share of economy in most developed countries, it is turning out to be a potential point of growth in less developed countries as a large communication technology and information market remains unexploited. The Internet has become the major driver of international trade giving equal opportunities to industrialized countries and LDCs. Supporting the outsourcing of services (soft programming, clerical support etc.), telecommunication technologies may include developing countries to global production and service networks, thus allowing for knowledge and experience spread as well as jobs creation. Telecommunication achievements also help small businesses to get access to global market with minimal costs as well as facilitating e-commerce. Evidence from Sri Lanka shows that development of telephony in rural areas intensified farmers' share of the price of crops sold

in the capital city by 30% (World Bank, 2001). The development of the industry is enabled and reinforced by the quality of the correspondent infrastructure: starting from “hard infrastructure” such as electricity, telephony and Internet coverage and bandwidth to “soft infrastructure” − skills of labor force such as level of English, technological intelligence etc. (Biller, Nabi, 2013). A “digital divide” due to ICT infrastructure lags has been defined as one of the major issues strengthening the gap between rich and poor countries (UNDP, 1999).

Together with a direct impact, the infrastructure improvement indirectly influences human capital: thus, access to telecommunications may increase level and quality of education, adequate water supply enhances workers’ health and sanitation, wide transport network provides opportunities for labor demand to meet the supply etc. Thus, people not living in cities themselves may benefit from agglomerations when they have a chance to be connected to them with the means of infrastructure.

Not only does well-developed transport infrastructure (travel speeds, road network condition) facilitate movement of goods and people within the region or country, but it also attracts international tourist flows and makes the country convenient for the transfer of goods and energy in case of favorable location.

Next, the so-called “economic infrastructure”, or basic infrastructure − utilities that are essential for development of an economy (transport and roads, energy supply etc.) − often empower economic activities and services that ensure well-being of the community (housing, education, healthcare), or “social infrastructure” (Hall and Jones, 1999). Thus, electricity and telecommunication are essential in most schools and hospitals in modern world; however, it is important to remember that these entities lack basic infrastructure in many extremely poor countries: for example, in some African countries due to lack of efficient road infrastructure in rural areas about 30 percent of perishable food products are damaged while being transported to the market centers (UNDP Africa, 2012). Evidence also shows positive effect on education and healthcare in rural areas of Philippines and Morocco with better infrastructure facilities (UNCTAD, 2005). In addition, as the development of economic infrastructure rises, LCDs and emerging economies may benefit from re-allocating public and private investment from economic to social infrastructure (Acosta-Ormaechea and Morozumi, 2017).

Biller and Nabi (2013) developed a framework that links urbanization, agglomerations, high-productivity jobs and economic growth to infrastructure services, bonding these factors

interdependent into self-feeding circle (see Figure 1). In addition to the infrastructure influence described above, the exchange of information and experiences allows labor and production to learn from each other and apply technological advances. Agglomerations tend to pull workers to urban areas, thus influencing infrastructure demand, highly productive jobs and economic growth overall. It is also stated that agglomerations build international connections between cities resulting in enhanced production and sustainable growth. Therefore, transport, energy and communications infrastructure that enhances local, regional and international connectivity nurture agglomerations, urbanization, high-productivity jobs and economic growth.

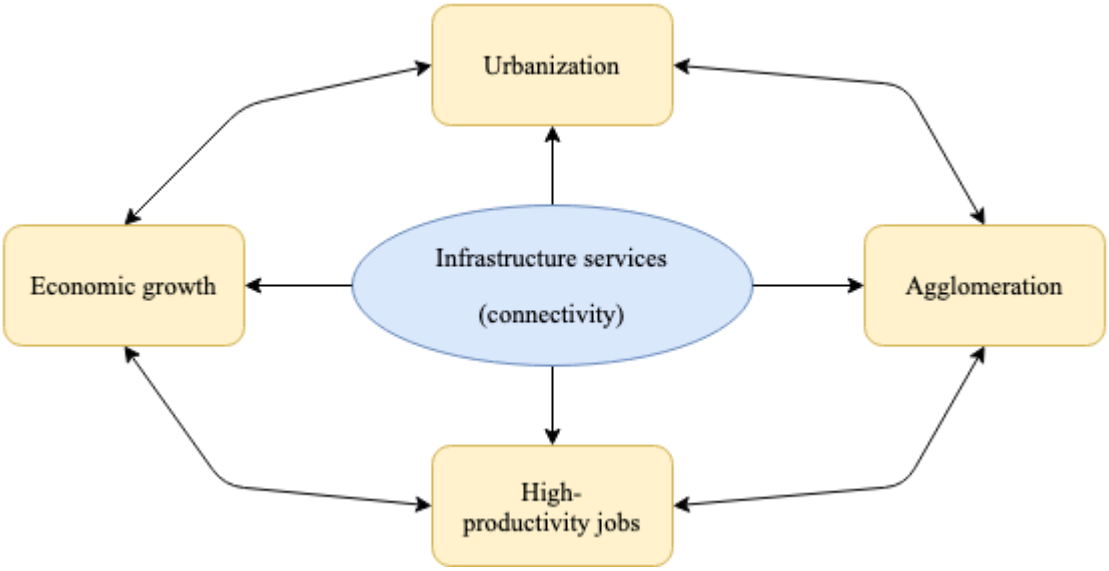


Figure 1. Framework linking infrastructure and economic growth

Source: Biller and Nabi, 2013

The impact of public investment shocks (sharp increase of investment) is well-studied in literature. In developed countries, shocks have significant and long-term influence on output: a one percent of GDP surge of investment spending increases output by 0,4 percent in the same year and by one and a half percent 4 years after the shock (Coenen et al., 2012; Eden and Kraay, 2014). Shocks also usually reduce the debt to GDP ratio, although the decrease in debt is only short-term: a one percent increase in public investment decreases debt to GDP ratio by 0.9 percent. Private investment rises in parallel with GDP due to increase in public investment (IMF, 2014).

The macroeconomic effects of public investment shocks vary significantly depending on the economic regime. During the periods of low growth, the public investment shock increases

production by about one and a half percent in the same year and by three percent in the medium term (Auerbach and Gorodnichenko, 2012; Blanchard and Leigh, 2013; IMF, 2013 and 2014). Shocks also reduce the ratio of public debt to GDP at low growth rates due to a significant acceleration in output growth.

The macroeconomic consequences of government investment shocks are much more significant in countries with high economic efficiency of public investment, both in the short and medium term: in countries with highly effective public investment, the public investment spending shock increases output by about 0.8 percent in the same year and 2.6 percent four years after the shock. Contrary, in countries with low efficiency of public investment, the impact on output is about 0.2 percent in the same year and about 0.7 percent in the medium term (IMF, 2014). Public investment shocks result in approximately nine percent reduction in the debt to GDP ratio four years after the shock in countries with highly efficient public investment.

The impact on output is stronger when public investment shocks are financed by debt than in the situation when they do not affect the budget: debt-financed shock of public investment of 1 percent of GDP leads to an increase in output by about 0.9 percent in the same year and by 2.9 percent four years after the shock whereas budgetary-neutral financed shock seems to have no significant impact (IMF, 2014). However, in countries with already high public debt, this type of financing can increase sovereign risk and the cost of financing in case of low investment productivity which altogether results in debt accumulation (Ostry, Ghosh, and Espinoza, 2014). Investment inefficiency is a rare case in developed countries, so this is true mostly for LDCs. The evidence from emerging economies shows that debt-financed public spending is related to the increase and variability of sovereign risk spreads compared to tax financing (Akitoby and Stratmann, 2008).

If monetary policy is rigid, the short-term effects of shocks from public investment are weaker. A steady increase in government investment by 1 percent of GDP in terms of soft policy increases production by about 2 percent in the same year, reduces for the third year after the shock as the monetary policy normalizes, then it surges by 2.5 percent in the long run due to the subsequent increase in the volume of state capital (IMF, 2014). Differences in the degree of public investment efficiency and returns on public capital also affect the macroeconomic response. The debt to GDP ratio decreases by about 3 percent of GDP three years after the shock, and then rises

slightly, stabilizing at about 1.5 percent of GDP below the basic year five years after the shock (IMF, 2014).

LDCs usually have common features such as low public investment efficiency, restrained development potential and limited access to international and domestic markets for borrowing (Buffie et al., 2012). Only half of the increase in government investment in emerging and developing economies in 1980-2012 turned into productive capital (IMF, 2014). In developing countries, public investment shocks are associated with a permanent increase in output stabilizing after the fifth year at about eight percent higher level, indicating the value of the public investment multiplier at the level of about 1-1.3 (IMF, 2014). Other authors show more modest but still positive results: growth in public investment by one percent of GDP increases production by 0.25 percent (Foster and Briceño-Garmendia, 2010; Dalgaard and Hansen, 2005), which gradually surges to about 0.5 percent in the fifth year or to one percent in four years (Eden and Kraay, 2014). The estimated value of the medium-term multiplier is from 0.5 to 0.9, which is slightly lower than the one calculated for developed countries (Pritchett, 2000). There is no certain evidence of impact on debt to GDP ratio: even though there is some reduction of it five years after the shock, it may be caused by investment boom and increased income from commodity exports as a result of output growth (Warner, 2014). Some evidence even states that debt financing causes growth of debt to GDP ratio in developing countries with no commodities export (IMF, 2014; Warner, 2014).

Due to the fact that developing countries have less reserve capacity, a rigid monetary policy and low efficiency of public investment, a public investment shock of a similar scale has a significantly weaker long-term impact on output in emerging and low-income countries than in developed economies.

In countries with lower investment efficiency, a 1 percentage point increase in government investment will increase production by about 2.2 percent in the long run, compared to about 2.8 percent in countries with fully efficient public investment (IMF, 2014). Therefore, in countries with low investment efficiency, the ratio of debt to GDP decreases to a lesser extent than in countries with fully efficient investments. Additionally, elimination of inefficiency of public investment by the year 2030 will provide an increase in fixed assets to the same extent as a surge in public investment by five percent of GDP in emerging economies and by fourteen percent of GDP in LDCs (IMF, 2014).

1.3. The importance of proper infrastructure investment management

Infrastructure governance is another factor influencing its impact on economic growth: for example, evidence from Sri Lanka shows that so-called “spatially blind policies” − kind of the policy which does not associate investments to specific regions − tend to create quality human capital by equalizing opportunities of the regions within the country to grow (Biller, Nabi, 2013).

Despite all the positive effects described above, the question of link between public investments in infrastructure and economic growth is still widely discussed. While numerous scholars relate infrastructure spending to higher rates of economic growth and public benefits, empirical research show different results on infrastructure investments effects on economic growth since they are difficult to separate from other factors of influence such as human capital spending or doing business conditions. Nevertheless, it is generally agreed that quality of physical infrastructure positively affects productivity, international competitiveness and ability to attract investments (Akitoby et al., 2007).

However, as many countries use debt to finance additional expenses, there is still an issue of investment allocation since there is high debt-GDP ratio which leads to some budget constraints. Values of public investment multipliers and long-term profits from state capital impact determining the reaction of the dynamics of the public debt to GDP ratio on public investment increase. GDP growth may initially outperform debt growth, and a corresponding increase in tax revenues may offset the surge in spending on public investment. The growth of public investment together with sufficiently high values of short-term multiples, the effectiveness of public investment and the elasticity of output by state capital can “pay off” in the sense that it leads to a decrease in the debt to GDP ratio. At the same time, numerous examples from different countries (and LDCs in particular) show that public investments are often ineffective, with low quantifiable benefits (World Bank, 1994; Pritchett, 2000; Caselli, 2005; Warner, 2014).

Macroeconomic effects of public investments seem to be one of the main factors influencing cost-benefit analysis of infrastructure investment increase. Due to lack of data for infrastructure investments and accumulated infrastructure capital in most countries, in most literature sources authors use public investments dynamics and accumulated public capital instead together with infrastructure indicators of installed capacity, such as longevity of roads, Internet bandwidth, kilowatts of electricity generating capacity etc. It seems reasonable since infrastructure

makes a big share of public investments as well as in terms of infrastructure investments, public financing is still one of the main sources worldwide (IMF, 2014). Secondly, since the capacity increased in the main goal of infrastructure investments, not the amount of funds invested, it seems reasonable to focus on infrastructure outputs.

Public investment increase tends to raise output through effect on demand in the short term as the capacity of the economy grows with the surge of infrastructure capital, and determines the effect on supply in the long term (Delong and Summers, 2012). These effects may have varying impact depending on the strengths of few factors: public investment efficiency; financing source; level of capacity utilization and soft monetary policy (Romp and de Haan 2007; Straub 2011; Bom and Ligthart, 2014). An increase in government spending also affects the debt to GDP ratio, which may increase or decrease depending on the value of the budget multiplier and the elasticity of income in terms of output. For instance, ineffective infrastructure project selection and management leads to slower productive capital accumulation and therefore lower long-term output increase. On the contrary, effective public investments together with strong infrastructure needs, significant share of unused capacity in the economy and a soft monetary policy are perfect preconditions for infrastructure investments increase (IMF, 2014).

"Efficiency borders" is a method of assessment of public investment efficiency (Albino-War et al, 2014). It includes measures of infrastructure investment quantity (expressed as a per capita sum of previous public investment adjusted for depreciation) and quality ("overall infrastructure quality" index from the World Economic Forum World Competitiveness Report). To determine a border of efficiency, a country's quality of infrastructure is compared with the one of other countries with the same or a higher level of fixed assets; the further the country is from the efficiency border, the lower is its efficiency index. Evidence shows that on average, emerging and developing countries' index is 10–20 percent lower than in advanced economies (Albino-War et al, 2014). There is also big variance inside each income group indicating opportunities for efficiency improvement.

An analysis of the public investment management quality is a powerful tool to define the true reasons of inefficiency. The Public Investment Management Index assigns scores to countries in four phases of public investment management: project evaluation, selection and budgeting, implementation, and retrospective analysis (Dabla-Norris et al., 2012). According to the Index, emerging economies usually score better than low-income countries (Dabla-Norris et al., 2012).

Sources of financing also influence infrastructure investment impact on output growth: thus, debt financing tends to result in higher production growth than budget-neutral investments, according to evidence from developed countries (IMF, 2014). However, in countries with high debt to GDP ratio and uncertain infrastructure investment benefits increase in public investment through debt financing may lead to negative market reaction by financing cost upsurge and higher debt pressure. The abovementioned issue is specifically relevant for LDCs where high infrastructure needs as well as inefficiency of public investments and lack of production capacity are present − consequently, investment increase may have limited effect on output growth and enhance debt to GDP ratio. Consequently, the composition of public investment has important macro-fiscal effects. Therefore, some weighted assessment and analysis of risks, costs and profits is needed to define appropriate sources of capital.

In this way, while talking about economic development as a result of public investment growth, some significant macroeconomic consequences have to be considered. The impact of investments depends on the rate of return on public capital, the type of financing, the effectiveness of public investment, the response of the private sector and the ability of policy makers to conduct fiscal consolidation and manage debt.

As it was mentioned before, improvement of public investment governance is the central issue to balance debt ratio and output growth in most countries, including LDCs. It can be reached through better assessment and selection of infrastructure projects by the identification and elimination of bottlenecks in the infrastructure, some deep analysis of costs and benefits, cost-based risk assessment and budgeting principles from scratch as well as betterment project implementation (IMF, 2014).

It is evident that infrastructure investments overall have positive impact on country's and regions' economic growth, output and private investments; however, it varies between different countries and sectors. While infrastructure projects require greater emphasis on operating, maintaining, integrating and planning their assets to reinforce urbanization and high-value added exports, prioritization according to current and prospective future needs is required to maintain the balance between infrastructure investment and current consumption or other investment needs. Country's economy structure affects resource allocation as well: for example, access to adequate water supply may have a direct impact on growth in a country where water-intensive industries are prevalent − same is true for energy supply, transport and communication network etc. (Biller,

Nabi, 2013). Emerging economies and LDCs need to focus more on social infrastructure, specifically education, due to low stock of human capital (Atolia et al., 2017). However, this type of infrastructure, as compared to economic infrastructure, requires larger current expenditures for operations and maintenance and increases productivity mostly in the long run (24 years compared to 15 years). Additionally, infrastructure for education tends to fuel government debt threefold higher than road infrastructure. One or another type of infrastructure can be especially important in a certain period of time. In this regard, the optimal combination of various types of infrastructure at different stages of economic development is of great importance. For example, the integration of a rural region or locality into a national road network without the appropriate energy or telecommunication infrastructure can have a very weak economic effect. Therefore, some balanced allocation policy is needed to take advantage from both complementary types of infrastructure. To ensure long-term economic growth, it is necessary to search for the optimal combination of infrastructure investments in various industries, including industrial and social spheres.

Infrastructure projects such as roads construction, development of railway networks and modernization and construction of sea and air ports require large capital investment and very high initial costs which in the same time bring benefits in the long term (usually more than 10-20 years) which makes it hard for private entities to measure returns on their investment. They usually become natural monopolies since single-entity service delivery is usually more cost-effective (Kazakova, Pospelova, 2017). Next, as infrastructure investments are aimed at bringing quality improvement and social benefits, not the quantified ones, social return from them is usually higher than standard return rates for private entities. These conditions reduce opportunities for private financing of infrastructure projects alone. Therefore, public entities have to balance future social and economic benefits from infrastructure development with financing costs and budget constraints. The costs of some infrastructure projects with high social returns cannot be reimbursed by usage fees or the price or increase in tax revenue from increased activity. Thus, some social benefits may have negative consequences as well.

In general, capitalizing on economic growth and development by increasing public investment while minimizing the risks to debt sustainability in developing countries requires policymakers to increase the efficiency of public investment, strengthen debt management capacity and budget flexibility. The main role of infrastructure is to ensure the reliability and quality of services; in this regard, the use of the physical characteristics of infrastructure capital in

empirical assessments, without taking into account the degree of customer satisfaction, which includes the introduction of innovations, management excellence, efficient use of existing facilities, distorts its real assessment. Efficiency implies the proper allocation of investments by sector, as well as the production of government assets at the lowest cost. When public investment is ineffective, increased spending can lead to a budget deficit growth without increasing the number and quality of government assets that can support economic growth.

Significant improvements in the provision of infrastructure services is another factor affecting the quality of infrastructure projects (Biller, Nabi, 2013). Infrastructure services can be augmented by increasing investments in new infrastructure projects − so-called "greenfield investments" operated in primary markets, as well as increasing operating and maintenance costs − "brownfield investments" operated in secondary markets, which reduce the depreciation rate of capital and extend the life of the infrastructure being used. Greenfield investments often prevail over operating and maintenance costs (Rioja 2013), which are usually the first to be cut in times of severe budget constraints (Adam and Bevan 2014). However, lack of repair and maintenance investments could lead to even greater costs in the future.

As it was described above, infrastructure provides numerous benefits to growth; in the same time, it implies the budget constraints and issues of infrastructure governance. Therefore, to be investment-worthy, infrastructure projects have to provide essential service to the community, get long-term stale cash flows and strategic competitive advantage regulated by competition authorities or economic regulators. Overall, for economies with clearly defined infrastructure needs and an efficient public investment process that have back-up economic capacities and a soft monetary policy, there are good reasons for increasing public investment in infrastructure (IMF, 2014).

1.4. The history and current state of global infrastructure financing

In the past, the macroeconomic response to public investment in emerging and developing economies was much more widespread than in advanced economies. Most investment booms have occurred in emerging and developing economies, and only a few in advanced economies. Infrastructure built in most developing countries in the 1960s strengthened economic growth for a while. In developed countries, the rate of public investment since the beginning of the 1970s has

tended to decrease due to worsening of growth prospects and macroeconomic conditions caused by oil shocks. In developing countries, by contrast, the rate of public investment in the 1970s increased significantly, although in the 1980s it returned to its previous level. The growth was attained by formulation of policies aimed at expanding regional market size and promoting regional trade, facilitated by World Bank (WB), International Monetary Fund (IMF) and other international institutions (Yehoue et al., 2006). In addition, demographic pressures, persistent fiscal crises and enhanced urbanization resulted in disparity between constrained supply and rising demand for infrastructure in many developing countries, leading to large cuts in public expenditure, under-maintenance of infrastructure, and lack of investment in new infrastructure in many sectors. Several years of underinvestment in infrastructure have contributed to reducing potential growth. Public capital stocks as a percentage of GDP peaked in advanced economies in 1983 and in developing countries in 1985. These peak levels accounted for 60 percent of GDP. Public investment booms are concentrated in the 1970s, when there was a significant increase in government capital in emerging and developing countries, and also in the mid-2000s, when public investment rates rose again in this group of countries (IMF, 2014). Beside these shocks, governments have confronted a growing need to find alternative ways to finance infrastructure.

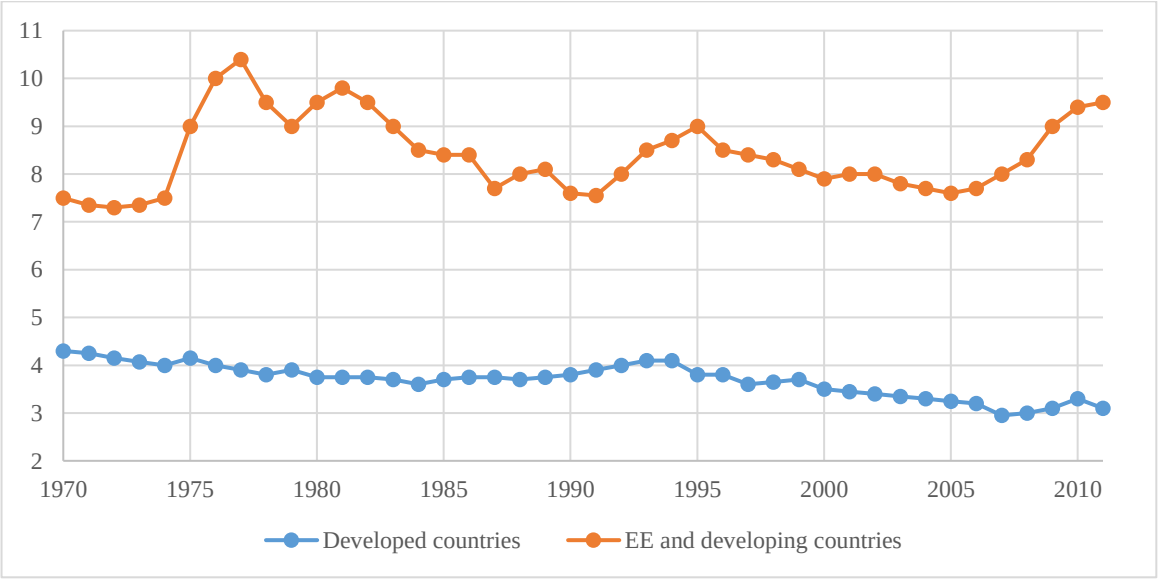


Figure 2. Public investment as a percentage to GDP in developed countries and emerging economies and developing countries

Source: IMF data (IMF, 2014)

Contrariwise to expectations, the privatization process of the 1980s did not stimulate greenfield infrastructure investment by private sector (Estache and Fay, 2007; Martimort and Iossa, 2012). Public sector infrastructure up to the 1980s in LDCs and developed countries was followed by large cost overruns, poor maintenance, corruption, and little positive externalities (Arezki et al., 2016). Since the late 1970s, more and more attention has been paid to increasing the role of the private sector in this process (Kessides, 2004). However, private capital involvement has had positive consequences such as greater efficiency, better maintenance and new sources of funding, with the development of PPPs. Apart from the public-funded efforts in infrastructure development in China and a few other Asian countries, the growth in infrastructure development has slowed.

After the global financial crisis, economic revival continues, but remains weak. In advanced economies, demand remains steadily low (Summers, 2013; Teulings and Baldwin, 2014). Many developing countries are still recovering from pre-crisis development: after the crisis, growth rates have risen sharply, but over the past few years they have fallen below the levels observed in the decade before the crisis (Cubeddu et al. 2014). The reason for this may be structural factors such as lack of infrastructure. In many emerging economies and LDCs, infrastructure bottlenecks are considered a limiting growth factor in the short term (Calderón and Servén, 2008; Foster and Briceño-Garmendia, 2010; Fujita, 2012; G20 Development Working Group, 2011). A number of developing countries and LDCs have significantly increased public investment in recent years to unleash their economies, faced with declining external demand and infrastructure bottlenecks (Figure 3). Infrastructure investment is often seen as a strategy to endorse internal integration and export competitiveness (Garcia-Escribano et al., 2015). In advanced economies, increased investment in infrastructure can be a much needed impulse for demand and long-term productive capacity. As stated by finance ministers and central bank governors of the Group of 20 countries in their communiqué in Sydney, increasing investment in infrastructure “is critical to boosting the global economy” (G20, 2011). Thus, positive macroeconomic signals in emerging markets and a new political discourse in developed markets make infrastructure development a global priority.

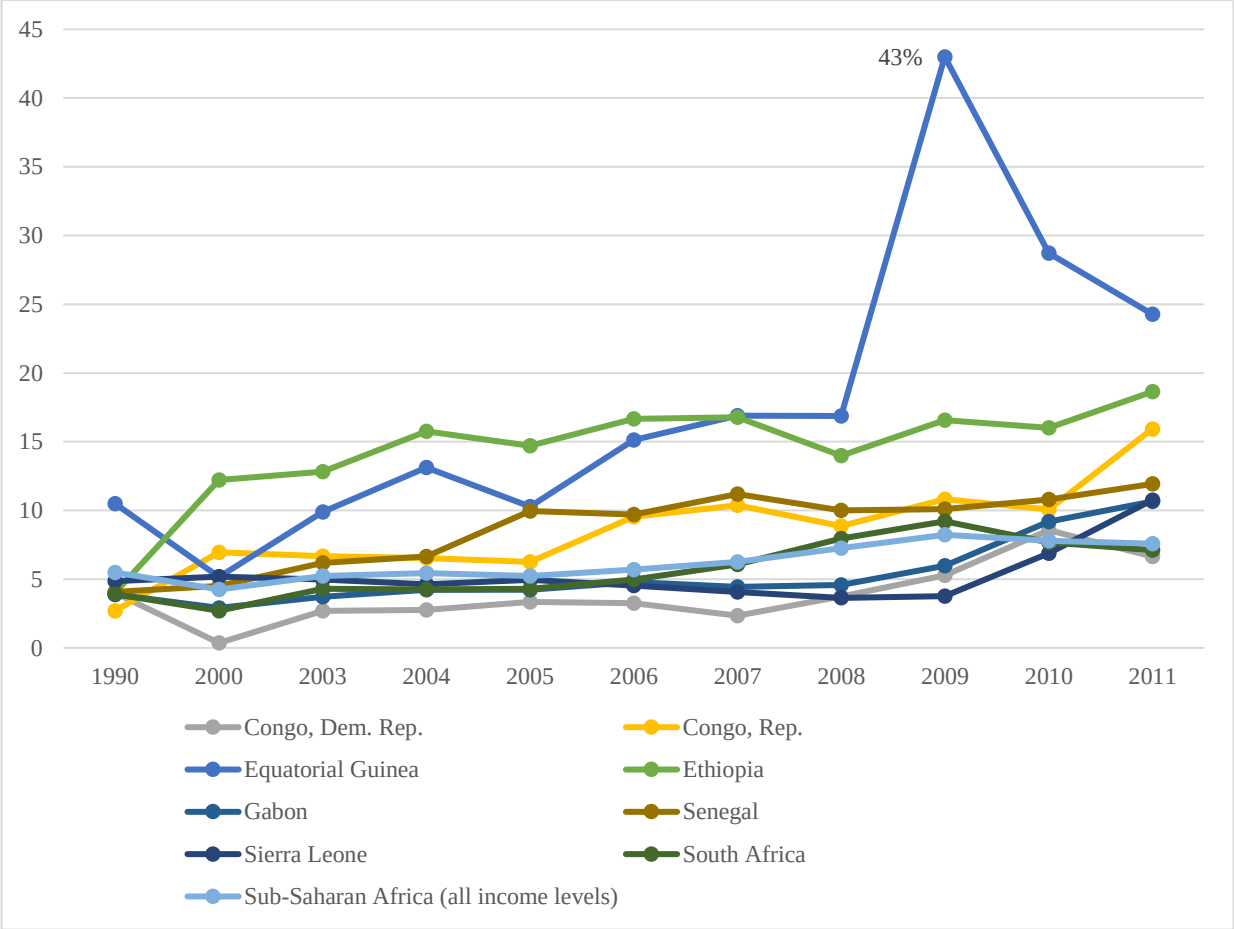


Figure 3. Public investment as a percentage of GDP in developing economies and LDCs, 1990-2011

Source: Africa Development Indicators (World Bank); Going for Growth (OECD)

Infrastructure improvement in most parts of the world has been seriously lagging over the past three decades. In emerging and low-income countries, the provision of per capita infrastructure services is still several times behind developed economies (IMF, 2014). Underinvestment is especially prominent in greenfield projects since brownfield projects were conceded to the private sector through concessions. There is an evident infrastructure assets gap in LDCs in terms of quality, quantity and accessibility as compared to emerging economies despite the intensification of the public investment process over the past 15-20 years (Gurara et al., 2017). Even in some advanced economies, where infrastructure capital is high compared to the rest of the world, the quality of existing infrastructure is not high enough due to aging infrastructure, poor maintenance and investment. For example, the American Society of Civil Engineers (2013) notes

the poor or mediocre condition of 32 percent of the main roads in the United States at present, and the U.S. Federal Highway Administration considers annual investment of between $124 billion and $146 billion to substantially improve conditions and performance.

The World Economic Forum (2013) estimates global spending on infrastructure investment to amount to US$3.7 trillion per year, with annual spending gap of at least US$1 trillion. Currently, access to infrastructure services is highly unequal, which only gets worse in the poorest countries. Many poor households stay left out infrastructure services, and have to pay higher prices to get access to them. For example, many African LDCs such as Mozambique, Chad and Uganda struggle to provide equal access to electricity, supplying it to only the richest 20% of the population (UNCTAD, 2005). Globally, 840 million people lack access to electricity, two-thirds of whom live in Sub-Saharan Africa (540 million). Among LDCs, on average only 40 percent of population have access to electricity (ITU, 2018).

1.5. Current and prospective infrastructure needs: global and income group view

Global infrastructure investment needs until 2030 are estimated at 60 percent (McKinsey Global Institute, 2013). To meet these aggregated needs, infrastructure investment should increase from a total of $36 trillion to $57 trillion over the next 10 years (Figure 4). Modeling the relationship between infrastructure investment and GNP using the sample of 52 countries from 1980 to 2002, it was found that in order to maintain the GNP growth rate of 3.6 percent per year, it is necessary to invest in power supply systems and telecommunication infrastructure 0.2 and 0.7 percent of GNP, respectively (Bogetic, Fedderke, 2006). To achieve an annual economic growth rate of 6%, a doubling of these indicators will be required. The calculations did not take into account the quality level of the existing infrastructure, so the real volumes of the necessary investments may turn out to be significantly higher. Infrastructure investment needs in developed countries make up three percent of GDP reaching 9 percent in emerging economies and 15 percent in LDCs (World Economic Forum, 2010, 2012). In particular, sub-Saharan Africa requires from 9 to 13 percent of GDP investment annually for at least ten years (Sachs and others, 2004; Economic Commission for Africa (UN), 2005). Thus, there is a large infrastructure gap (on average $1 to 1.5 trillion per year) to address to attain sustainable growth in many countries. In particular, in EU total investment needs by the Juncker investment plan were projected at €315 billion over three

years (European Commission, 2019) while European Investment Bank (EIB) has an annual volume of financing around €50-70 billion (Arezki et al., 2016).

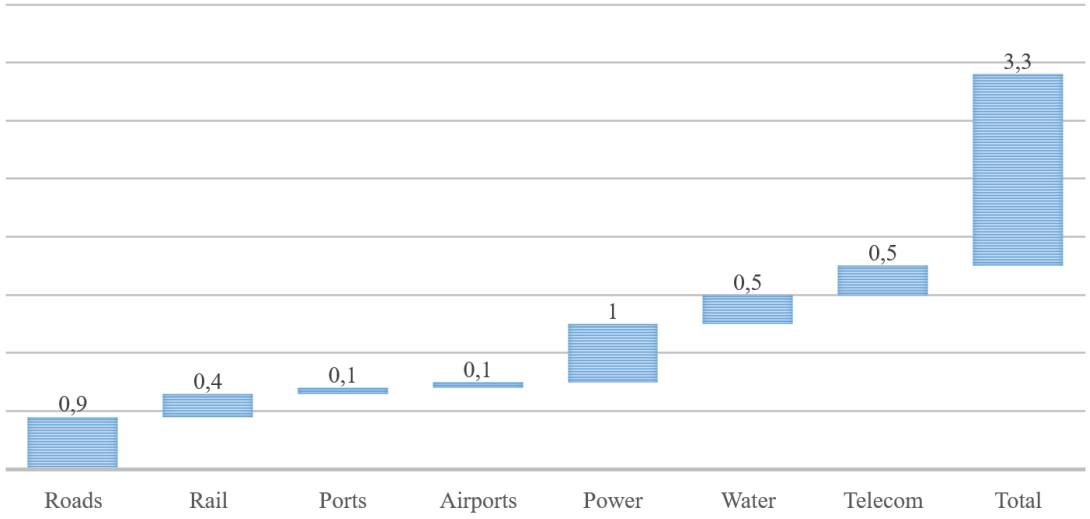


Figure 4. Average annual need for economic infrastructure, $ trillion, constant 2015 dollars, 2016-2030

Source: McKinsey, 2016

The highest demand for infrastructure investment comes from emerging economies and LDCs: while from the beginning of the century, more than 70 percent of global infrastructure investment originated in advanced economies, over the next 18 years emerging economies are likely to account for 40 to 50 percent of all infrastructure spending (McKinsey Global Institute, 2013). Much riskier greenfield infrastructure projects, which mostly take place in emerging economies, while involving a higher time to maturity and greater regulatory and enforcement risk, attract around 70 percent of current funds available (Arezki et al., 2016). Since many investors continue to demand higher returns, the higher risk will impose them to be more selective considering the riskier nature of green-field investments. In recent years, many developing countries have been increasing investments in infrastructure (Figure 3), mainly by the means of government spending, and also due to the growing participation of the private sector, mainly in the form of PPPs. The rise of private funding was facilitated by market liberalization (Hammami et al., 2006); however, in many developing countries, this has led to high construction and maintenance costs (Estache and Fay, 2007). Fast-growing countries are characterized by high government investment, which makes up at least 7 percent of GDP (Commission on Growth and

Development, 2008). Globally, it is anticipated that the ratio of public investment to GDP will increase, currently amounting to about 7 percent of GDP, to 14 percent of GDP in about three years and its subsequent stabilization at about 9 percent of GDP (IMF, 2014). IMF calculations show that such an increase can significantly increase production in the long term (by about 7 percent after 25 years), but it can also increase the debt-to-GDP ratio in the short and medium term, even when financing part of the growth of investments through preferential loans and grants.

We can expect higher availability of funds to invest in economic infrastructure due to the large size of assets under management of long-term investors ($85 trillion), including traditional institutional investors and sovereign wealth funds in Asia and the Middle East, who are searching for longer term assets as savings vehicles. Additional allocations for infrastructure financing by institutional investors would increase infrastructure investment capital by $2.5 trillion through 2030 (McKinsey Global Institute, 2013). Long-term investment gradually gains more attention, especially after the world financial crisis, since there is less competition on the market and high demand while harvesting the illiquidity premium (Arezki et al., 2016). Greenfield infrastructure investments in LDCs and brownfield investment in aging infrastructure in developed countries require new sources of funding to accelerate economic growth, recovery from financial crisis and contribute to government debt decrease.

While setting up infrastructure priorities, it is important to mention that individual countries have different infrastructure needs, and increased investment in infrastructure should only be considered if there is a documented need and economic benefit. Infrastructure investments should tackle the main disparities identified, be executed effectively, and be maintained and operated in a way that ensures endurance in service delivery (Ross et al., 2014). In advanced economies, as populations are getting older and birth rates aren't rising, there is an issue of nation aging − a demographic shift towards older age. Thus, there is a call for provision of infrastructure services needs in social infrastructure: demand of individuals for healthcare will increase over time as well as age care since people want a better quality of later years' life. Secondly, as the demand for clean energy rises, carbon economy is getting more attention through investment in carbon capture and storage plants, transmission networks and renewables. Particularly in EU, energy becomes the major investment sector, followed by transport and communications (Arezki et al., 2016). In the same time, these projects are usually small, and occupy a small market size comparing to social infrastructure and other sectors. Furthermore, governments will incentivize the private sector to

deliver carbon economy initiatives. In the USA, contrariwise, renovation and enlarging of transport network (including highways, bridges, railroads, and other transit systems) is the paramount concern.

In developing countries, at the same time, there is still a need in basic infrastructure − water and power supply, transport infrastructure such as road network and ports. Developing countries with lower GDP per capita tend to spend less on education than on road infrastructure, both in relative and absolute terms, as a share of GDP (Atolia et al., 2017). China is trying to overtake the rest of the world by investing hundreds of billions of dollars in new expressways, dams, highways, ports and airports (Figure 5).

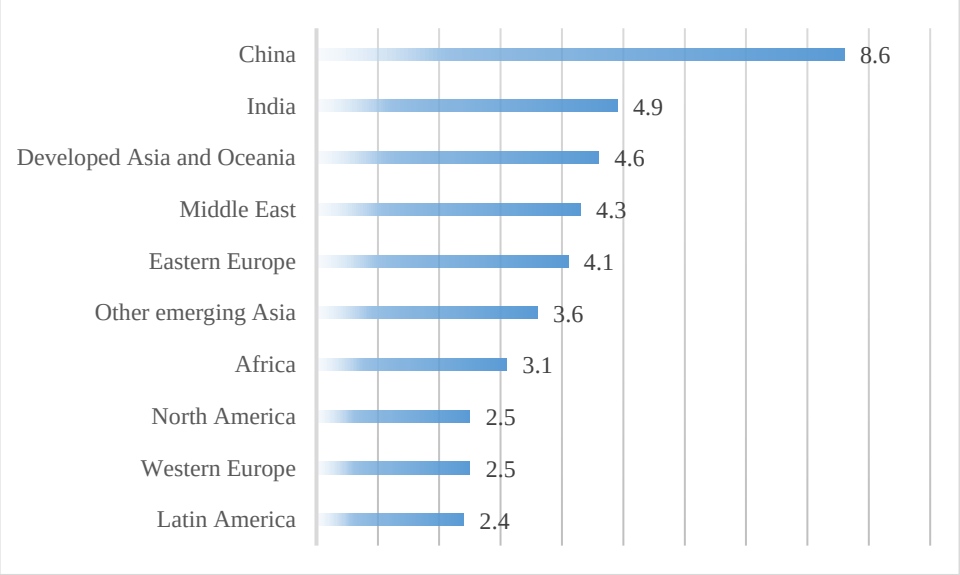


Figure 5. Infrastructure spending, annual average as a percent of GDP, 1992-2013
Source: McKinsey, 2013

In fast-growing urbanized areas, intensive construction of new metro and light metro lines is planned, as well as the creation of high-speed bus lines connecting residential areas with the industrial and commercial centers of these areas. In the same time, lack of infrastructure causes the high speed of infrastructure services growth: for example, telephones and Internet bandwidth have spread at an enormous and unprecedented rates over the past ten years. There were 22 million fixed and 37 million mobile lines in Africa in 2002, and particularly 10 million fixed and 26 million mobile telephones in Sub-Saharan Africa (ITU, 2003). The same trend has continued in all LDCs

until now: mobile subscription rate doubled from 2010 to 2017 while 3G coverage increased has increased tenfold (Figure 6).

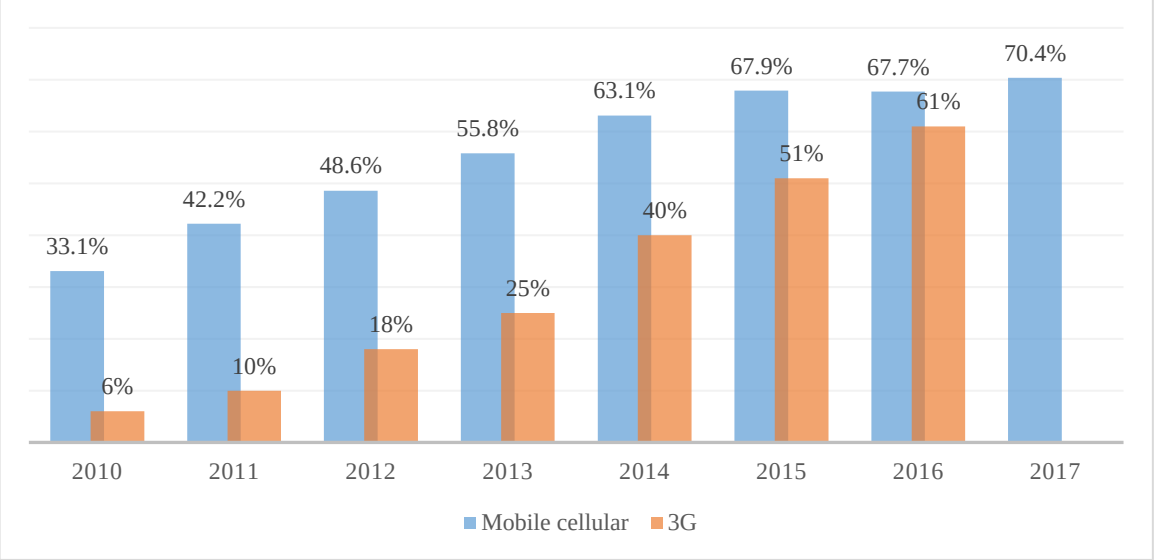


Figure 6. Mobile cellular subscriptions (per 100 inhabitants) and 3G coverage (% of population) in LDCs, 2010-2017

Source: ITU, 2018

However, there is still a significant opportunity for growth: despite the huge improvement in telecommunication availability around the globe, almost a half of the households in the world don't have the Internet access, whereas in Africa only one fifth of the population is provided with Internet connection (Figure 7). Overall, in LDCs Internet access is available to only 18 percent of population (ITU, 2018).

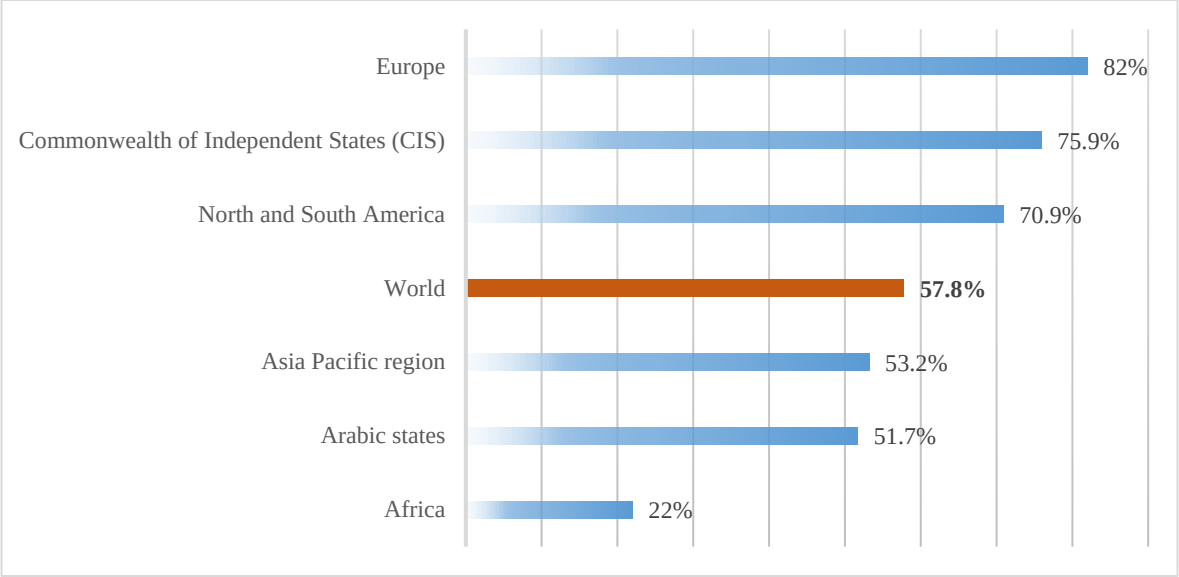


Figure 7. Percentage of households with Internet access by region, 2018

Source: ITU, 2018

As for the telecommunication infrastructure, Africa is only an example of the global trend of a rapid rollout of improvement in access to telecom services regardless level of development. Due to the faster growth rates, LDCs are catching up with the developed countries in terms of access (World Bank, 2005). For instance, China has the biggest number of phones in the world, and together with India and Brazil became the world leaders in the number of public pay phones (ITU, 2018). The same trend persists in the access to the Internet, where growth rate in developing countries are much higher than in OECD countries. However, the global number of broadband subscribers and international bandwidth in the developing world is far lower than its share of the world economy would suggest. There is still a huge gap in Sub-Saharan Africa, South-East Asia, Middle East and Latin America in terms of international bandwidth, web-hosting and computer usage for education (World Bank, 2005). As mentioned above, the latter is particularly important for LDCs, as improved social infrastructure through education impacts labor market positively, leading to the higher economic growth. Therefore, it is reasonable to expect extensive investment in ICT-related projects.

Thus, the global and local digital divide is currently wrapping up. ICT penetration is currently growing at an enormous rate, giving people in developing countries an access to telecom services and new technologies much faster than before. For instance, fixed telephony reached

ten-percent spread in 113 years, whereas mobile achieved the same penetration level in just 15 years (Kenny, Lanvin, and Lewin 2003). The number of mobile subscribers worldwide has increased from 11.2 million in 1990 to 7.9 billion in 2015 (World Bank, 2015). There is also a trend of convergence within developing countries, where rural areas are slowly overtaking urban areas due to rapid spread of mobile telephony. While the expansion of the mobile penetration into rural areas significantly increases the opportunities for rural population to access telecom services, the level and quality of that access is usually far lower than if they were to have their own subscription or line or access to a public telephone (World Bank, 2005).

Infrastructure development, achieved by sufficient funding and effective management, has led to new technology spread and price reduction: for example, fixed line switching costs have dropped over 50 percent in the last decade, and may fall a further 75 percent in the next few years (Ure, 2004).

Infrastructure investment may be a strong push for many LDCs − for example, given that there is sufficient funding, the economy of 53 African countries can grow from $1.1 trillion to $5.6 trillion (Coleman, Goldman Sachs, 2020). Africa is rapidly changing: over the next decade, an additional 187 million Africans are projected to live in cities. Construction is booming, new industries are growing.

Global trend for urbanization has created a number of issues starting from large, often illegally occupied areas with minimal urban services to neglect of the rules of construction and land use in wealthier areas in some cities (Smolka, 2013). It cannot be explained solely by macroeconomic factors: the provision of urban infrastructure, funding sources for services, management of land use and determination of property rights also have significant impact.

The rapid urbanization of the twentieth century led to the emergence of an active land market, and unforeseen circumstances, caused mainly by government intervention, strengthened the strong interests of landowners. When financial and human resources are relatively scarce, the provision of urban infrastructure and services in areas that can support higher densities leads to a significant increase in land value (Smolka, 2013). Therefore, private investors are interested in urban infrastructure development, and often are directly involved in its improvement.

In many countries, transnational infrastructure corridors are very poorly developed: with the presence of physical infrastructure, other barriers still exist − complex custom procedures and

regulations as well as different technical standards − which also add costs to international trade of goods (UNCTAD, 2005).

The public sector has been and remains a major provider of infrastructure, especially in LDCs; however, the government capital share in output over the past three decades has declined significantly in advanced economies, emerging economies and LDCs (IMF, 2014). In advanced economies, infrastructure funding decay primarily reflects a tendency for government investment to decline from about four percent of GDP in the 1980s to three percent of GDP at present (IMF, 2014). In emerging economies and LDCs, the sharp increase in public investment in the late 1970s and early 1980s significantly increased public capital, but since then the ratio of public capital to GDP has also declined. The ratio of public capital to GDP in developing countries is usually higher than in advanced economies (Figure 2), due to higher investment rates and lower GDP in the LDCs (Dabla-Norris et al., 2012; Gupta et al., 2014).

At the same time, the efficiency of public investment in developing countries is usually lower, therefore, the estimated volume of public capital is significantly reduced. Developing countries are also characterized by potential development issues and limited access to international and domestic borrowing. In terms of per capita public capital, which reflect the availability of physical infrastructure per person, developing countries have only a small share of the public capital available in advanced economies. For example, per capita power generation in developing countries is only one fifth of its level in advanced economies (Figure 8); in low-income countries, they make up about one-eighth of the capacity in emerging economies, and the difference in kilometers of roads per person is just as significant (IMF, 2014). The growth of public capital per person by 1 percent corresponds to an increase in infrastructure) per capita (measured by the synthetic index of energy supply, roads and telephones by 0.73 percent (IMF, 2014). Therefore, there is still a significant lag between infrastructure capital in advanced economies and developing countries.

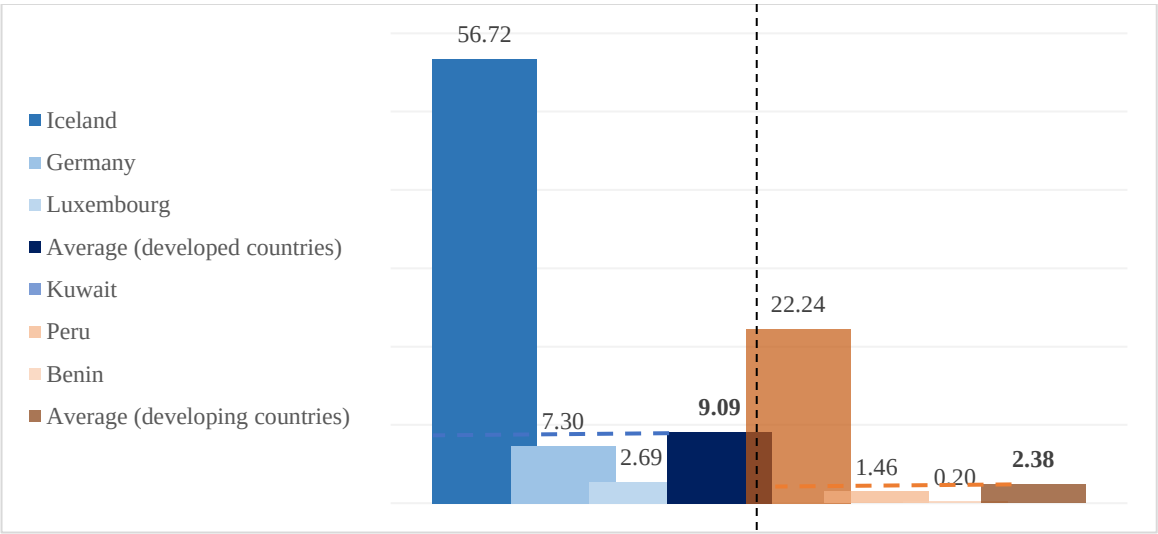


Figure 8. Electricity generation per capita (kWh/year) in developed and developing countries, 2014

Source: CIA World Factbook, World Bank

However, there are issues in developed countries as well. Common problems include poor strategic leadership, budget planning and project evaluation (including the lack of a systematic cost-benefit analysis); poor selection of projects and budgeting due to the lack of flexibility in the allocation of investments by sector and the lack of a single decision-making process on capital and current budgets and investments; delays in the realization and cost overruns as a result of overly optimistic cost estimates and inadequate cost control methods; and the lack of an interim and actual appraisal of projects (IMF, 2014).

1.6. Preconditions for additional sources of financing

Over the past two decades, private sector participation in infrastructure in the form of public-private partnerships (PPPs) has intensified, primarily in energy and telecommunications (IMF, 2014). In general, however, private infrastructure investment is still small compared to public investment, as public funding in infrastructure in the form of PPPs still accounts for less than one tenth of public investment in advanced economies and less than a quarter − in emerging economies and developing countries (IMF, 2014). For many countries, in view of the expected significant needs for infrastructure investment in the coming years, an increase in private financing

and the provision of infrastructure services will remain very important (G20, 2011). Thus, we can talk about an increase in the share of private capital in infrastructure investments; contributing to enhanced private financing can help lessen budgetary constraints and increase the efficiency and profitability of investments (IMF, 2014).

Public-private partnerships can be used to finance infrastructure projects in order to circumvent cost control, as a result of which governments sometimes take on most of the risk involved and face potentially large budgetary costs in the medium and long term (IMF, 2014). Thus, it is crucial that countries adhere to the highest standards of budget transparency when using public-private partnerships to provide infrastructure services (Hemming et al. 2006; Akitoby, Hemming, and Schwartz 2007).

Nowadays, most countries experience an unprecedented influx of private capital to infrastructure projects (UNCTAD, 2005). Primary markets investment aim at infrastructure needs in both developed and developing countries while secondary markets may cause a bubble creation due to strong appetite buying assets which are up and running at very low discount rates and high levels of debt.

The inclusion of private capital increases the competition on the infrastructure services market thus facilitating the process of doing business: in developing countries, which allowed for private funding of infrastructure projects, firms rarely blame poor telecommunications as a constraint to their activity, as opposed to countries with limited private participation (World Bank, 2005).

Grants and concessional loans contain another important source of infrastructure financing in low-income countries, while the additional role of bank lending is still limited (Gurara et al., 2017). In many developing countries, loans from official lenders such as the World Bank and other multilateral and bilateral aid agencies finance a significant portion of government spending (Eden and Kraay, 2014). These loans can have a positive effect on public investment and output (Corsetti, Meier, and Müller, 2012). As stated above, an increase in public investment financed by debt has a stronger effect on the volume of production than an increase by budget-neutral sources. However, the increase in public investment due to debt in all countries may cause a negative market reaction in some countries, where the ratio of debt to GDP is already high or there is no certainty regarding the return on investment in infrastructure, and increase the cost financing and further intensify debt pressure. Negative budget implications should be carefully weighed in light

of the more general benefits to society from increased public investment. In emerging and developing countries where infrastructure bottlenecks are holding back economic growth, the benefits of liquidation them can be significant. Infrastructure gaps are still large; their elimination will require the solution of several problems with the search for additional financing, the selection and implementation of projects. Thus, bridging infrastructure gaps requires a wide range of actions to increase the efficiency of government spending, mobilize domestic funding sources and support from development partners, and attract a large number of private sector participation.

CHAPTER 2

Infrastructure investments: methods, sources, challenges

2.1. Special features of infrastructure projects financing

Construction and modernization of current infrastructure assets aim at enhancing competitiveness and sustainable growth of the country and region in accordance with industrial needs, enhancing the quality of customer services and improving the socio-economic situation (Revzon, Mikhalcheva, 2016). The heterogeneity of infrastructure assets protects the project from competition, while increasing the complexity and uncertainty of its implementation, multiplying risks, increasing information asymmetry and reducing market liquidity (Shevchenko, 2016).

Infrastructure projects, being long-term strategical investments, have a number of distinctive features, which in turn influence mechanisms for their financing. Firstly, a significant amount of capital investment is required, entailing significant construction risks. High capital intensity and long term of infrastructure projects make them more sensitive to the cost and availability of capital sources. Marginal operating costs, on the other hand, are generally low, although maintenance costs can be large, especially in the later stage of the facility. Secondly, a complicated scheme of ownership is present in most cases, as large share of infrastructure assets is owned by the state and cannot be transferred to the private party. Thirdly, there is a high risk of a failure in receiving projected income, which serves as a source of return on investment. For example, in the case of toll roads in the transport infrastructure the risk of low traffic is crucial. Additionally, the large-scale infrastructure investment leads to a long period of return on investment (more than 10 years). Most infrastructure investments are much longer than typical private equity horizons. Uncertain returns accruing over decades may decrease the interest of potential investors. Next, since projects are often characterized by large scale and are implemented in several regions within the country, sound policy facilitates the project realization. Cash flows depend upon the diligence of different players involved in the infrastructure project: government, infrastructure providers, investors etc.

Infrastructure projects have a complex and diverse risk structure due to the uniqueness, technical complexity and low liquidity of the assets, which results in constant adjustments during

the design and construction phases and requires flexible management of the development and operation of the infrastructure. Therefore, implementation of infrastructure projects involves a vast range of risks: risks of design, construction, operation and dissolution of the project as well as political and economic risks, technical and business risks (Shevchenko, 2016). In addition, the specific risks of infrastructure assets depend on the technological and economic nature of the underlying assets, as well as the country and industry conditions, for instance investment climate and institutional development. Quantitative and qualitative risk assessment and the choice of risk management methods must head the adoption of all decisions by project partakers and be carried out throughout the infrastructure asset's life cycle (Diebold, Doherty, Herring, 2010).

Logically, the implementation of greenfield projects, widely popular in developing countries, is considered riskier than brownfield, since new projects construction is more exposed to design and construction risks (i.e. quality of project documentation, approval of the project and obtaining building permits, reliability of the technologies used), and, furthermore, requires investment in the development of the surrounding infrastructure. Contrariwise, brownfield investments have a more predictable risk profile and can be assessed based on historical data on commercial and social performance. However, brownfield projects may face comparable risks, since they have greater price sensitivity and exposure to market risk reinforced by previous commercial decline, and may be in poor condition due to aging, poor maintenance and management, intensive and/or improper operation (Weber, Staub-Bisang, Alfen, 2016).

Investors may face wide range of obstacles to investing in infrastructure projects due to insufficient resources to participate in large-scale projects, inappropriate conditions for participation in collective investments, lack of necessary knowledge and experience of infrastructure investment, regulatory barriers, risk of portfolio concentration etc. (OECD, 2014). Similarly, heterogeneity and lack of suitable projects, reputational risks, uncertain state infrastructure policy in the form of bureaucracy, corruption etc., asymmetry of information and insufficient data on infrastructure projects, financial risks (high financial leverage, refinancing problems) also seem to reduce investor interest in infrastructure projects.

These barriers tend to be hard to overcome in developing countries due to low liquidity and high financial and macroeconomic risks present. Hence, it is important for the state to provide investors with support and protection as well as a favorable legal, macroeconomic and investment conditions in the country. In the same time, an in-depth assessment of mechanisms to reduce

investment risks, knowledge of regional practice and trustworthy counterparties in the implementation of infrastructure projects are required from an investor's point of view.

Under traditional infrastructure procurement, the government hires companies to design, build, finance, operate and maintain the infrastructure objects, and manages the interfaces between those contracts. It makes it risky for government to invest in infrastructure due to cost overruns, delays at different phases of the project (development, construction, commissioning), underestimation of the costs of maintaining and operating an infrastructure facility, lower returns and lack of customer demand (Bennon, 2017).

Long term of infrastructure projects makes it difficult for banks to invest in infrastructure: since deposits, being a main source of financing of banks, are mostly short-term and have a short duration, contrariwise to infrastructure assets with long duration, a huge duration gap tends to appear (Sundaresan, 2017).

There is an emergent need for origination of new infrastructure assets: since the governments are mostly unable to meet the growing infrastructure demand, they need to look for potential ways of funding from investors interested in this asset class.

2.2. Public and private infrastructure investment: complementarity, not substitution

Traditionally, infrastructure investments were mainly publically financed due to the importance of infrastructure objects and services as sources of public goods provision as well as emergence of externalities. Governments were playing the role of the main customer, fund manager and beneficiary of infrastructure. However, the conditions for the growth of budget expenditures described in Chapter 1 have led to a deficit and state debt growth and a decrease in capital investments. The debt burden in turn puts political pressure on the choice between spending on infrastructure and other spending needs (for example, education, healthcare, social transfers etc.). States were also unable to ensure the efficiency of investment spending and the socio-economic effectiveness of infrastructure benefits at the proper level. The public sector often does not have the sufficient level of the technology, motivation and competencies necessary for the effective investment and infrastructure development, that are present in the private sector (Cheremisinova, Tarasenko, Pavtzyo, 2019). Additionally, most of developing countries lack access to capital on international financial markets. This is compounded by the underdevelopment

of capital markets within the vast majority of developing countries (Freidina, 2016). A large number of state-owned infrastructure facilities do not have a cost estimate and are therefore neglected in the calculation and evaluation of economic indicators. Such objects include numerous free roads, bridges and other public facilities. Their valuation and partial securitization would generate an additional financial flow and therefore create new opportunities to cover the state budget deficit and public debt. Budget allocations received from targeted taxes may procure revenues that may be secured against the provision of public infrastructure facilities (Buiter, 1983). However, due to the underdeveloped infrastructure and financial markets of developing countries these funds may not be sufficient to cover their huge infrastructure needs. These factors lead to an insufficient level of public investment in infrastructure, which accompanied with a growing demand for it, enhances the need for private capital involvement. The search for alternative sources, the development and implementation of innovative financing tools becomes extremely crucial on a global level (McKinsey, 2016).

At the same time, the state and the private sector have different goals achieved through their activities: thus, the main interest for business is profit-making, while the state seeks to obtain socio-economic benefits and sustainable growth. Thus, the vast majority of projects require significant government support due to the unlikelihood of maintaining an acceptable level of tariffs for infrastructure users in case of financing a project on a solely private basis, which is aimed at ensuring a high return on investment and increased profits (Revzon, Mikhalcheva, 2016). The research shows that attempts to organize financing of infrastructure projects through concessions with exclusively private capital without public backing resulted in default and subsequent redemption of these assets by state-owned enterprises (Shevelkina, 2014). Thus, infrastructure projects often require quite large investments, while their socio-economic profitability is much higher than financial one, making them less commercially popular. For example, toll roads are much easier for investors to get financial returns than schools or hospitals, while both types of infrastructure − economic and social − are crucial for meeting public needs. Moreover, a consistent and systematic vision of a region and country development, which aims at building big networks, increases growth due to higher returns. This is particularly important in the case of transportation, since larger transportation network serves as a growth catalyst (Mudge, 1996). However, the large scale project cannot be financed solely privately. Next, if private investments generate costs and benefits that accrue to third parties beyond their markets, the businesses would be unwilling to

invest in those infrastructure project since they cannot capitalize on project by charging whoever benefits, capturing them in markets (Mudge, 1996). Again, here evolves the need for public investment. In this regard, the government is called upon to participate in the financing of the project.

Public support is particularly valuable in unstable developing countries, where the government may be the only credible entity to guarantee credit worthiness. Consequently, governments can borrow funds at low rates. On the other hand, financial discipline and efficiency of government investments is usually lower than the one in private sector due to the possibility to raise tax revenues or transfer funds to meet financial constraints. This factor in turn makes government financing costlier and burdens state and local budgets. Also, in developing countries poor maintenance is a frequent case since users do not have a sense of ownership of the infrastructure, in view of the fact that infrastructure is provided up-front, paid for indirectly, generally by taxation, making users lose a true sense of the cost (Humplick, 1996).

Public-private partnerships thus help in achieving goals of both public and private counterparties while reducing risks, combining their advantages and offset disadvantages, balancing equity and efficiency issues. Governments in short of cash may allow vast class of investors private sector to operate underutilized assets to have an opportunity to recycle that cash elsewhere into building new assets and new long-term infrastructure (Humplick, 1996). It is also important to note that the return on an infrastructure project can be achieved only in case of overall economic growth, not profit; hence, there is a need for specific models for the implementation of such projects. Public sector should attract capital into important sectors for government not only in terms of underlying assets but also the related services that come alongside (for instance, healthcare, education, construction). The future of infrastructure investment would lie in a mix of innovative public and private sector funding, with a varying set of flexible models in different countries and a financial mechanism more open to new financial ideas. Public infrastructure, in general, whether publicly or privately owned, will be operated more like a business (Mudge, 1996).

Infrastructure investment in developing countries is a large fraction of public investment (more than 30-60 percent) and also of total investment (20-30 percent, depending on whether the country is a low or middle-income country) (Marcello et al., 2019). Despite the volume of PPP investments has been declining for the last 10 years, countries' interest in participation in such projects is growing in order to accelerate the supply of infrastructure assets and public services

related to them. In many European countries such as UK and France water supply agents and airports are privately owned and operated (for example, Heathrow, Gatwick, City Airport of London and Paris Airports). PPP is also a growing trend for infrastructure development in India (Sundaresan, 2017). Hong Kong's transit system is also privately owned: Mass Transit Railway (MTR) Corporation manages the subway and bus systems on Hong Kong Island, and since 2006 − in the northern part of Kowloon. MTR has a fare box recovery ratio − the percentage of operational costs covered by fares − of 185%, the world's highest (Sundaresan, 2017).

PPPs are a common way of transferring risks from the state to the private sector thanks to the structure of the contracts used. Accordingly, unlike traditional public procurement, in the PPP, the private sector takes over the debt, which also concludes a long-term service agreement with the state, which in turn determines the payment and other obligations of the state to the private partner. In cases of infrastructure with customer fees (for example, toll roads), the state may not have direct payment obligations, however, it usually has direct or indirect conditional obligations (for instance, payments for hours worked, hidden charges, and so on) (Hemming, Schwartz, Akitoby, 2007). In addition, in the cases when paid infrastructure is new to the country, the reaction and demand of the population become hard to predict. Hence, the calculation the elasticity of the traffic flows volume to the level of payment is very problematic, thus making revenues and returns unstable, which may lead to budget deficit (Gilroy et al., 2007). Therefore, care must be taken in analyzing future payments, as proved by examples of urban toll roads in France or some long-distance motorway projects in Europe (for instance, the M1 in Hungary) (Shevelkina, 2014). Investors are at risk of cost overruns, delays, quality of infrastructure builders work and mismanagement by the operating company. They also take the risk of government agencies changing the rates the operator can charge, other terms of the concession contract, corruption issues (for instance, concessions can be granted to inefficient operators in exchange of favors), or even outright expropriation.

Government agency takes responsibility for land acquisition, environmental clearance and rate setting. The concession granted to a private operator is often for only a fixed term, with renewal subject to approval by the government and conditional on pre-specified performance metrics. The concession operator may be subject to regulation (Sundaresan, 2017). Often the same company is charged with building and subsequently operating the facility under a BOO (Building, Owning, Operating) arrangement, thus becoming a concession operator or infrastructure builder.

Concession operators are increasingly technologically highly sophisticated global companies: for example, Suez, Cintra, Macquarie, EDF, Veolia, Vodafone, Vinci etc.

Banks extend term loans to infrastructure projects and a small number of dedicated, private equity asset managers make long-term investments in early stage projects. It is also possible to attract private capital from the large pools of savings in private sector institutions such as sovereign wealth funds (SWFs), pension funds and insurance companies, as well as from bond markets. The latter constitute the main investment tool by institutional investors and represent long duration liabilities players who may be natural players in this area; in the same time, this method requires certain policy conditions to be met such as developed financial market.

National and international development banks often ensure and facilitate the funding of infrastructure project, especially in developing countries, through capacity building, acquiring necessary skills, funding, providing credit enhancement for infrastructure projects. For example, the China Development Bank (CDB) has been a core of the PRC's infrastructure development as a public financing bank, as a coordinator, and more recently also as a catalyst of Chinese overseas infrastructure investments with around $2 trillion of assets (Sundaresan, 2017).

2.3. Current structure of world infrastructure funding

Private investment in developing countries tend to increase and fill the gaps created by the cutback of public spending. The World Bank estimated that the private sector has funded about 20 percent of infrastructure investments in developing countries during the 1990s, amounting to about US $850 billion (World Bank, 2002). For instance, private sector in Brazil, Ghana, India, Jordan, Colombia, Peru, Chili and Indonesia has intensified investments to compensate for the cut of state investment and meet the dire need for the new roads and improving transport network maintenance (Hemming, Schwartz, Akitoby, 2007). However, the degree of investment growth has been insufficient.

The decline in government investment in developing countries was largely driven by fiscal consolidation in the 1990s. As an example, the crisis in India in the beginning of the 1990s caused a limitation of public investment with a fiscal consolidation. The Government of Ghana also resorted to a decrease in public investment in 1998–2000 and in 2002. A similar reduction occurred

in Brazil in 1999, when government investment at the federal level fell from 1.1 percent of GDP in 1998 to 0.4 percent of GDP in 2003 (Hemming, Schwartz, Akitoby, 2007).

In many developing countries, including Brazil, Ghana, and Colombia, a decline in public investment on infrastructure could have been contributed by increased current government spending and reduced savings. For example, rising public sector wage costs, pensions and transfers to households, as well as contributing to the generally high level of earmarked income allocations, have enlarged current spending. In India and other federal states lack of budget discipline at subnational levels of government could also contribute to restraint of government savings (Hemming, Schwartz, Akitoby, 2007). The underdeveloped banking system in many developing countries, with practically no competition mechanisms among banks, makes it difficult to finance infrastructure projects by small and medium-sized banks (Revzon, Mikhalcheva, 2016).

Infrastructure investment has become much more popular after the global financial crisis and numerous following incidences of excess volatility in supposedly very liquid markets, since it was evident that the liquidity of an entire asset class can suddenly and abruptly evaporate. Consequently, illiquid assets, such as infrastructure, have gained more attention thanks to an illiquidity premium they offer (Arezki et al., 2016). Despite the difficult economic conditions, investors positively assess the volume and dynamics of future investments in infrastructure projects. This situation is similar in all sectors, with the most positive outlook being observed in the energy, utilities and mining, transport and logistics. Representatives of these sectors expect a significant increase in capital costs in excess of 30 percent (PwC, 2013).

Infrastructure has been a strong performing asset class over a sustained period − 10.8 percent over 2006-2015 (Figure 9). Therefore, the increasing amount of funds is being assigned to infrastructure, and some investors are increasingly investing directly (see Figure 10).

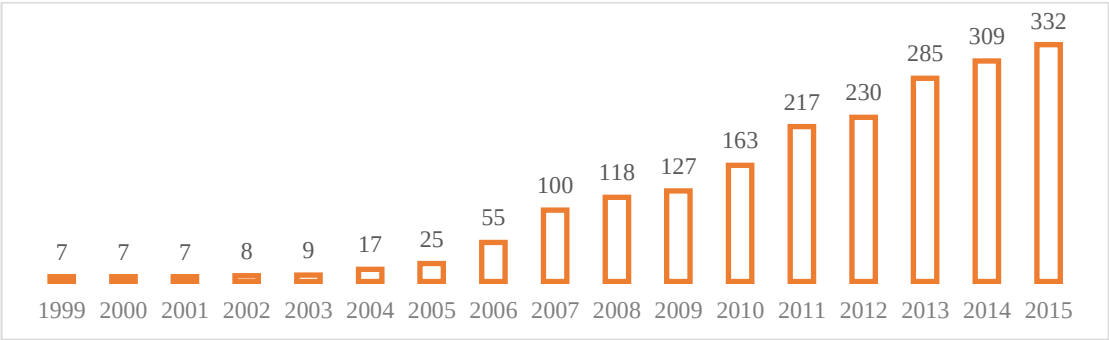


Figure 9. Unlisted infrastructure assets under management, billion dollars (1999-2015)
Source: Raymond, P. (2017)

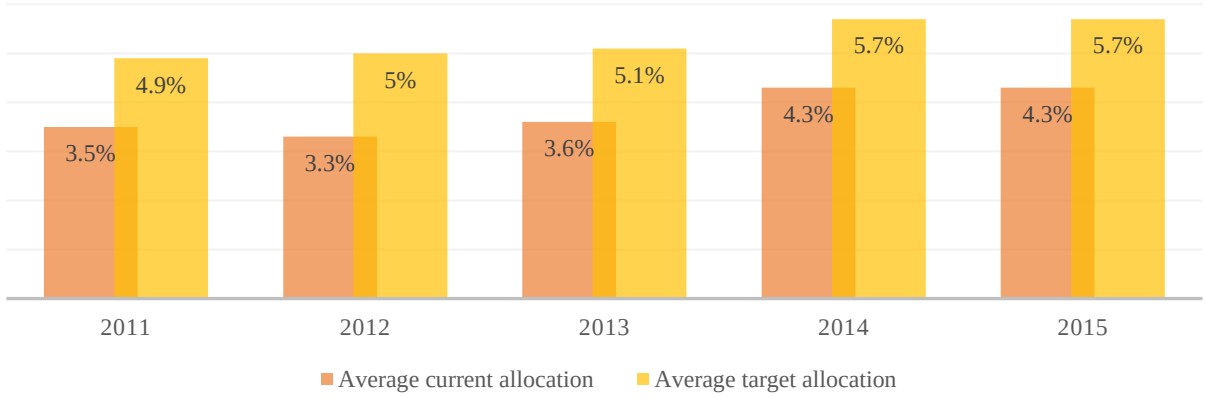


Figure 10. Funds allocation as a percent of assets under management, 2011-2015
Source: Raymond (2017)

Developed markets are still attractive for the investors due to competitiveness for mega-projects (over $1 million) and increasing usage of PPP structures. In the same time, in developing markets there is high growth potential underpinned by macro and consumer trends with a great degree of risk relating to developing regulatory, political and legal environment (Raymond, 2017). Traditional brownfield projects, prevent in developed countries, are a mature operating asset with lower risk-return ratio and competitive environment, while greenfield investment, mostly concentrated in developing countries, include pre-construction and development phases that carry higher risk.

Institutional investors, such as pension funds and insurance companies, usually have sufficient funds to invest in local infrastructure; however, they face strict portfolio regulations that limit their investments. Currently, they contribute only about 0.5% of global funding requirement (Edureka, 2015). Pension funds had until recently ignored greenfield projects, but government support may create strong growth and opportunity for them. Institutional investors are exploring the opportunities available in these markets, but so far most find it difficult to cope with the regulatory and political risks in these countries. In the face of uncertainty, investors are in search of modes of protection from political risks. Thus, insurance, export credit guarantees, government undertakings and bilateral investment treaties may can serve as good tools for raising external capital.

Debt financing, organized either by bank lending or by issuing corporate bonds, is prevalent in a global structure of private investments. Credit financing is the primary source of infrastructure

development, especially in the least developed countries, due to unfavorable factors of the external economic and legal environment. The share of equity in infrastructure development projects ranges from 1 to 30 percent, but most often its value is about 20 percent (Marcello, 2019). On average, financing is distributed between the public funds and private investors in the ratio of 65 and 35 percent respectively (Della Croce, Sharma, 2014). Bond financing is most attractive for the implementation of PPP projects (18 percent of global infrastructure investment is funded by bond financing) (Figure 11), while it is practically not used in the least developed countries, since countries with developing and emerging financial markets cannot ensure the creation of favorable conditions for investors, namely legal protection, increasing the institutionalization of the financial sector, reducing macroeconomic risks and asymmetries of information. Municipal and sub-federal bonds issued in public-private partnership projects also have a higher credit rating and investment attractiveness, which is especially important in the context of developing economies (Shevchenko, 2016).

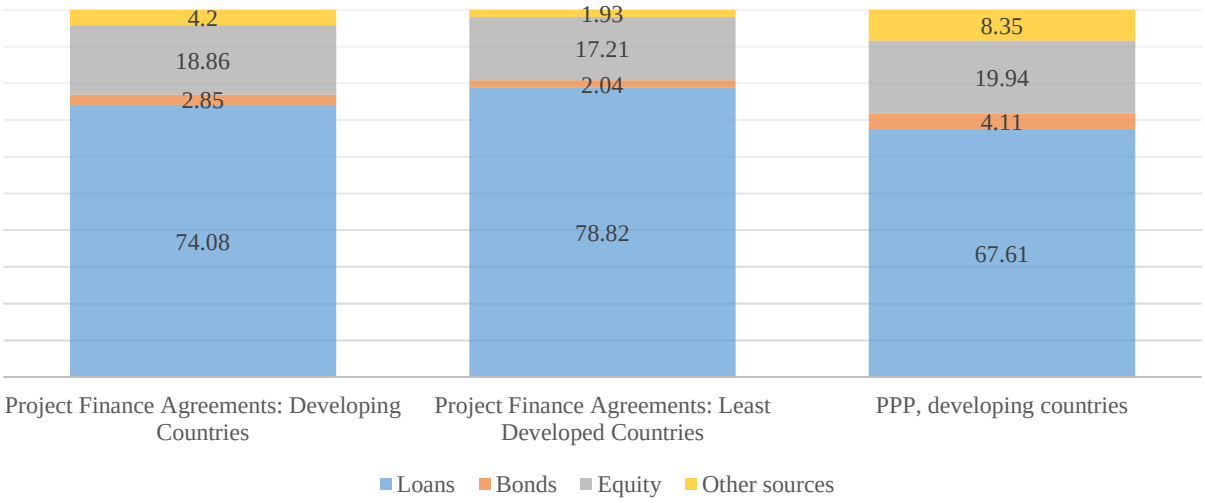


Figure 11. The financial structure of project finance and PPPs in developing and least developed countries on average between 2007-2015, %

Source: OECD, 2016

The unfavorable situation the world capital markets and the banking activities legislation tightening in Europe have significantly complicated and modified the structure of financing public-private partnership projects (Moiseeva, Kochetkova, 2015). The pre-crisis growth of the PPP market in the world took place against the background of relatively cheap borrowed funds. To

date, public-private partnerships have been forced to develop amid sharply depleted monetary resources.

PPP projects involve public-private partnerships to implement long-term investment infrastructure projects. The PPP arrangement allows attracting private investors to the implementation of infrastructure projects. Private sector may participate in PPP at different phases of the creation and operation of various infrastructure facilities: designing, financing, management and ownership, as well as construction, operation and maintenance. A wide range of developed countries have entered into PPP agreements to provide education, health, water, waste management and other social services (for example, Australia, Canada, France, United Kingdom, Ireland, and the Netherlands) (Khulukshinov, 2016). Some countries, which have extensive experience in using PPP to achieve development goals, have established specified PPP institutions to consolidate the mechanisms of interaction between the state and the private sector. For example, in the United States, the National Council for Public-Private Partnerships was established in 1985 (NCPPP, 2020).

In the United Kingdom, the main form of PPP contracts is the government's Private Finance Initiative (PFI), in which a private company receives an order from the state to create or modernize objects of social significance on terms of repayment. Government gives a guarantee with respect to the funding, thus, lending becomes less risky. This concept has become the foundation of the PPP institution. The priority method of financing PPP projects is the project method, which means a long-term contract between the state and the private sector, where financing of the parties takes place throughout the life of the project (HM Treasury, 2019). To fix the goals and objectives, a roadmap is drawn up, which indicates a list of conditions under which the state has the right to terminate its implementation. So far PFI has financed most of the PPPs since 1992: there were 704 current PFI projects as of the end of March 2018; the total capital value of the current portfolio was accounted at £57 billion (HM Treasury, 2019 (a). The main areas of activity are healthcare, education and railway construction.

In France, PPP has a strict legislative framework. The main forms of PPP are concession agreements, according to which the private sector takes 75 percent of the responsibility, contractual agreements and leasing agreements (Khulukshinov, 2016). Projects are implemented mainly at the local level in transport and social infrastructure (education and healthcare). The main types of project financing are public and private financing. The organization and management of PPP

projects in France is carried out by the PPP Development Center, which is a structural unit of the Ministry of Finance.

In Germany, the government has a regulatory role. The partnership institutions began to form in the 1990s, which were creating recommendations to improve the efficiency of cooperation with private capital. Two models of project financing are mainly used: project financing (or a network concept) with shared financing without using guarantees from the public sector, and forfaiting (or operating groups), which involves the use of guarantees from the state; a certain group takes responsibility for financing, taking into account the delegation of functions (Delmon, 2009).

At the same time, European PPP projects need the support of a larger number of participating banks from the European Union than before the economic crisis, as financial institutions are currently less at risk and consider the amount of credit debt in the project financing structure (PwC, 2013). Project owners are looking for alternative sources to bridge the financing gap: more than 90 percent of survey respondents expect more involvement into their projects from the private sector.

The interaction of the state and private capital has gained wide popularity in the United States and Canada. State support is aimed at the development of education, transport, space exploration, the environment, roads, and the introduction of innovations. At the same time, the state is responsible for monitoring and regulating processes at each stage of the project, materially encouraging the initiative of the private sector by providing licenses for the right to use scientific and technological achievements (Saha et al., 2017). In the United States, the responsibility for infrastructure lies primarily with state, local, and municipal governments. The country has a reliable market for sub-sovereign debt (municipal bonds), and private property is developed in many sectors (Van Ham, Koppenjan, 2001).

In large countries with a federal structure (Canada, India, Russia), the decentralization of the scope of partnerships helps to expand the number of individuals and organizations directly interested in the development and implementation of relevant programs (Moiseeva, Kochetkova, 2015). In general, the impact of civil society on the organization of public law relations by the state and the effective implementation of public interests is increasing.

In Australia, infrastructure activity in last few years was primarily driven by asset recycling programs assisted by federal government incentives. Governments have committed to use many

of the proceeds from that assets recycling into new infrastructure projects − government is actually assisting in the funding of new infrastructure (Macquarie Group, 2020).

The liberalization of the economy in the 1990s in many developing countries made them more attractive for PPPs (for example, Latin America and East Asia). In addition, the collapse of the socialist system in Eastern Europe and Central Asia, together with the bankruptcy of the public sector, and high debt levels accompanied with expensive social transfer programs, led to the spread of privatization and the participation of private capital in infrastructure financing (Von Hirschhausen, 1999). The sharper dynamics in funding in the least developed countries compared with developing countries is explained by the low level of development of economic institutions and financial markets (Shevchenko, 2016).

It is also important to notice that investments in PPPs tend to respond to global financial crises: for example, investment flows in PPPs peaked in 1997 at $100 billion, after which they dropped by half, to the level of the previous few years, in response to crises in Asia, Russia, the United States and other countries (Hammami, Ruhashyankiko, Yehoue, 2006). The scope of project financing is also sensitive to the movement of the economic cycle: there has been a decrease in 2010 and 2012 in developing countries and in 2009 and 2011 in the least developed countries.

The evidence shows that countries with large markets and high demand for infrastructure as well as governments burdened by high debts tend to attract more PPPs. Macroeconomic stability and stable inflation in particular are other factors engaging public-private cooperation. Stable institutions, strong rule of law and low level of corruption are essential for this kind of arrangements to guarantee long-term sustainability (Hammami, Ruhashyankiko, Yehoue, 2006). Moreover, the research proves that past experience with PPPs encourages other agents to enter public-private arrangements.

According to the World Bank's Private Participation in Infrastructure (PPI) database on projects for developing countries during 1990–2003, the types of PPP vary across industries due to the mode of entry, risk sharing, ultimate ownership and duration of the ownership. PPP framework is the most common among energy and transportation projects (1,116 and 735 projects correspondingly), followed by the telecommunications (600 projects) and water (261 projects) (Hammami, Ruhashyankiko, Yehoue, 2006). Greenfield investment is the most popular mode of entry into energy and telecommunication projects while concessions are prevalent in transportation and water sectors. There are three main PPP types which make up 70 percent of all projects: BOO

(Build-Own-Operate) is the main contract type (38.9 percent of all projects), followed by Build-Own-Transfer and Build-Rehabilitate-Own-Transfer (17.9 and 13.2 percent respectively) (Hammami, Ruhashyankiko, Yehoue, 2006).

In transition economies and developing countries, concessions are dominant PPPs, accounting for almost three-quarters of the total number of projects and 60 percent of their cost. The most capital-intensive projects in the fields of transport and energy are carried out on the terms of concessions (Boyko, Didovets, 2011).

Amount of funds being raised for infrastructure projects is very large, it is much higher than a number of investable projects in developed countries. In the same time, increased competition is driving down returns; in this way, the funds are looking to new geographies and new business models, new risk levels to be able to still make the previous level returns. Infrastructure investors are moving into unexplored markets taking on assets with greater commercial risk in order to maintain returns. Funds have so far targeted OECD countries; however, wider geographical remit could still meet infra-criteria. On the other hand, there is a challenge for investors and government to look for structures and platforms which reduce risk and reduce return expectation to a level to balance out, since return expectation itself is high that it becomes unaffordable in terms of user charges or tax payers.

In a regional perspective, Sub-Saharan Africa lags significantly from the rest of the world in PPP project development. Weak participation of private capital is aggravated by insufficient support of regional development agencies, with the only exception of the Banque Ouest Africaine de Développement (BOAD) in West Africa. The research does not show significant differences of private participation in PPP arrangements across all other regions (Hammami, Ruhashyankiko, Yehoue, 2006). However, taking into consideration an increasing interest in PPP arrangements and high growth in a region, we can expect a rise of the number of PPP projects to finance infrastructure development in Sub-Saharan Africa.

Despite the shortage in terms of supply-demand gap for infrastructure, the biggest obstacle to building and funding in Africa infrastructure is affordability. There is a mismatch between demand and ability to get the support a viable financing of projects. The main funding sources are governments which determine the priority areas to focus, local and foreign private sector, which is the biggest source of funding, and the donor community such as regional banks (i.e. African Development Bank).

Access to finance is by far the most important issue to infrastructure in Africa. Commercial banks are as active in Africa as they are in developed markets thank to attractive risk-reward structures. However, the private sector faces the challenge of getting access to the credit and assure to get paid, which in turn creates the need for creditworthy off taker in a transparent system. In the short term, the problem may be solved by enhancing governments to be creditworthy, whereas in long term cost-reflective tariffs, transparent sector, deregulation, sector unbundling and subsidies reduction are crucial. Currently, legal framework in most African countries significantly lags behind existing financing issues. Another issue is trust into a local currency, since most of the projects generate revenue in it. Thus, there is a need for domestic market infrastructure development, depth of the market accompanied by proper legislation to avoid currency mismatches. Additionally, commercial banks have more difficulties to find refinancing on long-term maturities (more than 10 years) which is often the case in large infrastructure projects.

There is also a problem of lack of human resources to realize infrastructure projects. The pool of talent is too little to be able to cope with a huge pipeline of infrastructure projects needed: the number of local experts (technical experts, legal counsel) results in a situation where too few people to work on large budget projects on advisory and execution phase that can take several years.

The sources of financing also tend to depend on the infrastructure sector. For example, venture investors have more interest on transport infrastructure than development banks, since it entails higher local currency risk, and due to the reason that cost of business is increasing provided the lack of proper road network. The development of transport infrastructure could contribute to the growth of small and medium-sized businesses, as well as give a push for intra-African trade. Inadequate power network development complicates building a manufacturing or industrial enterprise in emerging African countries.

In Uganda, African Development Bank (ADB) cooperates with private sector for electricity generation, while Japanese government co-funds the bank to provide transmission of bulk electricity to the customers. Low electricity tariffs previously set by the governments were deterring investors from African power sector. However, a $2 billion project with financing coming from a combination of many international investors to unleash the solar resources of the Egypt may be a successful example for the rest of Africa. The world's largest solar Benban power plant was built in Aswan, Egypt in 2019 occupying 6 square km space in the Egyptian desert

(Palmer, 2019). The favorable environment has helped to make sure that resources are mobilized in the right way.

As it was stated in Chapter 1, telecommunication is currently on a rise in Africa thanks to the mobile revolution, which was backed by financial institutions supporting local sponsors. Private sector therefore sees a great pool of opportunities in terms of data transmission. However, there are less commercially viable projects which also matter a lot − for example, in education and healthcare. Therefore, the proper mechanism to engage investments in these projects is urgently needed to mobilize funding at a much lower cost from a wider and diverse liquidity pool.

The global crisis has significantly complicated the conditions for economic activity in many developing countries, including Eastern Europe. Thus, the implementation dates and budgets of many infrastructure projects have been revised. In Russia, the public infrastructure is mostly financed by budgetary funds, in the use of various public and regional investment programs and other budgetary sources, which are not sufficient to cover all needs. In Central and Eastern Europe, member countries or candidates for EU membership receive financing for most of the infrastructure projects entirely or partially from EU funds, while the rest of the countries of the region mainly depend on the state budget and development banks. The European Investment Bank (EIB), European Bank of Reconstruction and Development (EBRD) and Asian Development Bank (ADB) play a vital role in infrastructure financing, especially in countries with low credit ratings and underdeveloped banking systems and capital markets (PwC, 2013).

Latin America has great opportunities for infrastructure development and infrastructure finance. Countries in Latin America have been increasingly willing to adopt PPP frameworks with financing infrastructure in part through the private sector by establishing concessions with some public support. Governments are willing to extend significant benefits for both the equity and the debt investors in an infrastructure project.

Latin America has a deep infrastructure gap; to fill it, banks and capital markets involvement is essential. However, attracting them to finance infrastructure programs may become much harder. The challenge is to match banks appetite for risk with investors' appetite for projects. Thus, banks need to play a role of instructor the projects providing bridge financing for companies, while capital market should take part in long-term finance. Thus, the appropriate scheme of infrastructure financing would start from bonds loan, whereas capital markets appear after the construction of project begins (1-2 years).

Due to political and economic situation, Latin America governments try to make the programs more appealing to banks and private sector providing subsidies of some sort to lenders and investors. In the same time, there is economic slowdown − few countries raise interest rates, low price levels for commodities impact on returns investors need and banks' risk appetite. The challenge is to find the right projects in the right sectors and companies to pay equity into the projects and to make sure the project company is able to repay to meet its financial obligations.

In addition, there may be a struggle to attract private institutional financing. Due to high and rising interest rates, bond investors focus more on sovereign notes rather than infrastructure bonds, since it harder to investors to find projects with the returns they need. This situation in turn impacts the cash flows and competition for money between sovereign bonds and project bonds. Hence, pension funds, which are natural investors for projects bonds, may tempt to buy sovereign bonds rather than more complicated and risky project bonds.

At the same time, the example of Brazil proves that relevant and well-structured projects may find sufficient funding provided the proper legal framework. The amount of investments and high-quality projects in Brazil is extremely high comparing to other countries. There is a huge demand for infrastructure with a gap to fill of additional $100 billion every year.

Governments across Asia are increasing their attention to infrastructure and spending on infrastructure (in particular India, China, Indonesia, Philippines) in accordance with the needs to achieve the high growth. Again, the fact that public sector and the budgets will not be able to support the extent of infrastructure that is needed is true for the region; hence, private sector will play a large role. Moreover, the demand for infrastructure increasingly comes from the private sector: in recent years, private companies required 30 percent of infrastructure in Indonesia, and 50 percent − in India. In addition, private sector in India is the main transport infrastructure investor with a share in total funding around 65 percent (Freidina, 2017).

The manner in which private sector invest in infrastructure could be very different from the past. Traditional project financing through long-term contracts is becoming challenging due to the growing level of uncertainty. Private sector institutional investors (infrastructure funds, pension funds) will look at other ways of partnering with governments programs for building infrastructure.

In Asia, government funds are of particular importance, where government is minority in the fund but has access to the projects that are largely in the public sector domain. Therefore, the model involves private capital with public sector ownership and operations.

In the same time, the share of infrastructure funds, pension funds and sovereign funds in private investment is around 20 percent compared to 50 percent in the Western world. In this way, Asian markets provide a good opportunity for these infrastructure funds to look for the right risk-return balance. The important thing for both investors and governments is to recognize the reality of building infrastructure in Asia, including the features of the public system, the multiple layers of government (central, provincial, municipal). For example, land acquisition approvals and other clearances, that need to be taken into account, have a certain lifecycle. Thus, preparing projects is going to be much longer with no shortcuts possible.

A distinctive feature of the Asian region is the widespread use of high technology, which may push Asian countries to make a leapfrog ahead in terms of project preparation, land planning etc. Governments might create platforms for digital management of projects to make construction companies, vendors, developers and government all operate under the same platform. It would take away a lot of uncertainty, identify unrealistic expectations on timelines and correct them, take away potential for gaming through cost changes, and therefore bring down risk and enhance the return expectations.

China and India are current world leaders in using PPPs to develop transport infrastructure and infrastructure investments overall. The main emphasis in these countries is on private capital, while the share of state budget funds and government loans in the amount of infrastructure investments is a little over 35 percent (Nagesha, Gayithri, 2014). For successful implementation of the strategy of infrastructure construction in developing countries using the example of India, the main emphasis must be placed on the quality of public administration, creating a favorable investment climate and ensuring macroeconomic stability.

In India, infrastructure projects are financed to a greater extent by institutional investors − commercial banks, non-bank financial institutions and insurance companies. Publicly-owned development corporations are actively working on attracting private sector into infrastructure funding by placing bonded loans and participating in PPP programs in transport infrastructure. Some examples include India Infrastructure Finance Company Limited, Indian Leasing and Financial Services, National Highway Authority of India and Indian Railway Finance Company (Nagesha, Gayithri, 2014). The guarantees of these corporations against the obligations of private PPP participants have also become widespread. International investors are being attracted through the sale of shares in the capital of large non-banking investment companies in India.

China, being a world leader in the infrastructure development, invests in infrastructure projects 8.3 percent of national GDP (Wang, 2015). The main investments are made in the transport infrastructure, including roads and railways, which is enshrined in the concept of the "One Belt − One Road" initiative, which aims at giving a new push to the Chinese economy. At the same time, high-speed railways and toll roads in China are funded under different models. Thus, high-speed railways are financed from the state and regional budgets (60 percent of investments) and bond loans (40 percent of financing), while in the construction of toll roads the main framework is corporatization of future facilities in the form of an IPO in domestic markets. The reinvestment of cash flows from already functioning toll roads is also a significant source of financing. The share of IPO and reinvested cash flows in the volume of financing of such projects is equivalent to 40-45 percent (Freidina, 2017).

The core of infrastructure projects financing in China is national development institutions − publicly-owned banks such as China Development Bank ($1.2 trillion of assets), Industrial and Commercial Bank of China ($2.8 trillion of assets) and China Construction Bank ($2.4 trillion of assets) (Freidina, 2017). The Asian Infrastructure Investment Bank was created at the initiative of China to finance international infrastructure projects.

Lately, Philippines have carried out the tax reform to facilitate infrastructure projects financing and align with ASEAN countries. As a result, there is a growing number of big projects funded by official development assistance from China, Japan and South Korea, mostly in the field of transport infrastructure (highways and bridges that interconnect 7100 islands of Philippines) (IMF, 2018).

From the sectoral perspective, there is a shift in the priorities of infrastructure development from the communications sector to transport and utilities, as well as support for infrastructure of less developed countries, carried out with the participation of international organizations and development banks. The growth of global investment in water supply, sanitation projects and the transport industry, accompanied with their decline in the developed countries, means the integrated development of infrastructure in the least developed countries. The drop in investment in telecommunications and energy is associated with the intensification of the use of existing capacities and a decrease in the capital intensity of modern technologies for the development of these infrastructure assets.

Thus, financial trends in infrastructure development suggest the creation of favorable conditions for attracting private sector capital and institutional investors. An important role is played by the expansion of participation in projects of structures of a supranational level: international organizations (World Bank Group, OECD, etc.), development banks and mutual assistance organizations. In view of the high volatility, the indication of loans and the expansion of guarantees of the public sector and international organizations are becoming an increasingly important factor in choosing the investment object in developing countries (Shevchenko, 2016). A consequence of the above factors is the modification of traditional financial instruments in order to improve economic characteristics (investment attractiveness, profitability, liquidity, transparency) and reduce transaction costs.

To sum up, positive macroeconomic changes in developing countries and a constant attractiveness of developed countries make infrastructure development a high current interest. At the same time, the pool of opportunities for strong returns becoming drier, thus making investors seek higher returns in alternative geographies, project lifecycles, and business models. Therefore, infrastructure is no longer a low-risk investment, since opportunities are becoming riskier and uncertain.

2.4. The overview of the main sources of infrastructure financing

The implementation of any investment project involves validating a financing strategy, analyzing alternative methods and sources of financing, and carefully developing a financing scheme. The adopted financing scheme should ensure sufficient investment for the implementation of the investment project as a whole and at each step of the calculation period, optimizing the structure of investment financing sources, reducing capital costs and the risk of the investment project (Igonina, 2007).

Regardless of whether the private or public sector makes infrastructure investments, one of the key factors is the source of their financing, which can have a decisive impact on macroeconomic development indicators. For example, loans from foreign sources at high interest rates in foreign currency can significantly reduce the profitability of projects. On the other hand, internal infrastructure loans can complicate the financing of other projects for private companies and cause a general reduction in private sector investment (Stern, 2000). Therefore, in each case,

a thorough analysis of possible scenarios for financing infrastructure projects is required in order to minimize possible damage to the economy as a whole.

When financing infrastructure projects, various capital channels can be used. It is also possible to use a combination of both a different capital structure and a variety of financial instruments to attract and securitize returns on invested capital (Cheremisinova, Tarasenko, Pavtzyo, 2019). The basis of this classification is the division of capital into own, borrowed and mixed.

Among the traditional methods of financing investment projects, there are self-financing (or internal financing); corporatization, as well as other forms of equity financing; credit financing (investment loans of banks, issue of bonds); leasing; budget financing; mixed financing based on various combinations of the considered methods; and project finance (Litvinova, 2013). The ways to increase public investment are to finance public investment by attracting borrowed funds, increasing public savings and redistributing public spending from other sectors; increasing return on investment by improving investment planning and processes for evaluating and implementing projects; and encouraging private sector investment. The proper strategy in each case will depend on the state of the country's public finances (Hemming, Schwartz, Akitoby, 2007).

Internal financing involves the use of the company's own funds in the form of authorized or share capital, as well as the flow of funds generated in the course of the enterprise, mainly net profit and depreciation. The formation of funds intended for the implementation of the investment project is strictly targeted, which is achieved, in particular, by allocating an independent budget for the investment project (Igonina, 2007). At the same time, self-financing can be used only for the implementation of small investment projects. Capital-intensive investment projects, as a rule, are financed from not only internal, but also external sources. External financing involves the use of funds from financial institutions, non-financial companies, the public, the state, and foreign investors.

The development of tools and the financing mechanism for infrastructure projects was significantly affected by the global financial crisis of 2007-2008. In addition to the classical project financing scheme, when borrowed funds were raised primarily through syndicated bank loans, a market for derivative financial instruments based on cash flows from infrastructure projects began to develop. In addition, infrastructure funds, that already occupy 2 percent of the total structure of investment funds, have been created by developed economies mostly to provide an opportunity for

relatively small private investors to invest in large infrastructure projects (Freidina, 2017). In recent years, corporatization has been actively developing in the world as a tool for financing infrastructure projects. Moreover, governments are looking for the ways to attract funds from pension funds, insurance companies and national welfare funds in infrastructure construction.

The stability and long-term predictability of cash flows make infrastructure a potentially attractive proposition for institutional investors. Sovereign funds of China and the UAE are absolute leaders in terms of infrastructure investments with investments of over 40 billion dollars by China Investment Corporation and $24.8 billion by Abu Dhabi Investment Authority (OECD, 2015).

Institutional investors have significant potential for investing in infrastructure, and infrastructure assets are most suitable for investment by pension funds and insurance companies due to the fact that they are not dependent on the economic cycle and do not correlate with other asset classes, as well as have a long-term and stable operating cash flow. Infrastructure investments are attractive for institutional investors during periods of economic downturn and lower interest rates in the market, as they offer investment instruments comparable in terms of profitability and reliability. In developed financial markets, infrastructure bonds and hybrid securities can be adapted to the needs of a particular type of institutional investor, who have special requirements for the liquidity and profitability of securities (Shevchenko, 2016).

Corporatization provides equity financing of investment projects, which may take the form of an additional issue of shares of the current joint-stock company in order to ensure the financial implementation of the investment project; attraction of additional funds (investment contributions, deposits, shares) of the founders of the existing enterprise for the implementation of the investment project; creation of a new enterprise (SPV), designed specifically for the implementation of the investment project (Igonina, 2007).

The advantages of corporatization are indefinite attraction of resources, low cost of attraction, no need to provide for the issue of shares, and so on. In order to implement the project on the use of joint-stock sources of infrastructure financing, it is necessary to create a special commercial organization in the form of a public-public joint-stock company. The main and exclusive purpose of the existence and operation of the joint venture is the construction and operation of infrastructure; shareholders of the company may be the state, individuals and legal entities (Shkvarchuk, Hamalii, 2013).

The state provides guarantees to investors, contractors and users of infrastructure. In this case, the main shareholders of the joint venture should be individuals − citizens who will directly use the infrastructure. The condition for attracting citizens' funds in investment proposals for the construction of infrastructure is the availability of temporarily free funds for citizens and the competitive advantages of such investment.

The most common sources of infrastructure projects financing are public, corporate and project financing. Public financing involves raising of borrowed funds by the government at a low interest rate and providing them through lending to the ultimate borrower through guarantees for debt obligations and subsidies. Financing of projects and the provision of loans, subsidies, benefits by the state is carried out with the PPP institutions. Project financing assumes that loans are provided directly to the newly created company, and debt servicing and repayment will occur using the cash flows of the investment project. With corporate financing, the shareholder company finances the project through borrowings provided to it taking into account a positive credit history in the past (Delmon, 2010).

Financing alternatives tend to foster accountability and strengthen links between users and providers in different ways (Humplick, 1996). The choice of financing source depends on the macroeconomic, political and market conditions of the country, as well as on the specific project and its scope.

In 2017, debt financing accounted for 70 percent of total infrastructure investments in the world. Debt financing is usually realized either by issuing bonds or by direct or syndicated lending (Saha et al., 2017). Debt capital instruments, such as loans and bonds, are the most significant sources of infrastructure financing and provide for the possibility of taking into account the features of infrastructure assets. Thus, debt capital can be structured by time in accordance with the main phases of the life cycle of an infrastructure asset. Secondly, the types of borrowed capital can be structured according to the cost criterion to minimize the weighted average cost of capital and achieve the optimal value of financial leverage (Shevchenko, 2016). In addition, infrastructure projects have a higher debt level than other asset classes, which is explained by lower volatility of cash flows and a greater propensity to borrow in project finance transactions. Debt instruments account for 70-90 percent (in some cases up to 100 percent) of the total capital of an infrastructure project (OECD, 2015).

Increasing external debt for infrastructure projects is a common tool for attracting investment in infrastructure due to the multiplier effect of the implementation of such government investments and the effect of the «budget leverage» in the form of the amount of private capital that an entrepreneur can attract in relation to the financial support that he receives from a state partner at the start of the project. However, given the high level of debt in most developing countries, this method may exacerbate the macroeconomic problems of these states (Leonov, 2019).

The most important advantage of financing infrastructure projects through bonds is the lower cost of borrowing and the ability to attract private and institutional investors to finance. At the same time, bonds are a more complex type of financial instrument. To increase the investment attractiveness of bonds, it is necessary to distribute risks among the stages of the project. At earlier stages of the implementation of infrastructure projects, bonds have a lower rating, since there is a rather high risk of project failure (Davison, Kelhoffer, Keisman, 2013).

In order to involve large-scale private and institutional investors in the process of financing of modernization programs for existing and construction of new infrastructure, it is proposed to create and launch new financial products on the market. Public corporations and other development institutions, targeted SPVs (special purpose vehicle), federal and regional budgets can be participants in the process of financing an infrastructure project from the state. Large state-owned companies, banks, investment funds can act as quasi-state participants in the program of financing projects (Freidina, 2016).

As for the private sector participants, banks and investment funds, as well as large private companies may provide financing of infrastructure projects. Small private investors can also co-finance a project through the purchase of infrastructure bonds and infrastructure structured products (Freidina, 2016). Creating and placing infrastructural financial instruments on the market will open up the possibility of attracting pension and investment funds into the infrastructure development.

Organization of project financing may take the form of investing in the authorized capital of an SPV project; issue of debt securities of the project: infrastructure bonds, Eurobonds, convertible securities; placement of structured derivative products among professional investors: investment and pension funds, domestic and foreign hedge funds. Infrastructure bonds are issued by the SPV project to secure future income from the operation of the infrastructure. The placement

of bonds is supposed to be among professional investors: qualified investors, investment and pension funds, hedge funds, etc. The issuance of guarantees by state development institutions allows to reduce infrastructure bonds and get a high credit rating (Hull, 2015). Convertible bonds can be used for commercial use projects with well-predicted cash flows (toll roads, high-speed rail lines, airports, sea and river freight ports). The issue of Eurobonds, the cash flows of which are provided by the proceeds from the operation of infrastructure facilities, helps to attract international investors in financing infrastructure projects.

The development of the derivatives market can also enhance infrastructure projects financing. The common mechanism for attracting private investors to finance infrastructure projects − a structured note based on infrastructure bonds − combines the cash flows of two assets: the cash flows of one of the assets are designed to generate guaranteed income by the note, while the other is designed to increase the likelihood of increasing the yield of the infrastructure derivative and attract individual and institutional investors. For example, infrastructure bonds guaranteed by the state will provide investors with breakeven, while high-yield and high-risk derivative financial instruments (options and interest rate swaps) can increase profitability (Freidina, 2016). The specific weight of assets in the note structure is distributed in such a way that the probable loss from investing in options or interest rate swaps does not exceed the coupon income from infrastructure bonds; that is, an amount not exceeding guaranteed payments on bonds will be invested in derivatives (Hillier, Grinblatt, Titman, 2012). Coupon payments on infrastructure bonds may be provided by funds received from commercially effective projects, cash flows from which are collected with public facilities, as well as revenues from state and regional budgets that must be used to maintain infrastructure (for example, transport tax).

In the case of placement of infrastructure bonds at a price above face value, a multiplier effect arises, which, in contrast to direct state financing of infrastructure, allows saving and more efficiently allocating budget funds (Freidina, 2016). Thus, the use of infrastructure derivatives increases the efficiency of the use of existing infrastructure and gives impetus to the construction of new facilities at lower government costs.

Equity is crucial in attracting lenders and other financing providers. The goal of the shareholders is to maximize the return on invested capital, which, when financing infrastructure companies, can be achieved through dividend payments, since the shares of such companies do not have a significant potential for increasing the market value (OECD, 2015a).

2.5. Public-private partnership (PPP) as a core of infrastructure development

PPPs help the government to get access to more financial resources by using the private sector as an intermediary (Kopp, 1997), and to allocate limited financial resources to socially important but less commercially viable projects (Williams, 1992). PPPs in addition allow for governments to respond to market forces and become more competitive through managing the public enterprises as private (Leibenstein, 1966). In addition to reducing the burden on the budget, PPP allows the state to attract new technologies, high-level specialists and accelerate the implementation of new projects. The private sector, in turn, receives benefits, subsidies and direct support from the state, as well as guaranteed profits (Khulukshinov, 2016).

Thus, according to the study, countries that use the PPP mechanism to provide services have saved up to 30 percent of their funds by attracting the private sector. Moreover, the report of the UK Accounts Chamber revealed that only 22 percent of PPP projects showed an excess of costs, and 24 percent showed temporary delays in project implementation, contrariwise to 73 and 70 percent respectively with traditional budget financing. A study by Australia's Infrastructure Organizations also proves that the cost of PPP projects under traditional financing was almost 12 times higher than with PPPs (Raisbeck, Duffield, Xu, 2010). In addition, there are frequent cases of early commissioning of objects completed as part of public-private partnerships, for example, the M1 and M15 motorways in Hungary, while this almost never happens with ordinary state orders (Shevelkina, 2014).

Budgetary co-financing of PPP involves direct support in the form of subsidies, cost recovery, the provision of land for construction and compensation of costs, contributions to the authorized capital, loans on concessional terms, as well as indirect support in the form of state credit and foreign exchange guarantees, tax, customs benefits, guarantee of demand on services, indemnification etc. (Shevelkina, 2014).

State guarantees involve raising funds from international financial organizations on conditions convenient for business and reducing risks in the framework of the project on the basis of public-private partnerships (Shevelkina, 2014). The public sector is able to take on the risks associated with the adjustment of exchange rates, inflation values, since these parameters are influenced by the state.

The implementation of the project assumes the availability of financial flows in the form of payments: by the state to business for the implementation of activities and financial and property support of the public sector, from the private sector in the form of financing for the implementation of the project, from the user to the private sector for the services provided by it, between business and banking organizations as providing financing, paying credit interest, or repaying a loan, paying taxes to the revenue side of the budget system by business (Shevelkina, 2014).

The project participants, on the basis of the terms of the contract, evaluate the project's capabilities in generating financial flows that determine the success of its implementation and become a source for servicing and paying off debt and capital income invested in the project. In the case when the state undertakes to make periodic payments to a private partner, there is a risk of underfunding, since budget planning is short-term, in contrast to a long-term infrastructure project. Thus, the formation of a financial model, which is the design of the project based on financial statements, should provide information on interconnected calculations of profit and loss, cash flows and the forecast balance.

PPP projects are usually implemented through of private capital; using government orders; on the basis of co-financing and at the expense of public debt obligations and the provision of various benefits by the state. Using the PPP mechanism, government in a cooperation with the private sector may implement large socially significant projects that require significant financial costs (Khulukshinov, 2016). Critical factors for success or failure of a project are operating and maintenance costs. The success of the partnership is defined by striving for efficiency, quality and accountability on both public and private sides (Hammami, Ruhashyankiko, Yehoue, 2006).

As the survey shows, 52 percent of investors and project managers have faced cost overruns when implementing PPP projects (PwC, 2013). In this case, the participants in the investment project resort to a budget (financing of the project is mainly carried out at the expense of budget funds) or a credit financing scheme (implementation of the project by providing funds on a repayable basis under the guarantee of the state or business) (Khulukshinov, 2016).

Project financing acts as a method of financing investment projects, characterized by a special way to ensure return on investment, which is based solely on the cash income generated by the investment project, as well as the optimal distribution of all risks associated with the project between the parties involved in its implementation (Igonina, 2017). One of the most important principles of project financing is the targeted use of funds, which allows us to solve the problems

of underfunding and misuse of budget funds. The implementation of this principle is ensured by the creation of a special project company for the implementation of the project. A special purpose vehicle (SPV) is created with the sole purpose of building and maintaining the infrastructure project. With the help of equity investors and credit organizations, SPV arranges for financing to build the project, and then makes deals with many contractors and operators needed to build the project. In addition, the SPV has a project development agreement with the sponsoring government (Bennon, 2017). The SPV is responsible for providing public services, including the design, construction, repair, and maintenance of assets. The bank may have a stake in SPV, provide a loan to the company, as well as enter into direct agreements with the authorities and subcontractors, giving it the right to intervene in the conduct of the project in case of default. The SPV provides the opportunity for many different parties to work together and helps to distribute and diversify risks and financing needs among several parties. Government assistance is also an important element of a PPP project (Kochetkova, 2019). The capital structure is characterized as a combination of debt and equity instruments that are used to finance a PPP project. Equity financing is usually provided by private sponsors in exchange for a share of ownership in the SPV. The remaining financing is usually provided through project financing. Assets and liabilities for the project are on the balance sheet of the company, not its shareholders. Thus, a special project company is responsible for the project assets, own funds replenished by partners, and for the project debts, in addition, it is responsible for the main contractual relations: concession, operation contract, use, financing, insurance (Shevelkina, 2014). In the case of project financing, the SPV borrows funds and repays the debt from the cash flows generated by the project (Kochetkova, 2019).

PPP includes a wide range of contractual relations between the public and private sectors in the provision of public infrastructure and services. The main participants in the financial relations of public-private partnerships are SPV, the state and financiers. All assets of the borrower that are connected to the project are secured in such a way that a security package is formed. In some jurisdictions, each different asset has its own form of security documentation. It covers all of the borrower's assets: real estate, inventories, equipment, licenses, concessions obtained, all key contracts and all key documents, bank accounts, insurance policies, hedging agreements etc. All during the risky construction period pledge to the lending parties would be trying to get a

completion guarantee from the sponsors, parents of the borrower suggest to ensure that it would use the fund to complete the project on time and on budget.

Financier-led model (FLM) is another PPP financing framework in which investment banks play a leading role in SPV management (Moiseeva, Kochetkova, 2015). In this case, the bank is responsible for the process of participation in the tender, may provide an SPV loan, and is also responsible for monitoring the implementation of the contract. Thus, the bank is a link: it enters into contracts with the parties responsible for construction, repair and maintenance, and is responsible for creating a consortium. The bank owns almost all SPV shares, it decides on the conditions under which other participants will work, is responsible for underwriting securities issues and for other elements of the contract (Litvinova, 2013).

Within the framework of the PPP mechanism, a structure of transactions for financing infrastructure projects is built, which allows private investors to obtain the optimal ratio of return on investment in relation to the probability of losing their investments both as a result of a commercial failure of the project, and as a result of administrative and institutional risks. When structuring a public-private partnership transaction in infrastructure construction at the initial stage, it is necessary to fix the parameters of future cooperation, such as guarantees of transfer of rights to receive benefits from the operation of the infrastructure object and the parties' share participation in the project, as well as the presence of private business in the corporate governance structure of the project, and dividend policy upon commissioning a project (Freidina, 2017).

The role of the state is to assess the main systemic threats to the economy, formulate recommendations on the most desirable areas of investment activity of private capital in the implementation of PPP projects, use direct and indirect methods and tools to attract and stimulate private sector in infrastructure projects. Priority should be given to those projects which, in addition to the economic and social effect, will be able to provide the greatest multiplier effect of employment growth and involvement of auxiliary business entities (Cheremisinova, Tarasenko, Pavtzyo, 2019).

Being a core of infrastructure development financing, PPPs facilitate the balance of allocated rights, risks and cost of investment between the private and public sector to build essential infrastructure (Ehrhardt and Irwin, 2004). Thus, it is important to consolidate the responsibility of both parties in order to prevent non-fulfillment of their obligations by the private sector, excessive regulation and corruption by the state, and to deliver infrastructure services to

consumers on time and at affordable rates. In this regard, it is also necessary to ensure openness of projects, transparency of tenders and evaluation of project results, as well as the study and dissemination of best practices of PPPs (Revzon, Mikhalcheva, 2016). The participants evaluate the financial benefits of participating in the project by means of Value for Money (price-quality ratio, which shows the effectiveness of the project) and Public Sector Comparator (comparative cost level, which characterizes the cost of costs throughout the life cycle taking into account risks) (Khulukshinov, 2016).

All PPP projects should undergo a feasibility study − analysis and evaluation of the proposed project in order to determine its technical feasibility, the possibility of implementation within the estimated cost, as well as economic viability. A feasibility study is especially important for investors and government agencies with little experience in this area. It helps to identify potential problems, but does not guarantee the absence of problems and risks (PwC, 2013). Thus, in addition to the feasibility study, risk and project management in general should be followed by project planning and forecasting, as well as accuracy in determining costs. For existing projects, the development of a common asset management structure and project life cycle planning are priority tasks. Lenders rely on technical and economic valuations of the project to ensure its ability to generate sufficient revenues. In case of project failure to get the predicted level of revenues, SPV has to sell the parts of the project's grid to repay the lenders.

Project financing requires additional scrutiny on the project; therefore, in developing economies this framework can be a tool to make sure the project economics and risks make sense. In general, most of these projects are procured using a performance-based contract, thus permitting the government to conduct an inspection to make sure that maintenance is being spent, or require the contractor to regularly report their maintenance activities (Bennon, 2017). Project finance structures are not "one size fits all"; therefore, each project requires an individual assessment of risk and opportunities to mitigate it.

Hemming, Schwartz and Akitoby (2007) have defined the determinants of PPP usage, which are: government constraints, political environment, market conditions, macroeconomic stability, institutional quality, the legal system, and past experience with PPPs. The research proves that heavy debt burden, high aggregate demand and large market size attract PPPs to country. The risks are present where there has not previously been any infrastructure provider, where potential demand is unknown, or where tariffs on public services were formerly subsidized and collection

poor. For some contracts, the state may take responsibility for tariff collection or buy the infrastructure services from private partners at a fixed price. This option reduces the risks for the private sector while increasing them for the government since there is a possible since in a crisis, a situation may arise that the state will not be able to afford its contingent liabilities (Ehrhardt and Irwin, 2004; Thomsen, 2005).

The essential factor for PPPs is macroeconomic stability and low inflation in particular. The higher is the country's rating (for example, the credit ratings of international agencies), the more attractive it is for private investors and providers (Dailami, Klein, 1997). Accordingly, some governments provide price or revenue guarantees to private partners. Thus, PPP development requires policymakers to ensure overall price stability. In addition, since most projects in developing countries are using foreign capital to finance infrastructure investments, they are subject to currency risks: while revenues from the project occur in local currency, debt repayment or dividend payments are made in foreign currency. Thus, the project profitability is at risk of monetary instability in a form of unexpected devaluations, for instance, as it happened in the 1990s in Eastern Europe, Latin America and Southeast Asia.

The proper governance also tends to increase PPP involvement in infrastructure investment as well as the amount of funds invested. Institutional quality, effective rule of law and protection of investors' rights, lower bureaucracy and favorable regulatory environment enhance the certainty reduce the risk for the project's investors (Pistor, Raiser, Gelfer, 2000). Common law systems also ensure the protection of investors of infrastructure project (LaPorta et al., 1998). They have the particular importance in terms of political instability in developing countries, where often reforms may affect the balance of risks between governments and private firms.

Successful past experience with PPP proves the efficiency of this method of infrastructure project governance. Additionally, it affects not only the number of PPP projects but also the level of investment in these projects. It is explained by solvency risks: governmental exchange rate guarantees should prevent local private firms from freely borrowing in foreign currency, while government debt guarantees may distort the incentive for decision-making in private sector (Hemming, Schwartz, Akitoby, 2007).

Alesina, Baqir, and Easterly (1999) concluded that ethnically divided countries tend to require a larger number of infrastructure projects to satisfy different preferences and reduce the

likelihood of conflicts, thus distributing governmental resources and increasing financial burden on the public sector. Therefore, in these countries PPPs are welcomed to attract more capital.

As for the ownership, it is stated that the party that receives more benefits from the infrastructure project and has similar technology structure should be the formal owner of the project (Besley and Ghatak, 2001; Francesconi and Muthoo, 2004). When the productivity of investments of the parties is equal, joint ownership is the most appropriate structure of ownership.

Therefore, in water supplementation, which is traditionally a responsibility of public sector, less competitive and requires less technology, the private sector involvement is lower than in telecommunications, where the advanced technology and innovation, which occur in terms of high competitive environment, is a key, private sector is the main owner and provider of the services (Francesconi and Muthoo, 2004). The energy sector, while being quite technology intensive, also requires a lot of capital, thus tending to be more public. Contrariwise, the transportation usually requires less technology and innovation while allowing for a greater divisibility of assets and private ownership.

Economic infrastructure (transport, water and energy) is more acceptable for PPPs than social infrastructure, since projects aimed at eliminating obvious bottlenecks in the infrastructure will have high economic rates of return and will be attractive to the private sector. Further, user charges are often more feasible and appropriate in economic infrastructure development projects. Additionally, in the case of economic infrastructure development projects, there is usually a more developed market that can combine construction with the provision of related services (for example, construction with the operation and maintenance of a toll road) than in the case of social infrastructure development projects (Hemming, Schwartz, Akitoby, 2007).

In developing countries infrastructure investments have been continuously privatized with two exceptions: road infrastructure, which largely remained in the public sector, and power generation in countries with limited energy resources where most generation and transmission have remained in the public sector. Water supply and other areas of infrastructure have been provided by lower levels of government and, in some cases, the private sector (Humplick, 1996).

At the same time, transport infrastructure is one of the main areas of PPP application due to the peculiarities of such investment projects. Firstly, the transport infrastructure creates significant socio-economic effects that cannot be fully taken into account by indicators of commercial efficiency: mobility of citizens, business development, creation of additional jobs,

increasing competitiveness, potential of the territory and its investment attractiveness. Transport infrastructure also has indirect positive effects due to the development of roadside infrastructure facilities (gas stations, roadside hotels, cafes, billboards and so on). Transport infrastructure projects are also quite capital intensive and have a long payback period. Uncertainty of future traffic also increases the risk of not receiving planned revenues (Shevelkina, 2014).

In countries with economies in transition (Bulgaria, Czech Republic, Hungary, Croatia, Poland, Romania, Ukraine, the Baltic countries), PPP projects for the development of transport infrastructure are predominantly funded: construction and reconstruction of roads, ports, railways, bridges and tunnels, light underground and airports. In Russia, PPP has been used relatively recently and is used in the construction of roads, airports, water supply and sanitation systems, heat supply (Hayrapetyan, 2009).

Contrariwise, in the telecommunications sector, public spending should be minimal, since around the world, the sector is largely driven and operated by the private sector. The telecommunications sector does not require any investment in a public-private sense, since it can be developed by the private sector (Biller, Nabi, 2013).

PPP has helped many countries to develop infrastructure, in particular in the transport sector. So, the new terminal at Pulkovo Airport in St. Petersburg, Russia, was implemented through a concession agreement without raising budget funds based on regional legislation on PPPs. The concessionaire's investments are estimated at 1.2 billion euros, thanks to which a new modern passenger terminal with an area of 170 thousand square meters was built with a capacity of 18 million passengers per year, a large-scale modernization of the airfield infrastructure was carried out, new aprons, a business center, and a hotel were built. As a result, passenger traffic and airport revenue doubled (Revzon, Mikhalcheva, 2016).

Regional and global development agencies assist the developing countries to enhance economic growth through investment in infrastructure. They provide the expertise guarantees, loans, equity finance, syndication, and risk management, which are all essential for successful PPPs (Hammami, Ruhashyankiko, Yehoue, 2006).

2.6. Sources of PPP financing and organization models

Another method of financing PPP projects is the use of state investment banks (SIB). SIBs can issue bonds secured by bank capital and loan repayment payments from the pool of local borrowers, which helps reduce risk for investors. SIBs also offer credit enhancement mechanisms, such as loan guarantees, allowing private sponsors to borrow money at lower interest rates, and grants. Through the use of SIB, the state can circumvent its own constitutional or legislative limits on debt, especially if the debt is secured only by payment for the use of infrastructure facilities or other income from user charges.

Infrastructure banks make soft loans to private or public firms, open lines of credit, work in impact fees, provide loan guarantees, or leverage public or private funds. The cooperation with infrastructure banks is beneficial for private sector investors since it aims to help large projects, allows subsidies and has market orientation. Thus, such projects must pass a partial market test, which avoids building of unnecessary projects. It also encourages planners and decision makers to take a long-term view. Infrastructure banks offer a lot of flexibility and can adapt to local conditions (Mudge, 1996). Additionally, international financial institutions (World Bank, IFC, EIB, EBRD, AfDB, ADB, IDB and so on) can act as guarantors in PPPs and help minimize the risk of government defaults (Shevelkina, 2014). Since developing economies use this procurement model fairly often, the impact of multilateral banks policies increases. Therefore, multilateral lenders like the World Bank require that project finance be used for some of their infrastructure projects (Bennon, 2017).

Infrastructure banks as well as international development institutions allow moving from reliance on a single national model to considering a variety of more flexible models to promote infrastructure funding (Brennan, 1996). Development banks have huge balance sheet, they are able to build capacity, to do a credit enhancement and provide coordination among various players. Investment banks become increasingly relevant to the infrastructure space because of their skills in matching investors with sponsors' needs: they may be responsible for funding, distribution, long-term risk hedging to make the deal financeable, since infrastructure objects are exposed to interest rates, foreign exchange risks and commodity risks, structuring an asset on behalf of a sponsor and finding the type of risk relevant to investors.

Protection of investors provided by multilateral development banks allows private entities to enter infrastructure investment process. In developing countries, PPP projects are commonly supported by multilateral development agencies, mainly the International Finance Corporation

(IFC). The Multilateral Investment Guarantee Agency (MIGA) as a part of World Bank Group, as well as the International Bank for Reconstruction and Development (IBRD) are also involved in organization of infrastructure investment projects. The most active regional organization is the Inter-American Development Bank (IADB), which supports 231 projects, followed by the European Bank for Reconstruction and Development (EBRD) and the European Investment Bank (EIB) with 156 and 124 projects, respectively, and the Asian Development Bank (ADB), which supports 65 projects (Hammami, Ruhashyankiko, Yehoue, 2006). They aim at providing the expertise, guarantees, loans, equity finance, syndication, or risk management. For example, multilateral development banks are an increasingly important source of climate finance committing 35 billion dollars in 2017 (OECD, The World Bank, UN Environment, 2018).

According to the governance structure of EIB, all member states of the EU become shareholders of the Bank, with board of investors consisting of their government representatives and its co-financing model with private investors that offers credit enhancement to private investors (Sundaresan, 2017).

IADB has the capability of approaching infrastructure risk across the entire credit spectrum for projects that involve risks that are fundamentally sovereign (for example, land acquisition for an urban transportation system), and provide a sovereign guarantee.

African Development Bank (AfDB) helps investors with mitigating the risk of having to deal with government, thus playing a role of a bridge between the private and public sector. The Bank also enhances business environment, legal and regulatory framework through the cooperation with local governments and other international institutions such the World Bank and IFC, and strengthens internal security by the means of transparent budgets, credit enhancement, and correct and clear and well-managed bidding process.

To meet the enormous infrastructure needs in Sub-Saharan Africa, European Union donors joined forces with EIB and other development finance institutions in 2007 to launch the EU-Africa Infrastructure Trust Fund (ITF). EU-Africa ITF is a leading Trust Fund dedicated to Sub-Saharan Africa with the funds provided by the European Commission and 13 EU member states. ITF purpose is to support transformational, cross-border infrastructures in 4 key sectors (water, transport, energy and ICT) with proper project governance, assessment, technology transfers, tailored approach etc. Since private actors cannot cover substantial risks in poor fragile countries, ITF is able take away those risks and make private sector even governments, i.e. Finland, invest

in African infrastructure projects. According to ITF, one euro of donor contribution may leverage 18 euro of investment from private sector (European Investment Bank, 2020).

With the use of ITF subsidy, highly indebted poor countries with limits in the amount of additional debt they can contract may increase the level of concessionality and put less burden to the electricity tariff. One example of the such project is power rehabilitation in Benin and Togo aimed at rehabilitation and extension of the electricity transmission network. In the first 11 years of activity, EU-Africa ITF Donors and Project Financiers have together financed 86 cross-border projects (European Investment Bank, 2020).

IFC is engaged in funding, regulation and sector reform together with local governments and the World Bank. In early 2019, construction of the Nachtigal Hydro Power Plant Project, Cameroon, has started that will deliver a third of country's energy needs. It is the largest privately financed project of its kind ever facilitated by 15 lenders, including IFC. In Zambia, IFC has organized an auction for the scaling solar project resulting in the lowest solar power tariffs in Africa to date and thus, providing more energy independence (Palmer, 2019). IFC energy projects also allow for sharing benefits with the local population granting the social license to operate. In addition to legal licenses and permits, company needs to have local acceptance for the project to continue to operate.

The leading development financial institution in Africa − the Development Bank of Southern Africa − focuses on the primary issues facing many Africans such as education, health care and infrastructure development. The Bank aims to finance the projects with are based on a technology which provides long-term infrastructure and can be used in very different ways. The organization is aimed at drawing public and private sector finance together to finance programmatic repeatable infrastructure projects to satisfy urgent similar needs in multiple spaces (DBSA, 2020). The cooperation with local development finance institutions (DFIs) is a key to free up local capital which is present, but not available due to cash squeeze by banks and dollar dependency. For francophone countries, some collaborations with French DFIs are also beneficial. Due to changing political landscape and instability, transparency and good governance are essential to engage private sector participation: and co-investments creation.

At the moment, the development of PPP projects is limited due to several problems, especially in developing countries: the lack of a strategic goal-oriented approach to planning and development of infrastructure, as well as a system for managing the PPP sector at the national level

and a unified model at the regional and local levels, insufficient level of development of the legal and methodological framework in the field of PPP, as well as the development of the market of private operators and competition in the field of PPP due to existing legal restrictions and barriers (Revzon, Mikhalcheva, 2016).

Thus, for the development of PPPs in developing countries, it is worth creating a mechanism that encourages countries and regions to use PPPs for creating infrastructure facilities, as well as providing state guarantees for attracted financing to PPP projects. In more developed jurisdictions, it is recommended that existing mechanisms for providing state guarantees or the creation of a specialized infrastructure credit agency be improved (Revzon, Mikhalcheva, 2016). It is also necessary to strengthen the role of extra-budgetary funds in financing PPP projects by expanding the scope of activities of pension funds, investment funds of entities, and the creation of specialized infrastructure funds, as well as increasing the economic motivation of investors through the development of the securities market.

The transformation of the banking system in order to increase the competitive environment, for example, by softening the obligations regarding the formation of reserves for securing loans issued for infrastructure projects, will also contribute to the development of PPPs. In addition, the state should initiate infrastructure projects, under the financial support of which it would be possible to issue long-term debt securities.

One form of public-private partnership is infrastructure financing through the issuance of infrastructure bonds. Its implementation is hindered by the lack of relevant experience and flaws in the procedure and mechanism for providing state guarantees for it (Puchkina, Susskaya, 2014). Potential investors in this case are commercial banks, pension and other funds oriented to a conservative investment strategy (Kozhin, 2012). The ability to attract funds from a large number of investors at a relatively low cost makes infrastructure bonds one of the most promising forms for private infrastructure financing.

The main objectives of the application of the bonds are financing the budget deficit, paying off debt, financing budget expenditures within the framework of debt repayment, restructuring the existing debt (Puchkina, Susskaya, 2014). This makes it difficult to directly use bonds to finance infrastructure, but this problem can be avoided by adopting appropriate legislation.

Given the limited financial capabilities of local, regional and state budgets in developing countries, it is possible to issue bonds for projects with high yield potential, i.e. airports and

seaports (Puchkina, Susskaya, 2014). With low potential profitability of projects, as well as with their social orientation, bonds of private companies with guarantee coverage should be used.

As part of this financing method, the entity enters into a project agreement with SPV, which in turn issues infrastructure bonds. In order to reduce risks for potential investors, government, regional or municipal guarantees are issued on issued securities. When issuing infrastructure bonds in foreign currency and entering foreign markets, guarantor organizations may be the International Bank for Reconstruction and Development (IBRD), the European Bank for Reconstruction and Development (EBRD) and other financial organizations. A more developed capital market will attract large volumes of financial resources at a lower cost. It is possible to use mixed guarantee coverage in the case of using multicurrency infrastructure bonds, which will make it possible to diversify foreign currency loans and reduce currency risks.

In addition to guarantees, the fulfillment of obligations certified by infrastructure bonds can be secured by a pledge of future monetary claims. These requirements consist of estimated income or cash receipts from the operation of the infrastructure facility (Puchkina, Susskaya, 2014). With respect to the remainder of the obligations to pay the nominal value and obligations to pay income, securities or real estate may act as collateral, or a bank guarantee may be provided.

If the project does not generate income, repayment is ensured by all items of the guarantor's budget revenues or by a specific type of income, in particular, transport tax. In this case, SPV transfers the finished infrastructure project to the state immediately after construction. If the infrastructure facility generates cash flow, then the face value and coupon income will be paid off at the expense of the infrastructure use fee, and the ownership will be transferred to the state after the payback period.

Attracting financing by issuing infrastructure bonds redeemable from project revenues or tax and non-tax revenues of the entity will eliminate infrastructure depreciation, ensure its modernization and construction. For investors, infrastructure bonds are a popular instrument for investing financial resources with a relatively low level of risk and a high level of liquidity, which will stimulate their conservative segment to be more active (Puchkina, Susskaya, 2014). Developing local currency bond markets may provide long-term local financing, while providing financial resilience.

There are examples of the successful application of the infrastructure bonds issue mechanism to finance projects. In the United States, infrastructure bonds are issued at the municipal level and are called special purpose bonds. Bonds are issued as general coverage (general bonds), and secured by cash flows from specific projects for the construction of infrastructure facilities (revenue bonds). U.S. municipal bond yields are generally tax-free, which makes investors more attractive. In addition to municipalities, corporate infrastructure bonds that are issued as part of concession projects are circulating in the US market. These types of bonds are backed by government guarantees or guarantees from major US commercial banks (Freidina, 2017). Municipal bond markets in the USA through the tax exemption make investors incentivized to supply capital to infrastructure projects. Ability to trade allows for exit options and liquidity. Most of the infrastructure investment in the USA is done through the municipal bond market.

In Australia, infrastructure bonds are issued by the government to finance a list of infrastructure facilities previously specified in the legislation: land and air transport, electricity, gas and water, sewage. In Europe, infrastructure bonds were issued by France to finance stadium construction projects in preparation for the 1998 FIFA World Cup (Freidina, 2017).

Among developing countries, a successful example of the use of infrastructure bonds to finance concession projects in the field of metallurgy and housing and communal services in Chile is noteworthy. Thanks to the use of public-private partnerships and the issuance of bonds, the share of private investment in Chilean infrastructure increased from 9 to 65% between 1995 and 2005 (Bethell, 2009).

In Nigeria, the government has established the program for 275 billion naira or 1,8 billion dollars' infrastructure bonds; so far around 50 billion naira or 330 million dollars were issued in terms of bonds. In Kenya, infrastructure bonds in Kenyan shilling (12-year and 8-year) are used to bridge the existing infrastructure gap. Kenyan public utility issued the first infrastructure bond in September 2009 for 27 billion Kenyan shilling. Local interest rates are quite high − 20 percent for 15-year projects. Thus, there is a macroeconomic issue with infrastructure bonds in Africa, since local currency interest rates need to be of acceptable levels (Rana, Izuwah, 2018).

An unsuccessful example of the placement of infrastructure bonds is Kazakhstan. Infrastructure bonds were issued by enterprises of Kazakhstan to finance projects for the construction of the railway and power lines. Both projects were funded under a PPP contract.

Securities buyers were predominantly local pension funds. In both cases, the issuer defaulted. The failure of the projects was primarily caused by deficiencies in planning at the stage of the formation of the securities prospectus and cash flow forecasting, as well as insufficiently defined joint and several liability of PPP participants and the lack of fiduciary responsibility of the parties (Freidina, 2017).

Issuing project bonds is appropriate when the issuer is SPV as part of the organization of project financing. It is advisable to issue secured income bonds when large infrastructure projects are being implemented within the corporation.

In order to attract private investors to work with infrastructure bonds, it is necessary to ensure low project risk and stability of cash flow, legislative compliance of infrastructure bonds with investment requirements for pension funds, insurance companies, open-end mutual funds, and government involvement in the responsibility for the project of creating infrastructure bonds objects, the ability to hedge risks on infrastructure bonds and the availability of tax benefits for investors and issuers of infrastructure bonds (Freidina, 2017).

Green bonds are another emerging tool to finance sustainable growth. Using this mechanism, the private investor invests in a green bond issued by utility company which provides environmentally-friendly infrastructure. The company guarantees that money will be used for investments that meet certain environmental criteria, while agencies control it and check if the funds are indeed applied to the investments in sustainable projects.

In the area of financing, the government may transfer responsibility to the private sector, while keeping financing in the public sector for the efficiency of operations and to maintain the advantages of government borrowing and flexibility. The same arrangements can be made for operation and maintenance. Humplick (1996) has summarized different models of private-public sector interactions for infrastructure projects in nine types described below. The main features of each of them are gathered in the Table 1.

Table 1.

The models of public-private infrastructure procurement

#	**Option**	**Ownership**	**Planning**	**Financing**	**Operation and Maintenance**
1	Specially Negotiated Contribution	Public	Public	Private	public

2	Joint Public/Private Organizations	Mixed	Public	Mixed	private
3	Formal Joint Ventures	Mixed	Public	Private	Private
4	Service Delegation	Public	delegated agent	Public	Private
5	Contracting Out	Public	Public	Public	Private
6	Leasing	Public	Lessee	Public	Private
7	Concessioning	Public	Concessionaire	Private	Concessionaire
8	Participation by Users	Users	Users	Users	Users
9	Privatization	Private	Private	Private	Private

Source: Humplick (1996)

Specially negotiated contributions entail one-time participation of partners, within which the private sector brings in certain types of financing to put an infrastructure project together. The developer gives some contributions to infrastructure to finance things that would otherwise not have been financed, usually for private goal. For example, in the extension of the London Underground Railway in the United Kingdom, a developer provided the financing for developing the dock areas and make them more attractive within a one-time deal. In France, developers have entered into a long-term arrangement to deal with urban density. Developers were given rights to provide higher density housing in certain areas of a city in return for some types of public infrastructure. The responsibility for managing the infrastructure remains in the hands of the cities since the 1970s (Humplick, 1996). Some cities have rejected this option as no longer feasible and have made it illegal, although it is still being used in other cities.

Some countries use joint companies to combine public and private investment. For example, the construction of Trans-Tokyo Bay Highway (15-kilometer link into the existing network of highways in the metropolitan area) entailed network infrastructure provided through private arrangements. The project was divided into the construction and the maintenance and operation. In the construction phase, the public sector remained the owner of the project, represented by the Japan Highway Corporation, which also coordinated the project. The corporation also had responsibility for planning, administering and collecting tolls, financing the survey work, and purchasing the land. The private company was responsible for raising the capital for construction and managing the construction, at the end of which they handed over the

completed project to the Japan Highway Corporation. New contract was negotiated, under which the Japan Highway Corporation paid the private entity through dedicated tolls collected by law, therefore, private and public companies had joint responsibility for maintaining and operating the highway (Humplick, 1996).

As a form of joint companies, formal joint ventures make public and private sectors enter into formal contracts for one-time projects. For example, in Australia government and a private developer have cooperated to provide urban infrastructure services. Under the agreement, the state has given the land and guarantees some elements of infrastructure, such as pipe connections and certain highway links (Humplick, 1996). The private developer has financed the construction and guaranteed to provide infrastructure not provided by the government, including low-income housing or housing for public allocation.

Transfer of planning and management responsibilities by government to private agents, or service delegation, means contracting out the service to the private while government still keeps public ownership. For example, agencies have been created in a number of countries (in most countries of Africa and in Russia) for governments to transfer responsibility for planning and managing the procurement of public works to private agents. Hence, due to high unemployment rates in many African countries (Niger, Senegal, Chad, Gambia etc.), governments have put a private agent in charge of monitoring how many jobs are being created by various projects and documenting improvements in local construction industries (Humplick, 1996).

The agent has responsibilities of providing the infrastructure, managing the implementation and reviewing and selecting projects. Thus, municipal governments and communities send project requests to the agent, and the agency reviews the projects and applies criteria agreed upon by the central government and the private agent on how to select projects. The agency also manages the procurement or selects the winning bidder and manages the payments to the contractor, hires a firm to supervise the work, and manages other aspects of the government project on implementation side. Private agent selects projects based on benefit-cost ratios and other criteria of social desirability and finances the project with funds from the central government.

Contracting out is widespread in the United States, however, it is limited to maintenance and operations in developing countries. For instance, in Pakistan railway company contracted out ticketing, cleaning, and catering for the railways, although everything else has remained in the public sector. Repair and maintenance of locomotives was contracted out in Kenya. In the

Philippines, the operation of an entire container terminal in the port sector was contracted out (Humplick, 1996).

In most developing countries municipal water companies are hampered by labor unions and are unable to restructure; as a result, they struggle to become more efficient. In Chile, for example, companies contract out reading meters and collecting fees for municipal water. Under a French model of contracting out, 70 percent of municipal water is contracted out, including management and operation of municipal systems and the treatment of waste (Humplick, 1996). The municipalities maintain ownership of the assets, determine strategic policy in terms of investment, regulate prices where there is no competition, award contracts for management of these services and regulate the performance of the company.

Under leasing, public sector plans and sets policy for the private sector, and is in charge of capital investments. It can also involve foreign financing through negotiated agreement between the government, a public-private company, and the external financier, the World Bank. The World Bank assumes declining shares of the foreign component of investment over time, and the central government assumes declining shares of debt. By the end of the lease period (10 years), the public-private company would be responsible for the full capital investment. For example, the service company to finance the water supply in Guinea is a mixed public and private company, 49 percent of which is owned by the government, while a foreign consortium owns the other 51 percent. The service company has a 10-year lease to provide services, mostly operation and maintenance (Humplick, 1996). The company assumes the commercial risk and is paid through user fees.

In the framework of management and lease contracts, a private company receives a state-owned object for management or lease for a fixed term, while the state makes investments. Risk management can be carried out by both the state and the private party. In a lease, the investment obligations of a private partner are operation, technical re-equipment and modernization (Shevelkina, 2014).

Concessioning is one of the most-used frameworks of PPPs in infrastructure development. The concession is mainly used in the conditions of a natural monopoly, which makes it possible to stimulate competition in the relevant field. During the concession, the state provides the private partner with the right to use the existing facility for a fee subject to return, retaining ownership of the facility, while the private sector carries operational and investment risks (Humplick, 1996). The contract provides for co-financing, design, construction and operation of the facility. The main

types of concessions are Rehabilitation-Operate-Transfer, Rehabilitation-Lease-Transfer and Build-Operate-Transfer (Shevelkina, 2014).

As a result of the concession, the state receives a functioning facility, saves on financing its construction or reconstruction, and entrepreneurs earn money on the subsequent operation of the facility. The main feature of concession agreements is that foreign financial investors can participate in them, and a foreign contractor can also be involved (Leonov, 2019).

The economic interest of the concession stems from three basic principles: the concessionaire is responsible for the construction and operation of the facility and knows how to minimize the total cost of construction and maintenance for the long term, the investment in the facility is based on economic criteria, and the project procedure allows financing faster than the rules, governing the budget.

In international practice, the economic effect of the use of concessions averages up to 15 percent of the cost (Shevelkina, 2014). The longer the term of the contract, the more opportunities the concessionaire has for reimbursing construction costs and the cost-effective operation of the infrastructure transferred to it by the state.

Under the French model, the public enterprise retains ownership of the infrastructure, but responsibilities are transferred to the private company. For example, in Côte d'Ivoire, under the arrangement to supply water, the local interest is 52 percent of the capital involved, the foreign (French) private company Saur owns 46 percent, and the government interest is 2 percent. Thus, investment and operational responsibility for supplying water for the whole country is given to the private company (Shevelkina, 2014). The contract has a provision for investments in low-income areas, and specifies what the company should do in terms of providing services to low-income housing − waiving the connection charge. The company assumes the social responsibility for this provision. Tariffs set by the company must meet a number of objectives: operating costs, funds for expanding and rehabilitating the networks, paying the shareholders, and paying the government a rental fee to repay the debt.

In the case of concessions, the fate of the enterprise is strictly prescribed in the concession agreement, regardless of the benefits or payback of the project, taking into account risks and penalties for failure to fulfill obligations, up to and including termination of the contract. Concession agreements based on models related to the collection of fees for the services provided usually imply an increase in tariffs when certain results are achieved, such as an increase in

passenger traffic in the case of airports, or a decrease in accident rate on the line in cases of water supply (Leonov, 2019).

Concession transactions are most effective in highly specialized industries in the face of developed competition, or in cases of small contracts, as the risk taken by the state is minimized, and there is extensive jurisprudence regarding the settlement of claims. Most major infrastructure projects are rejected by business due to the fact that during the construction or reconstruction of a large facility, the concessionaire is obliged to take all the financial risks and seek investors for this project, while government participation and the risks he takes are minimized.

Coming back to Côte d'Ivoire example, the company has been realizing a 5-6 percent growth rate in connections, including low-income housing connections. The performance has improved, and unaccounted-for-water was less than 15 percent. Collection from private consumers has never gone below 98 percent (Humplick, 1996).

In 1980, the urban water service in Port Vila, Vanuatu was operated by the Public Works Department. The water service in the urban areas was gradually degrading since the government was unable to collect sufficient funds to cover operating costs and the level of collection was poor. Since the funds were not sufficient to cover operating needs, the water supply network and the quality of service were deteriorating and negatively affecting other industries. Concession has helped to overcome the water supply system inefficiency thanks to the initial acceptance by the government of its own weak institutional state and well-designed contract with good provisions for tariff indexation and clear definition of service targets (Jha, 2005).

Around 25 percent of all airports in Europe are in concessions: in 2003, the French government transferred to management of private partners one of the largest national enterprises, Paris Airports, which includes Roissy-Charles de Gaulle, Orly, Bourges, Issy-de-Moulineaux turnover of 1.2-1.4 billion euros (Airports Council International, 2016). In 2017, a concession agreement was signed to transfer the operation of Takamatsu Airport to a consortium led by Mitsubishi Estate in Japan (Leonov, 2019). In Russia, there was the transfer of Pulkovo Airport to the Northern Capital Air Gate consortium in 2010 (InvestInfra, 2020). A large number of airports among successful concessions can be explained by the fact that this type of agreement is most effective for the competitive development of business in this area.

The concession allowed France to increase the length of roads by almost 10 times in 10 years, while almost two thirds of the roads were in concession. Today, about 70 percent of roads

in France (7 thousand km) are in concession: for example, a bridge in Normandy, a bridge to the island of Ile de Ré, A14 and A86 roads, tunnels under Mont Blanc and Frejus, etc. (Shevelkina, 2014).

The Prado-Carnage Tunnel project in Marseille consisted of converting an old railway tunnel into a two-level road construction. The financing and operation of this facility is fully secured by private funds, without the participation of the region and the government. The concession was granted for 32 years, then the construction will be returned to the city. Construction began in 1991 and was commissioned in 1993 (Shevelkina, 2014). The profitable part of the project is made exclusively by collecting tolls. The risks taken by the concessionaire turned out to be quite large and the financial profitability of the construction was revised downward.

In Portugal, a public-private partnership for the development of transport infrastructure is half supported by loans from the European Investment Bank and the Brisa organization, created by private investors, construction companies and Portuguese and international banks to build, finance, operate and maintain a road network of about 500 km. For the construction of the Vasco da Gama bridge in Lisbon, the European Union Assistance Fund allocated about 35 percent of the total funding, but this was not enough to cover all costs, so the state resorted to a concession (VINCI Concessions, 2020). The Portuguese state has allocated subsidies based on income from the bridge, as payment has been introduced since its opening.

Only international-level construction companies could take responsibility for financing and building such a project in three years, taking the risk of road traffic during the concession period of 33 years. The concession under this agreement ends from the moment when the flow on two bridges reaches 2.25 billion transport units (Shevelkina, 2014).

The M5 motorway in Hungary was also implemented as part of a 35-year concession agreement. The facility was implemented in 1995 and included work on a 100 km stretch. Debt financing was provided by international loans in local currency. The project revenues were not sufficient to cover the construction costs, in this regard, the state provides subsidies for operation every six months for 6 years, in order to ensure the financial equilibrium of the concession, starting with the full commissioning of the first stage in December 1998. The subsidy represented 20 percent of the total income of the concession (Bankwatch, 2020).

The practice in developed countries indicates that the creation of an extensive network of special institutions (agencies, joint-stock companies, state corporations and associations) with

broad powers in the development of policies and standards and the adoption of special regulations on PPPs contribute to the expansion of partnerships and successful PPP development (Shevelkina, 2014).

Users can give the responsibility for financing and managing the infrastructure to the private sector by participation of users. In Peru, there is a number of water user associations to whom the government has given without charge the responsibility for managing all of the irrigation infrastructure. The government provides technical assistance on carrying out the operation and maintenance, and poor communities receive grants for expanding irrigation systems. The government also manages the auctioning of rights, which are tradable. User associations can borrow money at commercial rates, and borrow only for new investments or rehabilitation and not for maintenance (Humplick, 1996). The associations design the projects and execute them, repay the loans while they can also operate and maintain the infrastructure.

Finally, privatization results in total transfer of ownership to the private sector. About 25 countries have now undertaken huge transfers of ownership of infrastructure. For example, in transferring economies the privatization process was driven by the transition from socialism to the capitalist system in the late 80s and early 90s (Humplick, 1996). Privatization arises a number of issues, such as asset ownership, investment planning and activities coordination, policy setting and regulation, current and capital financing, operation and maintenance, managerial authority, risk bearing, terms of contract etc.

The resources for private infrastructure projects come from various infrastructure development funds, infrastructure funds and domestic capital markets. The macroeconomic implications of privatization vary according to country conditions: existing managerial and technical capacity and efficient private sector involvement. An opportunity to introduce competition, good level of technology and commercial viability are some of the factors that enhance private sector participation.

Divestiture, or privatization, involves the acquisition by a private company of shares of a state-owned property, and the state transfers to it some authority for the ownership of the object, establishing requirements for improving the object and providing services.

Greenfield projects involve the construction and operation of new production facilities during the term of the contract. The production sharing agreement involves construction and

operation. The main types of such contracts are Build-Lease-Own, Build-Own-Transfer, Build-Own-Operate-Transfer, Design-Build-Own-Operate (Shevelkina, 2014).

Infrastructure mortgage is a PPP model, especially relevant in the absence of real money from the concessionaire and the high cost of credit resources, the lack of the possibility of reimbursement of invested funds by the state and limited budget funds of a number of entities. Infrastructure mortgage involves the use of the mechanism of state guarantees and capital grants on the basis of a special infrastructure development fund. The infrastructure mortgage mechanism is based on providing support to private partners on concession and PPP projects, while the sources of the fund's assets will be not only budget funds and tax deductions, but also "long money" of institutional investors who will be offered infrastructure bonds of the fund with guarantees from the Ministry of Finance, which allows these securities to obtain the necessary rating (Leonov, 2019).

The first and most important difference between infrastructure mortgages and concession agreements is that the concessionaire no longer has an obligation to build everything for their money or to personally attract investors. The state can finance the project either directly or can attract investors through the issuance of bonds of a special Fund for Infrastructure Investments (Leonov, 2019). The second advantage of the infrastructure mortgage is to increase the reliability of the financing received, since the objects of concession agreements are often financed on a residual basis, which can lead to interruptions in the financial flow and become one of the reasons for the construction slowdown.

Another advantage is the increased duration of financing, which can lead to a relaxation of investor requirements. In the case of the Fund, it is assumed that the main investors in it will be sovereign and pension funds, which will allow the creation of a continuous flow of funds over a longer period (up to 10-15 years) (Leonov, 2019).

2.7. Alternative and modern ways of public-private cooperation for infrastructure

The model of life cycle contracts, which in some countries is called DBFM (Design-Build-Finance-Maintain) is one of the varieties of concessions, involves the operation of facilities on a free basis, unlike the concession model, which is based on the principle of payment. Under this form, the state concludes a contract for the design, implementation and operation of the facility for

the life of the facility and pay the project in equal installments after putting the facility into operation with parallel maintenance of the facility by a private partner under the terms of the contract. The amount of remuneration of a private partner investor depends on the volume of work performed. Payments to a private partner are started by the state party only from the moment the facility is launched, which encourages the private partner to build the facility in a shorter time frame; the private partner is motivated to improve the quality of design and construction (Shevelkina, 2014). Thus, the scheme of life cycle contracts will allow the state to achieve a significant reduction in the cost of the facility and its maintenance, to reduce the time for the creation and commissioning of infrastructure facilities and to get rid of the unpredictability of future costs for maintaining the infrastructure in good condition.

Deferred tax payment mechanism, or Tax Increment Financing (TIF) involves the creation of a model for financing infrastructure by increasing future tax revenues from improvements made in poorly developed areas. The goal of such projects is to give an impetus to the development of the territory and social infrastructure (Leonov, 2019). It is assumed that the implementation of the infrastructure project in the area will increase the value of real estate and land in the nearby territories, increase the level of tax revenues without raising tax rates by increasing the tax base. According to the data on TIF-projects of the state of Nebraska, the use of this mechanism allowed to increase the amount of tax revenues by an average of 6 times (Nebraska Department of Revenue, 2016). The level of tax revenues generated within the TIF-district at the time of the start of the project is fixed in the contract.

After the start of the TIF project, all tax revenues that exceed their previous level, as well as the income generated by the TIF project, are refinanced in this project until its completion to repay the initial investment in the project. When tax revenues cover the investment spent, then the project is considered completed, and further tax revenues are transferred to the regional budget. In addition to the excess income generated by the TIF project, from the moment the project is launched, socio-economic effects occur in the form of new jobs, improving the quality of public services, and so on (Medda, Modelewska, 2011). As a result, a positive multiplier effect is created, which contributes to the accelerated socio-economic development of the territories and persists after the completion of the project.

TIF has become the most popular in the United States: a classic TIF project in the USA is a small reconstruction area, usually from 40 thousand to 400 thousand square meters. In Chicago,

the first TIF area was opened in 1984; today the city has 160 such areas, they cover 30 percent of its territory (Taylor, 2010). There are also examples of TIF in the UK, Australia, and India. A similar mechanism for land value capture, which will be described later, is actively used in many European countries, for example Poland (Leonov, 2019).

The most favorable environment for the TIF project is the medium-sized regions with growth prospects. When forming such projects, it is necessary to be able to increase economic activity − in a depressed region on the constructed infrastructure, it may not be possible to increase the tax base, so the investment will not pay off. Since TIF projects are to «self-financing», the lack of collected taxes will lead to a decrease in public investment. If future government revenues were capitalized using bonds, investors will demand a risk premium when purchasing bonds of this TIF, which will lead to a deterioration in the credit rating of the region. In more developed regions, the creation of infrastructure projects within TIF does not make economic sense, since in the case of the large economic potential of the territory, the project can be implemented without the participation of the government or within other forms of public-private partnership, and the use of the TIF mechanism would only distract the financial flow from other social needs of the region (Leonov, 2019).

In order for the TIF to function in the state along with other instruments for financing infrastructure projects, it will be necessary to create an organization that monitors the activities of projects with such financing and uses the accumulated experience in managing such projects to increase the reliability of future projects.

With value capture mechanism, development and property are made valuable by government action and public investments. Hence, proximity of transfer stations (subway, highways), availability of schools and hospitals result in higher property values. Value capture involves the measurement of how much of that increase actually happens when good infrastructure is present (Smolka, 2013).

Value capture mechanism of infrastructure financing is mainly used for the construction in the urban areas and includes different models based on diverse urban environments. The mechanism is based on the fact that the cost of housing increases after the completion of an infrastructure project. For example, in the work of Medda and Modelewska (2011), it was found that the emergence of new metro stations contributed to an increase in housing prices by 6.7-7.13 percent.

This fact is also confirmed by examples from other countries: for example, in Helsinki, Finland, real estate prices within walking distance of the nearest metro station are 7.5 percent higher than in remote places. The construction of the Ørestad metro line in Copenhagen, Denmark, worth 1.6 billion euros, increased demand among developers and investors by 52 percent by increasing the availability of nearby land. For five years, the fees received from direct payments (10 percent), real estate taxes (10 percent) and operating profit from the use of the subway (30 percent) fully covered the cost of building the metro, paying off a debt of 2.3 billion euros, which was provided during construction. The construction of the new Jubilee London Underground Line, UK, cost £3.5 billion, and increased the cost of renting nearby land by £ 1.3 billion. This 25 percent increase in land value will pay for the line in 20 years (Leonov, 2019).

After the construction of the metro in Toronto, Canada, the market price of housing near the city center increased by 45 percent and 107 percent in the area of suburban stations, in other areas, the cost grew by 25 percent. The cost of renting office space adjacent to metro stations is on average 30 percent higher than in the city as a whole. Around 90 percent of new office space and 40 percent of apartment buildings built after the construction of the subway were built near metro lines. An example of new metro stations in Moscow, Russia, also shows a higher increase in property prices (on average 7.5 percent) in the area near the station than in the city as a whole. In Milan, Italy, after the construction of the subway, a special tax was levied on improving accessibility to property within 500 meters of the metro station and helped to raise 36 billion lire to the city budget (Leonov, 2019).

In addition, the transit agency can receive a cut of the profits of malls and businesses in the transit route in exchange for transporting customers, as well as sign co-ownership agreements or accept a percentage of property development fees. This type of value capture is critical to bring private capital into infrastructure projects and make the financing sustainable. In the same time, value capture mechanism requires greater development of the infrastructure architecture (Sundaresan, 2017).

Thus, improving transport infrastructure has a positive effect on the value of real estate, and therefore represents a potentially significant return on infrastructure investment. Such conclusions can serve as an economic justification for using the TIF mechanism and its practical application in the fiscal system, which will help create an additional impetus for the growth of the national economy.

In development, value capturing is widely used in fast-growing cities in Latin America and aims at more equitable urban development and provision of infrastructure for all. Value capturing in the region involves different tools, such as betterment contributions, linkage fees, transfer development rights, building permit, as well as CPAC (Certificate of added construction potential). CPAC is traded on the stock market and is a permission to build in Latin American. The scheme works like this: each building has a floor area ratio (FAR) meaning the amount of floors the developer is allowed to build. If the developer wants to increase the building's number of floors, height, or density, and thus, switch from Basic to Max FAR, it can buy CPAC from the stock market. The proceeds from the CPAC trade are headed to the city budget. For example, Brigadeiro Faria Lima Avenue contructor provided the funding to make critical transportation infrastructure available to poor neighborhood, thus both providing infrastructure and rising property values (Smolka, 2013).

Value capturing is also a good way to provide affordable housing by introducing the policy of inclusionary housing: for example, by concluding that certain percentage (i.e. 15 percent) of new residential development has to be affordable in case the developer intends to extend the basic building model (Smolka, 2013). Thus, value capturing is a way to bring about more equitable urban development and more affordable housing by inviting private sector to participate in the creation of critical infrastructure.

Another modern and not yet widely explored model of urban infrastructure investment is crowdfunding. As budgets shrink, the restricted ability of cities and towns to infrastructure objects is leading citizens to step in with new ways to create public spaces and buildings − using crowd-based models.

For example, to modernize an old community center to a modern center in Glyncoch, South Wales, the investment of £793,000 was required. Over several years the citizens managed to raise as much as £750,000 in charity grant pledges, but those pledges could expire, if they could not raise the remainder on their own. The local citizens turned to a UK startup, SpaceHive, which seizes Kickstarter's crowdfunding model and applies it to civic building projects. Within weeks, Glyncoch's citizens had raised additional £43,000 (Gray, 2013).

In Rotterdam, locals pooled money to build a Luchtsingel pedestrian bridge across a city dangerous roadway. The funding method influenced the design of the bridge: 17,000 U-shaped planks were sold and stamped with the donor's name or message. Donors could buy a single plank

for €25 or a larger section for €1,250; as a result, the bridge won a €4 million municipal grant to continue on a bridge project. In Bogotá, a group of local citizens will own part of a new 66-storey BD Bacata skyscraper in the center of town. In New York City, two architects are creating and crowd-funding the first ever underground park, in an old abandoned tram station in Lower East Side: $150,000 were raised on Kickstarter, while the rest of the funds were attracted through more traditional models − corporations, foundations and philanthropists (Gray, 2013).

The model can take two main forms: crowdfunding as a donation and crowdfunding as infrastructure investment. Donation implicates citizens donating money through crowdfunding to support specific infrastructure and directly involves the people who contribute to be part of a design of infrastructure, as in the Rotterdam bridge example. Crowdfunding as infrastructure investment is aimed at creating a commercial infrastructure object into a commercial venture, for example, the underground park in the New York City, thus involving citizens to take ownership of infrastructure and be a part of its design and financing (Gray, 2013).

Currently, examples of crowdfunding for infrastructure are mainly concentrated in developed countries. The model could be used in developing markets as well; however, it is important to notice that the amount of funds being raised with crowdfunding is limited due to the amount of citizens interested in and getting benefit from the infrastructure object. Hence, the pool of potential is geographically limited, and smaller villages and towns are able to attract less revenue. Thus, this model is relevant mostly for small and medium scale projects performed locally. Additionally, since most infrastructure projects require large costs, the projects have to be broken into phases, and the long term of effect of the infrastructure project can scare away citizens from large investments.

On the other hand, among the obvious advantages of infrastructure objects, crowdfunding for infrastructure projects has social effects, such as creation of local communities, which also encourages politicians and businesses to get involved, and enhances partnership between businesses, citizens, local councils, charity groups, corporate donors and municipal and state governments. The democratization of design for public structures and spaces encourages leaps of imagination and innovation that would be unlikely to occur in a developer's or local planning authority’s boardroom.

CHAPTER 3

Infrastructure investment by the European Bank of Reconstruction of Development: the cases of Ukraine

3.1. The functions and financing mechanism of the European Bank of Reconstruction and Development

The European Bank of Reconstruction and Development (EBRD) has been established in 1991 with the aim to facilitate the transition to an open market economy through economic progress, reconstruction and development of private entrepreneurship in Central and Eastern Europe. The EBRD invests, engages in dialogue with government departments and provides technical assistance with donor funds in the energy, financial, corporate and infrastructure sectors. The EBRD finances projects that strengthen the private sector in countries and aim to make economies competitive, well-managed, environmentally friendly, inclusive, sustainable and integrated. The Bank promotes structural and industry reforms, mainly privatization and demonopolization, through enhancing private participation in the economy, providing technical assistance in the preparation, financing and implementation of projects, attracting internal and international capital as well as managerial experience into services, finance and infrastructure to improve market competitiveness, sustainability and quality of living (EBRD, 2013). The EBRD invests in commercial projects that provide financial benefits in a market environment and have an economic, social or environmental impact (EBRD, 2019). At the same time, the EBRD's approach to project implementation is similar to that of commercial banks. Only commercially viable projects that are financed on commercial terms are accepted for consideration (EBRD, 2005).

Recently, the EBRD has also been paying increased attention to a number of strategic initiatives, deepening and expanding work in less developed countries, and addressing energy security and energy efficiency in the region of operations (EBRD, 2016). Thus, the EBRD assists countries in reducing emissions declared at the 2015 UN Climate Conference. According to the concept of transition to a green economy (GET), the Bank assists in financing activities to increase energy efficiency and develop renewable energy, the efficiency of water and material

consumption, and resistance to the effects of climate change. Within the framework of the program, about 18 million people received improvement in the condition of district heating systems, waste collection and disposal, and water supply (EBRD, 2019). The EBRD is investing in climate finance and in projects that increase resource efficiency and resilience to the effects of global warming. The Green Cities Program of Activities for planning and financing a sustainable urban environment is central to the EBRD's efforts to combat climate change. As part of this initiative, in 2018, the EBRD invested 265 million euros in 10 projects, which together are expected to reduce greenhouse gas emissions by 319 thousand tons per year (EBRD, 2019). The action plan is funded mainly by donor funds.

The implementation of projects in the sector of natural resources, electric power and energy systems is of fundamental importance for the economic development of the EBRD's regions of operations, and allows countries to increase energy efficiency and resistance to the effects of climate change (EBRD, 2019). Important areas of EBRD activity in this sector are strengthening energy security, improving corporate governance and ensuring socially responsible economic growth.

For operations in developing countries, the EBRD has allocated $68.5 million (€60 million) to the Amundi Planet green bond fund − Emerging Green One (EBRD, 2019). The fund was also attended by the International Finance Corporation and the European Investment Bank, which will invest in the issuance of bonds by financial institutions, and will support the implementation of projects related to climate and ecology.

The EBRD is investing in the modernization of transport networks, improving the state of municipal and environmental services through cooperation with private and public organizations. In addition to improving the quality of life for millions of people in the regions where the EBRD operates, the implementation of these projects helps to make the economies of these countries more competitive, sustainable and integrated, which will accelerate their economic growth and create new jobs. In this way, in 2018, it was possible to achieve a reduction of 0.97 million tons of CO2 emissions and to complete 8 transport projects with an emphasis on improving management quality (EBRD, 2019).

Improving governance and transparency are vital to the economies of the EBRD's regions of operations to attract foreign capital and ensure their competitiveness in the world. The Bank

improves the quality of work of public and private organizations and promotes their close interaction through investment and dialogue with government departments (EBRD, 2019).

The EBRD's investments and cooperation with government departments in the field of structural reforms contribute to the improvement of the energy sector, information technology and transport networks (Figure 12 (a)). They allow the development of domestic markets, enhance international trade and investment, and contribute to the harmonization of national norms with international standards (EBRD, 2019).

The EBRD works with both large and small private clients, which are the backbone of many economies in the EBRD's regions of operations. The Bank also finances municipalities and joint stock companies, often in support of the functioning of vital infrastructure and services for the benefit of the public. The EBRD invests in well-structured and financially sound projects, both directly and through financial intermediaries represented by local banks and investment funds.

Since its inception, the EBRD has carried out 4504 projects with a total transaction volume of 106.6 billion euros. Currently, the Bank's capital is about 30 billion euros. EBRD shareholders are 70 countries and two intergovernmental organizations (European Union and European Investment Bank) (EBRD, 2016). The EBRD invests in 36 countries, and the active presence of the EBRD in all countries of its operations is ensured through a network of more than 43 field offices (EBRD, 2005). Local representative offices allow to receive extensive information about the social, economic and political situation in the region of operations, help in the preparation and implementation of new and monitoring of existing projects. The Bank is the largest investor in many of its countries of operations. Through its investments, the EBRD also attracts significant foreign direct investment to countries of operations (EBRD, 2016). The Bank invests mainly in private enterprises, usually acting in conjunction with its business partners, and interacts with state-owned companies in order to support privatization processes, the structural reorganization of state-owned enterprises, and for the improvement of the municipal economy.

The EBRD seeks to expand and deepen the co-financing base and mobilize domestic and foreign capital by increasing the number of commercial credit organizations and introducing new co-financing schemes and attracting new countries to the market in order to increase the resources for financing projects and for borrowers to gain access to international capital markets. Sources of additional capital can be commercial banks, government departments and bilateral financial institutions that provide grants, parallel loans and equity investments, export credit agencies and

other international financial organizations such as IFC and the World Bank (EBRD, 2013 (a)). The Bank actively cooperates with other IFOs, such as the IMF, EIB, IBRD, MIGA, OECD as well as the UN and its special entities, and other relevant private and public organizations. Together with other organizations, the EBRD expands its financing channels and improves the investment climate in the region of operations. Membership in the Bank is open to European and non-European countries that are members of the IMF, as well as the European Economic Community and the European Investment Bank (EBRD, 2013). The EBRD works with partners, attracting other investors and stimulating the process of mobilizing their funds, the volume of which today has already tripled the resources provided by the EBRD (EBRD, 2005). Donor funds play a vital role in ensuring success in these areas, become a catalyst for the EBRD's investments or create favorable conditions for them. In some cases, assistance in preparing projects is provided by bilateral or multilateral donors, providing grant loans. They are aimed at paying for the services of consultants involved in the preparation and implementation of projects (EBRD, 2005). Moreover, donors fund seven multilateral funds, which are managed by the EBRD to strengthen nuclear safety in countries invested by the EBRD (EBRD, 2019). Some of them specialize in financing companies in need of restructuring, in assisting companies in financial difficulties, or in providing intermediate resources for further development. The investment criteria that apply here are consistent with EBRD directives, but fund managers make their investment decisions on their own (EBRD, 2005).

The mechanism for the formation of the Bank’s authorized capital is as follows: initial share capital of 10 billion ECU (European Currency Unit) was divided into one million shares of ten thousand ECU each at par. Each member subscribes to equity shares of the Bank, initially at least one hundred shares. Any subscription to the initial authorized share capital is carried out for paid and payable upon demand shares in a ratio of three to seven. The Board of Governors reviews the share capital of the Bank at least once every five years. If the authorized share capital is increased, each member gets an opportunity to subscribe to a certain proportional share of the increase in share capital, equivalent to the proportion of shares that are subscribed to the total size of the Bank’s subscribed capital immediately before indicated increase. The Bank has regular and special funds, the funds of each of which cannot be used to cover the losses of the others (EBRD, 2013).

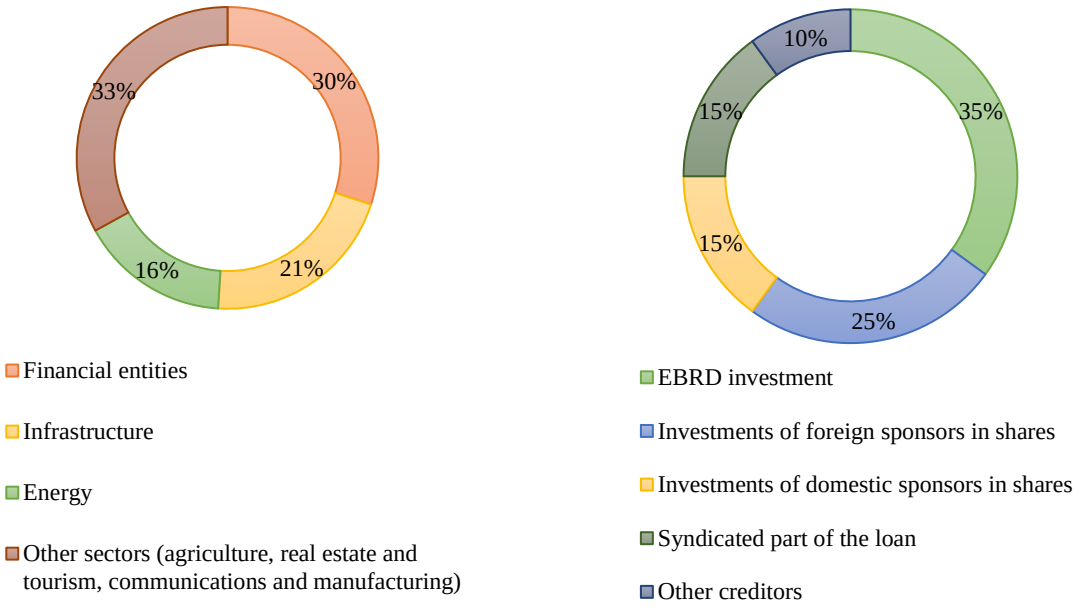
The EBRD applies a wide range of financing instruments based on the specifics of specific projects (Figure 12 (b)). The Bank's main financial instruments include loans, equity investments and guarantees (EBRD, 2019):

- providing loans, or jointly with multilateral institutions, commercial banks or other interested institutions, financing private sector enterprises or state-owned enterprises operating in a competitive environment, or preparing for privatization and participation of private capital;
- equity investments of these enterprises;
- when other methods of financing are not practical, guaranteed placement of securities issued by these enterprises;
- facilitating the access of enterprises to domestic and international capital markets by providing guarantees when other means of financing are not practical, as well as by providing financial advice and assistance in other forms;
- providing or participating in loans and providing technical assistance for the reconstruction or development of infrastructure, including environmental programs, necessary for the development of the private sector and for the transition to a market-oriented economy (EBRD, 2013).

The Bank's charter stipulates that at least 60 percent of loans should be provided to the private sector. It can also attract debt financing in global capital markets. In all its operations, the EBRD follows the rational principles of banking and investment (EBRD, 2016).

The EBRD's equity and quasi-equity instruments include quoted or unquoted ordinary shares; subordinated and convertible loans; income-bearing securities; preferred shares with obligatory repurchase; a guarantee for the placement of shares issued by state or private enterprises (EBRD, 2005). In addition to providing debt financing, the EBRD directly and indirectly enters into the share capital of companies in which in 2018 it invested 848 million euros (EBRD, 2019).

The EBRD provides both guarantees against all risks that the Bank issues to creditors, insuring them against default by borrowers, regardless of the reason for its occurrence, as well as partial guarantees against specific risks for default insurance caused by specific events. The maximum amount of the guarantee should be negotiated and quantifiable, with an acceptable degree of credit risk (EBRD, 2005).



a) b)

Figure 12. The EBRD financing share by sector (a) and the usual capitalization structure (b)

Source: EBRD, 2019

The EBRD seeks to maximize credit sources for customers and develop the most convenient forms of financing for them. Such methods of co-financing can be loans under the A/B scheme, when the EBRD finances part of the loan with its own funds, and the rest is syndicated through commercial credit organizations, parallel loans, guarantees of export credit agencies, political risk insurance, loans and equity investments from international financial institutions. organizations and non-repayable loans (EBRD, 2005).

The Board of Directors at least once a year reviews the Bank's operations in each recipient country and its strategy in the field of loans, the progress of each recipient country in the field of decentralization, demonopolization and privatization, the relative share of loans provided by the Bank to private and state enterprises etc. At the same time, the public sector is provided with no more than forty percent of the total amount of all loans, guarantees and equity investments (EBRD, 2013).

The Bank does not receive a controlling stake, does not exercise control or is not directly responsible for the management of any enterprise in which it has invested, except when it comes

to the actual non-payment or insolvency of the enterprise in which the Bank has invested, or the threat of non-payment and insolvency and other situations that could jeopardize these investments (EBRD, 2013).

EBRD can only act as a minority shareholder, while having a clear plan for withdrawing from capital. The EBRD usually leaves the capital of its customers 4–8 years after the initial investment in shares (depending on the specific project) by selling the Bank's stake to the project sponsors or at open bidding. In addition, the EBRD participates in private equity funds serving a specific region, country or industry, with the same investment criteria as for direct investments headed by professional venture investors and having their representatives in the field (EBRD, 2005).

Thus, the Bank's operations provide financing for specific economically viable projects, both individual and within specific investment programs, as well as technical assistance. The applicant submits a proposal for consideration, as a result of which the President of the Bank must submit to the Board of Directors a written opinion on this proposal along with recommendations based on a study performed by the Bank's employees. The conditions for issuing a loan, guarantee or participation in capital, as well as the conditions, rates and terms of repayment of the debt are determined by the contract. In addition to interest, the Bank charges a fee for loans granted to it in the framework of its ordinary operations. When providing a loan guarantee or guaranteed placement of securities, the EBRD levies fees paid at the rates and terms determined by the Board of Directors in order to provide appropriate compensation for its risks. The amount of commission and fees is allocated as a special reserve intended to cover potential losses of the Bank (EBRD, 2013).

The EBRD is constantly expanding its international shareholder base, with the result that EBRD shareholders now represent 60 percent of the world's population and 80 percent of global GDP (EBRD, 2019). Hence, the EBRD is a reliable and stable source of long-term financing for priority development projects, provides credit resources on the most favorable terms for the development of strategically important sectors of the economy and infrastructure, structural reforms, provides access to international best practices, standards and professional expertise. The EBRD finances projects in both the financial and real sectors of the economy, investing in new and existing companies. EBRD clients have different organizational forms and sizes and operate

in different sectors of the economy of the countries financed by the Bank (Ivanov, Klymenko, 2016).

The EBRD is becoming increasingly important in international economic relations with developing countries that are implementing reforms. Through its investments, the EBRD promotes structural and sectoral reforms, the development of competition, the strengthening of legal systems, the formation of infrastructure to support the private sector, and more. In lending, the EBRD uses deep lending instruments based on generally accepted banking and insurance standards in developed countries, combines the goals of supporting private sector initiatives, cooperates with banking institutions and governments to implement long-term development plans, interacts with other IFOs harmoniously combine interstate and regional approaches, etc. (Ivanov, Klymenko, 2016).

Infrastructure as a factor in the development of the economy and improving the quality of life is one of the important areas of EBRD project financing. The EBRD is committed to improving municipal infrastructure in its countries of operations. The municipal and environmental infrastructure sector covers investments and services within the competence of local authorities, regardless of whether they are provided by public or private organizations (EBRD, 2012).

The EBRD is developing financing schemes for municipal infrastructure, equipment and services, developing regulatory and tariff setting systems, assisting in the processes of commercialization and corporatization of service enterprises, helping to attract private enterprises in this sector, taking measures to improve the environment and creating favorable conditions for attracting donor grants and co-financing funds in the form of loans (EBRD, 2012).

For each funded project, the EBRD allocates a group of specialists with specific experience and skills in this industry, in the region, in the legal and environmental areas. The Bank relies on its contacts with governments, the status of a privileged creditor and a large portfolio of projects when assessing and accepting risks, as well as to create favorable financing conditions. The EBRD supplements rather than crowds out private sources of financing, and finances only those projects for which it is impossible to obtain funds from other sources on similar conditions (EBRD, 2013).

The EBRD finances private sector projects, typically ranging from 5 to 250 million euros, with an average investment of 25 million euros. At the same time, the Bank can invest between 2 million and 100 million euros in shares of economically attractive enterprises in industry, infrastructure and the financial sector. Smaller projects can be financed through financial

intermediaries (national commercial banks, microfinance banks, private equity funds and leasing companies) or through special programs of direct investment in smaller volumes for countries where reforms are lagging behind. Financial and operational leasing covers a number of production-related items, such as vehicles, equipment and commercial vehicles (EBRD, 2013). The requirements for this financing through intermediaries are similar to the EBRD directive requirements, but financial intermediaries make their own decisions regarding the choice of micro, small and medium enterprises for lending (EBRD, 2005). In order to receive financing from the EBRD, the project must have good economic prospects, assume that the sponsor makes a large contribution to the authorized capital, serve the interests of the domestic economy and promote the development of the private sector, as well as meet banking and environmental standards.

Funds in the amount of up to 2.5 million euro for investments in shares of enterprises under the guidance of experienced entrepreneurs can be obtained directly from the EBRD through its direct investment mechanism which is designed to serve small enterprises operating in countries and regions that are at the initial stage of transition to a market economy, including the Caucasus, Central Asia, Southeast Europe, Belarus, Moldova, Ukraine and certain regions of Russia (EBRD, 2005). The planned share of the Bank in the share capital is from 25 to 30 percent, but may increase to 49 percent with short-term investments. The desired investment cycle is from 3 to 5 years, but it can increase up to 7 years.

The EBRD develops each project taking into account the needs of the client and the specifics of the country, region or industry. Typically, the Bank finances 35 percent of the total project cost in case of long-term capitalization of the project company, or less if the project is a greenfield investment. The EBRD requires sponsors to make large contributions to the share capital in an amount equal to or higher than the EBRD investment. Thus, additional funding is required from sponsors, other co-financing organizations, or through syndication programs sponsored by the EBRD (EBRD, 2013 (a)).

The structure of the EBRD loans is quite flexible: the Bank presents its proposals on loan currency and interest rates, a loan can have a fixed or floating interest rate, be nominated in several foreign or national currencies, and have both short and long repayment periods (from 1 year to 15 years). If necessary, the client can receive a grace period on a loan. EBRD loans are priced competitively based on current market rates, such as EURIBOR. At the same time, the EBRD does

not subsidize projects, does not provide soft loans and does not enter into competition with private banks (EBRD, 2013 (a)).

As a rule, loans are repaid in equal and semi-annual payments. In exceptional cases, longer maturities with uneven payments can be set, for example, up to 15 years as a mortgage for large-scale infrastructure projects. The basis for lending is the projected cash flow in the framework of the project and the client's ability to repay the loan within the agreed time frame. The EBRD may assume credit risk in whole or in part to syndicate it in the market. A loan may be secured by the property of the borrower, and either it can be converted into shares or tied to equity (EBRD, 2013 (a)).

Given the presence of political and specific project risks, a special margin is added to the base interest rate. The EBRD also charges a fee for project appraisal, loan opening, development of a transaction scheme, syndication (if necessary), a liability paid with an allocated but not selected loan amount, a loan conversion paid at the same time as the interest rate, or a currency conversion charged with a convertible amount for early repayment and cancellation, and, if necessary, also a penalty for late payment. Sponsors reimburse the Bank for the costs of technical consultants, freelance lawyers, and travel expenses (EBRD, 2013 (a)).

The EBRD may require specific guarantees for the execution and completion of the project, as well as other types of support from sponsors. The EBRD requires insurance companies that implement the project insurance from commonly insured risks: theft of property, fire, specific risks during construction work, but at the same time does not require insurance against political risk or the inconvertibility of the national currency (EBRD, 2013 (a)).

The Bank usually requires the companies it finances to ensure repayment of the loan by pledging project property: fixed assets such as land, industrial and other buildings, movable property, such as equipment and other business assets, assignment of rights of claim to company earnings in hard and national currencies, pledge of shares of the sponsor in the company, and assignment of claims to insurance contracts and other contractual benefits of the company (EBRD, 2013 (a)).

The Bank may assist in the regulation of financial risks associated with project property and debt obligations (currency, interest rate and commodity price risk). Risk hedging instruments include interest rate swaps, currency swaps, upper limits and fixed maximum and minimum interest rates, as well as options and commodity swaps (EBRD, 2013 (a)).

The project cycle consists of several stages. During consideration of the project concept, the EBRD's operational committee approves the project concept and its plan, the proposed financing scheme, project development costs and related obligations of the parties, as a result of which the EBRD and the client sign a credential letter. After negotiating all the main parameters of the transaction during the negotiations, including signing the list of basic conditions, and completing all examinations, the project goes through the final review process in the Operational Committee. Further, the EBRD President and the project team submit the draft to the Board of Directors for approval, the Bank and the client sign a transaction that becomes legally binding, and as a result the funds are transferred from the EBRD account to the client's account. After the project initiation, the client repays the loan amount to the EBRD in accordance with the agreed payment schedule, and the Bank sells its shareholding. After the EBRD receives the last payment to repay its loan, the loan is considered repaid (EBRD, 2013 (a)).

The EBRD has developed a standard procedure for a pre-project survey of the composition of shareholders, the status of corporate governance and the forms of procurement of goods and services for each project. In addition, an inspection on the business reputation of the borrower and legal due diligence is carried out. During the legal examination, the legal form, assets and liabilities of the client are checked. The EBRD follows the principle of open and fair tendering for the procurement of goods, works and services for its operations (EBRD, 2005).

To assess the suitability of the project for financing by the EBRD, a brief description of the project is required, indicating the purpose of the EBRD funds expenses, information about the sponsor, his experience in production and business, financial condition and forms of support by the company for the project in terms of its participation in capital, management, production and business activities and sales of products, a detailed description of the proposed products or services and the process of their production, marketing review, including analysis of potential consumers of the product, the state of competition, market share, sales volumes, pricing and sales strategies. An accurate breakdown of project costs, a summary of requirements for the implementation of the project, including the involvement of contractors, and a description of the procurement of goods and services, a description of additional sources of fundraising and a review of projected financial indicators of the project are also necessary. The Bank also requires a summary of environmental issues with copies of documents on environmental audits or environmental impact assessments of the project, as well as a description of the required state licenses or permits, subsidies received,

the regime for regulating import and export operations, customs duties or quotas and the regime for regulating foreign exchange transactions (EBRD, 2013 (a)). Given this information, the process of reviewing an application and concluding a transaction usually takes three to six months.

Based on the results of environmental certification, the EBRD makes a decision on the feasibility of financing the operation and taking environmental issues into account when financing, planning and implementing the project. The decision on the extent of the required environmental survey is made by the EBRD's Environmental Management at the stages of concept review and final project review during the EBRD project cycle. In addition, management determines the need for public consultation (EBRD, 2005).

The implementation of EBRD projects strengthens the viability of the economy by assisting in the creation of a powerful financial sector, ensuring macroeconomic stability, energy and food security, and economic diversification. Assistance in the use of national currencies and the development of capital markets also strengthens the resilience of countries in shock situations and during excessive surges in volatility (EBRD, 2019).

3.2. The EBRD in Ukraine: the history and goals of cooperation

Cooperation between Ukraine and the EBRD began in 1992: since then, the Bank has invested about 14.6 billion euros in 450 Ukrainian projects, 75 percent of which are implemented by the private sector (Ukrinform, 2020). At the same time, the main task of the EBRD is not to invest its own funds, but to push Ukraine to improve the investment climate and catalyze the participation of private capital in investment. The organization has more opportunities to manage risks than most capital owners, so the Bank enjoys trust and authority in the market.

The EBRD invests heavily in Ukraine's infrastructure development. During the cooperation, 7 projects worth a total of 909.55 million euros were completed, including 659.23 million euros in loans (EBRD, 2020). These projects include the development of railways, reconstruction of Boryspil airport, road repairs, modernization of air navigation services, infrastructure development of Illichivsk sea trade port, modernization of power supply lines, development of water supply system, modernization of heat supply infrastructure, repair and construction, etc.

Due to the drastic political changes in Ukraine in 2014 (revolution, change of government, occupation of Crimea and the beginning of the war in Donbass, as well as the financial crisis), the EBRD changed its strategy in the country to mitigate the crisis and move to a more flexible mode of operation, adopting a package of measures for rapid crisis response. As a result, EBRD investments peaked in 2014 (Figure 15 (a)). The EBRD has facilitated a number of urgent reforms through a dialogue with the authorities, accompanied by targeted investments (EBRD, 2018). Ukraine's economic development is hampered by a lack of investment in productivity and a lack of critical reform. As a result of geopolitical changes, Ukraine has embarked on a strategic path of comprehensive political and economic reforms based on its European integration aspirations (EBRD, 2018).

The Package of Crisis Response in the field of energy security and reform of the energy sector in 2015-2017 contributed to a significant reduction in CO2 emissions and a significant increase in the share of projects to transition to a green economy in annual investment (Figure 13). As a result, the EBRD reaffirmed its status as one of the key investors in renewable energy and helped strengthen the legal framework for renewable energy and electricity by launching discussions on a new auction system, reforming corporate governance in state-owned energy companies, enacting electricity market laws and more (EBRD, 2018).

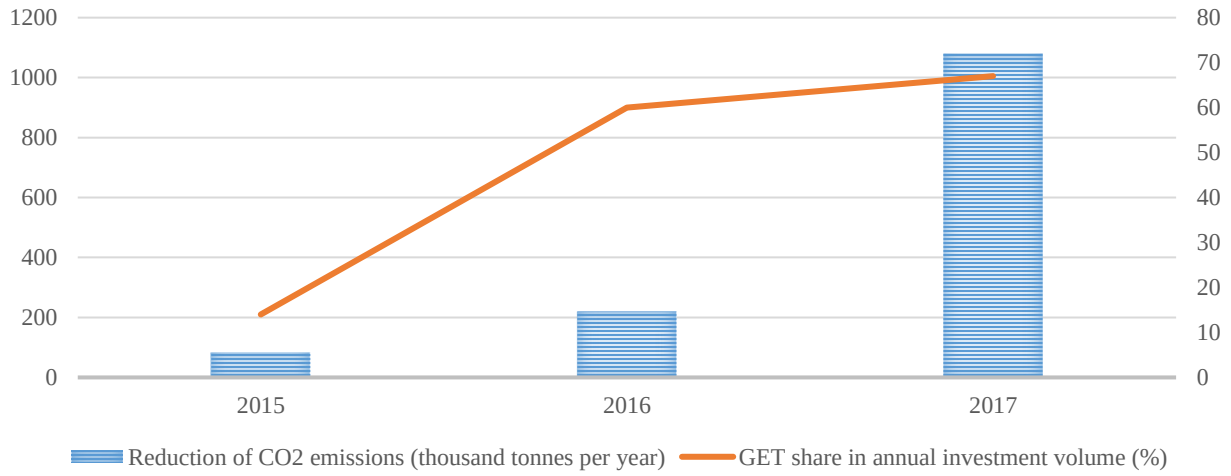


Figure 13. Trend for Green Economy Transition (GET) projects in Ukraine (2015-2017)
Source: EBRD, 2018

As of 2019, the EBRD's investment portfolio in Ukraine amounted to 3.86 billion euros and included 169 active projects (Ministry of Finance of Ukraine, 2019). The share of investment

in the private sector was 72.6 percent, and the Bank's direct investment accounted for 10 percent of the total. Operating assets amounted to 2.08 billion euros, and net total investment as of 2018 amounted to 12.6 billion euros (Figure 14) (EBRD, 2018).

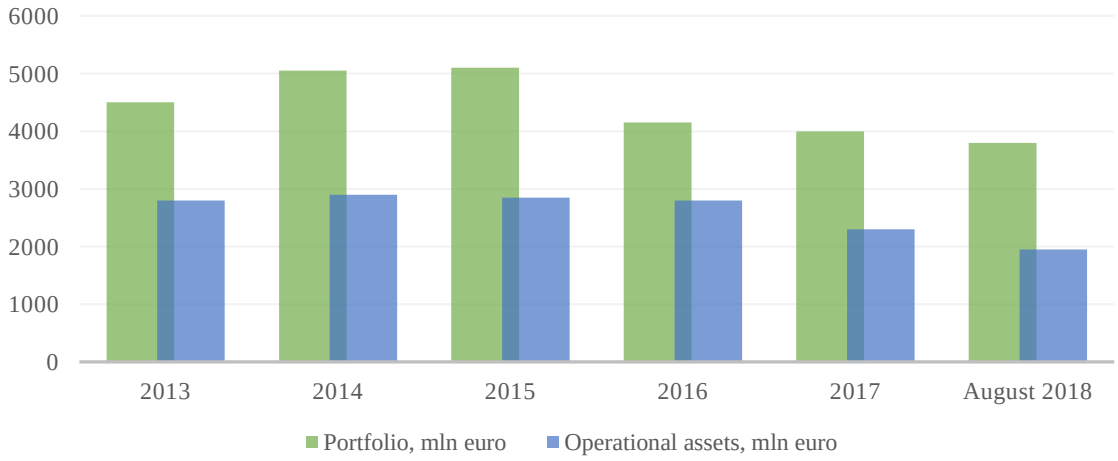
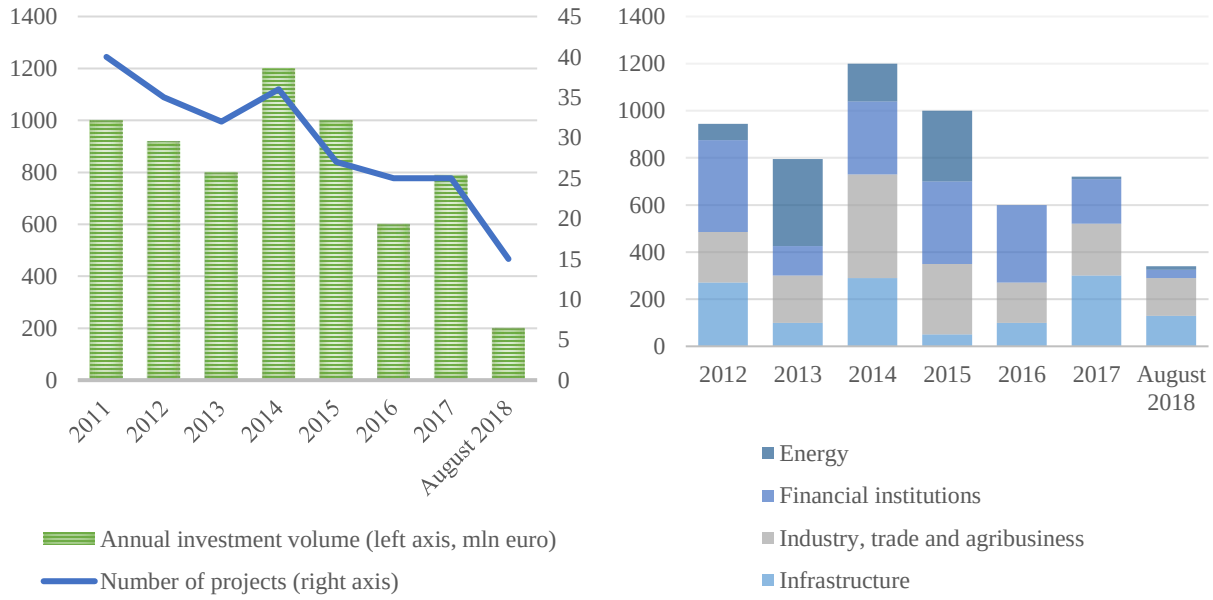


Figure 14. The dynamics of EBRD investment portfolio in Ukraine over 2013-August 2018

Source: EBRD, 2018



a) b)

Figure 15. Annual investment volume and operations (a) and annual investment by sector (b)

Source: EBRD, 2018

Improvement of Ukraine's cooperation with the EBRD is also evidenced by an increase in the share of long- and medium-term lending projects. The average duration of the Bank's completed projects in the country's public sector is 8.3 years, and for subsequent projects it has been over 14 years, thus, Ukraine receives long-term guarantees and resources for the domestic market. Growing rate of payments during the study period (currently 72 percent) is also a positive trend, and therefore the share of project payments in total commitments is growing (EBRD, 2020 (a)).

To determine the priority areas of activities of the EBRD, the Bank is guided by the current Strategy of the EBRD in Ukraine for 2018-2023, which was approved by the Board of Directors in 2018. During this period, the EBRD will focus primarily on improving the competitiveness and efficiency of governance by reforming the currently underperformed and inefficient public sector, while supporting the implementation of best operating and management practices in private companies, increasing economic resilience by improving energy security and ensuring the proper functioning of the financial sector, as well as further integration of Ukraine into the EU. The EBRD also actively supports green economy transition projects, promotes inclusive and gender equality, focusing on skills matching as an important element of competitiveness in line with the Gender Strategy and Economic Inclusion Strategy approved by the EBRD Board of Directors. Priority is given to projects that harmoniously combine investment with political change (EBRD, 2018). Once every six months, the EBRD, together with the Government of Ukraine, reviews the Bank's portfolio to discuss the status of project preparation and implementation and to agree on an action plan for the next six months.

The Government of Ukraine and the EBRD have agreed on areas of support for reforms, including liberalization and transparency of the energy market, restructuring of the state enterprise Naftogaz, support for a reliable independent regulator, implementation of a new approach to renewable energy, land allocation for energy facilities, tariff transparency, mains connection, etc. Increasing the participation of the private sector in all sectors and privatization is the main direction of increasing competition in inefficient sectors of the economy. To this end, the Bank supports structures that increase the participation of the private sector in infrastructure (PPPs, concessions, public service contracts, management contracts) by participating in policy-making and investment. The benchmark for measuring the achievement of this goal is the number of projects involving the private sector. The EBRD expects the state to improve its energy legislation (3rd energy package)

and infrastructure in order to support deregulation, effectively fulfill special responsibilities for the provision of services to citizens and tariff reforms. The EBRD's main areas of activity in this area are supporting the reconstruction and optimization of existing energy networks, promoting local and foreign private investment in energy, including through management agreements, concessions, PPPs and privatization, supporting demonopolization and liberalization of the sector through policy and financing of relevant investment projects, promoting energy efficiency and implementing resource efficiency measures, including through programs to finance the transition to a green economy and the Green Cities initiative for municipal projects.

In order to diversify energy sources by increasing the share of renewable energy, increasing energy efficiency and sustainability of municipal services, the EBRD uses extensive experience in energy market reform, the ability to maintain best practices in production and energy generation, tools for transition to a green economy, extensive experience in energy efficiency projects municipal services and a sustainable scheme to support the development of renewable energy. Effective regulation, market liberalization, diversification, increased production and energy efficiency will help create a sustainable energy market structure, increase resource efficiency and use renewable energy (EBRD, 2018).

Improving integration by expanding infrastructure links is one of the Bank’s activities in Ukraine due to rising integration through facilitating of trade and investment, expanding integrational links with EU. The Bank's management notes the poor condition of the physical infrastructure, in particular the roads, which continues to deteriorate and lags far behind its neighbors. The need to reduce gaps in local infrastructure, develop cross-border corridors and improve logistics requires the Bank to use its extensive experience in financing transport infrastructure on a sovereign and commercial basis and to support private operators in PPP, logistics and freight projects. In order to improve the quality and connectivity of infrastructure, investments are being made in the main national transport network (rail, air, sea, road and river transport) and projects aimed at expanding cross-border connections and trans-European corridors (TEN-T), including development of inland and international river waterways in accordance with the Transport Strategy. To strengthen its soft infrastructure, the Bank invests in the establishment of modern logistics centers and supports private transport and logistics operators. The EBRD also promotes cities and regions by investing in the modernization and empowerment of urban

transport. The Bank's benchmark for infrastructure development is an increase in its capacity and bandwidth.

The EBRD's main partners in creating a green economy and greater integration in Ukraine are the EIB and the World Bank, which co-finance green energy infrastructure and urban transport projects, as well as major transport projects. The Bank also raises donor funds to enhance energy security through energy efficiency financing programs and regular reforms, improve municipal and environmental infrastructure under Green Cities Action Plans, including in the public transport and district heating sectors. Donor funding will be channeled through EBRD multi-donor funds, including the Multi-Donor Account for Ukraine's Stabilization and Sustainable Development. The EU provides significant grants for policy reforms and support for increased connectivity, municipal infrastructure and energy efficiency projects through the Neighborhood Investment Fund's East initiative. In the near future, the EBRD plans to raise funds from the Clean Technology Fund and the Global Environment Facility for energy efficiency projects in the residential and corporate sectors, as well as the EBRD Special Shareholder Fund and the Eastern European Partnership for Energy Efficiency and Environment (E5P). Thanks to the latter, Ukraine received over 62 million euros in 2011-2014 for the implementation of 18 relevant projects (EBRD, 2018).

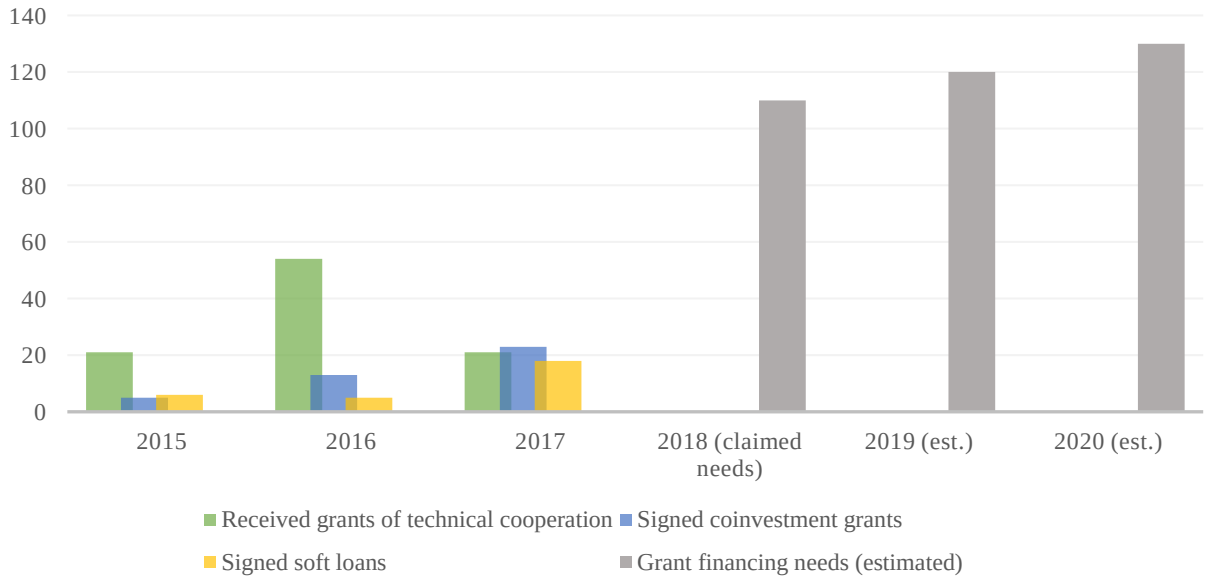


Figure 16. Donor financing during the previous strategy (2015-2017) and forecasted grant needs (mln euro)

Source: EBRD, 2018

Ukraine also receives technical and non-refundable technical assistance from the EBRD. Regulation of technical cooperation with donor countries and international organizations and with the EBRD is carried out on the basis of 21 framework international agreements of Ukraine and international agreements on the implementation of cooperation programs in various sectors of the economy, which are agreed at both intergovernmental and interdepartmental levels. The EBRD's technical assistance areas include energy and heating (€ 6.59 million), radiation safety (€ 3.46 million) and public transport (€ 11.54 million). Assistance was provided in particular for projects of rehabilitation of hydroelectric power plants, increase of HPP capacity, consulting services within the project of construction of overhead power lines and development of solar and wind energy, reconstruction and modernization of district heating, monitoring of Chernobyl protection projects, development of public transport in the cities (tram network, subway, etc.) (Ivanov, Klymenko, 2016).

In 2019, the EBRD invested € 1.1 billion in 51 projects in the public and private sectors. Due to this, Ukraine became the second largest recipient in terms of investment and the first in terms of number of signed projects. Ukraine is the leader in the region of Eastern Europe and the Caucasus in terms of total investment at the end of 2018 (EBRD, 2019). Green economy transition projects received € 680 million, the highest among all EBRD countries (Ukrinform, 2020).

In the public sector, the EBRD is currently financing 6 projects worth €1.41 billion in energy and transport infrastructure, related to the rehabilitation of hydropower plants, the modernization of the main pipeline, improving the safety of nuclear power plants, the construction of an overhead transmission line, the completion of the Dnipro metro and improving the transport and energy condition of highways around the city of Kyiv (Ministry of Finance of Ukraine, 2019).

Despite the above examples of cooperation between Ukraine and the EBRD, in the absence of a transparent system for tracking the use of borrowed funds, it is difficult to assess the effectiveness of their use in the economy of Ukraine. Another important issue is that the EBRD's investments, while focused on vital areas of state development, are largely partial assistance that will not be effective in the absence of government anti-corruption reforms and the transition of domestic companies to international standards of corporate governance and financial transparency. Another disadvantage that complicates the implementation of projects is the late return of value added tax to enterprises.

Obstacles to participation in projects for domestic enterprises include the duration of the project loan procedure, which ranges from three months to a year, and the EBRD's requirement to use a loan to purchase foreign goods and services, which stimulates foreign exporters and increases the dependence of domestic producers from their raw materials. An important impediment is the lack of equity to start implementation, which must be at least 30 percent of the total project cost. The loan is also secured by a pledge of liquid assets in the amount of at least 130 percent of the amount of the borrowed loan, which is subject to compulsory insurance (EBRD, 2020).

While the funds from international financial institutions are the cheapest source of credit, the analysis of the implementation of investment projects of international financial institutions in Ukraine revealed problems of their implementation: about 5 billion US dollars of cheap credit resources remain unused. One of the important problems facing Ukraine in the process of cooperation with IFOs is delays in the implementation or non-implementation of international agreements on projects of international financial institutions. For several years, a significant part of the funds for investment projects that have been signed and ratified did not come to Ukraine or did come with significant delays. There are large potential credit resources for investment projects that Ukraine does not tap and for which it often pays a reservation fee. About half of the EBRD's active portfolio (€723 million) remains untapped. By accelerating the sampling of these funds, Ukraine is able to increase investment inflows (Kolosova, 2019).

In Ukraine, the implementation of loans in the public sector is extremely slow, although EBRD funds are directed to the most important sectors of the country's economy − energy and infrastructure. At the same time, projects in the private sector are being implemented much faster and more successfully. Project implementers (beneficiaries) often complain about the existence in Ukraine of strict bureaucratic procedures for cooperation with IFOs and of rigid bureaucratic procedures of IFOs themselves (Kolosova, 2019). Meanwhile, EBRD projects operating in the private sector of Ukraine overcome these difficulties and successfully use credit funds.

At the same time, the Bank faces systemic barriers to investing in projects in Ukraine due to high levels of corruption, bureaucratization, low level of investor protection, often over-regulation, lack of rule of law, weak standards of public administration and slow implementation of reforms. To address these barriers, the EBRD aims to increase policy assistance and advice in conjunction with investing in fast-growing companies, provide assistance in overseeing the implementation of specific projects and advice on key sectoral reforms and bottlenecks in

legislation (EBRD, 2018). The EBRD identifies key recommendations for improving the efficiency of public administration, including strengthening the capacity of anti-corruption institutions, intensifying privatization, increasing competition, developing capital markets, liberalizing markets (including the energy market) and reforming them.

The Legal Reform Program is an EBRD initiative to improve the investment climate in Central and Eastern Europe by promoting an investment-friendly and transparent regulatory framework. Areas of LRP in Ukraine include consultations on reforming relations in the field of concessions for the implementation of infrastructure projects. Reforming concession legislation involves developing a new law on concessions by combining the best provisions of current laws of Ukraine governing concession activities in various fields and harmonizing it with the best international experience, including model legislation on public-private partnerships. The updated concession legislation will help attract powerful international and Ukrainian investors to modernize and rebuild Ukrainian infrastructure. This will allow Ukraine to develop new road, port, energy and utilities infrastructure that will meet international quality standards, create new jobs and boost economic growth (Ivanov, Klymenko, 2016).

The project will be funded by technical assistance from international donors administered by the EBRD within the EBRD Special Shareholder Fund and the Multilateral Donor Fund for Stabilization and Sustainable Development of Ukraine, established by the United Kingdom, Denmark, Italy, the Netherlands, Germany, Poland, the USA, Finland, France, Switzerland, Sweden and Japan (Uryadovyy portal, 2016).

To improve the development of cooperation between Ukraine and the EBRD in view of these problems, it is necessary to implement such steps as ensuring timely implementation of projects, efficient use of resources by domestic borrowers and recipients and control over their use, reorientation to use domestic goods and services in project implementation instead of imported ones through a system of tender procurement, improving the regulatory framework in the field of international financial and technical cooperation and the contractual framework for cooperation with international organizations, donor countries and the EU, and expanding their credit tools. The growth of investment inflows depends on the improvement of the investment climate in Ukraine, the tax regime, and the creation of an independent judiciary. In order to accelerate the implementation of joint investment projects, the Ministry of Finance of Ukraine

approved the Concept of Cooperation with IFOs and established a working group to those address issues (Ministry of Finance of Ukraine, 2019).

3.3. Case studies of transport infrastructure financing

During the EBRD's transport work in Ukraine, 31 projects were signed, 13 of which were completed and disbursed. The remaining projects are active and are under consideration, implementation or disbursement (EBRD, 2020 (b)). In the field of transport infrastructure, 7 projects with the EBRD and the EIB were completed with a total cost (EUR 909.55 million), of which EUR 659.23 million were loans. The total amount of financing allocated by the EBRD for the railways of Ukraine since 1999 is about 300 million US dollars.

Ukrzaliznytsia (UZ), or State Administration for Railway Transport of Ukraine, is one of the EBRD's largest clients in the field of transport in Ukraine. It is an entity wholly owned by the state. As a result of the reorganization of the former State Administration of Railway Transport of Ukraine as part of the reform of the railway sector, Ukrzaliznytsia was transformed into a public joint stock company in 2015 − Ukrainian Railways PJSC. One of the completed project is Railway Development Project signed in 1999, that has financed the purchase of track maintenance machinery and track improvement materials for the major rail corridor between the cities of Lviv and Kyiv. The funds are used to purchase heavy track equipment to perform repairs of the upper structure of the track using modern technology. The project has assisted in improving the rail line which is the main transport link to Europe, substantially reduced life-cycle costs of track maintenance by modernizing maintenance methods of UZ and improved overall financial performance of the company through commercialization, policy reforms and better management. Commercialization program has been implemented through a permanent five-year business plan, and the one for the commercialization of UZ's non-core businesses. The result is faster and more reliable rail freight transport services at lower cost. The gradual abolition of cross-subsidization of UZ cargo services to cover passenger losses has allowed UZ to restrain freight tariffs, making Ukrainian goods more competitive in the international market (EBRD, 2020 (c)).

EBRD has financed the project by the sovereign guaranteed loan of 50 million euros with a 15-year term; the overall project cost was 96.2 million euro. The project has been implemented with the technical cooperation with EU-Tacis (Bangkok Facility) which has provided 500 thousand

euros for project preparation and 750 thousand euros for project implementation (EBRD, 2020 (c)).

Since all of the projects must undergo environmental analysis to receive EBRD financing, the investment came after a pre-investment study, which developed an Environmental Action Plan (EAP). The project was categorized as B/0 and has identified environmental issues that must be addressed during project implementation. Under the EAP agreed, UZ has provided adequate disposal of hazardous and non-hazardous solid wastes, water run-offs and possible increased noise along the railway corridors (EBRD, 2020 (c)).

Another project that is currently being repaid is introduction of high-speed passenger trains on the railways of Ukraine and construction of the Beskid railway tunnel. The project envisages the purchase of track equipment and the construction of a new 1.82 km long Beskid-Skotarske tunnel, which eliminates a critical bottleneck on the Pan-European corridor V (Ministry of Infrastructure of Ukraine, 2020). Replacement of old-style night sleeper services on medium distance inter-city routes with fast day passenger services provides much better service to customers and a higher return to UZ (EBRD, 2020 (d)). In addition to the physical implementation of the project, EBRD has assisted the institutional strengthening of UZ by developing a new corporate structure. Adjusted legislation together with the implementation of UZ's Railway Reform Policy as well as introduction of efficient procurement methods for equipment and rolling stock purchase have contributed to UZ conversion into a joint-stock company.

The structure of financing was the following: of the total project cost (€ 253 million), the largest share was provided by the EBRD (approximately € 86 million), the EIB provided € 55 million (joined in 2014), and the rest was Ukrzaliznytsia's own funds. The EBRD invited the EIB to join the project when it became clear that the cost of the project, which was originally laid down in our loan agreement, became higher after the financial crisis (Ministry of Infrastructure of Ukraine, 2020). Thus, the first part of the project was financed by the EBRD, while the second one was financed by EIB. The share of EBRD was used for the purchase of track machinery and passenger carriages, the construction of the Beskyd tunnel and consultancy services (EBRD, 2020 (d)). In addition, Austrian bilateral funds have financed 60,000 euro in engineering assessment and geological survey for Beskyd Tunnel Feasibility Study. Bilateral grant funds have financed 200,000 euro in the geological survey to serve as basis for later tunnel design and construction of the Beskyd tunnel. Drafting new legislation to allow corporatization and implementation of

Railway Reform Policy as well as environmental measures for institutional strengthening and implementation was financed by 800,000 euros provided by EU-TACIS (Ministry of Infrastructure of Ukraine, 2020).

The loan agreement was signed in 2004, the first tender for the search for a contractor was held in 2008-2009 and ended up unsuccessfully. In 2010 the second tender took place and a contractor was found. The final contract was signed in 2011, work began in late 2013 and were ended in 2018, currently the project is under repayment. The company must pay the entire amount ($ 40 million) by 2022 (EBRD, 2020 (d)).

The complexity of the project itself played a significant role in the long search for a contractor. Since there was no detailed project of the future tunnel in the tender, only a technical task, Ukrainian contractors were unprepared for the design of the full project. In addition, their proposals were evaluated not only by price, but also taking into account other factors (experience in the field, the availability of staff, equipment, etc.). Before the second tender, the EBRD took into account all the mistakes and selected a contractor to implement the entire turnkey project, but the company turned to the design institute to draft the project. The tender was conducted by Ukrzaliznytsia according to FIDIC international standards. The contract, signed in 2011, was based on the FIDIC Yellow Book, which involves construction and design by the contractor. In addition, since the contract between Ukrzaliznytsya and the contractor was concluded on the basis of FIDIC, the presence of outside observers at the construction site, referred to as consulting engineers, was required. This function was assigned to the Austrian company D2Consult (EBRD, 2020 (d)).

The project was classified as IEE, requiring an Initial Environmental Examination (IEE), thus making each sub-project undergo an environmental due diligence. The purchase of new passenger carriages and modern track machinery have been classified B/0 requiring an environmental analysis. The construction of a new double track Beskyd tunnel has been classified A, requiring a full environmental impact assessment and public consultation as per Ukrainian law and the Bank's policies and procedures (EBRD, 2020 (d)).

In 2017, an agreement was signed to provide a UZ loan under the state guarantee in the amount of up to € 150 million for electrification of 253 km of railway line on the route “Dolynska-Mykolayiv-Kolosivka” in southern Ukraine, connection of this line to high-voltage electricity network, and laying the second track on single-track sections of the line in order to increase the efficiency of the railway and its capacity to serve the ports of Odesa region. Provision of financing

for the electrification of railways and the construction of the second track will reduce energy consumption and eliminate the bottleneck in connection with the three major ports through which Ukraine exports grain. The project also supports reducing energy consumption in the railway sector of Ukraine and strengthening the institutional capacity of Ukrzaliznytsia and the Government of Ukraine to implement best corporate governance practices. In addition, green economy transition will be facilitated due to significant reduction of CO2: a net reduction of GHG emission by 140,000 tCO2eq/year will result from switching locomotives from diesel to electric traction (EBRD, 2020 (e)).

The total cost of the project is up to € 367.9 million: financing will be provided from an EBRD loan, a parallel loan from the European Investment Bank for the same amount, own funds of UZ and grant financing for technical cooperation tasks, which include an assistance in the organization of procurement and project implementation, tasks in the field of development of corporate management of UZ, analysis of opportunities for preparation of the energy efficiency project within the Program of consultations on sustainable transport development and implementation of the energy efficiency program (EBRD, 2020 (e)).

The EBRD has provided a senior loan of € 150 million, which will include two tranches: € 124.5 million for the electrification of the Dolynska-Mykolayiv railway line (148 km), the construction of a second track on single-track sections of the line, and the construction of a high-voltage transmission lines, and € 25.5 million for electrification of the railway line on the route "Mykolaiv-Kolosivka" (105 km) (EBRD, 2020 (e)).

According to the Initial Environmental and Social Examination, the project is classified as Category B, so the project does not have a negative impact on protected areas and does not cause the need for resettlement, and the environmental and social impacts associated with the project are not considered significant and can be mitigated (EBRD, 2020 (e)). To reduce the risks of land use and land allotment and the danger to the population due to the emergence of new railways and power lines, a Land Acquisition and Compensation Program, a Stakeholder Engagement Plan and a Plan of Environmental and Social Measures are developed.

In 2019, the EBRD signed an agreement on an investment of US$ 100 million in a tap issue of UZ senior unsecured Eurobonds, which is structured as an issuance of loan participation notes carried out by a SPV − Rail Capital Markets PLC. The Issuer is a public limited company incorporated under the laws of the United Kingdom which will on-lend the proceeds of the

issuance to UZ. The EBRD provides US 94.9 million dollars out of total project cost which includes proceeds from the initial public issuance of USD 500 million that took place on 1 July 2019. The EBRD has a subscription of approximately 17 percent of the total issue of $ 600 million. The bonds will be listed on Euronext in Dublin, Ireland. The investment will further improve the financial performance of UZ and the implementation of its strategic investment plans. The proceeds from the EBRD's financing will be used to finance the rehabilitation of priority railway lines predominantly on the Trans-European Transport Network corridors within Ukraine which are currently limiting the operational speed of trains. More precisely, 70 percent of the $ 100 million raised will be aimed at modernizing the railway infrastructure of the international transport corridors TEN-T, while another 30 percent of the company will spend on upgrading the control signaling and communication, as well as improving the control system of railway traffic (Cabinet of Ministers of Ukraine, 2019).

As a result, the project would increase the speed of trains, overall throughput capacity, and reduce CO2 emissions. UZ management policy will be supported by the EBRD's procurement rules, Environmental and Social Policy and the implementation of a Corporate Governance Action Plan for UZ's subsidiaries. The project, categorized B, has undergone the Environmental and Social Due Diligence which concluded that it will include standard operational and construction risks related to the track rehabilitation which can be mitigated by the application of standard industry good practice, and that UZ has a well-developed Environmental, Health, Safety and Social (EHSS) risk management framework. Each railway section is subject to a detailed project development process, including an EHSS impact and risk review, which will also include consideration and inclusion of appropriate mitigation measures in the event of any social adverse impacts and disturbances on railway traffic. In addition, the Environmental and Social Action Plan includes improvements needed to strengthen the monitoring and control of rehabilitation work, conduct regular internal and external inspections of EHSS and labor to verify that EHSS standards are being applied correctly and that all mitigation measures are being implemented.

UZ raises money from the EBRD at the lowest rate in 8 years, the deadline for repayment of the additional issue is 2024 with an effective rate of 7.292 percent per annum. Procurement of materials will be carried out according to EBRD rules. Both residents of Ukraine and non-residents of Ukraine can participate in the tender which will provide an opportunity to attract a wide range of participants to the procurement. New Eurobonds were issued without any government

guarantee, i.e. the amount of the company's debt will not affect the amount of Ukraine's total public debt.

The operational condition of the vast majority of roads in Ukraine does not meet modern requirements and needs to be improved taking into account the socio-economic needs of the state. The urgency of the problem of providing quality and safe road infrastructure is associated with a significant underfunding of state programs for road construction and repair. Over the past 12 years, the EBRD has invested more than € 500 million in the reconstruction of the M06 highway between Kyiv and Chop (EBRD, 2020 (f)). The highway upgrade has had great impact on international trade and on economic growth in Ukraine and the region since the road connects EU with Ukraine, Russia, the Caucasus and Central Asia.

The project of M-06 motorway rehabilitation included also purchase of road maintenance equipment, technical assistance for project preparation and implementation and the road sector financing reform provided for the repair of the M-06 Kyiv-Chop highway at km 824-km 614 (Chop-Stryi). The EBRD loan contributed € 75 million out of a total project cost of € 115 million (EBRD, 2020 (g)). Funding for the state budget of Ukraine amounted to about 23.5 million euros. The proceeds from the loan were used to rehabilitate important sections of one of Ukraine's most important roads, the M06 motorway, and assisted the Ukrainian State Corporation for Road Construction, Repair and Maintenance (Ukravtodor) in restructuring financing and managing the road sector. The preparation of detailed design and tender documents and the supervision of civil works was funded by the EU-TACIS (1.5 million euros). The project was completed in 2005.

The project introduced competitive bidding for construction contracts, which encouraged private sector investment in the road construction industry, which was previously dominated by state-owned enterprises. In addition, the loan facilitated the privatization of Ukravtodor's non-customer activities and improved its financial performance and management.

An environmental analysis has categorized the project as B/0, so the impacts associated with the project are not significant and limited to noise, safety and air quality during construction. Mitigation measures to address these impacts as well as EU and national environmental requirements are included in tender documents (EBRD, 2020 (g)).

The second Kyiv-Chop highway rehabilitation project started in 2005 and was completed in 2008 to improve the condition of Pan-European Corridor III (Kiev-Lviv-Krakow-Berlin) and Corridor V (Lviv-Chop-Budapest), which link Ukraine with Western Europe, in the section

Lviv-Brody, km 621-km 441. The project supported the reform of road sector administration and financing. Additionally, the proceeds were used for the consultancy assistance for supervision of civil works. Another goal of the project was commercialization and improved management of Ukravtodor through a strategy to reform the road network administration and management (Ministry of Infrastructure of Ukraine, 2020).

The total cost of the project was 138 million euros, of which 38 million euros were provided from the state budget of Ukraine, the remaining 100 million euros were provided by the EBRD. Given that the project was largely related to the modernization of the existing road, no significant negative environmental impacts were expected, and the project was categorized B/0 (EBRD, 2020 (g)). The impacts of the project were limited to temporary noise, safety, air quality impacts during the construction. Mitigation measures are developed in the Environmental Action Plan. The contracting and tender documents included all the national and EU environmental, health and safety requirements.

In 2006, Ukravtodor received a third loan, this time from two banks at the same time − the EBRD and the EIB. The credit agreement aimed to improve the condition of the international transport corridor III on the section of the M06 road, from Kiev to the city of Brody, Lviv region (km 14 – km 441). The project has continued the reform of the road sector through the restructuring of road network management by separation of ownership, administration and between state and local roads, improvement of the road sector financing strategy and increase of the competition in the sector. The project has promoted greater private sector participation in the road sector in Ukraine by improving the legal framework and initiating various PPP-based road projects. The development of PPP legislation based on the best international practice was determined as a part of technical cooperation of Ukrainian Government and the EBRD and financed under EU IPF 2003 by 350,000 euros (EBRD, 2020 (g)).

The total cost of the project was 572 million euros, of which 172 million euros were provided from the state budget of Ukraine. The banks have allocated 200 million euros each. The project is now being repaid. An Initial Environmental Examination has categorized project as B/1: since the rehabilitation of an existing road does not entail any widening and secondary connection roads construction, the project is not expected to have any significant negative environmental impacts. According to the EBRD requirements, Ukravtodor disclosed a summary of the relevant environmental issues and mitigation measures and action plans. The environmental problems

associated with the existing road should be mitigated through the protection measures included in the project, the Environmental Action Plan and the Construction Management Plan. The improved condition of the road traffic safety measures included in the project has significantly improved the very poor road safety conditions. The national and EU requirements for environmental protection, health and safety as well as Environmental and Construction Management Plans were included in the contract and tender documents. Independent engineers monitor the contractors' performance every six months and report on the progress of the project. Ukravtodor reports annually to the EBRD on measurable environmental impacts and implementation of EAP.

The fourth project to improve the transport and operational condition of highways at the entrances to Kyiv (Pan-European corridors) from 2010 aimed at overhauling and reconstructing a number of highways at the main entrances to the city of Kyiv. The project is in the active stage of implementation. The implementation of the Loan Agreement with the EBRD provided for the implementation of contracts for the operation of roads on the final result (OPRC) of the highway M-06 Kyiv-Chop on the section km 832 - km 434 (Ukravtodor, 2016). A total of 148 km of roads were repaired.

One of the most well-known EBRD infrastructure projects in Ukraine is the infrastructure development of the Illichivsk Sea Commercial Port. This project was the first in the Ukrainian port sector to receive a loan from an international bank in the amount of 26 million euros under the guarantee of the Government of Ukraine. The loan was granted for 15 years with a four-year grace period. The total cost of the project was 38.9 million euros (Cabinet of Ministers of Ukraine, 2007). The technical cooperation included a market, technical and environmental due diligence, funded by the EU-funded Transport Team Framework Agreement (TACIS) (EBRD, 2020 (h)).

As part of the project, berths №7,8,9 were reconstructed, dredging works were carried out and transshipment equipment was purchased for further processing at the renewed facilities of metal and export ore in bulk. These measures freed the berths №1, 2 from metal processing to increase the capacity of the Illichivsk port for container transshipment and create conditions for the handling of ocean-going container vessels in accordance with the needs of the modern market. The implementation of the project allowed turning the Illichivsk port into a significant transport hub by increasing production capacity and created conditions for the development of the largest container capacity in the Black Sea (Cabinet of Ministers of Ukraine, 2007).

The project was driven by the dynamic growth of container traffic in the world, the total volume of which at that time was 15 percent of all cargo flows of world maritime trade. Container traffic through the seaports of Ukraine is growing by 30-50 percent annually, which confirms the container turnover of the port of Illichivsk (Cabinet of Ministers of Ukraine, 2007).

The project also included a corporate development program to transform the port into a more commercial organization by implementing business planning, IFRS auditing and strengthening the Port's internal capacity in strategic development and managing its relations with private operators. The commercialization of one of the country's largest ports has created the conditions for a continued political dialogue with the government on sector reform, which will allow Ukrainian ports to borrow without sovereign guarantees in the future (EBRD, 2020 (h)).

The project has been screened B/1 and presented great opportunities for environmental, worker health and safety improvements at the Port and while reducing its impacts on the Black Sea environment. Environmental due diligence has proposed an Environmental Action Plan to bring the facilities into compliance with applicable national and EU environmental standards (EBRD, 2020 (h)).

However, there were some difficulties in implementing the project, which slowed down its implementation. Thus, in November 2009, the Economic Court of Odesa region suspended the tender for the reconstruction of three berths in Illichivsk seaport. Then, in March 2010, the Court of Odesa Region revoked the termination of the tender for the selection of a contractor for the reconstruction of berths № 7, 8 and 9 of Illichivsk port. In particular, the court denied Moebius Construction Ukraine Ltd., which was not allowed to participate in the tender, a claim against the seaport and the EBRD (UNIAN, 2011).

Further, the first tender for the reconstruction of berths was canceled, the second (for the purchase of handling equipment) was terminated before the submission of proposals by potential bidders. The tenders were suspended due to changes in market conditions during the litigation surrounding the tender for the reconstruction of berths. According to the Port estimates, updating the tender documents has saved about 1.5 million euros (UNIAN, 2011).

As part of the loan project, due to delays in the implementation of the loan project during the preparation and entry into force, the Port proposed to the Bank to postpone the last date of the loan to May 1, 2014. After a more detailed study by the experts, the EBRD agreed to postpone the last date for granting the loan is May 1, 2014. Open international tenders were held for the selection

of a contractor for construction works on the reconstruction of berths № 7,8,9 and the selection of a company-supplier of handling equipment, which was installed on the reconstructed berths № 7,8,9 (UNIAN, 2011).

For the reconstruction of the warehouse part of the complex, purchase of transshipment equipment and further operation of the transshipment complex with berths № 7,8,9 the loan agreement provided for the involvement of an operator-investor, the choice of which was made by the port on the basis of an open international tender in accordance with the «Methodology for selection and monitoring of Investor Operators» developed by experts of the EU, approved by the EBRD (UNIAN, 2011).

3.4. Case study of energy infrastructure financing

According to the Strategy, energy sector efficiency is one of the main priorities of EBRD in Ukraine. The energy intensity of Ukraine's economy is one of the highest in the world and more than three times higher than the corresponding average in the EU (Figure 17). The residential sector and industry are also characterized by low energy efficiency. District heating systems are inefficient due to improper care, losses, poor insulation and old equipment. Thus, outdated energy infrastructure requires significant investment. Meanwhile, renewable energy has a very low share in the overall generation structure, is highly subsidized and requires a new competitive pricing system. The Bank proposes to achieve strengthening of energy security through effective regulation, market liberalization, diversification and increase of production, as well as increase of energy efficiency.

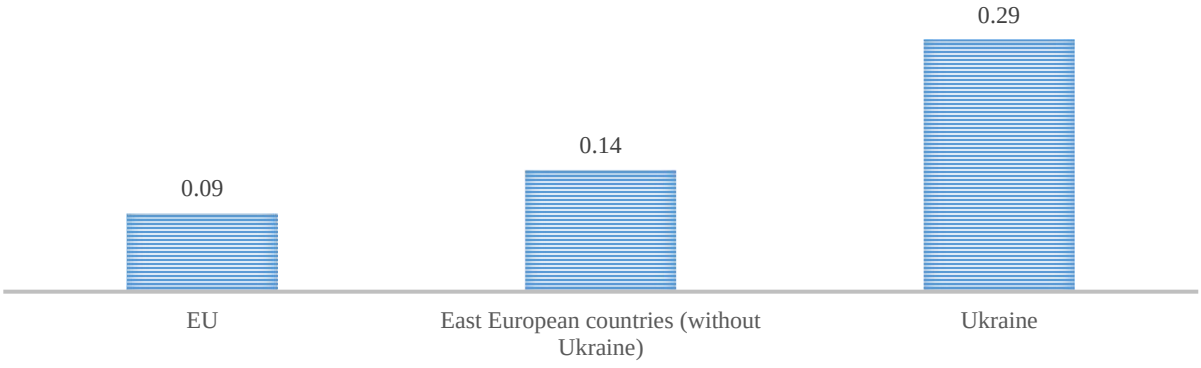


Figure 17. Total primary energy consumption per unit of GDP (PPP), 2015

Source: EBRD, 2018

In the public energy sector, the main partner of the EBRD is National Joint Stock Company "NAK" Naftogaz of Ukraine (“NAK" or "Naftogaz”). Large-scale support for reforms from the EBRD (unbundling, modernization of corporate governance in Naftogaz and the future gas transmission system operator, separation of natural gas storage and transportation activities, gas sector reform) resulted in increased profitability, achieving parity between gas prices for final consumers and import prices in 2016, the creation of a largely independent supervisory board, diversification of gas resources (EBRD, 2020 (i)).

The project of urgent reconstruction and technical re-equipment of the main gas pipelines was signed in 2014 and is currently being paid. The project provided for the replacement of four sections of the Urengoy-Pomary-Uzhhorod main gas pipeline, which need major repairs, as well as the modernization of the Romenska gas compressor station. The gas pipeline is a key component of the Ukrainian gas transmission system, which provides gas supplies from Russia to Europe and the return import of gas to Ukraine from the European Union. The client is Ukrtransgaz (state gas transmission operator), which is fully owned by PJSC National Joint Stock Company Naftogaz of Ukraine (NAK), a state oil and gas holding company managed by the Ministry of Energy and Coal Industry of Ukraine (EBRD, 2020 (i)).

The pipeline modernization project promotes institutional reforms in Ukraine's gas sector, improved management, health and safety practices, environmental and social aspects of Ukrtransgaz, and increases the efficiency of compressor stations and pipelines in terms of energy efficiency and related carbon emissions. The government estimates that technological losses of gas during transportation will be reduced by one-fifth. The allocated funds will help strengthen Ukraine's energy security by diversifying gas suppliers and delivery routes, creating an independent regulator in the commodity market, improving tariff methodology and developing a gas network code, which will set mechanisms for setting tariffs for the use of Ukraine's gas transmission system (EBRD, 2020 (i)).

The total cost of the project was $ 600 million, of which the EBRD and the EIB provide € 150 million each. The NJSC attracted a government loan of up to $ 200 million, the funds of which were provided in the form of a sub-loan to Ukrtransgaz as the project executor. NJSC Naftogaz will provide equity investments in the amount of 166 million euros. The preliminary

feasibility study for the reconstruction of the gas transportation and storage system (€ 2.6 million) was completed and funded by the EU NIF (Naftogaz Europe, 2014). Procurement will be open to all potential bidders.

The amendments to the legislation adopted by the Cabinet of Ministers of Ukraine on the separation of the function of transporting natural gas clearly define the mechanism for further use of objects and property of the gas transmission system, as well as legal entities responsible for the use of these tangible assets. At the same time, the updated resolution does not directly regulate Ukrtransgaz's relations with the EBRD and the EIB regarding the use of credit after the separation of the gas transmission system operator, as a result of which Ukrtransgaz did not see the possibility of using the funds under the loan agreement with the EBRD and the EIB in 2019. In addition, the establishment by the National Commission for State Regulation of Energy and Utilities of lowered tariffs for Ukrtransgaz made it impossible for the company to meet the criteria of financial stability, which are defined in loan agreements with the EBRD and the EIB (Economichna Pravda, 2019).

Therefore, in 2019, Ukrtransgaz asked the EBRD and the EIB to revise existing loan agreements for the project due to the operator's inability to meet the financial stability criteria defined in the loan agreements, due to lower tariffs for its services since the end of last year. The company noted that measures to increase the reliability and efficiency of the use of the pipeline can be implemented at the expense of significantly less funds than is stipulated in loan agreements, therefore the company asked the EBRD to reduce the loan amount from 300 million euros of the planned amount of loan funds to 125 million euros. In its appeal to financial institutions, Ukrtransgaz also asked them to consult with the Ukrainian government to determine the degree of responsibility of the operator and the new operator of the gas transmission system for loan agreements, the mechanism for using funds and servicing the loan after the unbundling process in Ukraine (Economichna Pravda, 2019).

The project received category B, so national studies for EIA are included in the project documentation. The implementation of the project ultimately increases the safety of gas transportation activities: the presence of corrosion and cracks in existing pipes can lead to gas leaks and accidents if this problem is not addressed in a timely manner. The main part of the planned pipeline replacement activity will use the existing trench, respectively, the discharge strip for the pipeline will remain unchanged. Several sections will be laid using a new trench, next to the existing one, in the pipeline drainage area. An independent commission is being set up to purchase

the land, and consultations are being held with the landowners and land users involved. Land users are paid a one-time compensation for crop loss, and a real estate encumbrance agreement is signed with the landowners and an annual rent is paid. An independent certified body analyzes the soil within the land plots, and the contractors are responsible for restoring the soil after the completion of the work to the initial quality parameters. Following the completion of the ESDD (Environmental and Social Due Diligence), mitigation measures need to be taken were included in the Environmental and Social Action Plan (EAP), which is an integral part of the loan agreement. Ukrtransgaz is required to submit annual reports on environmental and social issues, including a detailed report on the implementation of the EAP (EBRD, 2020 (i)).

Ukrenergo, fully State owned company responsible for high voltage transmission and dispatch of electricity in Ukraine, is another big partner of the EBRD. In the field of infrastructure, there is a project signed in 2007 that is now being repaid.

The project involved the construction and operation of two new transmission lines: the 750 kV Rivne NPP - Kyiv transmission line of the total length 353 km and the 135 km 750 kV Khmelnytsk NPP - Chernobyl NPP line diversion to Kyiv substation. The line and the diversion were constructed along new routes while a number of alternative routes were considered too. The project aims to increase the reliability of electricity supply to consumers in Kyiv region and improve the reliability and stability of the energy system to increase overall efficiency, create indirect environmental benefits and promote international cooperation in the sector. The project also results in the reduction of greenhouse gas emissions and assistance in the tariff reform process for the Ukrainian electricity transmission sector.

The total cost of the project was € 452 million, of which the EBRD provided a € 150 million sovereign loan. Technical cooperation aimed at project preparation and procurement activities financing from the Bank, as well as the assistance program for the reform of electricity transmission tariff methodology of the National Electricity Regulatory Commission (NERC). Since the project was categorized as A/0, it must have undergone an Environmental and Social Impact Assessment (ESIA) on both national and EBRD levels. The ESIA has not found any adverse consequences of the project and have shown few positive aspects of the new transmission line in terms of strengthening the Ukrainian National Grid.

In 2019, another Ukrenergo project has been signed: transmission network modernization provides a loan under the state guarantee of Ukrenergo in the amount of up to € 149 million with

a total project cost of 198.2 million euros to finance the purchase of up to 26 new transformers, as well as automation and modernization of 12 high-voltage substations in key parts of Ukraine's power grid. The remaining funds will be provided directly by Ukrenergo. The loan is designed for 15 years with a grace period of 4.5 years. The approximate completion date of the project is 2024. This project is part of the Comprehensive Program for Automation of Ukrenergo Substations, approved by the Ministry of Energy and Coal in 2018, which will also be financed with the support of the European Investment Bank, the World Bank and the credit institution for the reconstruction of KfW (EBRD, 2020 (j)).

The Special Shareholder Fund (SSF) will allocate funds to assist in procurement, which will allow procurement to be conducted in parallel with the preparation and entry into force of funding and reduce the risk of delays in project implementation. Funds for technical cooperation will be used to obtain a certificate from the Chartered Institute of Procurement and Supply (CIPS). With the donor funds, the EBRD will analyze the technical capabilities of the network to connect new capacity, which will help Ukrenergo to analyze technical challenges related to the impact of increasing the share of renewable energy capacity in Ukraine on the stability of the energy system (EBRD, 2020 (j)).

The modernization of the key transmission infrastructure will help increase energy efficiency in the country and synchronize with the European Network of Transmission System Operators (ENTSO-E) and is an integral part of Ukraine’s ongoing program to meet the requirements of the EU’s Third Energy Package. The project will lead to significant energy savings and a corresponding reduction in CO2 emissions by increasing the efficiency and reliability of power substations (EBRD, 2020 (j)).

The EBRD also aims to accelerate the commercialization and institutional strengthening of Ukrenergo and the industry as a whole, as well as the development of procurement standards, which provides for the implementation of the Corporate Governance Action Plan (CGAP) with special attention to launching the certification of the company as a transmission system operator, ensuring the proper functioning of its supervisory board with a majority of independent members within the joint-stock company and the introduction of internal audit and risk management functions.

The project has obtained Category B and provides localized impacts that can be assessed and mitigated based on the results of the Environmental and Social Due Diligence (ESDD). Key

issues identified during the ESDD include the potential need for soil and groundwater remediation after transformer replacement, drainage, and the safety of workers and local communities during construction and operation (EBRD, 2020 (j)).

In order to assist in the realization of the potential in the field of alternative energy and support and finance the first non-large hydropower renewable energy projects in Ukraine, in 2009 the EBRD has launched the Alternative Energy Financing Program in Ukraine − Ukraine Sustainable Energy Lending Facility (USELF), which aims to provide technical support and credit financing for renewable energy development projects that meet commercial, technical and environmental standards (Ivanov, Klymenko, 2016). The first phase of the project provided € 50 million EBRD financing and € 20 million from the Clean Technology Fund (CTE). Since the first phase was successful, in early 2014 the Bank's Board of Directors decided to continue this program and increase funding by € 70 million (€ 50 million from the EBRD, € 20 million from the Fund (USELF-II)) (Ivanov, Klymenko, 2016). Since inception, the facility has invested more than 100 million euro to finance over 150 MW across all renewable energy technologies (EBRD, 2020 (k)).

Currently, Ukraine receives most of its electricity from nuclear power (54 percent), coal (34 percent) and natural gas (6 percent). As nuclear fuel and natural gas are mainly supplied from Russia, an aggressor country, and the Donetsk and Luhansk regions, where Ukraine mined much of its coal until 2014, are now controlled by the separatists, the state must import anthracite, gas and fuel. This dependence poses a threat to energy security for Ukraine. In addition, much of Ukraine's energy production capacity will need to be decommissioned or upgraded over the next decade. Thus, it is necessary to increase the capacity of energy generation in Ukraine in favor of more favorable sources. Renewable forms of generation have less impact on the environment than other forms of energy production, reduce import dependence and contribute to energy security. To stimulate the development of alternative energy sources in Ukraine, the government has introduced a renewable energy tariff scheme (FIT) (EBRD, 2019 (a)).

Given the development of renewable energy, investor interest in these projects is growing, so the EBRD continues to support renewable energy in Ukraine by financing the USELF program of 250 million euros to finance new private projects realized by private renewable energy developers of any size and technology used. Small developers may receive the assistance in project design and preparation from technical cooperation funds of the EBRD. In addition, a consultancy

team helps smaller developers with project permitting and licensing, commercial negotiations, environmental and social due diligence and project management.

As part of the energy initiative, the EBRD has also launched a new FINTECC program that will help Ukrainian companies invest in energy-saving technologies and provide Ukraine with more than $ 50 million. The three-year program is supported by grant funding of $ 7 million from the Global Environment Facility (GEF) and $ 4 million from the European Union Neighborhood Investment Fund. It will help Ukrainian companies invest in the best available technologies, which should help reduce greenhouse gas emissions. These can be technologies for the efficient use of energy, materials and water, as well as renewable energy, which are not very common in Ukraine. Under the program, the EBRD plans to provide loans of up to 40 million euros. Each participant will be able to receive grants in the amount of 5 to 25 percent of the project cost, but not more than 1 million dollars.

The National Renewable Energy Action Plan, approved in 2014, sets a goal of achieving 11 percent of gross final consumption of electricity from renewable energy sources by 2020. However, despite the significant growth of renewable energy in recent years, its penetration remains low at about 1.5 percent of annual production. In this view, the EBRD facility will finance assets that generate renewable energy, promote the involvement of the private sector in renewable energy and increase competition in energy sector which is dominated by the state nuclear power plant, some thermal power plants and large hydropower plants, which account for almost 80 percent of the country's total installed capacity. From the view of policy, the EBRD support governmental intentions on introducing competitive auctions mechanism. The independent consultant representing the EBRD carries out an Environmental and Social Due Diligence and categorizes the project, develops a non-technical summary (NTS), Stakeholder Engagement Plan (SEP) and Environmental and Social Action Plan (ESAP).

The current USELF-III attracts funds from private companies to implement alternative energy projects in Ukraine. At the moment, 10 financing projects for air and solar power plants have been signed under the program (Table 2). Projects typically involve less investment than upgrading existing public sector networks, have minimal negative environmental impact, help reduce carbon emissions, and encourage the local private sector to invest in energy.

Table 2.

Current EBRD projects under USELF-III in Ukraine

Project Name	Client	Date	Amount (euro)
USELF: Syvash Wind Power Plant	Syvashenergoprom LLC	21 June 2019	75,000,000
USELF: Ingulets Solar	Ingulets-Energo 2 LLC	14 February 2019	19,100,000
USELF - Chigirin Solar	Greenteco SES LLC	28 June 2019	19,679,000
USELF III: Modus Solar PV Project	Bolochyvskyy Solar Park-1 LLC	26 September 2019	22,823,000
USELF: Aquanova Shalanky	Aquanova Development	27 September 2019	2,000,000
USELF: Yavoriv Solar Power Plant	Energopark Yavoriv LLC	11 October 2019	5,800,000
USELF: Vita Solar Power Plant	Vita Solar LLC	18 October 2019	8,500,000
USELF - Mykolaiv Solar	Rengy Bioenergy LLC	14 December 2018	18,140,000
USELF - Kamianka Solar	Chysta Enerhiia-2011 LLC	21 December 2018	12,230,600
USELF: Yavoriv Solar Power Plant	Energopark Yavoriv LLC	21 December 2017	30,080,000

Source: EBRD, 2020 (k)

Considering as an example one of the sub-projects, namely Chigirin Solar Plant, the loan of up to € 19.7 million will be used for the development, construction and operation of a 55.4 MW solar power plant in Cherkasy Region. It is estimated that the project will reduce CO2 emissions by 36,396 tons per year. This will reduce Ukraine's reliance on fossil fuels, which is expected to improve Ukraine's energy security, diminish climate change, and enhance environmental quality. The ultimate owner of Greenteco SES LLC is Scatec Solar ASA (Norway). FMO (Dutch Development Bank) is also considering investing in this project (EBRD, 2020 (l)). The construction should last around 28 weeks. It is the fourth project of Scatec Solar in Ukraine. The EBRD also supported the company's projects for the construction of solar power plants with a capacity of 47 MW in Mykolayiv and 30 MW in Kamyanka.

The total cost of the project is 56,226,000 euros, of which the EBRD provided 19,679,000 euros. Another part of funds will be provided by a 10-million-euro loan from the Swedish State Institution for Financing Development (The Swedish Fund) and a 5-million-euro loan from Northern Environmental Finance Corporation (NEFCO). Credit funds, according to the developer, will cover 70 percent of the total costs of the project (EBRD, 2020 (l)).

The location was previously designated as the place for nuclear power plant but construction was in the very early stages when the project came to a halt as a result of the Chernobyl disaster. The ESDD of the project concluded that it has the category B and environmental and social impacts are localized on the site, and ways to mitigate them were identified during a pre-investment environmental and social study. Although solar energy projects are generally not associated with significant environmental or social impacts, some aspects related to land acquisition, biodiversity, stormwater management due to the proximity of the Tyasmin River, potential visual impacts on the surrounding residential areas, and also by clearing the site and compensating for land owned by local residents. Appropriate mitigation measures have been included in the Environmental and Social Action Plan (EAP) (EBRD, 2020 (l)). In addition, since the existing road going through the center of the location will no longer be available, Scatec Solar ASA will provide another road around the perimeter of the site nearer to the local communities (EBRD, 2019 (a)).

CONCLUSIONS

The construction and rehabilitation of infrastructure objects creates demand in various industries in economy, which both directly (such as design, construction, technical and legislative support) and indirectly relate to infrastructure. Infrastructure development results in higher productivity and output, and allows for income growth by the means of economies of scale and higher investment productivity. Efficient infrastructure enforces the trade flows by reducing transaction costs, increasing mobility of capital and products, enhancing their competitiveness, giving access to markets and thus driving small and medium businesses to participate in export operations.

From the social perspective, infrastructure provides opportunities for labor mobility, attracts tourist flows and supports integration of regions. Reduction of mortality and poverty, improvement of healthcare and education, as well as inequality decrease through the convergence between different income groups and regions and higher inclusion are well-proved consequences of infrastructure betterment. Hence, the balance between economic and social infrastructure is crucial to support strong and sustainable economic growth.

In developing countries, which lag significantly from developed economies in terms of economic development, infrastructure improvement results in much higher economic growth due to lower level of initial capital stock. At the same time, restricted budgets often push governments to raise funds for capital investment by increasing taxes, borrowing or cutting other expenses, which may in turn result in decrease of productivity and economic growth. Thus, effective risk and cost management, evaluating the priority of projects, the balance between costs and benefits, and careful selection of projects are of particular importance.

The involvement of the private sector in the process of investing in infrastructure is inevitable due to the growing needs for infrastructure and the inability of states to provide the proper level of financing on their own, including due to the global financial crisis. At the same time, the creation and maintenance of socially significant, but less economically profitable infrastructure objects and services requires government participation in infrastructure financing. In this regard, the development of public-private partnerships is extremely important for developing countries. At the same time, a lot of legislative changes and supporting policy measures are required in order to start and effectively use this mechanism.

The specifics of each region and individual country should be taken into account when choosing a particular instrument for financing infrastructure. Thus, international investment banks have a sufficient amount of funds, but require countries to fulfill certain obligations and conditions that developing countries find it difficult to achieve, such as political stability, implementation of reforms, often unpopular among citizens, developed financial market, and so on. The use of funds from banks, insurance companies and pension funds implies the development of the domestic capital market. Foreign loans can attract large amounts of funds and have a greater return on economic growth, but at the same time there is a risk of deepening the country's dependence on foreign currency and increasing the debt burden.

Relatively new methods of financing infrastructure have similar features: for example, life cycle contracts imply significant state participation in the investment process, which is not always economically feasible in developing countries; green bonds require sufficient development of capital markets; and the value capturing and crowdfunding mechanisms are mainly suitable for small local projects, rather than large-scale infrastructure upgrades. Thus, the most effective option is to choose the source and mechanism for financing infrastructure facilities, depending on the specifics of a particular country, sector and a single project.

The analysis of the state of the EBRD infrastructure investment in Ukraine has shown that the Bank has a long history of cooperation for infrastructure development with both public and private entities. Most of the projects have been successfully realized and repaid, while the current portfolio is also large and includes numerous projects in various sectors − from agribusiness to financial infrastructure. The EBRD actively collaborates with the Ukrainian government to launch key reforms to demonopolize industries and enhance competition as well as to support sustainability of an economy. In the sector of transport infrastructure, the Bank deals mostly with state-owned enterprises, since the majority of road, railway, airport and port infrastructure objects are publicly owned. In the field of energy infrastructure, the EBRD's investments in state-owned enterprises projects are mainly focused on rehabilitation of existing infrastructure, whose projects are more expensive and regulated. At the same time, private projects are concentrated in the field of alternative energy, the regulation of which is freer due to the liberalization of the sector, and requires much smaller financial investments from both the Bank and private clients.

Thanks to the long-standing partnership between the EBRD and Ukrainian enterprises, the use of state guarantees is a rather rare occurrence, which does not add an additional burden to the already high public debt, and also indicates a high level of trust on the part of the Bank.

The choice of this financing mechanism is beneficial for Ukraine due to the lack of domestic funds for investing in infrastructure, a high level of debt, an underdeveloped capital market, political instability and, consequently, low investment attractiveness, as well as insufficient attention to the problems of sustainable development. Thus, the cooperation of Ukraine and the EBRD is predominantly effective, since it serves as a push for the government to implement the essential reforms and speed up the approximation of legislation to EU legislation in the framework of the Association Agreement with the European Union, while mobilizing local business to participate in infrastructure investments. The presence and very active activity of the Bank in Ukraine is a positive signal for international investors, both institutional (for example, the EIB) and private (for example, the Norwegian company Scateca).

At the same time, the use of Bank loans should not be considered as the only source of financing infrastructure in Ukraine, as there are certain factors that inhibit the potential of this interaction: the long process of selecting and signing a project agreement, bureaucratic processes, too slow implementation of legislative changes by Ukraine, dependence on foreign currency and so on. In this regard, it is recommended to combine different sources and mechanisms of investing in infrastructure, as well as develop domestic financing through more active interaction between business and government.

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