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## The Financing Structure of Global Infrastructure Projects

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**Abstract:**

**Purpose:** The purpose of this overview paper is an assessment of the financing structure of global infrastructure projects.

**Design/Approach:** The basis for the research and considerations concerning the structure of financing in the global market for infrastructure investments is the many years of observations of the phenomena, volumes, and entities operating in this market. The basis for the observations was mainly reports and statistics of the IJ Global Project Finance and Infrastructure Journal. A review of English-language and Polish publications on the problems of financing infrastructure development was the premise for the research objective - to assess changes in the financing structure of infrastructure projects globally. The study used secondary data published by IJ Global for the years 2017- 2020. In making the assessment, an attempt was made to maintain a holistic approach to combine partial elements into a whole for a synthetic assessment of changes in the financing structure of infrastructure investment financing.

**Findings:** The unprecedented situation in the world and global markets, triggered and exacerbated by the COVID-19 pandemic, has caused negative changes in the infrastructure sector. Despite the major setbacks, the performance of infrastructure investments globally has turned out to be favourable, mainly due to increased bond issuance. At the global level, there is a noticeable shift in the proportion of infrastructure investment financing. In general, Europe, North America, MENA countries and Sub-Saharan Africa have achieved higher levels of total funding, while the Asia Pacific region and Latin America have achieved lower levels.

**Practical implication:** The research conducted on the financing structure of infrastructure investment globally and by world region may provide a rationale for expanding research in this area and assessing the vulnerability of financing relationships to unexpected external difficulties.

**Originality/Value:** The study, in the form of a scientific contribution with a high degree of applicability, takes the form of a review using literature and published statistics and was geared towards analyzing and assessing changes in the financing structure of infrastructure investment geographically.

**Keywords:** Infrastructure investment, global funding, financial structure, funding sources, world regions.

**JEL Classification Codes:** F21, F6, G21, G23, H54, O5.

**Paper type:** Research article.

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## **1. Introduction**

The investment market in all types of infrastructure has been severely affected by the recent global financial crisis and the COVID-19 pandemic, as most countries have been unable to finance capital-intensive infrastructure investments from highly stretched budgets and widening deficits (Soleymani, Ravanshadnia, and Montazer, 2021).

While multilateral banks such as the World Bank Group, the European Investment Bank, the Asian Development Bank, etc., and sovereign development banks continue to play an important role in securing the financing structure for infrastructure investments, finding and matching complementary sources of finance remains an important issue. The problems of funding sources for infrastructure projects are the subject of many discussions, studies and even support programmes.

The issues of scarcity of funding for infrastructure investments mainly concern global, continental, and strategic national projects. Smaller investments, of regional or local scale, are less exposed to the risk of not achieving financial closure. However, this does not mean that smaller infrastructure investments do not face problems related to the choice of financing structure, the sequencing of strategic investments, etc.

Irrespective of the size of the investment and its importance for the economic development of the world, the country or the region, the issues of selecting financing sources and mitigating the risks associated with their use are present in every public infrastructure project.

The purpose of this overview paper is to analyse the financing structure of infrastructure projects worldwide. The study was conducted on a secondary data basis. Published statistics published by specialised periodicals and agencies were used. In writing using the descriptive and comparative method, a review of the literature on the subject and statistical data published by specialised institutions dealing with the assessment of the global infrastructure market was carried out, paying particular attention to its geographical structure.

The study, in the form of a scholarly contribution with a high degree of applicability, takes the form of an overview using the literature on the subject, published statistics and the author's observations of the infrastructure investment financing market over many years.

## 2. Literature Review

The level of infrastructure development varies across continents and countries. The approach to infrastructure and its components is also different. Institutions dealing with infrastructure and its financing adopt as infrastructure the sectors summarized in Table 1.

**Table 1.** Classification of infrastructure

Sector	Content
Transport	airports, bridges, canals, car parks, rail, subways, ports, terminals, roads, tunnels
Social Infrastructure	convention centres, street lighting, urban regeneration, culture facilities, defence, education, fire & rescue, government, healthcare, housing, justice, sports & leisure and waste & recycling
Power	transmission, distribution of energy
Renewables	biofuels, biomass, geothermal, hydrogen, offshore wind, onshore wind, photovoltaic solar, small hydro, thermal solar, tidal, waste-to-energy, and wave power
Oil & Gas	LNG (Liquefied Natural Gas), natural gas, petrochemicals, pipelines, refineries
Water & Sewage	pipe networks, sewage treatment, storage, wastewater and water treatment facilities reservoirs, dams,
Telecoms	base stations, broadcasting, operators and networks for 3G, 4G, broadband, cable, fibre-optic, fixed-line, GPRS, GPS, GSM, satellite, VoIP, WiFi, and data centres.

*Source:* Own study based on League, 2023.

Investment needs in highly developed countries (European Union countries and the United States) are mainly driven by the need to upgrade infrastructure renewals, and in countries at a lower level of development by the need for new facilities and networks (Arezki *et al.*, 2016; Noja *et al.*, 2022). According to Ehlers, developed countries will have to incur a similar level of expenditure to finance low-carbon energy projects and necessary investments in the transport sector and social infrastructure by 2050 (Ehlers, 2014).

According to Brichetti *et al.* (2021), expenditures on new investments should account for about 60% and expenditures on the maintenance of existing facilities and networks for 40% of total infrastructure investments. The peculiarities of infrastructure investments due to their nature - high capital intensity, long payback period, and public utility - compound the difficulties associated with their selection, design, implementation and, above all, their financing structure and achieving financial closure (Gonzales-Ruiz, Botero- Botero, and Pena, 2022; Thalassinos and Hakim, 2022).

The financing structure (financial montage) of a project presents the sources of financing by the size of the shares of the different sources of financing allocated to

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cover the costs of an investment project, in other words, the proportions of the different sources of financing to cover the investment costs of a project (Brzozowska, 2005). Another formulation states that the financing structure is how an entity finances its activities, i.e. the financing of liabilities and capital.

A broader formulation is capital structure meaning long-term sources of finance such as equity and debt (Banking, 1991). A financing structure can be defined as a conscious and deliberate process of identifying and selecting financial institutions and determining the proportion of funds from different financing sources allowing the inclusion of different financing sources for the implementation of a planned venture (Yifu Lin, Xifang Sun, and Ye Jiang, 2009; Esty, 2004; Gebhardt, Ziegler, and Mourant, 2022).

The process of establishing and negotiating the financing structure is particularly evident when applying for external funding, the obtaining of which in turn allows for reductions in the own contribution, which does not mean that other projects do not work on establishing the financing structure. Natural partners for participation in the completion of the financing structure are local government units, private entities, banks and other financial institutions and government units.

The financing structure can be taken into account for long- and short-term financing. The distribution and composition of governmental and non-governmental financing when considering state regulation, the share of large banks and small banks for assessing bank exposure, the share of equity and debt capital in the financing of corporate investments or the distinguishing features of the financing structure for infrastructure investments are the high degree of indebtedness concerning the investment cost estimate (from 50% to 90% of the project cost estimate value).

The insufficient collateral on project assets, the dependence of the loan period on the degree of development of the country of investment - the less developed the country, the shorter the loan periods, the higher support for investments from public authorities, and the easier access to aid funds and loans from international financial organisations are also important issues on the financing structure of investments.

Each project is different and implemented under different natural, political, social and economic conditions and therefore it is difficult, even impossible, to develop an optimal financing structure that has a model character (Cenkier, 2009; Donkor and Duffey, 2014).

The financing structure of investments is usually the longest negotiated issue (Kwiatkowski, 1998). The terms of the financing are crucial for the debtor's future liquidity, i.e. its ability to meet its current obligations and even its solvency. It is important to bear in mind that the interests and positions taken by the negotiating parties are inherently divergent, particularly about issues such as the length of the

loan period, the price of the debt funds (interest rate plus fees) and, above all, the ratio of equity to repayable capital.

Obtaining financial closure of an infrastructure project requires time-consuming consultations, negotiations, and detailed calculations with all creditors whose financial commitment forms the financing structure of the project, i.e. the proportions of the various financing sources to cover the total investment costs (Finnerty 1996). In defining the financing structure, Xueqing considered the four dimensions illustrated in Table 2.

**Table 2. Financing structure (capital structure)**

	Approach criteria	Examples
1	Types of financial instruments	Equity, loans, subordinated loans
2	The proportion of different financial instruments	Equity: debt capital Repayable funds: Non-repayable funds
3	Sources of funding	Development financial institutions, commercial banks, various types of equity capital, public funds (budget)
4	Contractual terms of the financial instruments used	A grace period, repayment period of debt instruments, loan guarantees issued by the State Treasury

**Source:** Own compilation based on Xueqing, 2005.

Each of the presented cross-sections will affect the fine-tuning of the financing structure and, consequently, the cost of project financing (Demirel *et al.*, 2022). A high proportion of equity concerning total cost favours lower interest rates on borrowing. Potential creditors take into account the amount of equity contributed by the potential debtor(s) when considering whether to finance a particular investment and impose a minimum level of equity contribution.

The financing structure is characterized by a very high degree of leverage - the debt-to-capital ratio is on average as high as 80:20. The leverage is a consequence of the mixed financing structure for investment projects, i.e. with external capital from loans, bond issues, leasing and credit.

The financial risk associated with a mixed capital structure is greater than when a project is financed with equity alone. The leverage effect, therefore, depends not only on the scale of the capital commitment but also on the cost of raising capital. The higher the investment risk, the higher the cost of raising capital.

The largest share in the financing structure of infrastructure projects (Table 3) is held by repayable funds in the form of subordinated debt, bonds, leasing transactions and loans from individual banks, a group of banks, and multilateral financial institutions (World Bank Group).

**Table 3.** *Forms of financing for infrastructure projects*

Non-repayable funds	Repayable funds
— Government subsidies	— Municipal and revenue bonds
— Local governments subsidies	— Leasing
— Equity contributions from private sponsors	— Derivates and securitization instruments
— EU Funds	— Loans and borrowings from DFI
	— Commercial loans
	○ Single
	○ Syndicated

*Source:* Own elaboration.

Non-repayable funds, apart from EU funds, are usually a supplementary source of covering investment costs, although their size and availability influence the position of potential creditors, and in the case of applying for EU funds, having them at a certain level is a prerequisite for being able to obtain financing. The financing structure is dominated by debt resources, mainly in the form of loans and credits, granted more often within an organized consortium and less often based on individual loans and credits (Brzozowska, 2005).

The financial commitment of public authorities is often further increased by guarantees and sureties required by lenders (for example, such sureties are required when granting credits and loans by the World Bank Group as a form of security for the funds granted).

In addition to capital contributions from public partners in the form of in-kind contributions and earned budget surpluses, and from private partners in the form of shares or equity (equity participations in infrastructure investments refer to equity take-up and mezzanine finance (Bull and Lethbridge, 1996). Equity participations usually range from 15 to 30 per cent of the cost value of the investment (Songer, Diekmann, and Pecsok, 1997), the primary source of financing for infrastructure projects is loans from commercial banks.

The most commonly used loans in the financing of public investment projects are term loans, revolving loans, stand-by loans and bridging loans. The second major group of debt instruments is loans from multilateral financial institutions such as the World Bank Group, the European Investment Bank, the European Bank for Reconstruction and Development, the Asian Development Bank, the African Development Bank, the Inter-American Development Bank, and the Caribbean Development Bank.

Bond issues, equity issues or equity participations, have until recently been much less important, albeit growing, in the international financial market. Bond issuance is further distinguished by lower interest costs, high flexibility and the possibility to promote the issuer. For large organizations, bond issuance is almost routine and

the costs are relatively low concerning the volume of turnover generated (Grinblatt and Titman, 1998).

Infrastructure funds, which are private equity investment funds, have become increasingly important in recent years. The objective of infrastructure funds is to provide medium- to long-term capital by investing in equity or structured equity instruments of entities involved in infrastructure development (Davis, 2008).

Infrastructure funds usually invest for a period of five to eight years. Most of the largest infrastructure funds are concentrated in developed countries - Europe and North America - and are sponsored by large financial institutions. The share of infrastructure funds in the financing of infrastructure investments is treated as private financing within publicly listed funds as unlisted funds.

Other sources of funding capital market instruments - derivatives (currency and interest rate swaps, possibly options) de facto act as hedging instruments in such transactions.

### **3. Research Methods**

The basis for the research and considerations regarding the structure of financing in the global infrastructure investment market were long-term observations of the phenomena, volumes, and actors in this market. The basis for the observations was mainly reports and statistics of the IJ Global Project Finance and Infrastructure Journal.

A review of English-language and Polish publications on the problems of financing infrastructure development was the premise for the research objective - to assess changes in the financing structure of infrastructure projects globally. The study used secondary data published by IJ Global for 2017- 2020.

The volume of infrastructure investment globally in terms of its sources of financing divided into DFI loans, commercial bank loans, bonds and equity instruments is shown in Exhibit 2. Infrastructure investment by geographic region was examined for 4 years covering the period 2017- 2020.

The study used data published by Infrastructure Journal Global. The statistics distinguish between 6 geographical regions in the world, namely: the Asia-Pacific region, Latin America, North America, and Europe and two African regions: the Middle East and West Africa and Sub-Saharan Africa.

The same criterion for the breakdown of funding sources was adopted as in the global analysis, namely DFI loans and advances, commercial bank loans, bonds and equity instruments. The results of the study are presented in Figures 3 - 5.

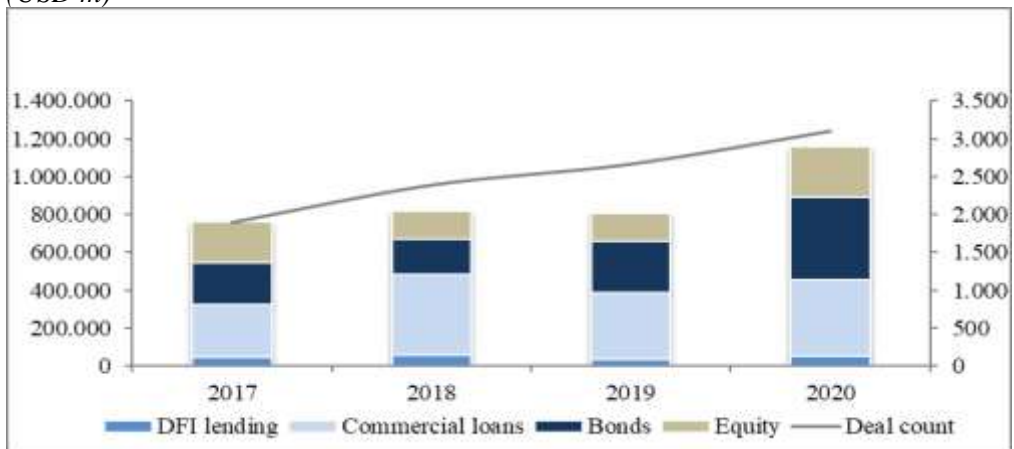
#### 4. Research Findings

Global infrastructure investment in 2020 is valued at US\$1,426,106 million, an increase of more than US\$220 billion over 2019. The unprecedented situation in the world and global markets triggered and exacerbated by the COVID-19 pandemic, has caused changes in the infrastructure sector, particularly in tourism, transport, and recreation.

The infrastructure sector has been adversely affected, but the more visible negative impact of previously unpredictable events will occur in the infrastructure sector with greater intensity with a time slip in the future. During the same period, the number of transactions globally increased to 3,000, comparable to the state of 2019.

According to IJGlobal, the increase in the number of transactions has been driven predominantly by an increase in transactions related to renewable energy projects (Infrastructure 2020). However, despite the high hurdles caused by restrictions in countries around the world, it is important to emphasize that the performance of infrastructure investments globally proved to be positive, mainly due to increased bond issuance (cf. Figure 1).

**Figure 1.** Global Infrastructure finance value by Source of Funding 2017-2020 (USD m)



**Source:** Own study based on *Infrastructure and Project Finance. League Table Reports 2016-2020, Infrastructure Finance Charts*, <https://ijglobal.com/>.

Borrowings and loans by DFIs also increased globally, with a growth rate of around 35% in 2020 compared to 2019, noting that the level in 2020 was comparable to the pre-pandemic state of 2018. Equity transactions reached US\$270 billion in 2020, an increase of nearly 82% over the previous year.

The largest changes in the structure were in bonds, with issuances reaching previously unattainable values and amounting to USD 273 068 million and USD 438



070 million in 2019 and 2020, respectively, an increase of more than 60% over 2019 and 134% over 2018. The bond issues were mainly in the oil and gas and telecommunications sectors in Europe and North America (Infrastructure, 2020).

The funds raised from the sale of bonds and the asset transactions carried out allowed financial stability to be maintained during the COVID-19-induced crisis. The value of loans granted in 2020 also increased - by more than 15% compared to 2019 achieving generally the level of the value of loans granted in 2018.

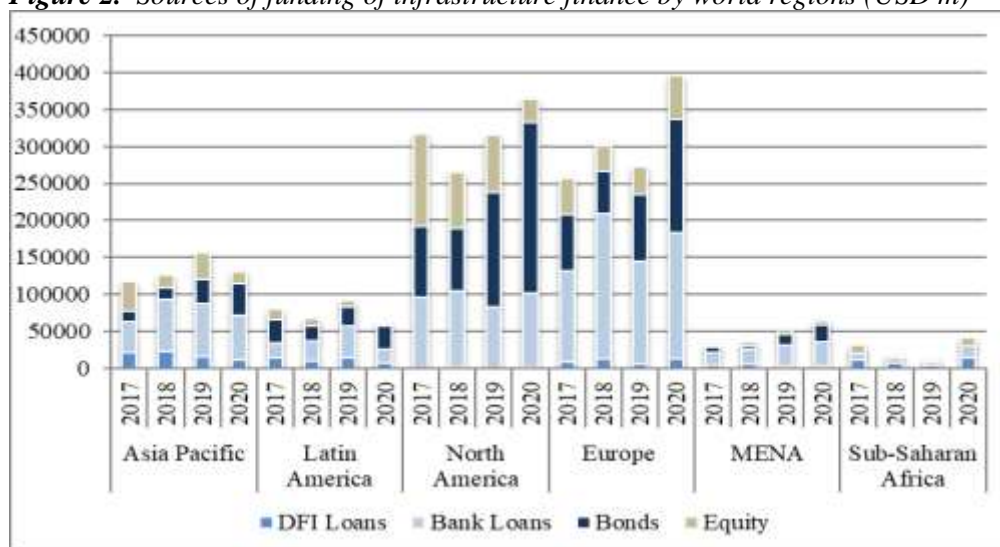
Loans were generally predominant in the financing structure, with the share of the total (loans from banks and loans from multilateral financial institutions) between 2017 and 2020 ranging from 42% in 2017 to 39% in 2020. Averaging the share of the different sources in the years under study, it can be seen that the financing structure consisted of 42% bank loans, 29% equity instruments, 10% multilateral financial institutions' loans and 25% bonds.

At a global level, there is a noticeable change in the proportion of financing for infrastructure investments. The share of bonds remained stable until 2018, while their importance has risen sharply in the last two years. The share of bank loans fluctuated in favour of an increasing predominance of the share of equity instruments.

This was the result of the impact of two factors, namely the rapid development of the infrastructure funds market and their expansionary policies, and the growing importance of projects involving private capital (public-private partnerships. Figure 2 shows the value of infrastructure investment in each region by the funding source adopted. All types of funding sources were present in all regions.

North America and Europe are the regions with the largest scale of infrastructure financing in the world, followed by Asia Pacific and South America. The MENA regions and sub-Saharan Africa are characterised by much lower infrastructure investment values. In 2020, the highest values were achieved in Europe, which thus overtook North America.

This result was achieved by increasing bond exposure by a total of more than USD 154 billion, resulting in the highest funds over the years studied at USD 395.5 billion, while North America closed 2020 with USD 364.5 billion. In general, Europe, North America, MENA countries and Sub-Saharan Africa achieved higher levels of total funds, while the Asia Pacific region and Latin America achieved lower levels.

**Figure 2.** Sources of funding of infrastructure finance by world regions (USD m)

**Source:** Own study based on *Infrastructure and Project Finance. League Table Reports 2016-2020, Infrastructure Finance Charts*, <https://ijglobal.com/>.

Bonds have become a panacea to overcome the difficulties caused by the COVID-19 pandemic. The growth rate of bonds in Europe was about 71% in 2020 compared to 2019, in MENA countries more than 60%, and in North America 27.5%, Latin America and Asia-Pacific more than 26%. The use of bonds to offset financing difficulties is also confirmed by the results of the changes in the relationship between 2019 and 2018.

In MENA countries, bond growth increased by nearly 280% over this period, Asia-Pacific by more than 100%, North America by more than 80%, Europe by 55% and Latin America by more than 20%.

The changes in the structure of financing by region over the years under study are shown in Figure 3 and Table 4. The variation in the share of each financing source is mainly due to the relationship between bonds and commercial loans. Increased bond issuance triggered a reduction in the share of commercial loans in all regions.

Loans and credit from DFIs had a significant share in the less developed regions (Sub-Saharan Africa, Latin America, Asia Pacific). North America used DFI loans and advances in trace amounts that are not even highlighted in the chart. The share of DFI loans and credit ranks in the financing structure of Sub-Saharan Africa at 35-36%, Latin America at 12-18%, MENA countries at 5-10% and Europe at 3%. Table 3 summarises infrastructure financing structures by region for the two extreme years of the study: 2017 and 2020.

**Table 4.** Structure of source of funding infrastructure finance in regions in 2017 and 2020.

Region	Bank loans		DFI loans		Bonds		Equity	
	2017	2020	2017	2020	2017	2020	2017	2020
Europe	48%	43%	3%	3%	30%	39%	19%	15%
North America	30%	28%	0%	0%	31%	63%	39%	9%
Asia Pacific	35%	47%	18%	9%	13%	32%	34%	12%
Middle East and North Africa (MENA)	57%	51%	12%	5%	20%	35%	11%	9%
SubSaharan Africa	28%	35%	35%	36%	2%	2%	35%	27%
Latin America	24%	30%	18%	12%	40%	53%	18%	5%

**Source:** Own study based on *Infrastructure and Project Finance. League Table Reports 2016- 2020, Infrastructure Finance Charts*, <https://ijglobal.com/>

In Europe, there has been little change in the funding structure; the main change is in the increase in the share of bonds and a proportional decrease in the share of bank loans. Major changes occurred in the financing structure of North America, where the share of bonds doubled at the expense of a reduction in the share of equity instruments, the values of which steadily decreased in subsequent years.

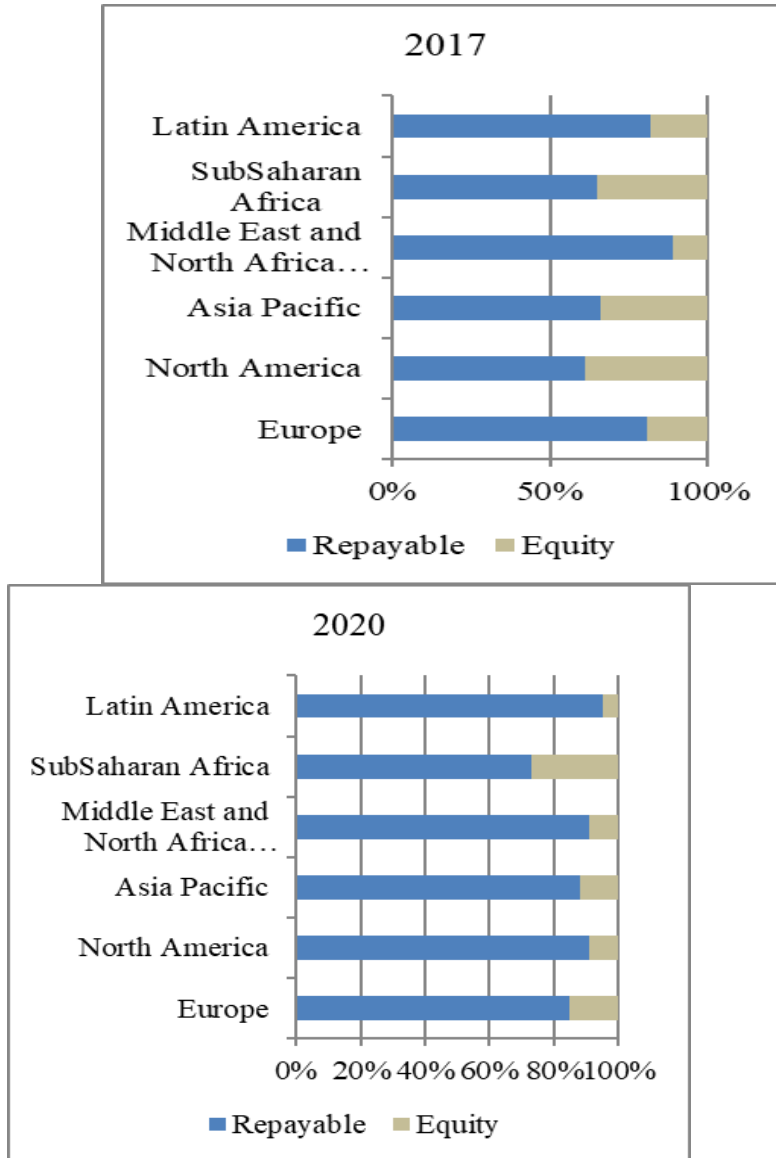
In contrast, a peculiar feature of the infrastructure financing structure in the Asia Pacific was an increase of about 20 p.p. in the share of bonds, a large reduction in the share of equity instruments from 34% in 2017 to 12% in 2020, although it is difficult to establish any regularity or trend in this case. MENA countries continued to have the highest share of commercial loans in the financing structure, accounting for more than half of the value of infrastructure financing in these countries, and an increase in the share of bonds from 20% in 2017 to 35% in 2020.

The sub-Saharan African region is characterized by a peculiar difference in the financing structure of infrastructure investments. The first feature of dissimilarity is the high share of loans and advances from DFIs discussed earlier, followed by a trace share of bonds (2%). Commercial loans, DFI loans and advances and equity instruments have roughly equal shares, with temporary variations, of 1/3 each. In the Latin America region, the main change concerns the decreasing share of equity instruments from 18% in 2017 and a systematic annual reduction to 5% at the end of 2020.

This reduction was offset by an increasing share of bonds (from 40 to 50% in 2020) and a higher share of commercial loans. It should be added that the Latin American region, unlike other regions, was severely affected by the global economic situation, as its financial resources for infrastructure decreased by 63% in 2020 compared to 2019. The second case with a decline in financial resources was the Asia Pacific region, with a reduction of nearly 56% in 2020 relative to 2019.

In general, the greatest weight in the assessment of the financing structure is given to the relationship between debt and non-repayable instruments. As is well known, infrastructure investments are characterized by a very high degree of leverage, mainly due to their capital intensity and long payback periods. For comparison, the financing structures in 2017 and 2020 by world region are summarized (Figure 3).

**Figure 3.** The financing structure of infrastructure investments in the regions in 2017 and 2020.



**Source:** Own study based on *Infrastructure and Project Finance. League Table Reports 2016-2020, Infrastructure Finance Charts*, <https://ijglobal.com/>.

The results presented confirm that all regions saw a significant decrease in the share of equity instruments - particularly high in North America and Asia Pacific - in favour of an increase in the share of debt instruments (loans, advances, bonds) - North America, Latin America and Asia Pacific saw the largest increases.

## **5. Conclusions**

Infrastructure is a necessary, albeit indirect, factor in economic and civilisational development. Infrastructure needs are steadily increasing, despite the continued growth in investment. According to the latest estimates, the global infrastructure gap is expected to reach USD 15 trillion by 2040 against estimated infrastructure investment needs of USD 94 trillion (A G20 Initiative, 2021).

The level of infrastructure is a determinant of socio-economic development and improved quality of life. Areas rich in infrastructure are characterised by higher investment attractiveness for potential investors. Deepening globalization processes, the development of new markets, new technologies, increased environmental standards and the increasing need to maintain, improve and renew existing infrastructure facilities further reinforce the need for infrastructure investment.

The unprecedented and unfavourable situation caused by the COVID-19 pandemic has contributed to the deterioration in performance and problems in raising the necessary sources of finance in the global infrastructure investment market. It has to be said that the market has been adversely affected, the offsetting effects of which have triggered marked changes in the structure of infrastructure project financing through an increase in the share of debt instruments, including an increase in bond issuance in the most developed regions, i.e., Europe and North America.

However, it should be noted that due to the length of the investment cycle, the effects of the pandemic and the financing and capital decisions taken may occur with slippage in future years.

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