

Infrastructure Monitor 2022

Global trends in
private investment
in infrastructure



Global
Infrastructure
Hub

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About

Infrastructure Monitor is the Global Infrastructure Hub's (GI Hub) flagship report, produced annually. It identifies and examines global trends in private investment in infrastructure.

The data insights included in the report help governments, investors, and the broader infrastructure industry steer infrastructure investment where it is needed.

As a data resource serving the G20, this report is also used to monitor progress toward establishing infrastructure as an asset class, an objective set by the G20 in 2018. Infrastructure Monitor insights address key priorities of the G20 and provide policymakers with global benchmarks.

Data used and analysed in the Infrastructure Monitor 2022 report were gathered from our partners EDHECinfra and GRESB, and we received data and support from MSCI and Moody's. This report was first released in October 2022, covering trends in: i) private investment in infrastructure projects; ii) infrastructure investment performance; iii) availability of private capital for infrastructure; and iv) the role of multilateral development banks in private investment in infrastructure. An additional section on environmental, social, and governance (ESG) factors in infrastructure investment will be released shortly after the initial release, to allow for the inclusion of the most current data.

With Infrastructure Monitor, our objective is to bring together, in one report, a global evidence base and expert data insights on the state of private investment in infrastructure.

We welcome your feedback on this year's edition and your suggestions for the 2023 edition.

About the GI Hub

The GI Hub was created by the G20 and established in 2014 with a mission of supporting the G20 to drive an ambitious agenda on sustainable, resilient, inclusive infrastructure through action-oriented programs. Operating with an inclusive and collaborative mindset, our purpose is to accelerate infrastructure development to transform societies and empower future generations.

We work collaboratively with the public and private sectors to produce data, insights, knowledge tools, and programs that equally inform policy and delivery, helping decisionmakers and practitioners create positive impacts through infrastructure.

Executive summary



Executive summary

Private investment in infrastructure

Private investment in infrastructure projects in primary markets is almost back to pre-pandemic levels, but stagnant for the eighth year running.

After remaining resilient overall through the initial shock of the pandemic in 2020, private investment in infrastructure projects in primary markets recovered in 2021 to just 0.3% below its 2019 level. This recovery was largely the result of growth in the regions hardest hit during the pandemic – Oceania, Latin America, and Asia – which all saw investment bounce back following steep regional declines in 2020.

However, the longer-term story of private investment in infrastructure is one of stagnation. Private investment in infrastructure projects in primary markets has been stagnant for eight years running and the USD172 billion invested in infrastructure projects by private investors in 2021 remains far shy of what is needed to close the infrastructure investment gap. Investment trends also differ among high-, middle-, and low-income countries, and the level of investment in middle- and low-income countries continues to decline.

Private investment in infrastructure projects in primary markets
(USD bn and number of transactions)



Source: Global Infrastructure Hub based on IJGlobal data.

Note: Throughout this report, unless otherwise specified, 'private investment in infrastructure projects' refers to private sector investment in infrastructure projects in primary markets (financed by private and public financiers) including greenfield and brownfield infrastructure, as well as privatisations. Investment values represent commitments made at the financial close of investment and not executed investment.

The gap between private investment in high-income countries and that in middle- and low-income countries keeps widening.

In 2021, private investment in infrastructure projects grew by 8.3% in high-income countries, while investment in middle- and low-income countries fell by 8.8%. The gap between private investment in infrastructure projects in high-income countries and that in middle- and low-income countries continues to widen; in 2021, 80% of private investment in infrastructure projects occurred in high-income countries and 20% in middle- and low-income countries.

While the declining trend in infrastructure investment in middle- and low-income countries began before the pandemic, it was exacerbated during the crisis, and investment levels remain significantly lower than those seen in high-income countries.

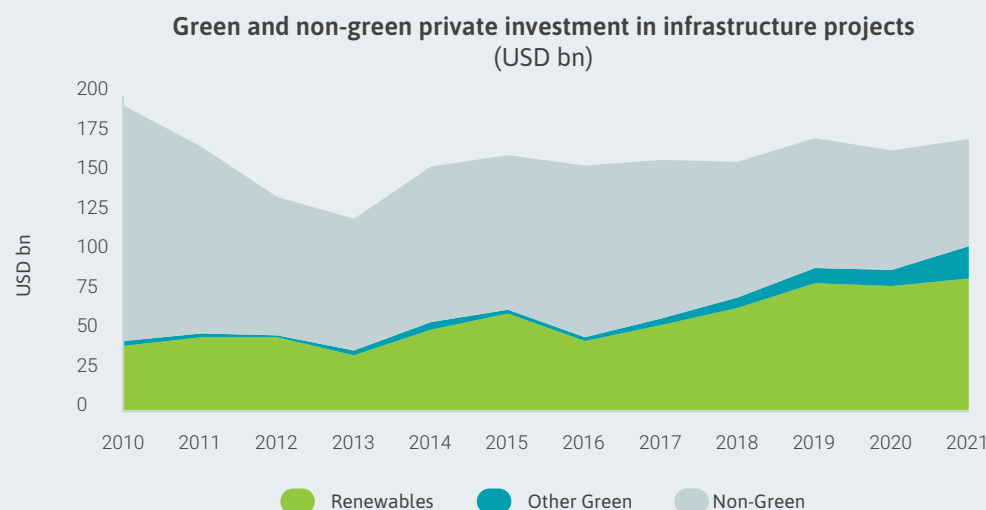
The renewables sector continues to attract the most investment, garnering almost half of total private investment in infrastructure projects in 2021. Meanwhile, the global trend away from non-renewables continued. Non-renewables now represent only 11% of total private investment in energy projects. Encouragingly, following a trend that emerged during the pandemic in 2020, private investors are showing growing interest in telecommunications and social infrastructure, sectors that have historically attracted very low levels of private investment.

Executive summary

Private investment in infrastructure

Green private investment is at a record high.

Global private investment in infrastructure projects was 'greener' than ever in 2021, and at 60% of total private investment in infrastructure projects, a record high. Most of this green investment is in the renewable energy sector. Encouragingly, the trend towards greener investments in infrastructure was seen across high-, middle-, and low-income countries, although the share of green investment remains higher in high-income countries.



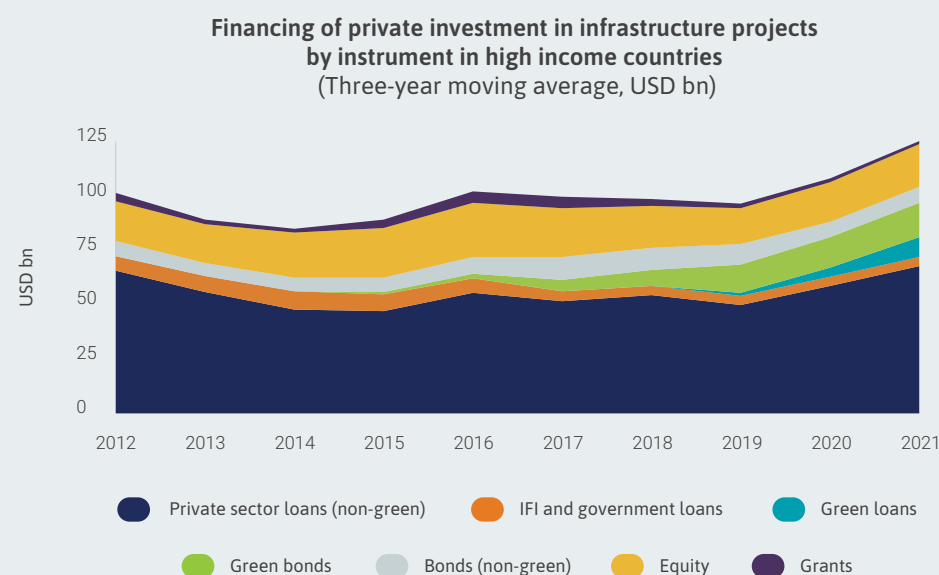
Source: Global Infrastructure Hub based on IJGlobal data.

Note: 'Green investment in infrastructure' means investment in environmentally sustainable projects supporting the transition to net-zero emissions of carbon dioxide. 'Other Green' includes investments in other subsectors such as electric vehicle charging infrastructure, carbon capture and storage (CCUS) facilities, and electric transport (among others) or investments financed by a sustainable instrument.

Mirroring global trends seen across other asset classes, sustainable financing of infrastructure continues to strengthen.

The global trend towards greener investment in infrastructure is also reflected in the types of instruments being used to finance these transactions. The share of private investment in infrastructure financed by a sustainable instrument such as a green bond or loan has grown notably. Green bond financing has been gathering pace since 2015, while the green loan market is more nascent but has been noticeably active since 2020.

In 2021, green bonds and loans accounted for one-fifth of the financing for private investment in infrastructure projects. Although growth in sustainable financing is most evident in high-income countries, it is also starting to emerge in middle- and low-income countries.



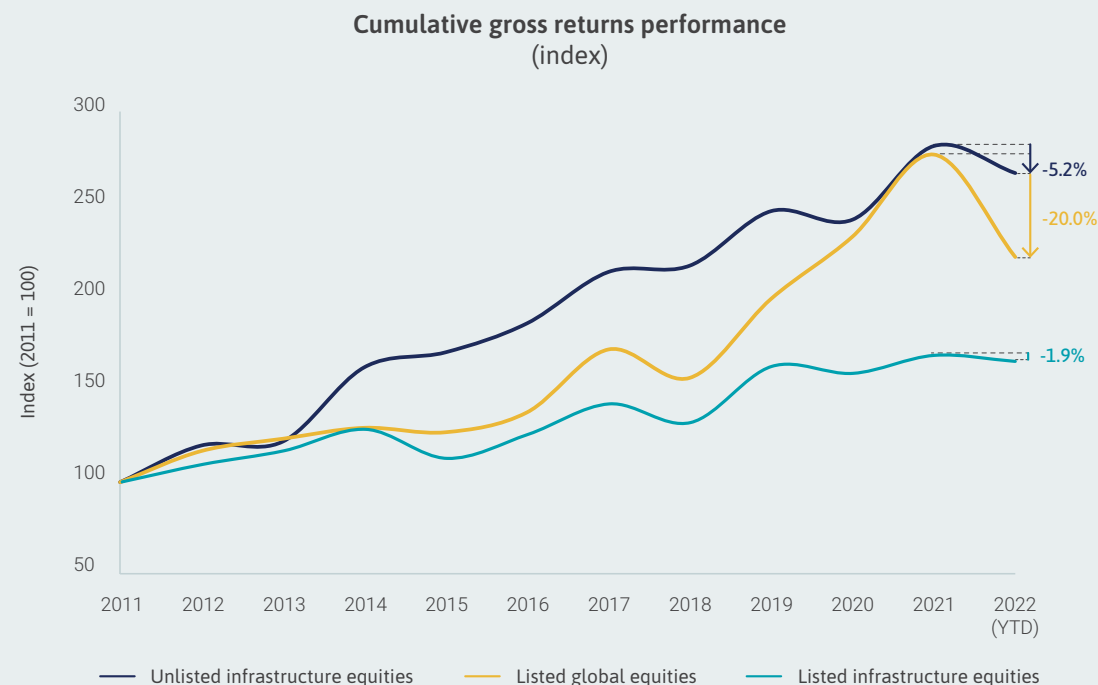
Source: Global Infrastructure Hub based on IJGlobal data.

Executive summary

Infrastructure investment performance

The performance of infrastructure equities through recent economic shocks highlights their resilience and stability relative to listed global equities.

Infrastructure equities have provided increasing returns to private investors for a decade prior to the pandemic. The pandemic temporarily stalled this trend in 2020 but it resumed in 2021. During the first half of 2022, rapid inflation and consequently rising interest rates negatively impacted returns on listed infrastructure equities by -1.9% and on unlisted infrastructure equities by -5.2%. The fall in returns on infrastructure equities is significantly less than the fall in listed global equities returns (-20%) which highlights the resilience and stability of infrastructure equities during economic downturns. Unlisted infrastructure equities continue to outperform listed global equities as expected, despite economic shocks like rapid inflation, the war in Ukraine, and pandemic-related lockdowns.



Source: EDHECinfra (2022a) and MSCI (2022) as of June 2022.

Note: Annual returns are based on monthly gross returns data in a calendar year. The indices present aggregate performance levels. Listed global equity performance is measured by the MSCI All Country World Index (MSCI ACWI), listed infrastructure equity performance is measured by the MSCI ACWI Infrastructure Capped Index (MSCI ACWI-IC), and unlisted infrastructure equities performance is measured by EDHECinfra's Infra300 equity index.

In the last decade, returns on private infrastructure debt increased strongly. This trend temporarily stalled during the pandemic, and global economic shocks negatively impacted returns in the first half of 2022 due to rising interest rates.

Returns on private infrastructure debt were consistently positive over the preceding decade up to the onset of the pandemic, given the low-interest-rate environment.

In 2020 and 2021, index levels remained resilient notwithstanding the pandemic, but in the first half of 2022, rising interest contributed to a decline in demand for and return on private infrastructure debt. Still, the asset class remains attractive for private investors as its inflation-hedging potential is stronger than that of other investment options. Despite the decline in infrastructure investment returns, private investors are allocating more capital than ever to infrastructure to mitigate inflation risk.

Cumulatively, default rates for infrastructure debt have been consistently lower than for non-infrastructure debt, and this difference grew during 2020.

Default rates for infrastructure debt are consistently lower than those for non-infrastructure debt. As the cumulative performance of non-infrastructure debt deteriorated during the pandemic in 2020, and as infrastructure debt not only withstood the shocks of the pandemic but actually improved its performance across all country income groups, the gap between the performance of infrastructure debt and that of non-infrastructure debt widened.

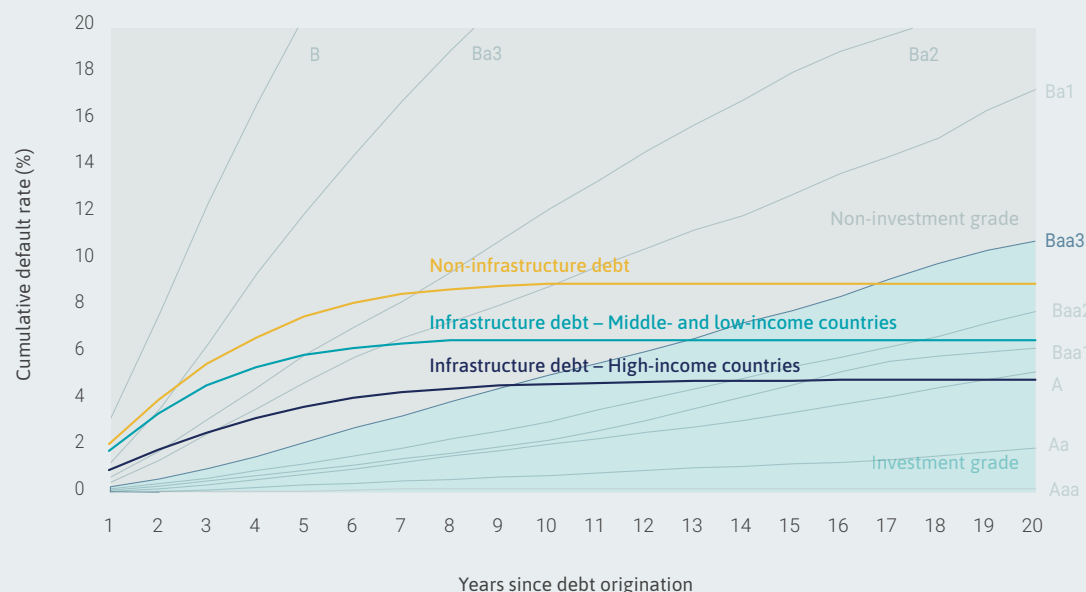
As the default curve excludes older infrastructure loans, infrastructure debt becomes less risky and performs faster as an investment grade security. Thus, infrastructure debt performance has been continually improving over at least three decades.

Globally, infrastructure debt had a recovery rate of 83.6% in 2020, slightly higher than the 2019 rate of 83.3%. The recovery rate for infrastructure debt has been consistently and significantly higher than for non-infrastructure debt (67.8% in 2020).

All regions except Latin America and Eastern Europe have higher recovery rates for infrastructure debt than for non-infrastructure debt. This is especially true in Western Europe where the infrastructure debt recovery rate was 84.0% in 2020, while that of non-infrastructure debt was 52.1%.

Expected losses – defined as the proportion of debt value expected to be lost from potential debt defaults – are low for infrastructure debt as a result of high recovery rates and low probabilities of default.

20-year cumulative default rate by sector and income group



Source: Moody's (2022). Data as of 2020.

The amount of private capital available for infrastructure more than quadrupled from 2010 to 2021.

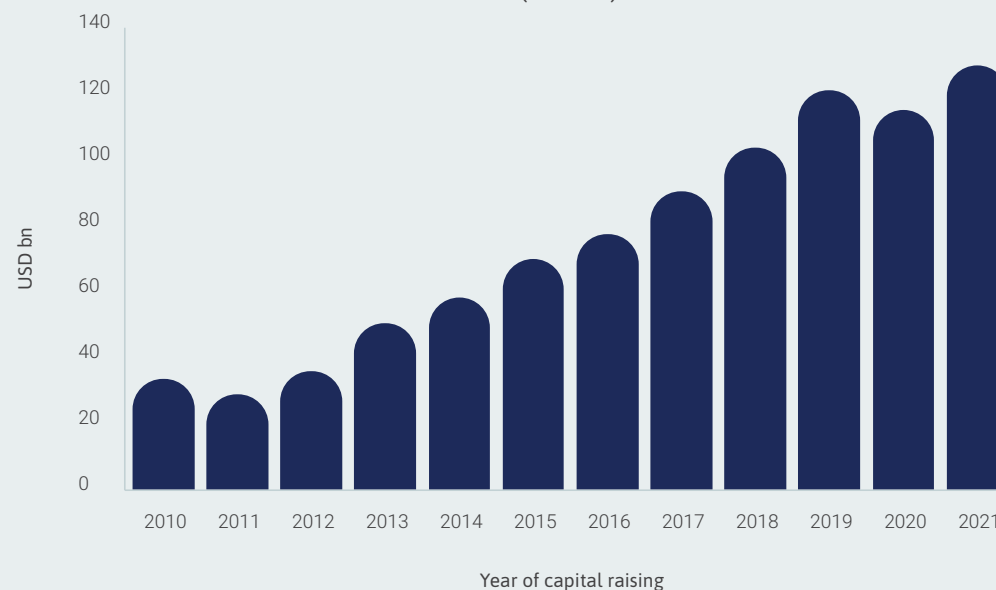
In the last decade, private infrastructure capital raised by funds per annum quadrupled from about USD34 billion in 2010 to USD129 billion in 2021.

During the pandemic, the volume of capital raised dropped slightly, but it remained above the 2018 level and recovered to a new record of USD129 billion in 2021.

Despite a decline in returns due to rising interest rates during the first half of 2022, the asset class remains attractive for private investors, as it has relatively stronger inflation hedging potential than other investment options.

Early in 2022, private infrastructure capital raised by infrastructure funds had already reached 2021 levels (USD122 billion); if the trend continues, capital raised by the end of 2022 is expected to reach a new record high.

Private infrastructure capital raised by funds, 2010–2021
(USD bn)



Source: Preqin (2022c) data as of 23 September 2022.

The greater market value of infrastructure funds' investments reflects greater availability of capital but also greater dry powder.

The availability of more private capital for infrastructure (from more funds raised or reinvestment of gains made on investments) has resulted in an increase in infrastructure investment by funds. In addition, the capital committed by investors and available to fund managers but not yet invested or allocated – known as dry powder – has quadrupled from USD72 billion in 2010, to USD298 billion in 2021.

The current record level of dry powder translates into a greater capacity to deploy capital in the short to medium term as new infrastructure investment opportunities arise, especially in a post-pandemic era with rising interest rates. While dry powder levels are at their highest, in relative terms, dry powder as a percentage of assets under management (AUM) has gradually declined from a high of 43% in 2010 to 30% in 2021, indicating that a higher percentage of AUM has been deployed towards infrastructure investments.

Available funds are not fully deployed for several possible reasons, including:

- The limited availability of bankable infrastructure projects creates a level of demand that exceeds supply of projects. A globally uneven distribution of bankable infrastructure projects exacerbates the shortage of projects.
- High hurdle rates of infrastructure funds constrain fund managers from investing in infrastructure assets.
- Trends in hurdle rates have not aligned with trends in returns over time. An analysis of 25 funds established from 2005 to 2021 inclusive, reveals that hurdle rates remained at 8% for over a decade across regions and sectors.

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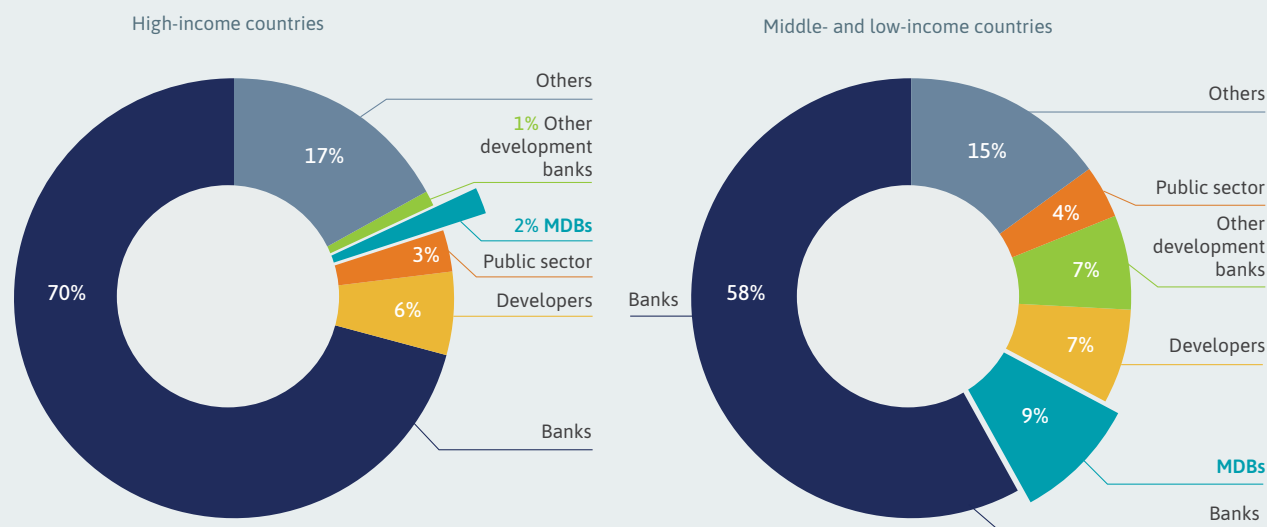
The role of MDBs in private investment in infrastructure

Multilateral development banks (MDBs) continue to play a major role as financiers of private investment in infrastructure, in middle- and low-income countries.

MDBs support private investment in infrastructure in several ways. One way is direct financing of private investment in infrastructure projects, a role that is particularly critical in middle- and low-income countries where other sources of support are less available. Over the past decade, MDBs have increasingly focused on middle- and low-income countries, and in 2021, they were the second-largest type of financier in these countries (behind banks). MDBs have played a critical role in the global transition towards net zero emissions, with significant financing channelled into renewable energy projects. While financing of non-renewables still occurs, it is anticipated that it will decline to achieve global net-zero goals.

The participation of an MDB in a project signals its viability, stability, and creditworthiness, which helps reduce risk and attract more private capital. In 2021, 27% of private investment in infrastructure in middle- and low-income countries involved an MDB as a co-financier. Transactions involving an MDB as a co-financier tend to be larger than those financed by the private sector alone, as MDB involvement can reduce risks associated with larger projects. MDBs also have significant potential to indirectly mobilise private financing for infrastructure projects, without being directly involved in the project itself. Levels of private indirect mobilisation tend to be significantly higher than levels of direct mobilisation.

Private investment in infrastructure projects by income group and financier type, 2021
(% of total value of private investment in infrastructure)



Source: Global Infrastructure Hub based on IJGlobal data.

Note: 'Others' includes institutions such as export credit agencies, insurance companies, pension funds, infrastructure funds, asset managers, and utilities. 'Banks' includes commercial banks, investment banks, and other financial service providers (not captured within other categories of financial institutions).

'Other development banks' includes bilateral development institutions, national development banks, and other development institutions not included within MDBs.

Figures for MDBs reflect data from 15 MDBs. Within the IJGlobal transactions database, all private investment in infrastructure projects receiving MDB financing is accompanied by additional financing from a private financier.

Private investment in infrastructure



Private investment in infrastructure

Key findings

- Private investment in infrastructure projects in primary markets has largely recovered from the slight dip seen during the pandemic in 2020 and is now almost at pre-pandemic levels. But, it remained stagnant overall in 2021 for the eighth year running.
- While private investment in infrastructure projects in high-income countries is growing steadily, it continues to fall in middle- and low-income countries.
- While investment remains stagnant, the number of transactions has been rising in recent years due to greater investor interest in solar projects. These projects tend to be smaller transactions.
- It was a bumper year for secondary market investment, with investors increasingly seeking a safe haven for pent-up capital.
- Oceania, Latin America, and Asia – the regions hardest hit during the pandemic in 2020 – all saw investment bounce back in 2021.
- Private investors continue to focus on renewables and to show interest in telecommunications and social infrastructure. Wind and solar projects continue to attract the most investment, while growing interest in telecommunications has seen it rise to be the third largest sector.
- Private investment in infrastructure is more focused than ever on green projects; these currently represent 60% of private investment in infrastructure projects, and the level of private investment in renewables is likely to be significantly higher when investment that is not project-based is included.
- Mirroring global trends across other asset classes, sustainable financing continues to strengthen, accounting for one-fifth of the financing for private investment in infrastructure projects in 2021. While growth in sustainable financing is most evident in high-income countries, it is also starting to emerge in middle- and low-income countries.
- Sustainable financing in infrastructure has been led by Western Europe and North America but has also begun to spread more widely across the globe, across more regions.
- Private investment in infrastructure projects continues to be mostly financed by banks, which continue to increase their share, while the public sector share is falling.
- Bank financing of private investment in overseas infrastructure projects is growing.

Private investment in infrastructure

Introduction

This section presents data and analysis related to levels of private investment in infrastructure, primarily drawing on Infrastructure Journal (IJ) Global's transactions dataset. Unless otherwise stated, the analysis refers to private sector investment in primary market projects financed by public as well as private financiers, including greenfield projects (new projects on undeveloped sites), brownfield projects (construction on previously developed sites, such as upgrades), and investment via privatisation of public sector assets.

The IJGlobal transactions dataset offers the best available comparable data for global project-based private investment in infrastructure. However, the list of transactions in the dataset is not exhaustive, and therefore figures presented in this section underestimate true levels of global private investment in infrastructure.

IJGlobal is the most comprehensive, global dataset for private investment covering all infrastructure sectors. In some sectors, notably renewables, global organisations have attempted in recent years to improve the availability and granularity of data; however, detailed data are generally not available for most infrastructure sectors.

Note the following:

- (i) IJGlobal focuses on project-based private investment and does not capture most corporate private investment in infrastructure, which may represent a significant portion of private investment in some infrastructure sectors. For example, balance sheet financing is estimated to account for 70% of total private investment in renewable energy.
- (ii) IJGlobal coverage of low- and middle-income countries is more limited than its coverage of high-income countries.
- (iii) IJGlobal coverage of green, sustainable, and sustainability-linked bonds is limited, particularly as use-of-proceeds (intended and actual) are typically not reported and difficult to identify as either primary or secondary investment.

The estimates in this report are best interpreted as indicative of the broad trends in the size and nature of private infrastructure investment.

Private investment in infrastructure

Private investment in infrastructure projects in primary markets is almost back to pre-pandemic levels, but stagnant for the eighth year running.

- In 2021, global private investment in infrastructure projects in primary markets recovered to 0.3% below its pre-pandemic level (2019), increasing by 4.4% to USD173 billion in 2021.
- Despite recovering to pre-pandemic levels, private investment in infrastructure projects has been stagnant for eight consecutive years, and far shy of what is needed to close the infrastructure gap.
- The number of transactions closed has also recovered, resuming its upward trend since 2016 and surpassing pre-pandemic levels. In 2021, 647 transactions closed – the highest number since 2010.
- While the number of transactions has been rising since 2016, the average transaction size has declined, which has meant a stagnant level of private investment in infrastructure projects.

Private investment in infrastructure projects in primary markets
(USD bn and number of transactions)



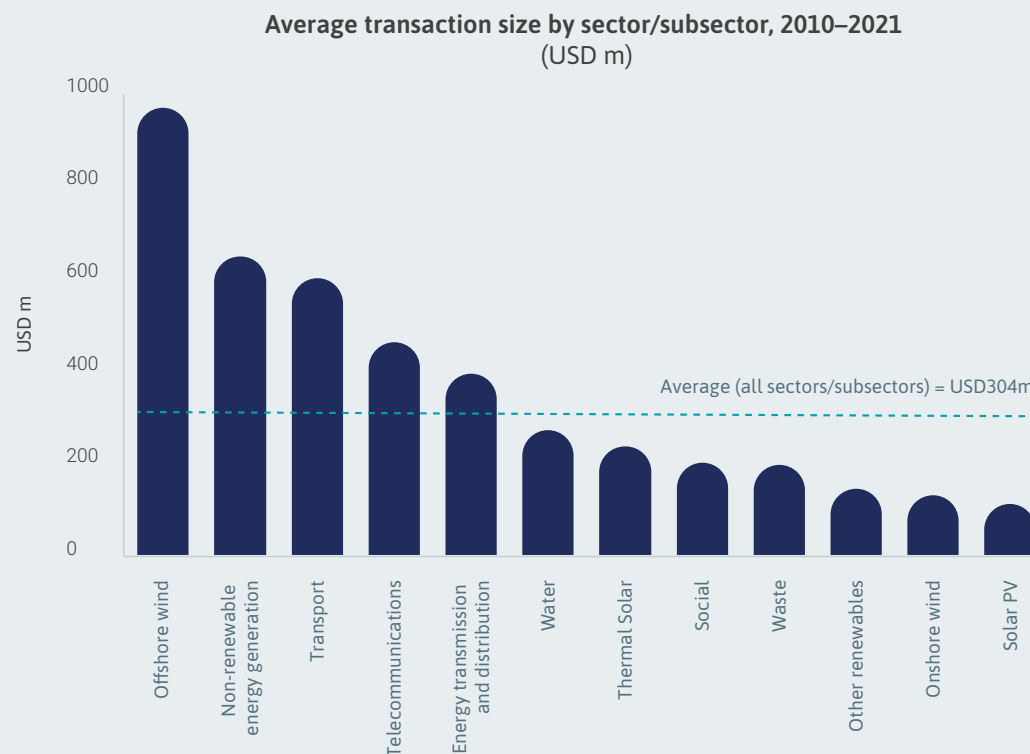
Source: Global Infrastructure Hub based on IJGlobal data.

Note: Throughout this report, unless otherwise specified, 'private investment in infrastructure projects' refers to private sector investment in infrastructure projects in primary markets (financed by private and public financiers) including greenfield and brownfield infrastructure, as well as privatisations. Investment values represent commitments made at the financial close of investment and not executed investment.

Private investment in infrastructure

Growth in number of transactions is largely driven by investment in high numbers of small-value solar projects.

- Growth in the number of transactions has been largely driven by growth in the number of solar photovoltaic (PV) projects, which tripled between 2016 and 2021.
- However, of all infrastructure sector projects, PV projects have the lowest average transaction size. The average transaction size of a solar PV project is around USD109 million, equating to roughly 11% of the average offshore wind project, 17% of the average non-renewable project, and 18% of the average transport project (the three largest infrastructure sectors/subsectors by transaction size).
- In 2021, 46% of the total number of transactions were in the PV solar and onshore wind subsectors, which have the lowest average project size. In particular, PV solar accounted for 31% of total projects, more than half of which (56%) had a project size smaller than USD100 million.



Source: Global Infrastructure Hub based on IJGlobal data.

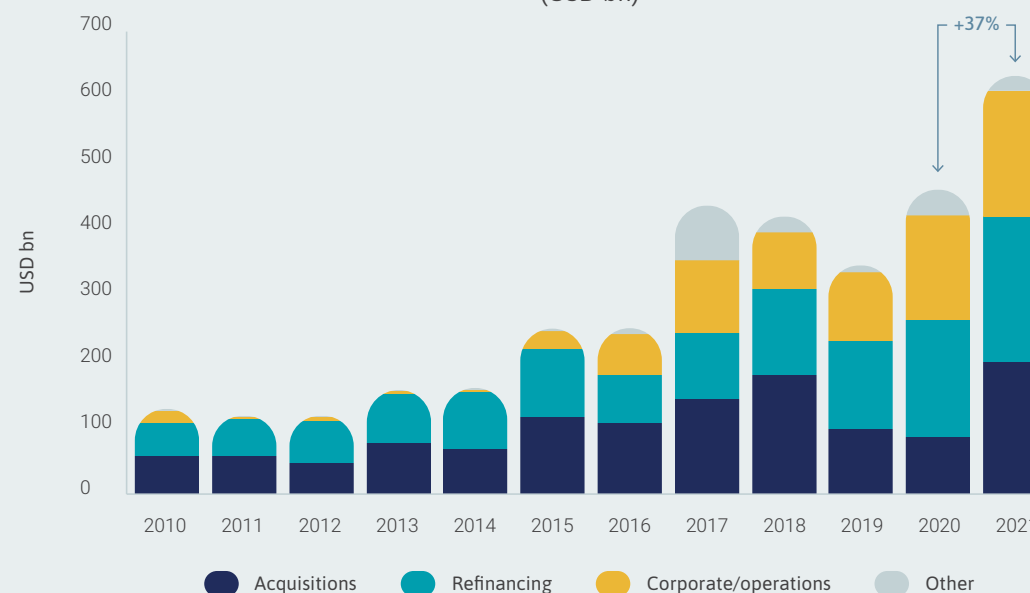
Note: 'Other renewables' are renewable projects outside of offshore wind, onshore wind, solar PV, and thermal solar (e.g. hydroelectric) projects.

Private investment in infrastructure

2021 was a bumper year for secondary market investment, with investors increasingly seeking a safe haven for pent-up capital.

- In the secondary market, private investment in infrastructure has emerged largely unaffected by the global pandemic, growing for a second consecutive year in 2021. Indeed, private investment in infrastructure accelerated significantly in 2021, rising by 37% to USD632 billion in 1,017 transactions, the strongest result since data collection began.
- Private investment in infrastructure in secondary markets has almost quintupled since 2010, reflecting the growth of infrastructure as an asset class and the increasing trend towards active portfolio management in all private markets. Considering the long holding periods of infrastructure assets, the secondary market is well suited as a mechanism for servicing investor needs and preferences changing over time.
- The 2021 increase was driven mainly by strong growth in acquisitions – particularly in telecommunications and in energy transmission and distribution – which more than doubled following two years of decline. This is likely to reflect several factors, including:
 - The increasing attraction of investors towards the safe haven of secondary markets (where investors perceive mature projects as having lower risk than greenfield transactions) amid heightened global uncertainty
 - Pent-up demand following pandemic restrictions in 2020, which constrained site inspections and due diligence for many infrastructure investors
 - The potential hedge that infrastructure assets can offer against rising inflation, concerns about which began intensifying in 2021 and beyond.
- In 2021, refinancing accounted for USD221 billion, the largest component (35%) of secondary investment in infrastructure, as investors continued to take advantage of low interest rates. However, this trend may change in 2022, as interest rates rose in the first half of the year and are expected to continue rising in the second half.

Private investment in infrastructure projects in secondary markets
(USD bn)



Source: Global Infrastructure Hub based on IJGlobal data.

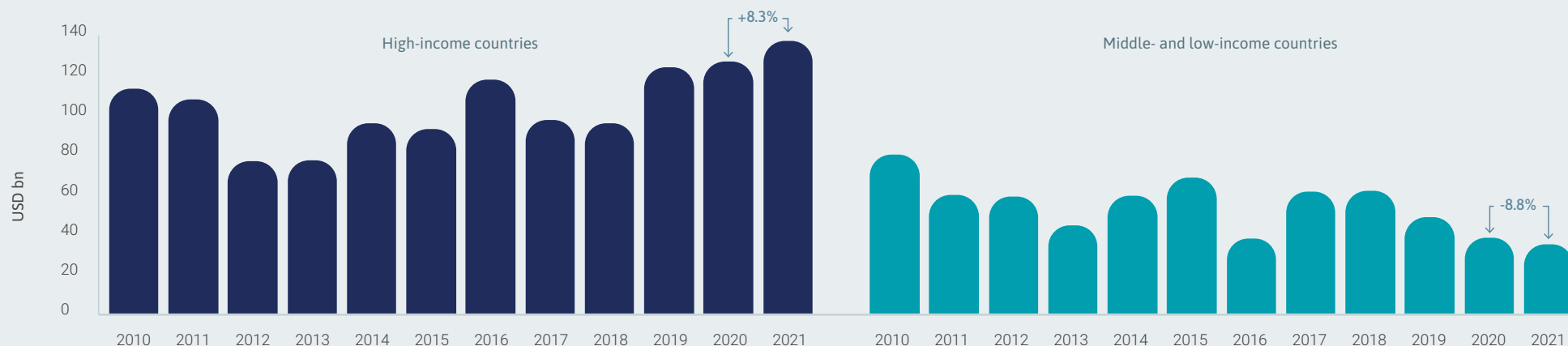
Note: 'Other' includes securitisations and transactions for more than one purpose. 'Corporate / operations' refers to financing by infrastructure companies for general corporate purposes and ongoing operations. Note that the observed increase since 2014 reflects, to some degree, improved data coverage for this component by IJGlobal in more recent years.

Private investment in infrastructure

Although private investment in infrastructure projects is growing steadily in high-income countries, it continues to fall in middle- and low-income countries.

- In 2021, private investment in infrastructure projects grew by 8.3% in high-income countries, while investment in middle- and low-income countries fell by 8.8%.
- The gap between private investment in infrastructure projects in high-income countries and that in middle- and low-income countries continues to widen over time; in 2021, 80% of private investment in infrastructure projects occurred in high-income countries and 20% in middle- and low-income countries.
- While investment in high-income countries has continued to rise, even through the pandemic, investment in middle- and low-income countries remains significantly lower and below pre-pandemic levels.
- The declining trend in infrastructure investment in middle- and low-income countries began before the pandemic and was exacerbated by the crisis. Heightened political risk and a lack of adequate mechanisms to mitigate financial risk, including exchange rate risk, can be barriers to investment in these markets.

Private investment in infrastructure projects by income group, 2010–2021
(USD bn and % growth in 2021)



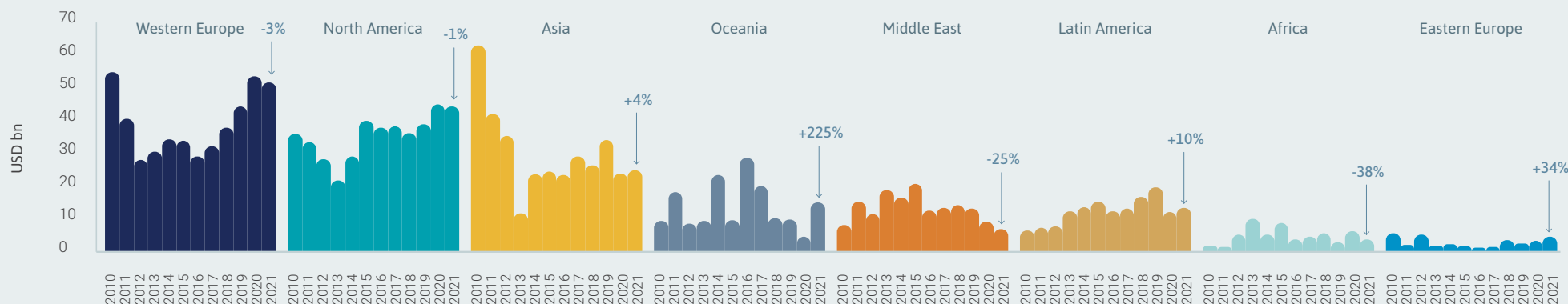
Source: Global Infrastructure Hub based on IJGlobal data.

Private investment in infrastructure

The regions hardest hit during the pandemic in 2020 – Oceania, Latin America, and Asia – saw investment bounce back in 2021.

- The level of private investment in infrastructure projects varies widely worldwide, with developed regions recording significantly higher levels than developing regions.
- The increase in private investment in infrastructure projects in 2021 was driven by growth in Oceania, Latin America, and Asia, three regions that recorded steep declines in 2020. Investment in Eastern Europe also increased considerably in 2021, albeit from low levels.
- Oceania saw the sharpest turnaround in 2021 and was the driver behind overall growth in private investment in infrastructure projects globally. Oceania's 2021 result surpassed pre-pandemic investment levels, thanks to strong growth in the transport sector, which mainly reflects the successful financial closure of Australia's large Melbourne Northeast Link motorway project.
- Latin America and Asia recorded more modest growth in 2021, although investment in these two regions still remains below its pre-pandemic level.
- In contrast, Western Europe and North America, with the highest levels of private investment in infrastructure projects (accounting for around 50%) fell slightly in 2021 following particularly large transactions in 2020; both regions remain well above their pre-pandemic levels.
- Private investment in infrastructure projects in the Middle East and Africa fell significantly in 2021. However, the result in Africa masks a much healthier picture – the number of transactions more than doubled in 2021.

Private investment in infrastructure projects by region, 2010–2021
(USD bn and % growth in 2021)



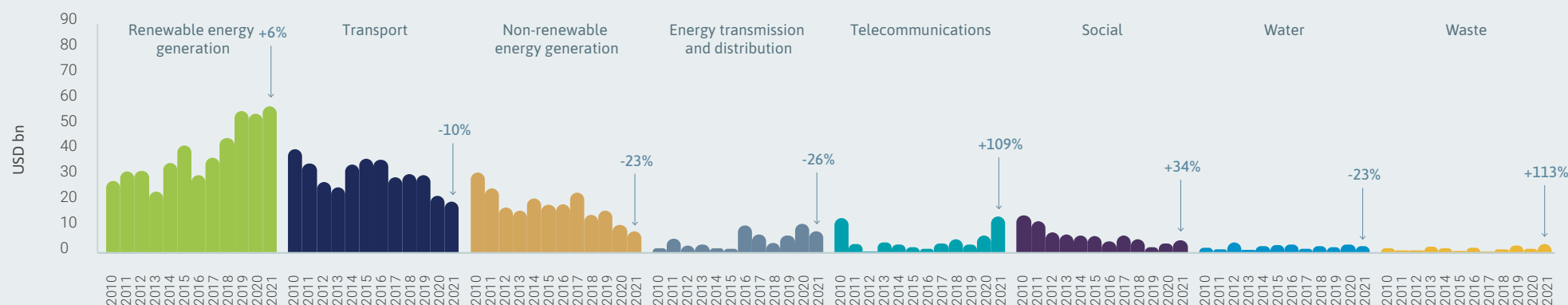
Source: Global Infrastructure Hub based on IJGlobal data.

Private investment in infrastructure

Private investors continue to focus on renewables and to show interest in telecommunications and social infrastructure.

- Private investment in infrastructure projects varies significantly across sectors. The renewables sector continues to attract the most interest, with 48% of total private investment in infrastructure projects. Notably, investment in battery storage (renewables sector) skyrocketed in 2021, almost quadrupling its 2020 level. Meanwhile, the global trend away from non-renewables continued, with non-renewables now representing only 11% of total private investment in energy projects.
- Transport remains the second-largest sector in terms of investment share but is still struggling to emerge from the impact of the pandemic, falling a further 10% in 2021. However, the decline in private investment in transport projects is a longer-term trend. Investment in the sector has fallen over the past decade in terms of absolute value and as a share of total investment. Transport's share almost halved from 30% in 2010 to 17% in 2021. A key driver of this fall has been falling investment in roads across Western Europe in line with the EU's goal to shift towards more sustainable modes of transport.
- In 2021 two key sectoral trends that emerged during the pandemic in 2020 continued – the growing popularity of telecommunications and, to a lesser extent, social infrastructure. Investment in telecommunications more than doubled in 2021 and is now more than quadruple its pre-pandemic level. The rapid worldwide rise in online participation continues to add to the momentum towards digital connectivity. In fact, virtually all growth in the value of private investment in infrastructure projects in 2021 was driven by telecommunications, mainly in Western Europe.
- Investment in social infrastructure, while remaining low, also increased for the second consecutive year. The increase was driven by heightened demand during the pandemic for social infrastructure assets, which were largely shielded from the negative effects of the pandemic, and the fact that social infrastructure has the potential to meet ESG objectives for investors.
- Private investment in infrastructure projects in the water and waste sectors remains very low, despite strong growth in waste in 2021, driven by an increase in waste-to-energy projects.

Private investment in infrastructure projects by sector, 2010–2021
(USD bn and % growth in 2021)



Source: Global Infrastructure Hub based on IJGlobal data.

Private investment in infrastructure

The wind and solar subsectors continue to attract the most private investment, and telecommunications is now the third-largest sector for private investment.

- In line with sustainability goals, investors continue to show strong appetite for renewables, which attracted the largest share (48%) of total private investment in infrastructure projects in 2021.
- In Western Europe, North America, Asia, and the Middle East, the renewables sector attracts the most private investment in infrastructure projects; in other regions (Latin America, Oceania, Eastern Europe, and Africa) the most attractive sector is transport.

Private investment in infrastructure projects by subsector, 2021
(USD m)



Source: Global Infrastructure Hub based on IJGlobal data.

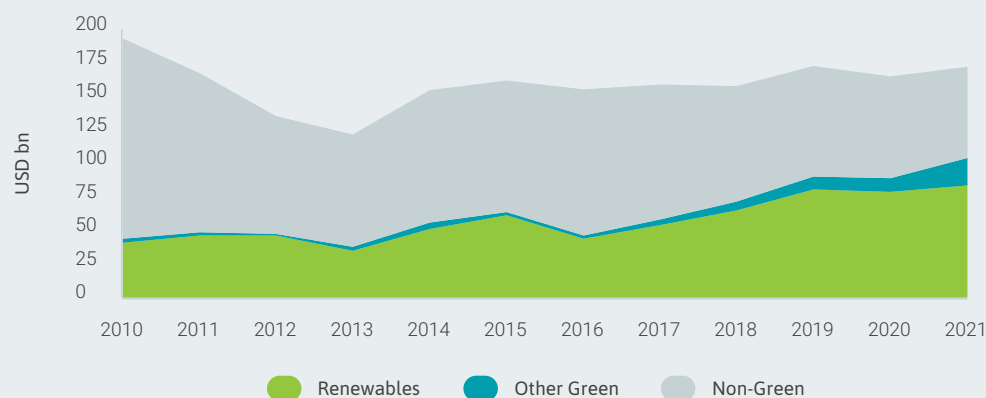
Note: 'Other renewables' includes biofuels, geothermal, hydrogen, marine, and others. 'Other social' includes prisons, municipal street lighting, and others. CCUS = Carbon Capture Utilisation and Storage, EV = Electric vehicle charging infrastructure.

Private investment in infrastructure

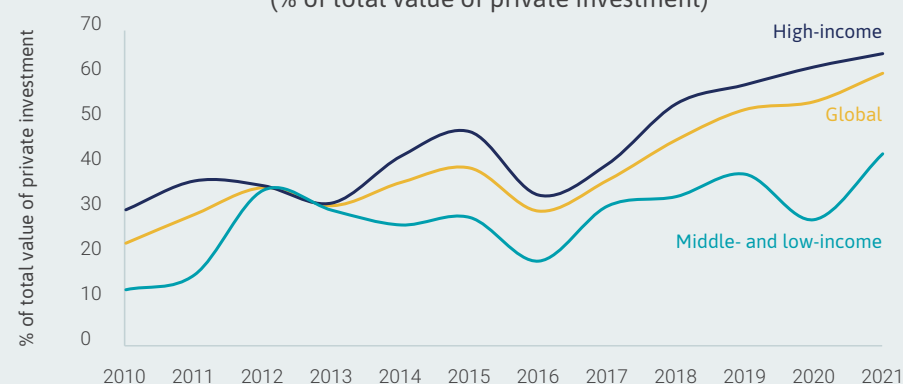
Private investment in infrastructure is more focused than ever on green projects, as green private investment reaches a record high.

- Global private investment in infrastructure projects was 'greener' than ever in 2021, reaching a share of 60% of total private investment in infrastructure projects – a record high.
- While strong investor interest in renewables is positive, efforts to decarbonise infrastructure and reduce its significant climate footprint must still extend beyond renewables and into other sectors, as we noted in last year's Infrastructure Monitor 2021. Encouragingly, the increase in green investment in 2021 was mostly outside of the renewables sector, in which investment has been minimal in previous years. There was an increase in green investment in sectors such as waste, with a rise in waste-to-energy projects, mostly in high-income countries.
- The trend towards greener investments was evident across income groups. Green investment in high-income countries continued its gradual rise, increasing from 62% of private investment in infrastructure projects in 2020 to 65% in 2021. Green investment in middle- and low-income countries resumed its upward trend in 2021, following a dip in 2020, rising from 28% in 2020 to 43% in 2021.

Green and non-green private investment in infrastructure projects
(USD bn)



Share of green private investment in infrastructure projects
by income group
(% of total value of private investment)



Source: Global Infrastructure Hub based on IJGlobal data.

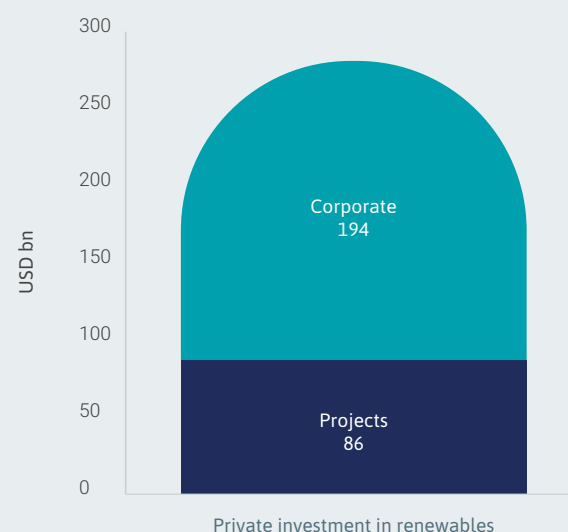
Note: 'Green investment in infrastructure' means investment in environmentally sustainable projects supporting the transition to net-zero emissions of carbon dioxide. 'Other Green' includes investments in other subsectors such as electric vehicle charging infrastructure, carbon capture and storage (CCUS) facilities, and electric transport (among others), or investments financed by a sustainable instrument.

Private investment in infrastructure

Total private investment in renewables is significantly higher when transactions that are not project-based are included.

- It is indisputable that the level of private investment in renewables has grown significantly, as has the sector's share in global private investment in infrastructure.
- The analysis presented in this report is based on IJGlobal transactions data – the most comprehensive source of data on a global basis for project-based private investment across all infrastructure sectors. However, it does not cover most corporate private investment in infrastructure.
- Project-based private investment in renewables only accounts for around 30% of total private investment (CPI, 2022), while direct private investment by companies in renewables accounts for 70%. Unfortunately, data on the latter are mostly unavailable for most infrastructure sectors outside of renewables, where such data are more readily available due to increased global efforts to improve data in support of the transition to renewable energy.
- Taking into account reports examining total investment in renewables ([BNEF, 2022](#); [IEA, 2022](#)) and the private portion of that investment ([IRENA and CPI, 2020](#)), it is estimated that total private investment in renewables was USD280 billion in 2021 (USD86 billion from projects, and USD194 billion from direct investment by companies). See 'Appendix 2 – Methodological notes' for details.

**Estimated private investment in renewables
in primary markets by type, 2021
(USD bn)**



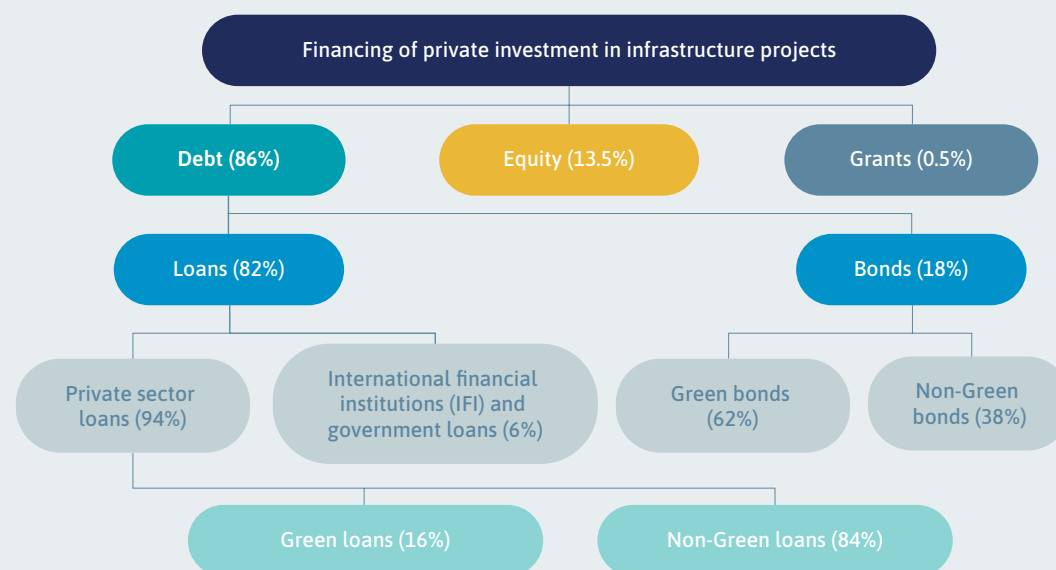
Source: Global Infrastructure Hub based on IJGlobal, BNEF, and CPI data.
Note: The IJGlobal transactions dataset contains some data on investment financed directly from company balance sheets, but coverage is very limited.

Private investment in infrastructure

Sustainable financing continues to increase, accounting for one-fifth of financing for private investment in infrastructure projects in 2021.

- Private investment in infrastructure projects is mainly financed by debt. The share of debt financing continued to grow in 2021, increasing from 77% in 2020 to 86% in 2021. Over time, there has been an increase in debt-to-equity ratios, likely linked to the maturation and consolidation over the years of technologies such as solar PV and onshore wind. This maturation has helped make lenders more comfortable with risks in projects involving these technologies.
- In 2021, 20% of private investment in infrastructure projects was financed either by a green bond (10%) or a green loan (11%). This sustainable financing share is more than double the average sustainable financing share (9%) in the five years before 2021.
- Note that while IJGlobal provides the most comprehensive source of global data for private investment in infrastructure projects across all infrastructure sectors, its data on green bond issuances are not as exhaustive as those of other data providers. Therefore, it is likely that in this analysis the volume of green bonds for primary infrastructure is underestimated.
- Additionally, there are data challenges related to all existing green bonds data, particularly around the use-of-proceeds : (i) green bond data generally do not indicate whether proceeds are being earmarked for primary or secondary purposes and (ii) data on actual use-of-proceeds are extremely limited. However, anecdotal evidence suggests that most green bonds are used to refinance existing assets rather than finance new assets ([CPI/IRENA, 2020](#)).

Financing of private investment in infrastructure projects by instrument, 2021
(% of total value)



Source: Global Infrastructure Hub based on IJGlobal data.

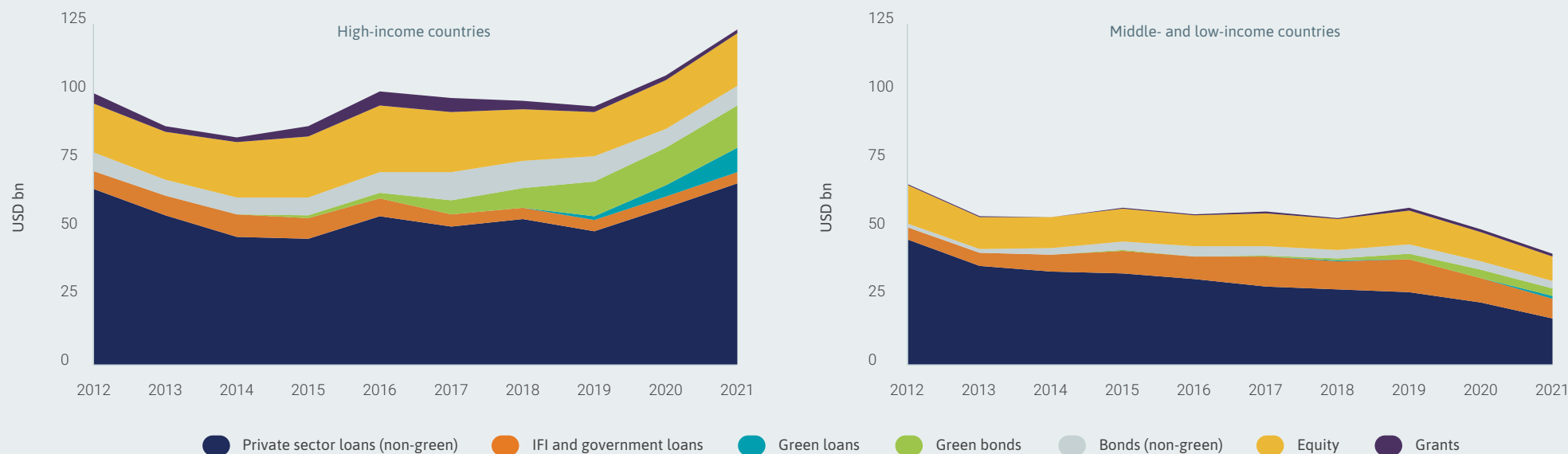
Note: 'International financial institutions (IFI) and government loans' includes lending from development banks (multilateral and national), export credit agencies, and the public sector (e.g. government authorities and state-owned enterprises). Sustainability-linked loans and sustainability-linked bonds are included in green loans and green bonds respectively, although these transactions are few.

Private investment in infrastructure

Sustainable financing has been most evident in high-income countries, but is starting to emerge in middle- and low-income countries.

- In 2021, sustainable financing (green bonds plus green loans) made up 22% of total private investment in infrastructure projects in high-income countries (11% green bonds and 11% green loans) and 12% in middle- and low-income countries (3% green bonds and 9% green loans).
- Green loan financing for private investment in infrastructure projects is relatively new. While green bond financing has been gathering pace since 2015, the green loan market is much more nascent and has only been noticeably active since 2020, almost exclusively in high-income markets.

Financing of private investment in infrastructure projects by instrument and income group
(Three-year moving average, USD bn)



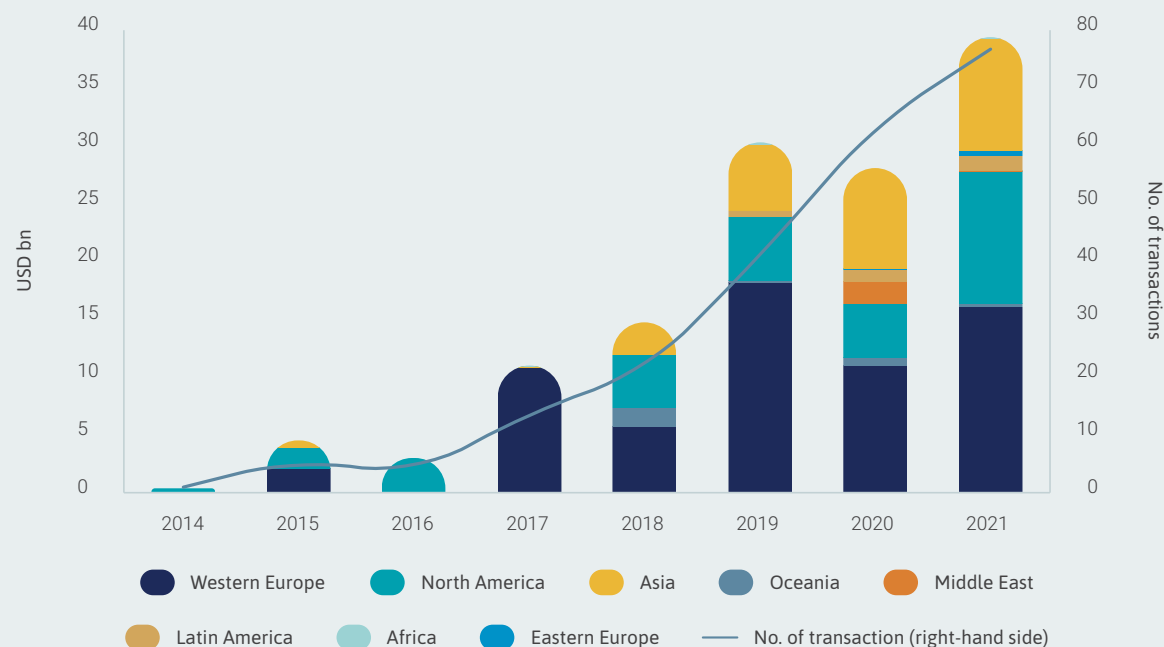
Source: Global Infrastructure Hub based on IJGlobal data.

Private investment in infrastructure

Sustainable financing has been most prevalent in Western Europe and North America but is spreading to more regions.

- Western Europe and North America have been the global leaders in the sustainable financing of infrastructure, adopting sustainable instruments earlier than other regions and accounting for two-thirds of all sustainable financing of infrastructure projects in 2021.
- The use of sustainable instruments to finance infrastructure projects has started to emerge in other regions in recent years, notably Asia.
- The number of transactions financed by a sustainable instrument has accelerated over the past three years – almost quadrupling between 2018 and 2021.

Sustainable financing of private investment in infrastructure projects by region
(USD bn and number of transactions)



Source: Global Infrastructure Hub based on IJGlobal data.

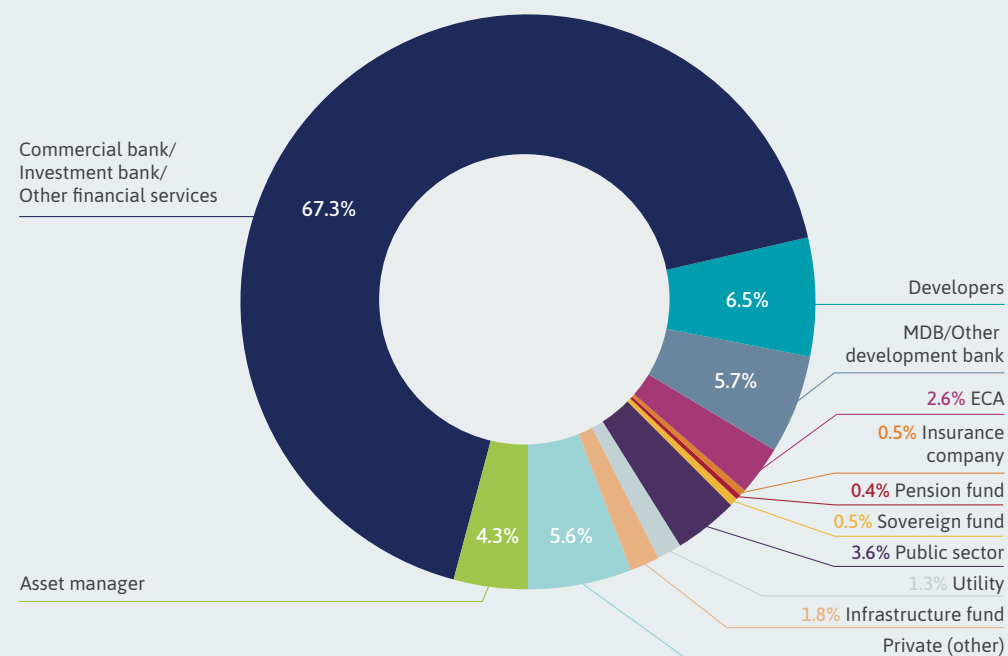
Note: 'Sustainable finance' includes green bonds, green loans, and sustainability-linked bonds and loans. 'Number of transactions' also includes transactions partly financed by a sustainable instrument.

Private investment in infrastructure

Private investment in infrastructure projects continues to be mostly financed by banks, which continue to increase their share, while public sector share is falling.

- In 2021 financial service institutions, primarily commercial and investment banks, continued to play a leading role in financing private investment in infrastructure projects. Their role has grown in prominence over time, including in 2021, with bank share of financing increasing from 53% in 2011 to 67% in 2021.
- Developers have the second largest share (6.5%) mostly in the form of equity, followed closely by MDBs and other development banks.
- Over time, public sector funding of private investment in infrastructure projects has been falling. It continued to fall in 2021. Public sector share fell from 19% in 2011 to 4% in 2021.
- The shift away from public infrastructure financing towards private was prominent at the start of the decade, mostly in India, the biggest public financier of private investment in infrastructure projects over that period. Facing fiscal constraints and high government debt, India made efforts to improve its regulatory environment to encourage PPPs and attract greater private sector financing for its growing infrastructure needs. Thus, India reduced its participation in total public financing of private investment in infrastructure projects from 64% in 2011 to 4% in 2021.
- During the last decade, the US and Australia, also important public financiers of private investment in infrastructure projects, also reduced their participation.
- Direct financing of private investment in infrastructure projects by insurance companies and pension funds remains low at 1%. However, such entities participate indirectly through unlisted funds and capital markets and directly in secondary markets.

Financing of private investment in infrastructure projects by financier, 2021
(% of total value)



Source: Global Infrastructure Hub based on IJGlobal data.

Notes: 1. ECA = Export Credit Agency, MDB = Multilateral Development Bank, Developers = Developer / Engineering procurement / Construction firm, Asset Manager = Asset managers, fund managers, and private equity firms. 2. 'Other development banks' includes bilateral development institutions, national development banks, and other development institutions not included within MDBs.

3. 'Other financial services' includes institutions such as financial advisory firms and hedge funds, and excludes insurance companies, pension funds, and asset managers, which are included as their own category for the purpose of this analysis.

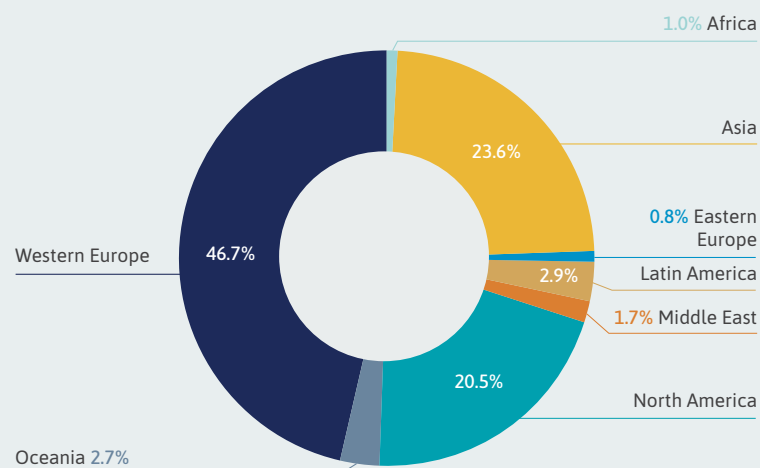
Private investment in infrastructure

Bank financing of private investment in overseas infrastructure projects is growing.

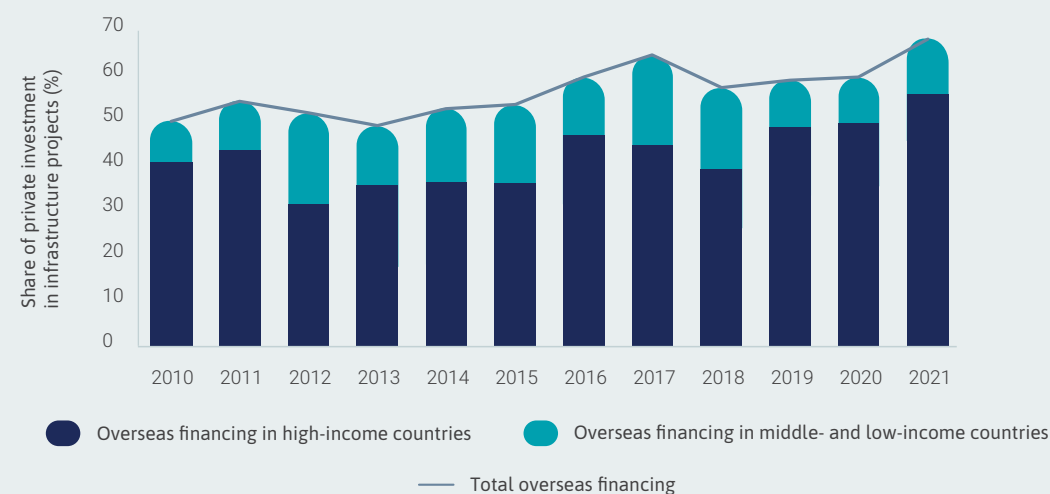
- Banks financing private investment in infrastructure projects are primarily based in Western Europe; around two-thirds of their transactions are cross-border transactions.
- Over the past decade, banks have been increasing their financing of private investment in infrastructure projects outside of the bank's headquarter country. In 2021, 68% of private investment financed by a bank was in overseas infrastructure projects,

possibly suggesting a greater confidence among banks about unfamiliar markets or that banks are increasingly seeking opportunities to expand into new markets. However, 82% of overseas financing was in high-income countries, suggesting that banks still have reservations about financing projects in middle- and low-income countries.

Banks financing private investment in infrastructure by region of company headquarters, 2021
(% of total value)



Overseas bank financing of private investment in infrastructure projects
(% of total value of private investment in infrastructure projects)



Source: Global Infrastructure Hub based on IJGlobal data.

Note: 'Overseas financing' is defined as a transaction taking place in a country that is different from the financier's company headquarters.

Infrastructure investment performance



Infrastructure investment performance

Infrastructure equity performance



Key findings

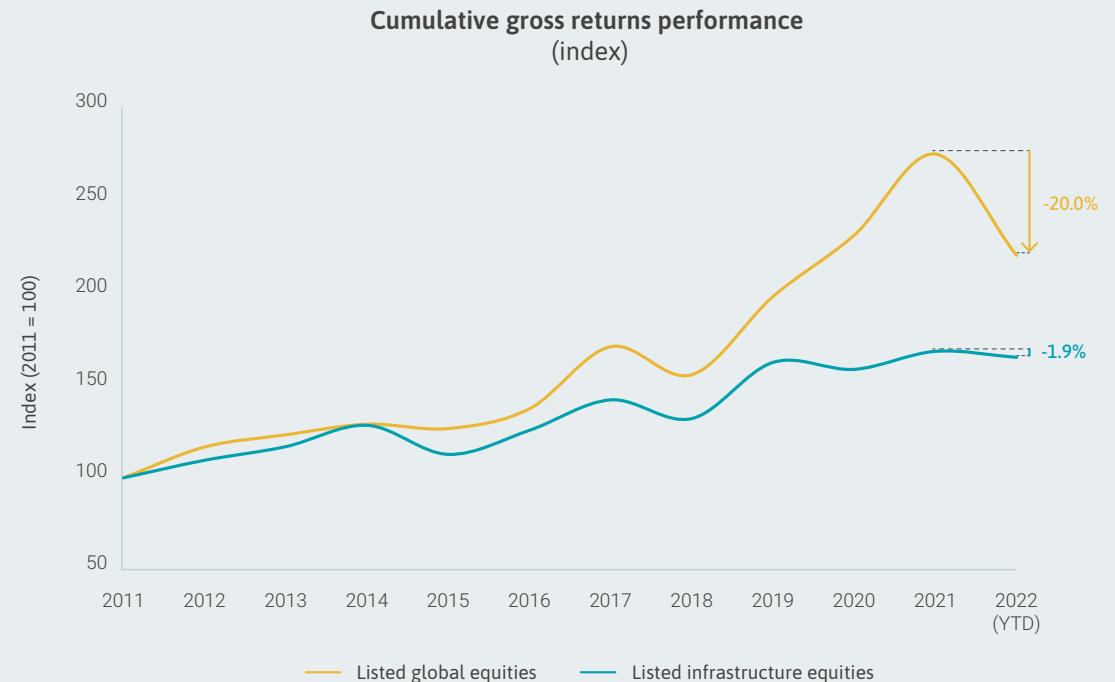
- Listed infrastructure equities have remained fairly resilient despite recent global economic shocks.
- Listed infrastructure equities provide less volatile returns and more stable dividends than listed global equities.
- Unlisted infrastructure equities continue to outperform listed equities despite rising interest rates negatively impacting equity returns in the first half of 2022.
- Rising interest rates are negatively impacting valuations of all infrastructure equities; this is especially evident in 2022.
- Recent economic shocks have increased the risk premium of unlisted infrastructure equities after a declining trend since 2000.
- Infrastructure equities, and especially unlisted infrastructure equities, continue to offer lower risk than listed global equities across different time horizons, even after economic shocks and uncertainties.
- Unlisted infrastructure equities continue to provide the highest risk-adjusted returns, considered historically.
- Unlisted infrastructure equities in the transport sector exhibit higher risk-adjusted returns than returns in other sectors, as of June 2022.

Infrastructure investment performance

Infrastructure equity performance

Listed infrastructure equities have remained fairly resilient despite recent global economic shocks.

- Long-term performance trends show that investment in listed global equities including infrastructure equities has provided positive returns to investors.
- However, listed global equities and listed infrastructure equities have different risk and return factors, especially in the current context where global economic shocks such as rapid inflation, the war in Ukraine, and pandemic-related lockdowns have disrupted the global economy.
 - On average, listed global equities provided exceptionally high returns in 2020 and 2021, but fell drastically in the first half of 2022 by 20.0%, erasing all the gains of 2020 and 2021 and thus demonstrating high volatility.
 - In contrast, returns on listed infrastructure equities have increased consistently over time, albeit at lower levels than returns on listed global equities, but also with lower volatility. The pandemic temporarily stalled this trend in 2020, but it resumed in 2021. During the first half of 2022, returns on listed infrastructure equities remained fairly resilient.
- Inflation during the first half of 2022 has had relatively limited impact on the earnings of listed infrastructure companies (e.g. regulated utilities, and telecommunications and transport companies). Their earnings are typically linked to price changes, and even when prices increase, demand remains resilient for these essential services. As well, the value of infrastructure assets typically rises with inflation. Non-infrastructure companies listed on the stock exchange are unlikely to have similar protection against inflation.



Source: MSCI (2022) as of June 2022.

Note: Annual returns are based on monthly gross returns data in a calendar year. The indices present aggregate performance levels. Global equity performance is measured by the MSCI All Country World Index (MSCI ACWI), listed infrastructure equity performance is measured by the MSCI ACWI Infrastructure Capped Index (MSCI ACWI-IC).

Infrastructure investment performance

Infrastructure equity performance

Listed infrastructure equities provide less volatile returns and more stable dividends than listed global equities.

- Although in recent years listed global equities have provided higher cumulative gross returns, listed infrastructure equities provide less volatile returns and more stable dividends (MSCI 2022).
- Comparing the exposure of listed infrastructure equities and listed global equities to different risk and return factors, MSCI (2022) reveals that infrastructure equities provide less volatile returns (risk) and stable dividend payments relative to an average listed global equity, which makes the return and risk profile of infrastructure equities attractive. Infrastructure equities also have more momentum (the tendency of rising stock to continue to deliver high returns) and value (price paid to purchase a stock) than listed global equities.

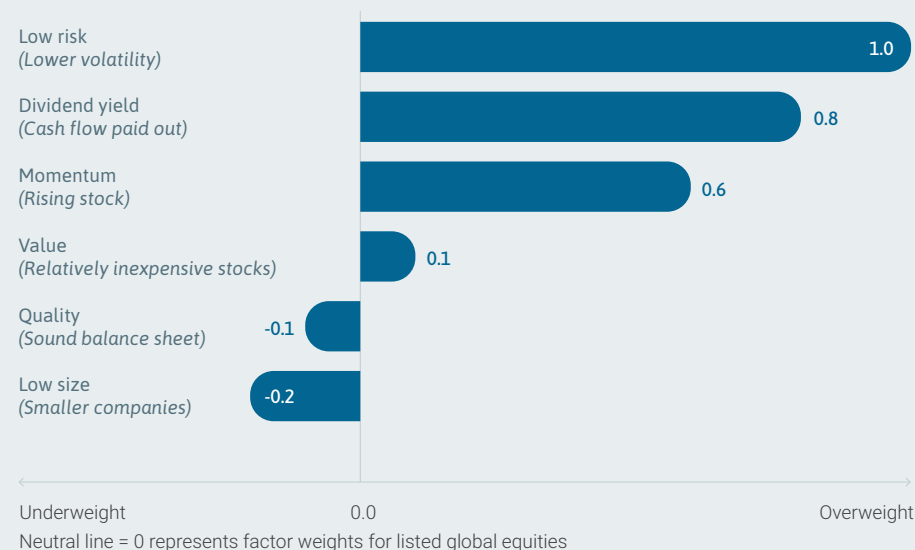
	Risk (3 years)	Dividend yield
Listed global equities	18.0%	2.3%
Listed infrastructure equities	15.9%	3.8%

Source: MSCI as of June 2022.

Note: Risk is measured through the annualized standard deviation of monthly gross returns data.

- Infrastructure is a non-cyclical industry and has stable and predictable revenues, which explains its lower risk relative to listed global equities and its resilience amid economic shocks. Consequently, listed infrastructure companies can provide higher dividend yields than listed global equities on a consistent basis.
- Momentum is a stronger factor for listed infrastructure equities than for listed global equities. Value is also a stronger factor for listed infrastructure equities than for listed global equities because the price of listed infrastructure equities is typically not inflated by speculative investing based on high growth expectations.
- Low company size is a relatively less favourable factor for listed infrastructure equities than for listed global equities. Lower size can be advantageous in terms of a lighter administrative burden and greater potential for growth, but listed infrastructure companies are larger by nature. Similarly, quality (soundness of balance sheet) is relatively unfavourable for listed infrastructure companies because they typically have higher leverage, which makes their balance sheets less sound than those of average listed companies.

Key factors driving listed infrastructure returns and risk relative to listed global equities (Factor weight standardised relative to listed global equities)



Source: MSCI (2022).

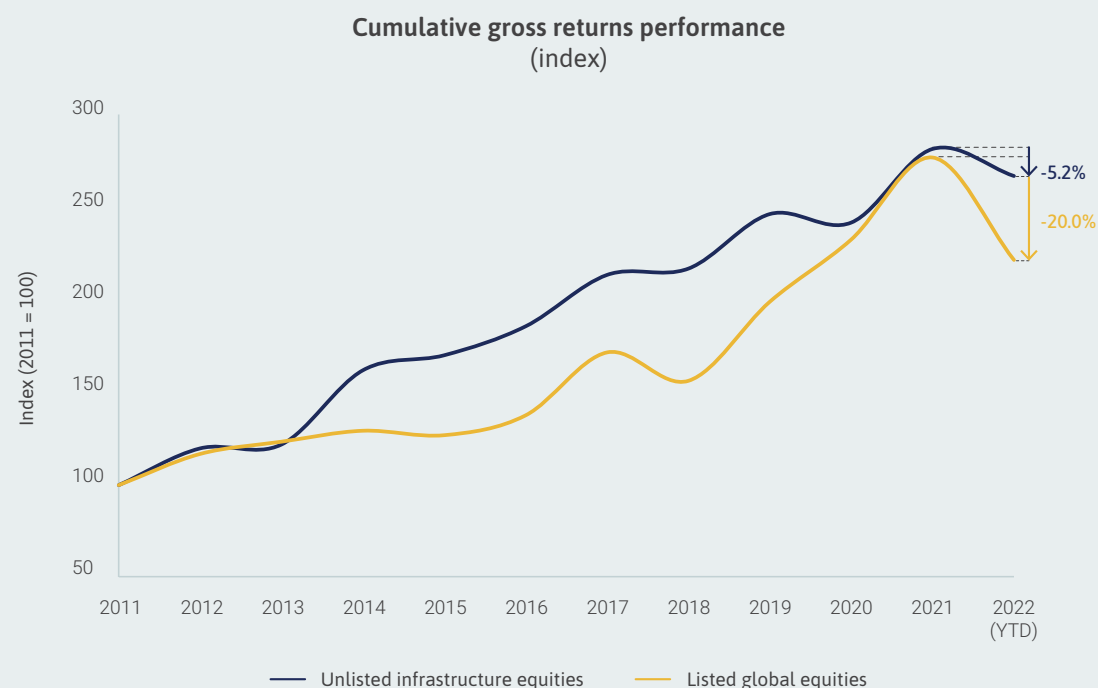
Note: Neutral line = 0 represents factor weights in the global equity universe determined by the MSCI Investable Market Index (IMI). Weight is the degree to which a factor is a driver of risk and return of listed infrastructure equities relative to the global equity universe. 'Overweight' means that the factor is more favourable for listed infrastructure equities relative to listed global equities. 'Underweight' means that the factor is less favorable for listed infrastructure equities relative to listed global equities. Research identifies these factors as the key drivers of risk and return, which are measured through 16 metrics. The data estimates depict factor exposure relative to MSCI IMI based on standardised values from a cross-sectional regression in the MSCI Barra Global Equity Factor Model. MSCI data is from January 1999 to 30 June 2022.

Infrastructure investment performance

Infrastructure equity performance

Unlisted infrastructure equities continue to outperform listed global equities, despite rising interest rates negatively impacting equity returns in the first half of 2022.

- Unlisted infrastructure equities have provided positive returns to investors over time, outperforming listed global equities. The pandemic temporarily stalled this trend in 2020 but it resumed strongly in 2021. However, during the first half of 2022, rising interest rates negatively impacted equity returns, including unlisted infrastructure equity returns.
- Returns on unlisted equities declined slightly as their valuations fell due to rising interest rates in 2022. Investments that are highly leveraged (high debt-to-equity ratio) are negatively impacted in a rising interest rate environment. Infrastructure investments typically have a high debt-to-equity ratio of 80:20 or 60:40. According to the EDHECinfra (2022a), the sensitivity of the value of unlisted infrastructure equity investments to changes in the interest (discount) rate is about 10% on average; that is, a 1% increase in the discount rate would reduce the fair value of unlisted infrastructure equity investments by 10%, assuming the same future cash flows.
- The fall in returns on unlisted infrastructure equities is significantly less than the fall in listed global equity returns, and unlisted infrastructure equities continue to outperform listed global equities as expected.



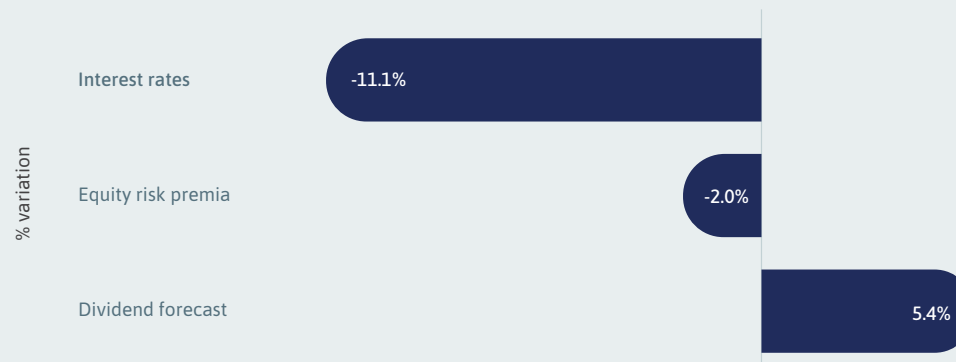
Source: EDHECinfra (2022a) and MSCI (2022) as of June 2022.

Note: Annual returns are based on calendar year. The indices present aggregate performance levels. Unlisted infrastructure equities performance is measured by EDHECinfra's Infra300 equity index. Listed global equities performance is measured by the MSCI index.

Rising interest rates in 2022 are negatively impacting valuations of all infrastructure equities.

- EDHECinfra (2022c) has analysed the impact of increases in dividend forecasts, interest rates, and risk premiums on the net asset value (NAV) of global infrastructure equities. The analysis reveals that of all the factors, rising interest rates affected the valuation of infrastructure equities the most in the year preceding June 2022.
- The highly inflationary environment has triggered a substantial increase in the expected level of future dividends, which increased the NAV, but also in interest rates and risk premiums, which reduced the NAV.
- During the last year (June 2021 to June 2022), the net impact of the highly inflationary environment on the NAV of infrastructure assets has been negative. The NAV of global infrastructure equities has fallen by 11.1% due to higher interest rates and by 2% due to higher risk premiums. On the other hand, although valuation rose by 5.4% due to higher dividend forecasts, the rise was not enough to offset the negative impact of higher interest rates and higher equity risk premiums.

Average one-year change in net asset value of global infrastructure equities due to increase in the level of:

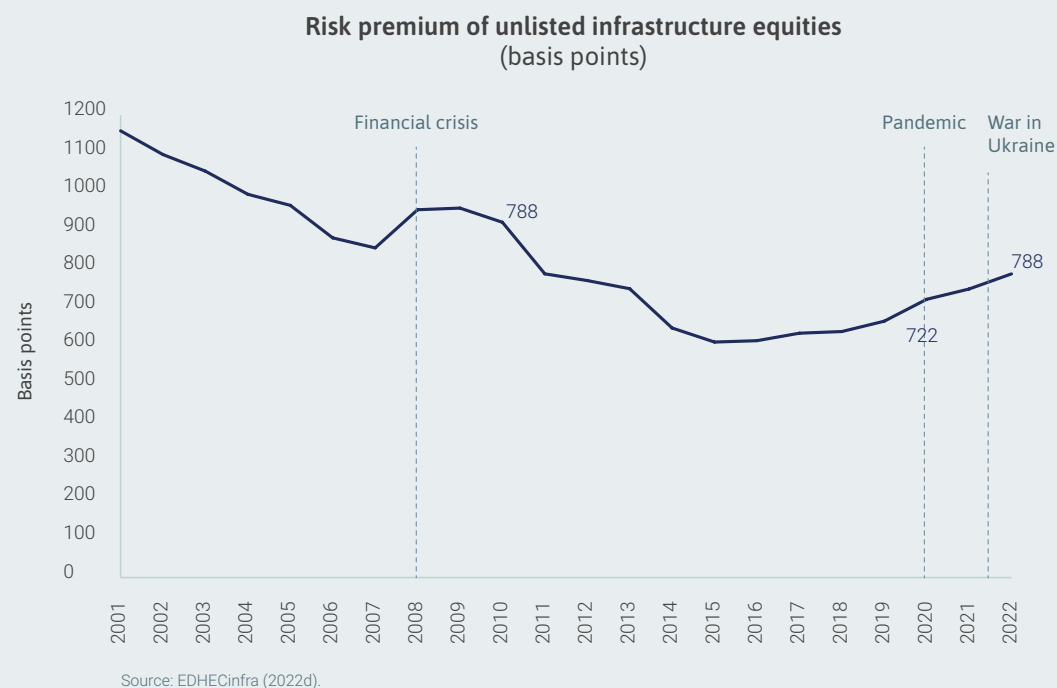


Source: EDHECinfra (2022c). Data as of June 2022.

Note: 'Net asset value' is the market value of an investment or its equity, based on the value of the underlying assets less any liabilities. Data estimates are derived from a regression model based on the dividend discount model (DDM). A widely accepted method for equity valuations, the DDM model computes equity value from three factors: dividend forecast, interest rates, and risk premiums. This analysis shows the average change in net asset value (NAV) due to change in dividend forecast, interest rates, and equity risk premiums. It does not include any impact of paid-out dividends.

Recent economic shocks have increased the risk premium of unlisted infrastructure equities after a declining trend since 2000.

- The risk premium of unlisted infrastructure equities has long attracted investor attention. However, the greater recognition and maturity of infrastructure as an asset class almost halved the risk premium from 1,200 basis points in 2002 to 600 basis points by 2015. The premium stayed at that level until the outbreak of the pandemic, when it started to increase again.
- Economic shocks bring uncertainty and risk. During the financial crisis of 2008, the risk premium for unlisted infrastructure equities rose, but it fell back to lower levels over the next few years. Currently, the pandemic, the recent economic shocks, rising inflation and interest rates, and the war in Ukraine and associated supply chain disruptions have all increased the risk premium of unlisted infrastructure equities from 665 basis points in 2019 to 788 basis points in June 2022 – a level last seen in 2011.



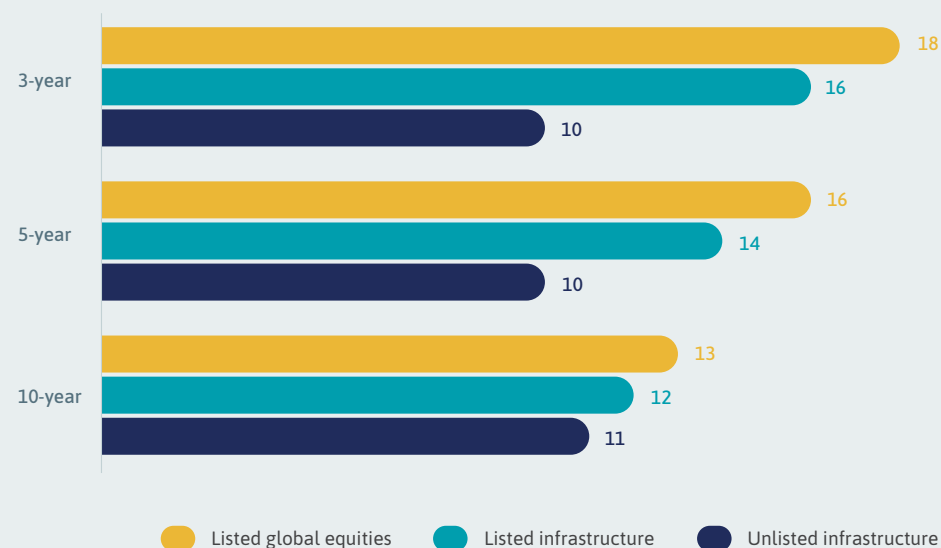
Infrastructure investment performance

Infrastructure equity performance

Infrastructure equities, and especially unlisted infrastructure equities, continue to offer lower risk than listed global equities across different time horizons, even after economic shocks and uncertainties.

- Notwithstanding the negative impact of rising interest rates on the returns and risk premiums of infrastructure equities in the first half of 2022, annualised total risk of infrastructure equities has consistently been lower than that of an average listed global equity across different time horizons.
- Unlisted infrastructure equities have shown the lowest risk across different time horizons, compared to listed infrastructure equities and global equities.

Annualised total risk by type of equity
(%)



Source: MSCI (2022), EDHECinfra (2022a). Data as of June 2022.

Note: Risk is measured through the annualised standard deviation of monthly gross returns data.

Infrastructure investment performance

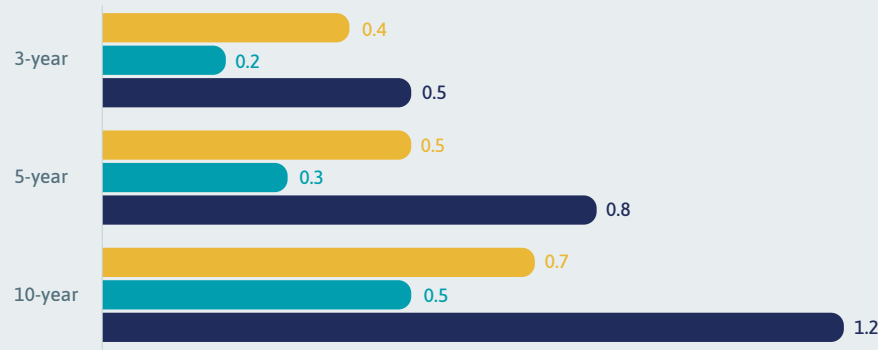
Infrastructure equity performance

Unlisted infrastructure equities continue to provide the highest risk-adjusted returns historically.

- The lower risk and historically high returns of unlisted infrastructure equities means they have also generated higher risk-adjusted returns in all markets and regions, especially in Europe.
- Unlisted infrastructure equities shows the highest risk-adjusted returns in all markets and regions. The risk-adjusted returns of unlisted infrastructure equities are higher in developed markets than in emerging markets. Europe historically has provided higher risk-adjusted returns on unlisted infrastructure equities than have Asia-Pacific and the Americas.
- Risk-adjusted returns on listed infrastructure equities were also higher in developed markets than in emerging markets. However, by region, risk-adjusted returns on listed infrastructure equities in the Americas were significantly better than those in Europe and Asia Pacific, most likely because infrastructure financing in the Americas relies significantly on stock markets.

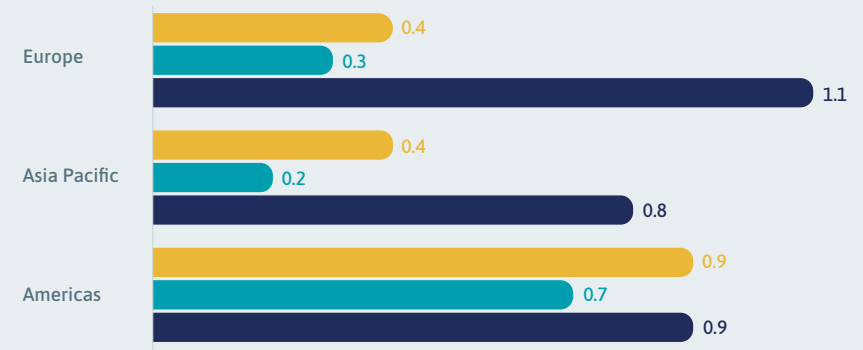
Risk-adjusted returns by type of equity
(Sharpe ratio)

Sharpe ratio (<1=bad; ≥1=acceptable to good;
≥2=very good; ≥3=excellent)



10-year risk-adjusted returns by type of equity and region
(Sharpe ratio)

Sharpe ratio (<1=bad; ≥1=acceptable to good;
≥2=very good; ≥3=excellent)



● Listed global equities ● Listed infrastructure ● Unlisted infrastructure

Source: MSCI (2022), EDHECinfra (2022a) Data as of June 2022.

Note: Risk-adjusted return is measured by the Sharpe ratio, which is the ratio of excess returns to the standard deviation of returns, where excess return is total return minus risk-free return. These estimates are based on gross returns regardless of fees. Fees to invest in the unlisted infrastructure asset class are higher than fees to invest in listed equities.

Infrastructure investment performance

Infrastructure equity performance

Unlisted infrastructure equities in the transport sector exhibit higher risk-adjusted returns than returns in other sectors, as of June 2022.

Based on a review of the performance of the global infrastructure asset class by sector:

- Unlisted transport equities provided high risk-adjusted returns in the decade preceding June 2022. There were strong signs of recovery in the sector as economies emerge from the pandemic.
- Unlisted renewable energy and utilities equities also provided high risk-adjusted returns in the decade preceding June 2022.
- The digital infrastructure sector provided high risk-adjusted returns, but precise estimates could not be deduced for this sector due to data and definition constraints.

10-year risk-adjusted returns for unlisted infrastructure equities by sector (Sharpe ratio)



Source: EDHECinfra (2022a). Data as of June 2022.

Note: Risk-adjusted return measured by the Sharpe ratio is the ratio of excess returns to the standard deviation of returns, where excess return is total return minus risk-free return. Sectors presented are based on the MSCI GICS classification for listed infrastructure and the EDHECinfra classification for unlisted infrastructure. Sharpe ratios by sector are lower than the global average partly because of the diversification benefits when all sectors are combined.

Infrastructure investment performance

Infrastructure debt performance



Key findings

Risk and return metrics

- In the last decade, returns on private infrastructure debt increased strongly. This trend temporarily stalled during the pandemic in 2020 and 2021, and global economic shocks negatively impacted returns in the first half of 2022.
- Despite the decline in infrastructure investment returns, private investors are allocating more capital than ever to infrastructure to mitigate inflation risk.
- Even after private infrastructure debt returns declined due to global economic shocks in the first half of 2022, historically private infrastructure debt has provided attractive returns at low risk.
- Private infrastructure debt provided the highest risk-adjusted return in developed markets over the last decade.
- Private infrastructure debt in the transport sector provided higher risk-adjusted returns than in other sectors over the last decade.

Credit risk metrics

- Cumulatively, default rates for infrastructure debt have been consistently lower than for non-infrastructure debt and this difference strengthened during 2020.
- Infrastructure debt performance continues to improve over time with newer infrastructure debt reaching investment grade faster than older infrastructure debt, particularly in the last decade.

- Infrastructure debt performs better in high-income countries than in middle- and low-income countries, but better than non-infrastructure debt in all countries, and this improved during 2020 despite the shocks of the pandemic.
- Infrastructure debt performs differently by region. Eastern Europe, Latin America, and Oceania have the highest default rates.
- Infrastructure debt performance varies by sector, with telecommunications exhibiting relatively higher risk in high-income as well as in middle- and low-income countries.
- Debt performance improved in most infrastructure sectors during the pandemic in high-income, as well as in middle-income and low-income countries.
- Infrastructure debt default risk is lower for public-private partnerships (PPPs) than for non-PPPs. In 2020, default rates declined mostly for PPPs in middle- and low-income countries.
- Ultimate recovery rates following default are higher for infrastructure debt than for non-infrastructure debt.
- Expected losses from infrastructure debt defaults are low in high-income countries.
- Infrastructure as an asset class continues to be an attractive investment option for portfolio optimisation, particularly for investors with low risk-appetite and long investment horizon.

Infrastructure investment performance

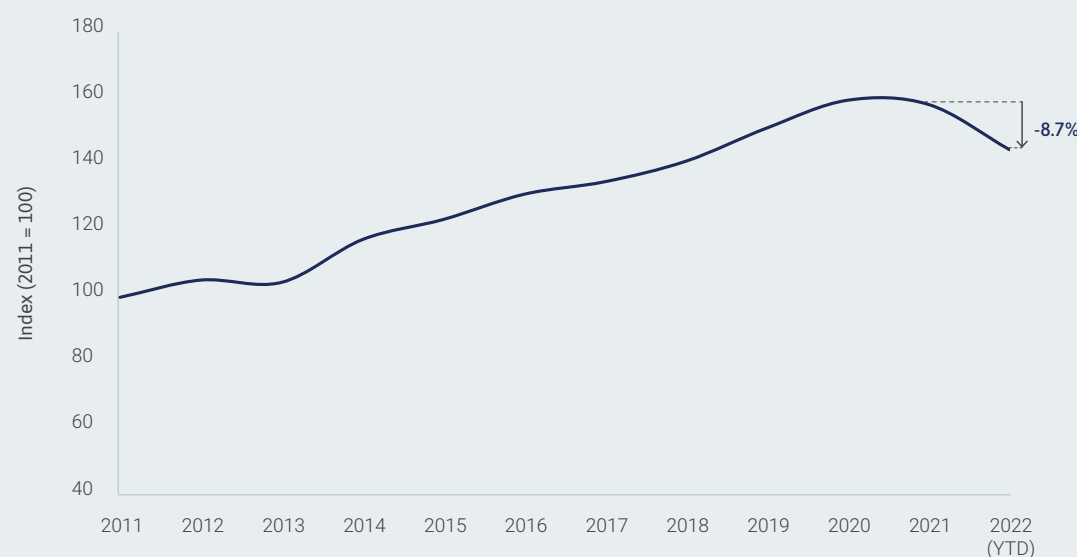
Infrastructure debt performance

Risk and return metrics

In the last decade, returns on private infrastructure debt increased strongly. This trend temporarily stalled during the pandemic in 2020 and 2021, and global economic shocks negatively impacted returns in the first half of 2022.

- Returns on private infrastructure debt were consistently positive over the preceding decade up to the onset of the pandemic.
- In 2020 and 2021, index levels remained resilient notwithstanding the pandemic, but in the first half of 2022 declined by 8.7%, sharply reversing the consistent growth trend. While dividend yield has remained stable, lower market valuations have negatively impacted capital appreciation.
- The consistent growth from 2011 to 2021 occurred in a low-interest rate environment, where investors searching for higher returns found private infrastructure debt attractive on account of its lower risk than other investment options. However, rising interest rates in 2022 prompted investors to move towards other less risky fixed-income assets. Rising rates have thus contributed to the decline of demand for and return on private infrastructure debt.
- Rising rates also affected risk, but to a much lesser extent. As of June 2022, average annualised risk over the past three years was 5.0%, slightly up from 4.2% over the past five years, and 4.0% over the past 10 years.

Cumulative gross returns performance of private infrastructure debt (index)



Source: EDHECInfra (2022a) as of 2022.

Note: Unlisted infrastructure debt performance is measured by EDHECInfra's InfraDebt 300 index. Gross returns is a measure of overall market performance of the index, captured through capital appreciation in market value plus net income accrual relative to the initial value of the asset.

Infrastructure investment performance

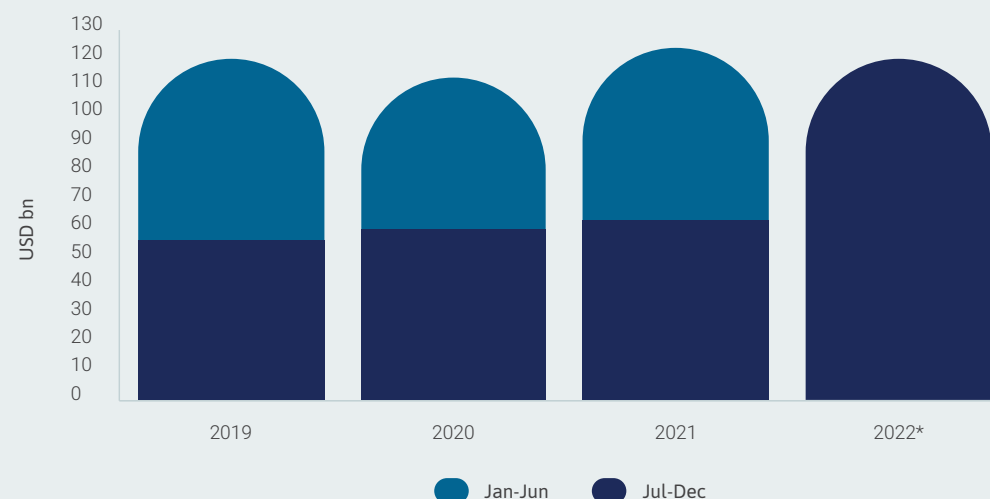
Infrastructure debt performance

Risk and return metrics

Despite the decline in infrastructure investment returns, private investors are allocating more capital than ever to infrastructure to mitigate inflation risk.

- Despite rising interest rates driving down returns on infrastructure assets, the asset class remains attractive for private investors on account of its relatively stronger inflation-hedging potential than that of other investment options. High inflationary pressures in 2022 are driving private investors to allocate capital towards investment options that provide inflation protection. (Preqin, 2022b).
- Infrastructure investments provide a good hedge against inflation because the cashflows that underpin them are either inelastic or are indexed to inflation, providing a means to pass-through rising costs to the end-user (BlueOrchard, 2022). Most infrastructure assets have an explicit link to inflation through regulation, concession agreements or contracts. Infrastructure assets without an explicit link often have the pricing power to deliver a similar (or better) outcome reflecting their strong strategic position (Colonial First State, 2018).
- Infrastructure equities have historically proved capable of delivering returns well in excess of inflation. For 2011-2021, private infrastructure debt, listed infrastructure equities, and unlisted infrastructure equities have respectively delivered accumulated returns of 59%, 69% and 181%, well above the 27% accumulated world inflation over the period (World Bank, Global Development Indicators).
- In recent years, private infrastructure capital raised by funds increased to significant levels as investors with long time horizons sought high-quality infrastructure assets generating stable returns over the longer term, diversification towards sustainable assets, and attractive risk-adjusted basis performance. Even during the pandemic, infrastructure demand remained at an all-time high. In the last decade, private infrastructure capital raised per annum quadrupled from about USD30 billion in 2010 to USD128 billion in 2021.
- Despite the sluggish economic activity and the heightened uncertainty during the pandemic, and the decline in returns in the first half of 2022, investors are allocating more capital than ever towards the infrastructure asset class to mitigate inflation risk.

Annual private infrastructure capital raised by funds
(USD bn)



Source: Preqin (2022b). Data as of 12 July 2022.
*2022 figures only include data from the first half of 2022.

- In 2020 and 2021, private infrastructure capital raised by infrastructure funds reached a record USD122 billion and USD128 billion respectively, continuing the sustained growth. In 2022, the level of capital raised had already reached USD122 billion in the first half. If the trend continues, by the end of 2022 capital raised will be significantly higher, reaching a new record.

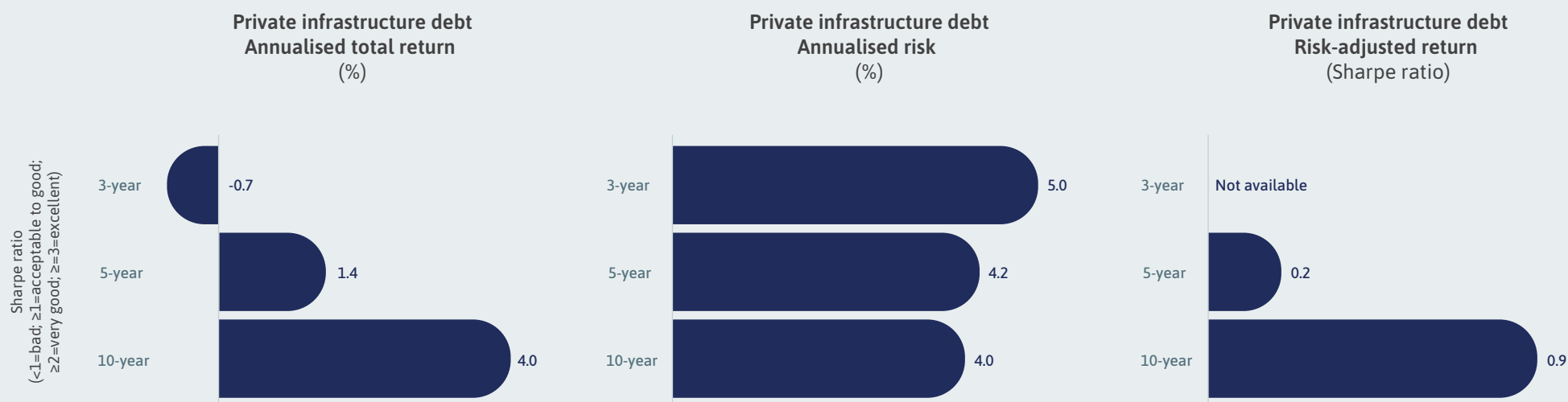
Infrastructure investment performance

Infrastructure debt performance

Risk and return metrics

Even after private infrastructure debt returns declined due to global economic shocks in the first half of 2022, historically private infrastructure debt has provided attractive returns at low risk.

- Although private infrastructure debt returns were resilient during the pandemic, economic shocks during the first half of 2022 reduced the annualised return in the short term, primarily due to a decline in capital returns as the market value of private infrastructure debt fell with the rise in interest rates. Still, private infrastructure debt historically has provided high returns.
- Annualised risk on private infrastructure debt was relatively stable at 4% over the last 10 years.
- These historically high returns and moderate stable risk are reflected in historically risk-adjusted returns.



Source: EDHECInfra as of June 2022.

Note: Private infrastructure debt performance is measured by the InfraDebt300 index, which represents the performance of the most recent senior debt instruments issued by the constituents of the infra300® unlisted infrastructure equity index. Annualised risk is measured through the standard deviation of returns for the index. The Sharpe ratio is the ratio of excess returns to the standard deviation of returns adjusted for skewness and kurtosis.

Infrastructure investment performance

Infrastructure debt performance

Risk and return metrics

Private infrastructure debt provided the highest risk-adjusted return in developed markets over the last decade.

- Developed markets provided higher risk-adjusted returns on private infrastructure debt than did emerging markets.
- Europe and the Asia-Pacific provided higher risk-adjusted returns for private infrastructure debt than did the Americas.

Private infrastructure debt 10-year risk-adjusted returns (Sharpe ratio)



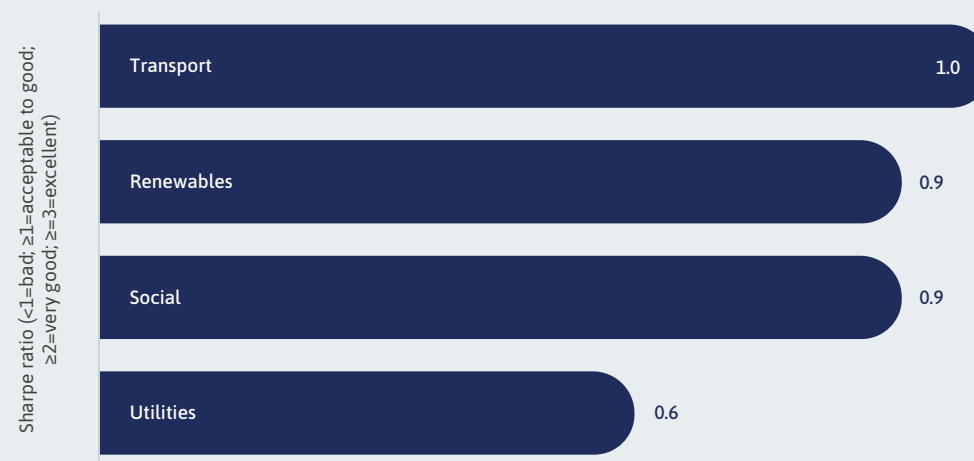
Source: EDHECinfra as of June 2022.

Note: Private infrastructure debt performance is measured by the InfraDebt300 index, which represents the performance of the most recent senior debt instruments issued by the constituents of the infra300® unlisted infrastructure equity index. Sharpe ratio is the ratio of excess returns to the standard deviation of returns adjusted for skewness and kurtosis.

Private infrastructure debt in the transport sector provided higher risk-adjusted returns than in other sectors over the last decade.

- The transport sector has shown higher risk-adjusted returns over the long term than other sectors, boosted by strong demand after the winding down of pandemic lockdowns.
- The renewables and social sectors provided good risk-adjusted returns, supported by a strong global focus on decarbonisation and post-pandemic recovery.

Private infrastructure debt 10-year risk-adjusted returns by sector (Sharpe ratio)



Source: EDHECinfra as of June 2022.

Note: Sharpe ratio is the ratio of excess returns to the standard deviation of returns adjusted for skewness and kurtosis. Sectors presented are based on MSCI GICS classification for listed infrastructure and EDHECinfra classification for unlisted infrastructure.

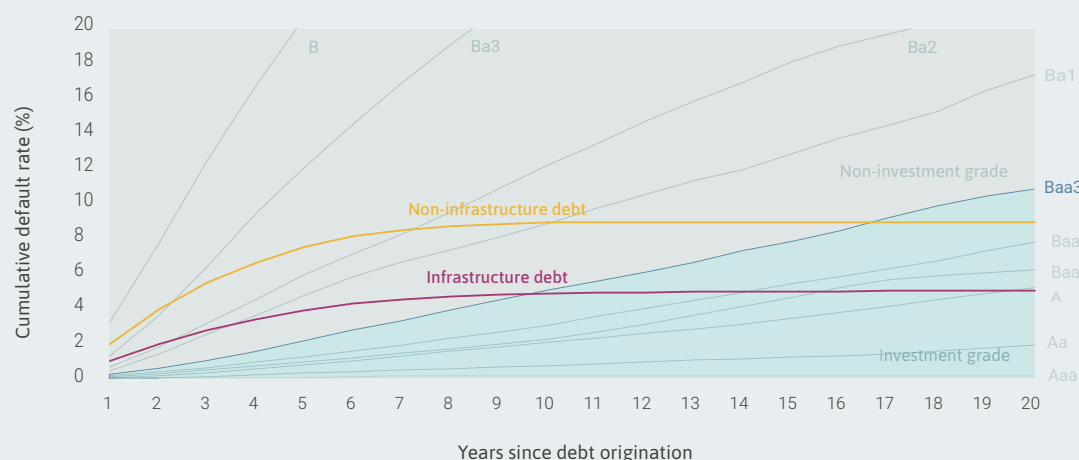
Infrastructure investment performance

Infrastructure debt performance

Credit risk metrics

Cumulatively, default rates for infrastructure debt have been consistently lower than for non-infrastructure debt and this difference strengthened during 2020.

20-year cumulative default rate by sector



Source: Moody's (2022). Data as of 2020.

Note: Throughout this section, 'infrastructure debt' refers to unrated private / unlisted project finance debt. Cumulative default rates associated with Moody's debt credit ratings for investment and non-investment grade securities are shown in the background of the default curves being Baa3 (BBB-) rating the frontier between investment and non-investment grade. This analysis of infrastructure credit risk metrics includes data to 2020. Therefore, the cumulative trends of the effect of the pandemic (2020) are analysed in this report.

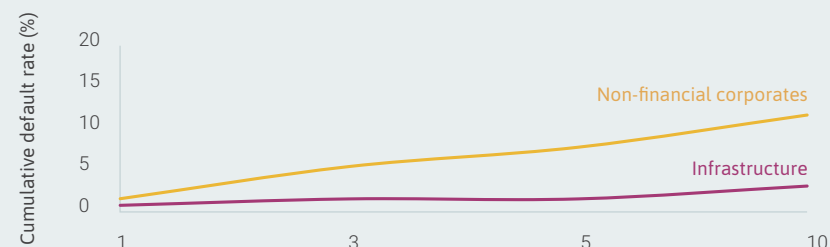
20-year cumulative default rate

	1983-2020		1983-2019
Infrastructure	5.0%	↓	5.4%
Non-infrastructure	8.9%	↑	8.2%

Source: Moody's (2022). Data as of 2020.

- Infrastructure debt exhibits an increasing cumulative default risk during the initial years of the loan, but the risk increase slows as the loan matures and then stabilises by year 10, after which the debt performs as an investment-grade security.
- Non-infrastructure debt exhibits a similar cumulative increase in default risk – but with higher marginal default rates during the initial years of the loan until the risk stabilises – and performs as an investment-grade security by year 17.
- The cumulative performance of non-infrastructure debt deteriorated during the pandemic in 2020, while in contrast infrastructure debt withstood the shocks of the pandemic successfully, and its performance improved.
- Cumulatively, default rates for rated infrastructure debt securities also have been consistently lower than for non-financial corporate debt over time. By year 10, the cumulative default rates were 4% for infrastructure debt, and 15% for non-financial corporate debt.

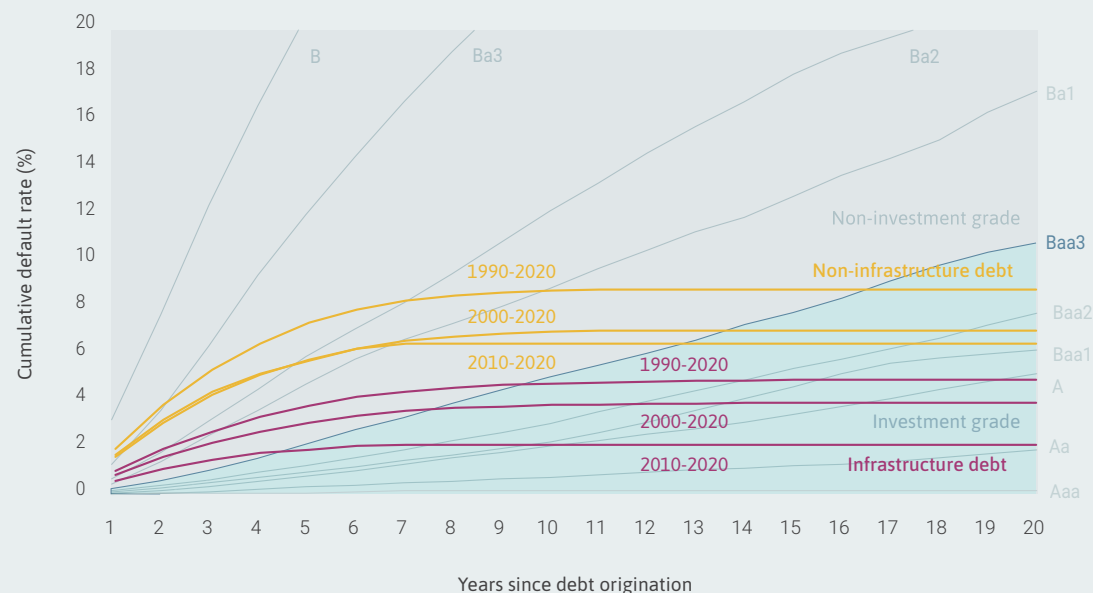
Rated debt securities 10-year cumulative default rate by sector



Source: Moody's (2021). Data as of 2020.

Infrastructure debt performance continues to improve over time with newer infrastructure debt reaching investment grade faster than older infrastructure debt, particularly in the last decade.

20-year cumulative default rate by origination year



Source: Moody's (2022). Data as of 2020.

Note: Considering that infrastructure debt default rates stabilise by approximately year 10 after debt origination, defaults may still occur for projects originated after 2010. Although these results may shift the three curves higher, the gaps between them will remain. Debt composition in terms of region, income group, and subsector did not change for the three curves.

- As the default curve excludes older infrastructure loans, infrastructure debt becomes less risky and performs faster as an investment grade security.
- For the sample, debt composition by region, income group and sector has remained the same over time.
- From 1990 to 2020 inclusive, infrastructure debt had an average cumulative default rate of 4.9% and performed as an investment-grade security by year 10, while 8.8% was the equivalent for non-infrastructure debt, which performed as an investment-grade security by year 17.
- From 2000 to 2020 inclusive, infrastructure debt had an even lower average cumulative default rate of 3.9%, performing as an investment-grade security by year 8; while non-infrastructure debt had an average cumulative default rate of 7%, and performed as an investment-grade security by year 14.
- From 2010 to 2020 inclusive, infrastructure debt had an even lower average cumulative default rate of 2.1%, performing as an investment-grade security by year 5; while non-infrastructure debt had an average cumulative default rate of 6.5% and performed as an investment-grade security by year 13.
- Infrastructure debt withstood the shocks of the pandemic successfully in 2020, and its performance improved; in contrast the cumulative performance of non-infrastructure debt deteriorated.

Infrastructure investment performance

Infrastructure debt performance

Credit risk metrics

Infrastructure debt performs better in high-income countries than in middle- and low-income countries, but better than non-infrastructure debt in all countries, and this improved during 2020 despite the shocks of the pandemic.

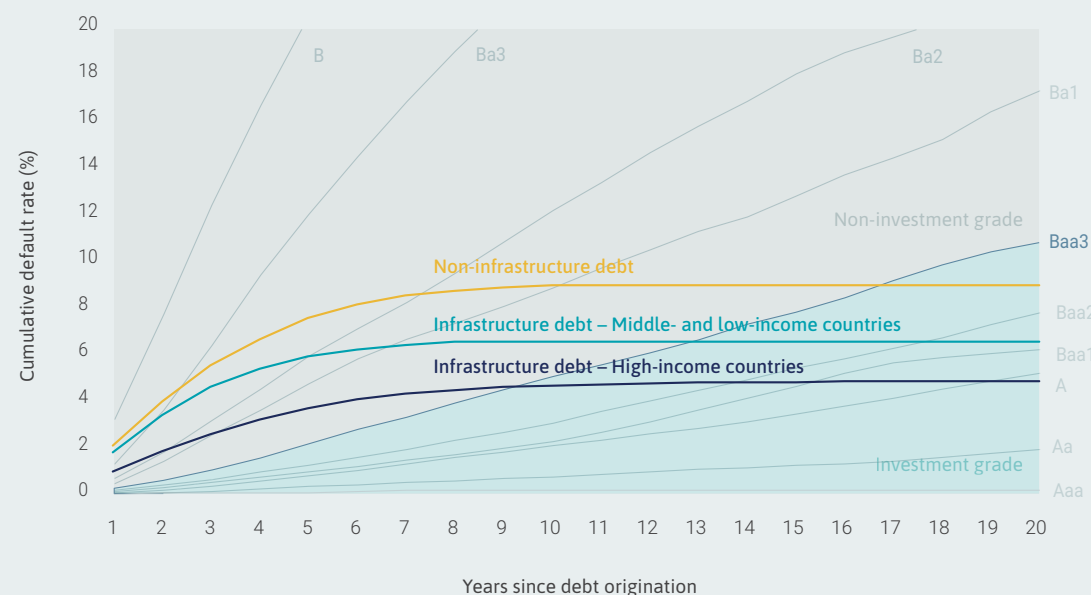
- Default rates for infrastructure debt in high-income as well as in middle- and low-income countries have remained beneath the non-infrastructure debt default rates, throughout the loan duration.
- Cumulative default rates for infrastructure debt in high-income countries remain significantly below those in middle- and low-income countries over the life of the debt. However, the gap between the marginal default rates in high-income as well as in middle- and low-income countries decreases over time.
- Infrastructure debt in high-income countries performs as an investment-grade security by year 10, and in middle- and low-income countries by year 13, while non-infrastructure debt performs as an investment-grade security by year 17.
- Contrary to expectations, in 2020 infrastructure debt performance improved in high-income as well as in low- and middle-income country groups, successfully withstanding the shocks of the pandemic.

20-year cumulative default rate

	1983-2020	1983-2019
High-income countries	4.8% ↓	5.2%
Middle- and low-income countries	6.5% ↓	7.0%

Source: Moody's (2022). Data as of 2020.

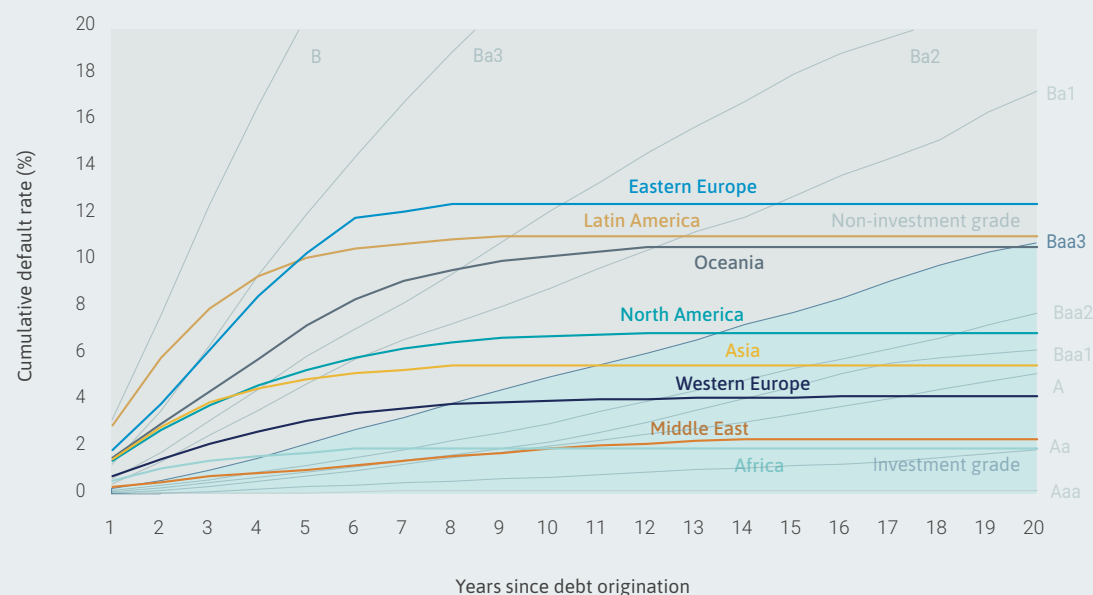
20-year cumulative default rate by sector and income group



Source: Moody's (2022). Data as of 2020.

Infrastructure debt performs differently by region. Eastern Europe, Latin America and Oceania have the highest default rates.

20-year cumulative default rate by region



Source: Moody's (2022). Data as of 2020.

Eastern Europe, Latin America, and Oceania have the highest default risk. In fact, default rates for infrastructure debt in these regions are higher than non-infrastructure debt. In 2020, default rates worsened in each of these regions to a smaller or larger extent. While default rates for infrastructure debt increased significantly in Oceania, they increased only slightly in Latin America, and remained almost the same for Eastern Europe.

Infrastructure debt default rates are lowest in the Middle East and Africa. However, the sample size of projects for these regions is small, and the projects analysed may have guarantees that significantly offset high risks. In 2020, default rates worsened in both regions.

North America, Western Europe, and Asia have better default rates (4% to 6.6% in a 20-year period). In 2020, default rates improved in these regions, and they withstood the shocks of the pandemic successfully.

20-year cumulative default rate

	1983-2020		1983-2019
Middle East	2.2%	↑	1.2%
Africa	1.8%	↑	1.1%
Western Europe	4.0%	↓	4.6%
Asia	5.2%	↓	5.9%
North America	6.6%	↓	6.8%
Oceania	10.1%	↑	7.3%
Latin America	10.5%	↑	10.3%
Eastern Europe (non-investment grade)	11.84%	↑	11.82%

Source: Moody's (2022). Data as of 2020.

Infrastructure investment performance

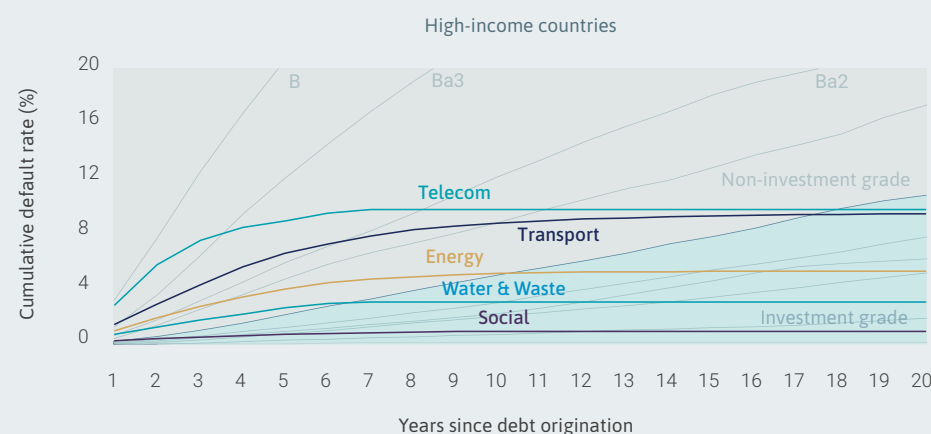
Infrastructure debt performance

Credit risk metrics

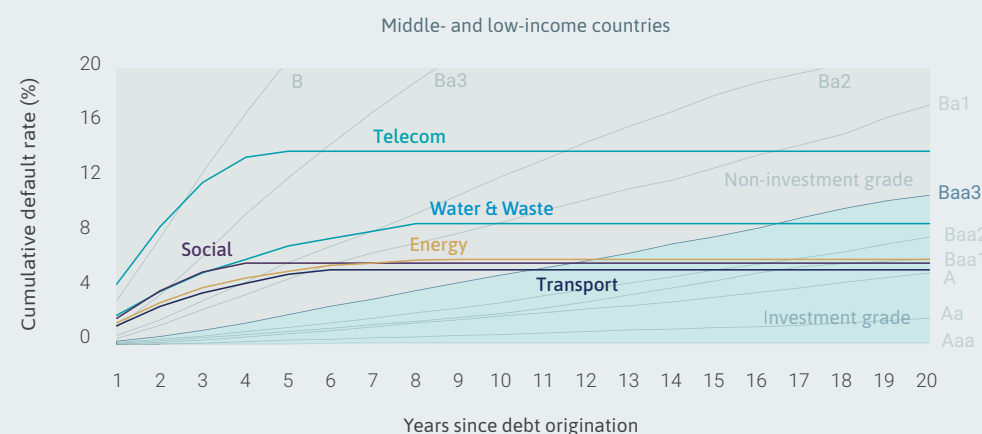
Infrastructure debt performance varies by sector, with telecommunications exhibiting relatively higher risk in high-income as well as in middle- and low-income countries.

- Cumulative default rates are lower in high-income countries than in middle- and low-income countries for all sectors except transport. In general, infrastructure markets in high-income countries are more experienced, which reduces risk. In high-income countries, there is also a higher likelihood of better-prepared projects being selected than in middle- and low-income countries.
- The telecommunications sector has high cumulative default risk compared to other sectors. Disruptive innovations and the Internet of Things (IoT) have meant that high levels of investment are required in this sector, while competition has significantly driven down retail prices in most countries. The associated higher debt stress and risk of default is evident, especially in middle- and low-income countries.
- The social sector and the water and waste sector in middle- and low-income countries are riskier because they are less mature. There is also less experience in these countries, and more social complexity, which makes investments riskier.
- The exception is the transport sector where debt is riskier in high-income countries. This may be because in high-income countries, market risks are higher due to variances in price and volume assumptions, there is more competition, and there are fewer risk mitigation mechanisms than in developing economies. Particularly for roads, which represents the largest share of the transport sample, there is risk associated with traffic demand forecasting because it depends on individuals; it is difficult to quantify demand risk and allocate associated risk. Tolls tend to reduce traffic, making it harder to satisfy debt servicing, much less derive a sufficient return on investment. In contrast, in developing economies the government typically guarantees a minimum demand, which lowers the risk profile.

20-year cumulative default rate by subsectors and income group



Source: Moody's (2022) Data as of 2020..



Source: Moody's (2022) Data as of 2020.

Infrastructure investment performance

Infrastructure debt performance

Credit risk metrics

Debt performance improved in most infrastructure sectors during the pandemic in high-income, as well as in middle-income and low-income countries.

- In 2020, infrastructure debt performance improved for all infrastructure sectors, which withstood the shocks of the pandemic successfully in high-income countries as well as in middle- and low-income countries.
- The exception was the telecommunications sector, in which risk increased in high-income countries resulting in the highest cumulative default risk compared to other sectors in high-income countries. This was partly due to the revenue decline generated by the lockdown mostly in Europe driven by a reduction in use of roaming functionality due to travel restrictions, a decline in equipment sales as a result of store closures, and the postponement of in-premise customer installations (International Telecommunication Union, 2020). In middle- and low-income countries, debt performance improved slightly for the telecommunications sector but still did not reach investment grade performance throughout the loan duration in 2019 and 2020. Disruptive innovations in this sector frequently result in greater need for investment to develop new infrastructure while lowering returns on older investments, which has added to default risk and debt stress.
- The most significant improvement in performance during the pandemic was in the social sector in middle- and low-income countries, as governments became more attentive to the needs of this sector. With the inclusion of 2020 data, the 20-year cumulative default rate fell from 9.0% to 5.9% in middle- and low-income countries and the number of years to achieve investment grade performance fell from 17 years to 12 years.

20-year cumulative default rate

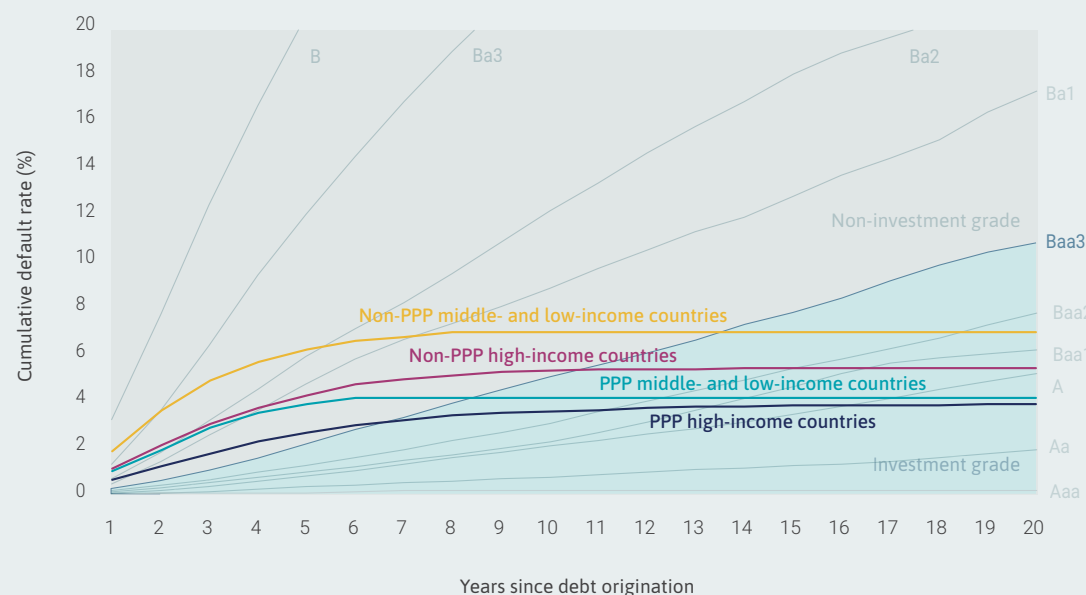
	1983-2020	1983-2019
High-income countries		
Social	0.9%	0.9%
Water	3.1% ↓	3.4%
Energy	5.3% ↓	5.8%
Telecommunications	9.8% ↑	9.1%
Transport	9.5% ↓	10.2%
Middle- and low-income countries		
Transport	5.4% ↓	6.5%
Social	5.9% ↓	9.0%
Energy	6.1%	6.1%
Water	8.8% ↓	9.6%
Telecommunications (non-investment grade)	14.0% ↓	14.4%

Source: Moody's (2022). Data as of 2020.

Note: The study sample for telecommunications sector includes media distribution, which may also explain the worsened performance in 2020 amidst the pandemic.

Infrastructure debt default risk is lower for public-private partnerships (PPPs) than for non-PPPs. In 2020, default rates declined mostly for PPPs in middle- and low-income countries.

20-year cumulative default rate by contract and income group



- Cumulative default risk has been consistently lower for infrastructure debt for PPP projects than for non-PPP projects in high-income as well as in middle- and low-income countries.
- In 2020, despite the pandemic, infrastructure debt performance improved for PPP as well as for non-PPP projects, especially for PPP projects in middle- and low-income countries.

20-year cumulative default rate

	1983-2020		1983-2019
High-income countries			
PPPs	3.9%	↓	4.3%
Non-PPPs	5.4%	↓	5.8%
Middle- and low-income countries			
PPPs	4.2%	↓	5.1%
Non-PPPs	7.0%	↓	7.3%

Source: Moody's (2022). Data as of 2020.

Infrastructure investment performance

Infrastructure debt performance

Credit risk metrics

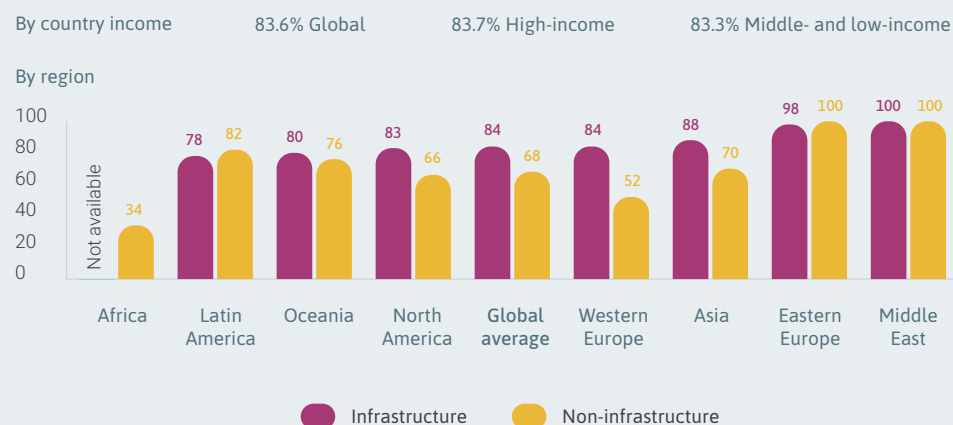
Ultimate recovery rates following default are higher for infrastructure debt than for non-infrastructure debt.

- Globally, infrastructure debt had a recovery rate of 83.6% in 2020, slightly higher than the 2019 rate of 83.3%. This recovery rate for infrastructure debt has been consistently and significantly higher than for non-infrastructure debt (67.8% in 2020).
- Recovery rates were roughly similar across country income groups in 2020. For high-income countries, the rate improved from 81.6% in 2019 to 83.7% in 2020 and declined slightly for middle- and low-income countries from 84.3% in 2019 to 83.3% in 2020.
- All regions except for Latin America and Eastern Europe have higher recovery rates for infrastructure debt than for non-infrastructure debt. This is especially true in

Western Europe where the infrastructure debt recovery rate was 84.0% in 2020, while that of non-infrastructure debt was 52.1%.

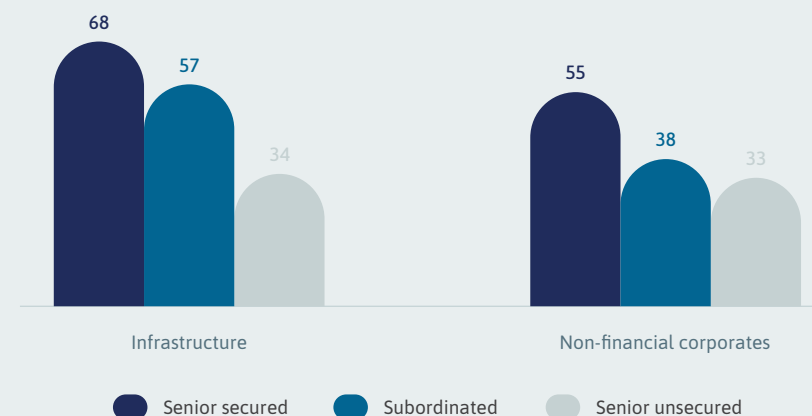
- Although these recovery rates are based on unrated project finance debt, they also hold for recovery rates for rated infrastructure debt securities, which have also been consistently higher than for non-financial corporate debt.
- Performance data strongly suggest that infrastructure as an asset class is much less risky than other assets such as corporate debt and bonds.

Unrated debt ultimate recovery rate by income group, region and sector (%)



Source: Moody's (2022). Data as of 2020.

Rated private debt trading recovery rates by type of security (%)



Source: Moody's (2021). Data as of 2020.

Note: Trading recovery rates are estimated by the average trading prices on an issuer's bonds 30 days after its initial missed payment or bankruptcy filing.

Expected losses from infrastructure debt defaults are low in high-income countries.

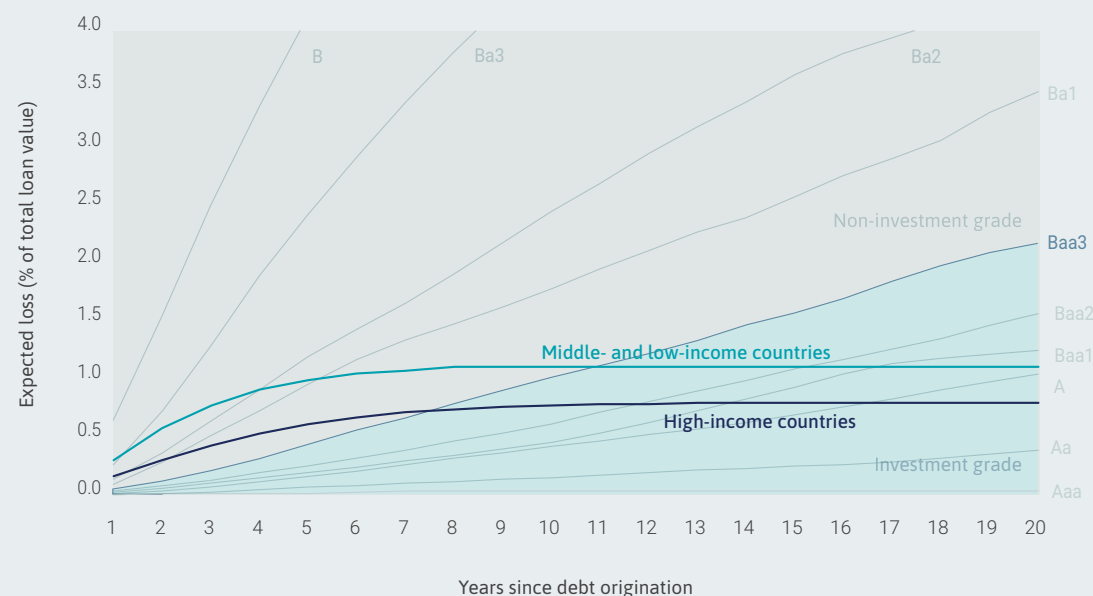
- Expected losses – defined as the proportion of debt value expected to be lost from potential infrastructure debt defaults – are low for infrastructure debt, the result of high recovery rates and low probabilities of default.
- The cumulative expected loss for high-income countries increased during the pandemic from the 2019 rate of 0.5% to 0.8% in 2020 (still lower than the 1.1% expected loss of an investment-grade security (A-rated)).
- In contrast, with the pandemic the cumulative expected loss for middle- and low-income countries declined from the 2019 rate of 2.5% (which was higher than that of any investment-grade security) to 1.1% in 2020 (similar to the 1.1% expected losses of an investment-grade security (A-rated)).
- Expected loss results are based on unrated project finance debt. Rated infrastructure debt is also less likely to incur credit losses than non-financial corporate debt. Over 10 years, credit losses as a percentage of face value were 0.5% for infrastructure debt and 8.9% for non-financial corporates.

Rated private debt credit losses by sector
(% of face value)

	Over 5 years	Over 10 years
Infrastructure debt	0.3%	0.5%
Non-financial corporates	6.0%	8.9%

Source: Moody's (2021). Data as of 2020.

Unrated infrastructure debt 20-year cumulative expected loss by income group
(% of total loan value)



Source: Moody's (2022). Data as of 2020.

Infrastructure investment performance

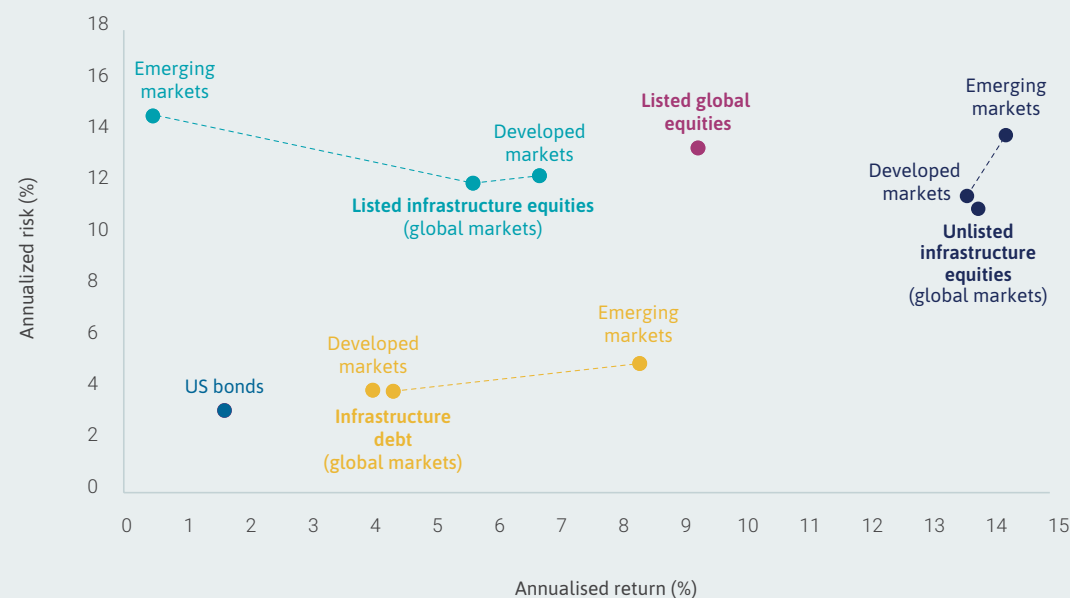
Infrastructure debt performance

Credit risk metrics

Infrastructure as an asset class continues to be an attractive investment option for portfolio optimisation, particularly for investors with low risk-appetite and long investment horizon.

- Infrastructure as an asset class continues to provide a wide range of attractive investment options.
- Over a 10-year period, returns on infrastructure debt were higher than returns on 10-year government bonds in developed markets, at slightly higher risk.
- Listed infrastructure equities in developed markets provided returns comparable to listed global equity returns, but at a lower risk.
- Unlisted infrastructure equities provided significantly higher returns at a lower risk than listed global equities, which is why the popularity of unlisted infrastructure equities among investors has increased over time.
- In emerging markets, unlisted infrastructure equities are attractive as they provide higher returns than listed global equities at roughly the same level of risk, while in developed markets they provide higher returns than listed global equities at a lower risk.
- According to Preqin (2022a), including infrastructure assets in the portfolio mix helps reduce portfolio risk without sacrificing returns. But moving up the risk spectrum, the impact of adding infrastructure assets becomes smaller. For low-risk portfolios, it could be efficient to allocate 30% of the portfolio to infrastructure but this weight would decline as risk appetite increases. Also, infrastructure assets are an attractive investment option for long-horizon portfolios on account of their low correlation with other investment options and their consistent returns.

10-year risk-return by asset class



Source: MSCI (2022), EDHECinfra (2022a) S&P (2022)

Note: Estimation methodology and calculations vary across index providers.

Availability of private capital for infrastructure

Availability of private capital for infrastructure

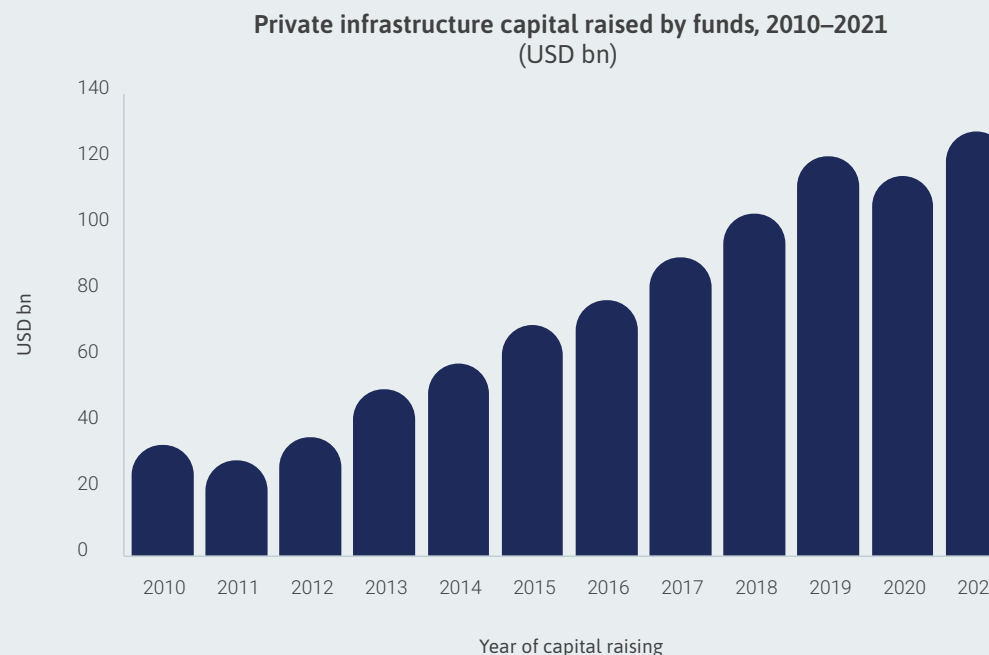
Key findings

- The amount of private capital available for infrastructure has more than quadrupled over the last 10 years. Most private capital is raised in North America and Europe.
- Greater availability of private capital for infrastructure has translated into more investment.
- Infrastructure capital investment has been concentrated in North America, Europe, and Asia over the last decade.
- Capital investment continues to provide high returns, attracting yet more private capital for infrastructure.
- The greater market value of infrastructure funds' investments reflects greater availability of capital but also greater levels of dry powder.
- Some regions have attracted more infrastructure AUM than other regions.
- Limited availability of projects and high hurdle rates have led to a significant accumulation of dry powder, mostly in North America and Europe.
- Private capital raised for greenfield infrastructure projects is harder to invest than capital raised for brownfield and secondary projects.

Availability of private capital for infrastructure

The amount of private capital available for infrastructure has more than quadrupled over the last 10 years.

- Funds use private capital to invest in infrastructure equities or in infrastructure companies. The options available to private investors are determined by what is available in the retail funds management market. Some private investors invest directly in infrastructure at the project level.
- In the last decade, private infrastructure capital raised by funds quadrupled from about USD34 billion in 2010 to USD129 billion in 2021.
- During the pandemic, the volume of capital raised dropped slightly, but it remained above the 2018 level and recovered to a new record of USD129 billion in 2021. Early in 2022, private infrastructure capital raised by infrastructure funds had already reached 2021 levels (USD122 billion); if the trend continues, capital raised by the end of 2022 is expected to hit a new record high.
- This increase reflects the growth in the number of investors with long time horizons who are seeking high-quality infrastructure assets that generate stable, long-term returns; diversification focused on sustainable assets; and attractive risk-adjusted performance.
- Despite a decline in returns due to rising interest rates in the first half of 2022, the asset class remains attractive for private investors as its inflation-hedging potential is relatively stronger than that of other investment options. Investors are allocating more capital than ever towards infrastructure to mitigate inflation risk.



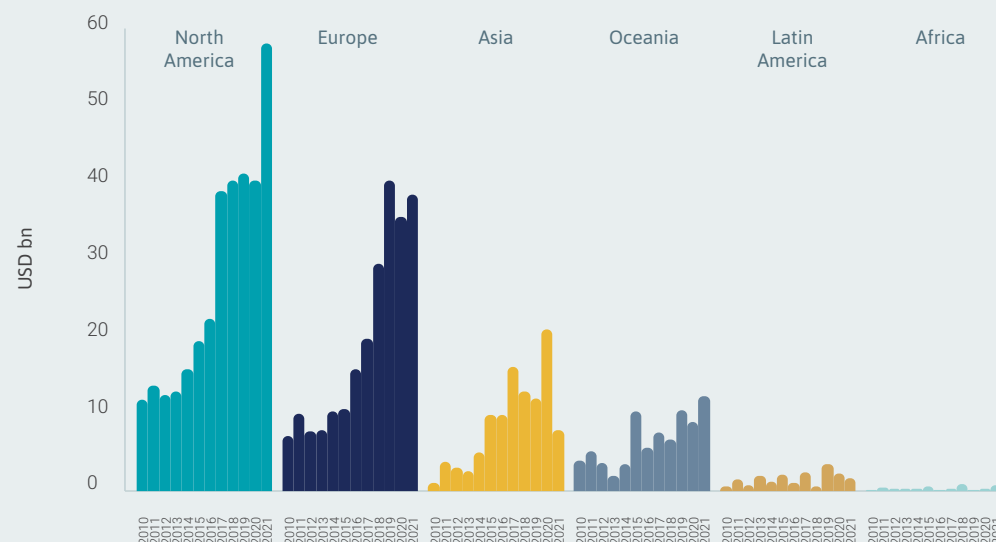
Source: Preqin (2022c) data as of 23 September 2022.

Availability of private capital for infrastructure

Most private capital is raised in North America and Europe.

- Globally, most private infrastructure capital was raised in North America and Europe over the last 10 years, and especially over the last six years. In 2020, due to the pandemic, the amount of capital raised in those regions declined slightly, but in 2021 the amount continued its previous upward trend.
- On average, Asia attracted only 13% of the total private capital for infrastructure from 2020 to 2021. However, of all the regions, Asia recorded the biggest increase since 2010, growing almost seven times. Asia is also the only region in which the amount of private capital raised for infrastructure increased in 2020 over the previous year. This increase was followed in 2021 by a 62% decline, as fewer projects reached financial close due to an uneven post-pandemic economic recovery in the region.
- Over the past decade, Oceania, Latin America, and Africa also saw growth in private infrastructure capital flows into funds, but not by enough to increase those regions' share of total capital raised. Capital levels in these regions are significantly smaller than levels in other regions.

Private infrastructure capital raised by funds, by region of origin, 2010–2021
(USD bn)



Source: Preqin (2022c), data as of 7 July 2022.

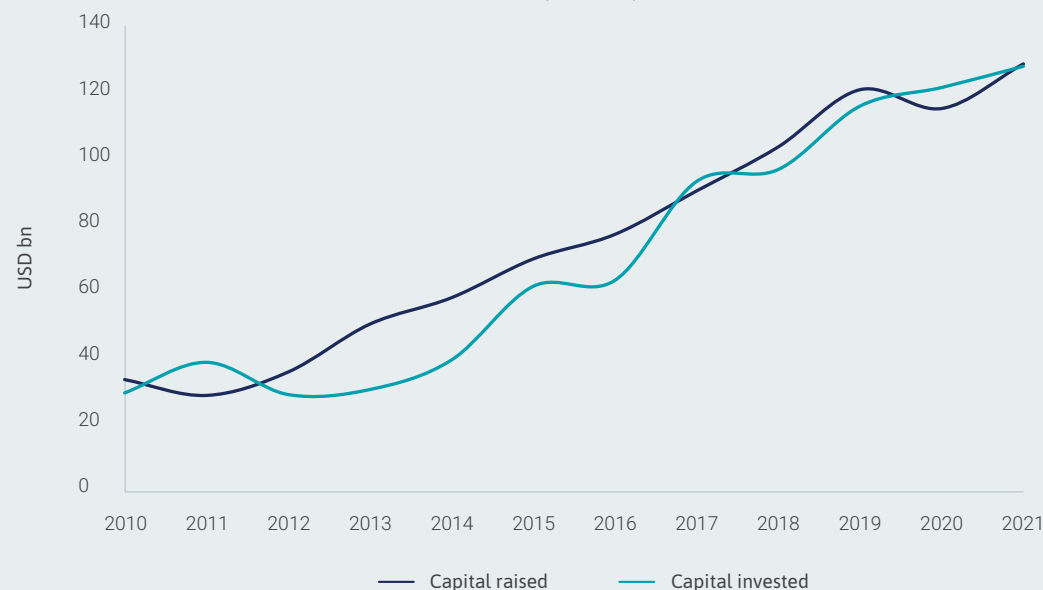
Note: The graph excludes multi-regional funds. Region of origin refers to location of the funds' headquarters.

Availability of private capital for infrastructure

Greater availability of private capital for infrastructure has translated into more investment.

- The availability of more private capital for infrastructure (from more funds raised, funds invested, and reinvestment of gains made on investments) has resulted in an increase in infrastructure investment by funds.
- From 2010 to early 2020 (before the onset of the COVID-19 pandemic), private capital raised generally outpaced private capital invested; the only exception was in 2011. During the pandemic in 2020 and 2021, private capital raised was outpaced by private capital invested.
- Since 2017 the pace of funds being called up for investment was generally able to keep up with funds raised, as fund managers did well in managing higher levels of risk in investing in newer technologies, including digital assets and renewables.

Private infrastructure capital raised and invested by funds, 2010–2021
(USD bn)



Source: Preqin (2022c, 2022h), data as of 23 September 2022.

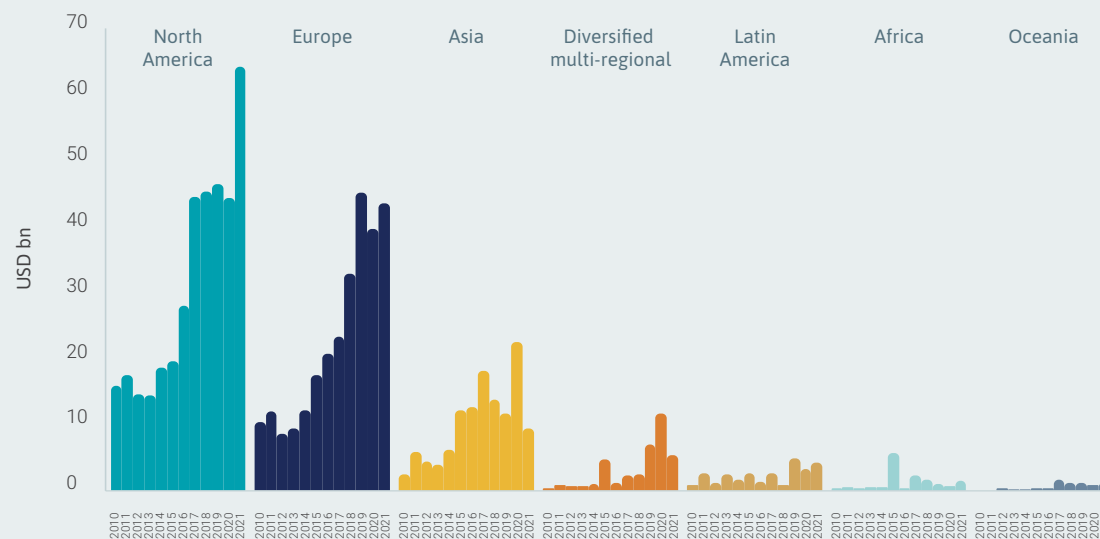
Note: Investment data refers to capital called up for investment. This amount includes management fees. Capital called may exceed 100% due to recycling of capital.

Availability of private capital for infrastructure

Infrastructure capital investment has been concentrated in North America, Europe, and Asia over the last decade.

- Over the last 10 years, most private infrastructure capital was raised for and invested in North America, Europe, and Asia. These regions have also been better able to accelerate investment as they increased the amount of capital raised.
- In almost all regions, capital invested (or committed) decreased during the pandemic in 2020. However, in Asia, capital invested increased during the pandemic.
- The trends reversed in 2021 with investment increasing in several regions, most notably in North America. A sizeable share of the funds raised in North America in 2021 targeted investment in Europe. In Asia, while the funds raised for investment increased in 2021, the invested capital declined.
- In Latin America and Africa, private capital inflows from funds in other regions boosted investment.
- In contrast, Oceania's level of private capital investment points to private capital outflows to other regions.

Private infrastructure capital invested by funds by region, 2010–2021
(USD bn)



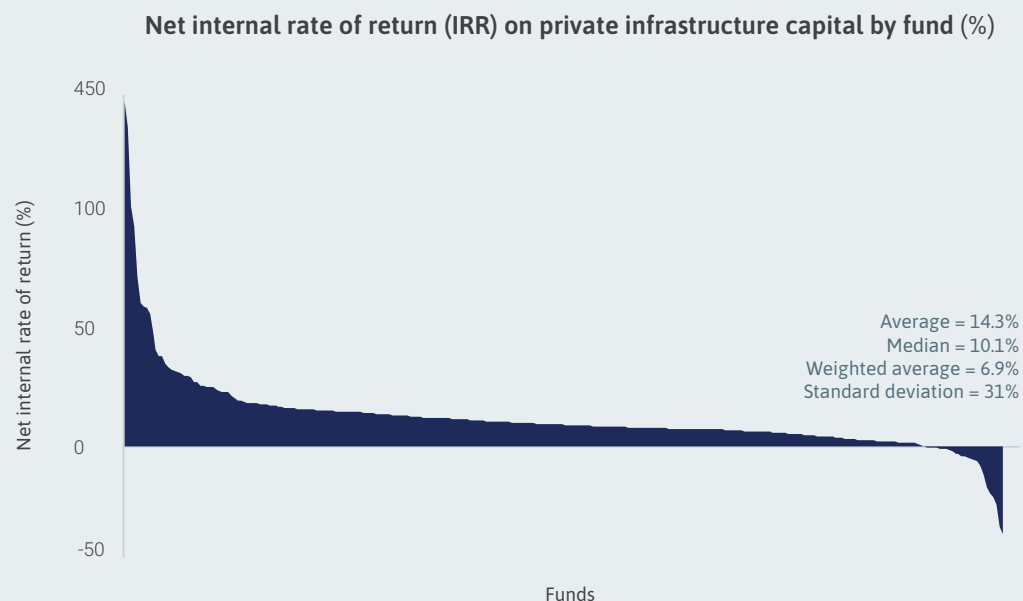
Source: Preqin (2022c), data as of 23 September 2022.

Note: Region of origin refers to location of the funds' headquarters.

Availability of private capital for infrastructure

Capital investment continues to provide high returns, attracting yet more private capital for infrastructure.

- Favorable risk-adjusted returns have continued to attract investor funds into infrastructure. Growth in private capital available for infrastructure is partly due to high returns on these investments.
- On average, funds earned a net internal rate of return (IRR) of 14.3% on invested private infrastructure capital, including earnings plus value of the assets held. The returns varied widely between different funds – the maximum net IRR was 448.0%, driven by higher return expectations fueled by the strong performance of the global commodities market.
- Despite recent increases in market uncertainty in the current economic climate, the median net IRR has remained around 10% over the preceding decade. Median net IRR also remained the same across sectors and regions.
- Returns on invested capital increase the pool of capital available for reinvestment.



Source: Preqin (2022e).

Note: Net IRR is based on realised cash flows as well as the valuation of unrealised assets. These data present net IRR earned by a fund to date (July 2022), after fees and carry, for 280 funds following an infrastructure investment strategy for which net IRR estimates are available.

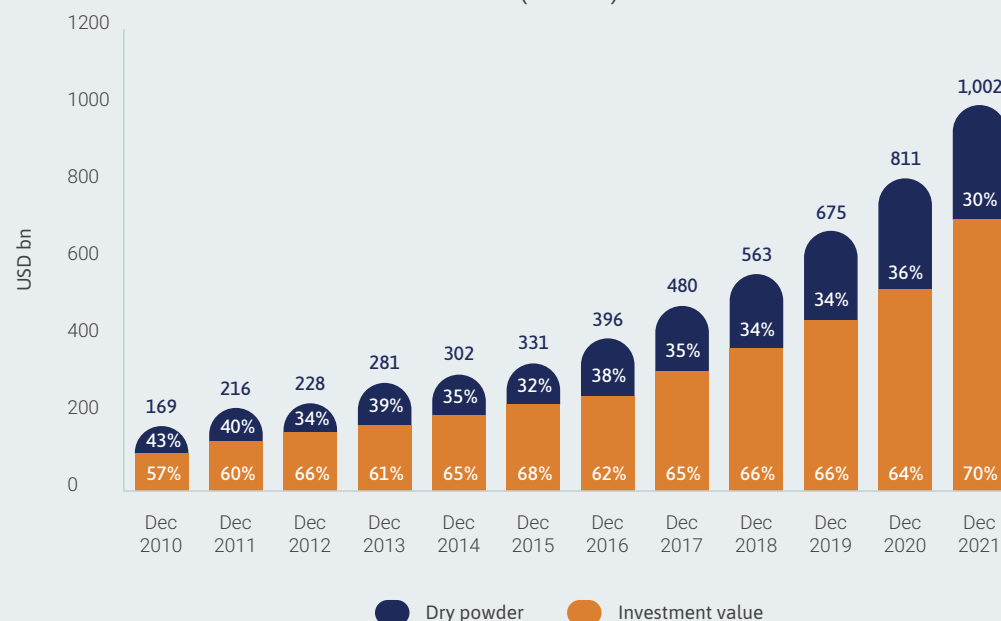
Availability of private capital for infrastructure

The greater market value of infrastructure funds' investments reflects greater availability of capital but also greater dry powder.

- The total market value of infrastructure AUM has grown rapidly from USD170 billion in 2010 to USD1 trillion in 2021 and is poised to reach USD1.87 trillion by 2026 (Preqin (2022g)). This growth indicates that private investors continue to increase allocations of capital to infrastructure assets.
- There are two components to infrastructure AUM:
 - The biggest component, **investment value**, has increased seven-fold from USD97 billion in 2010 to USD704 billion in 2021. Investment value is the market value of portfolio investments in primary and secondary markets (including mark-to-market gains).
 - The second component, **dry powder**, has quadrupled from 2010 (USD72 billion) to 2021 (USD298 billion). Dry powder includes capital committed by investors and available to fund managers but not yet invested or allocated. Capital committed is the sum of unallocated capital and portfolio returns, minus any disbursements to investors. The current record level of dry powder translates into a greater capacity to deploy capital in the short to medium term as new infrastructure investment opportunities arise, especially in a post-pandemic era with rising interest rates.

While dry powder levels are at their highest, in relative terms, dry powder as a percentage of AUM has gradually declined from a high of 43% in 2010 to 30% in 2021, indicating that a higher percentage of AUM has been deployed towards infrastructure investments.

Cumulative infrastructure assets under management, by component, 2010–2021
(USD bn)



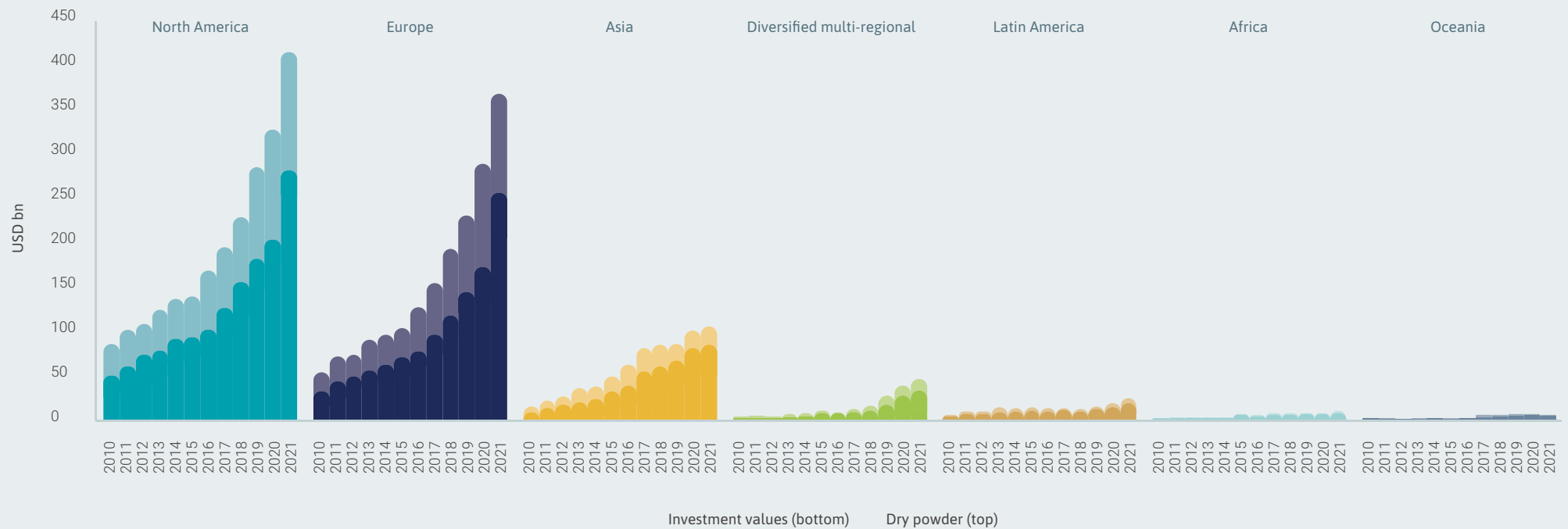
Source: Preqin (2022g), data as of 7 July 2022.

Note: 'Dry powder' refers to capital committed by investors that has not been invested or allocated. Capital committed is the sum of unallocated capital, invested capital, and portfolio returns, minus any disbursements to investors. Preqin's measurement of dry powder includes only close-ended funds, i.e. funds that issue a fixed number of shares through a single initial public offering (IPO) to raise capital for initial investments.

Availability of private capital for infrastructure

Some regions have attracted more infrastructure AUM than others.

Cumulative infrastructure assets under management, by component and region, 2010–2021
(USD bn)

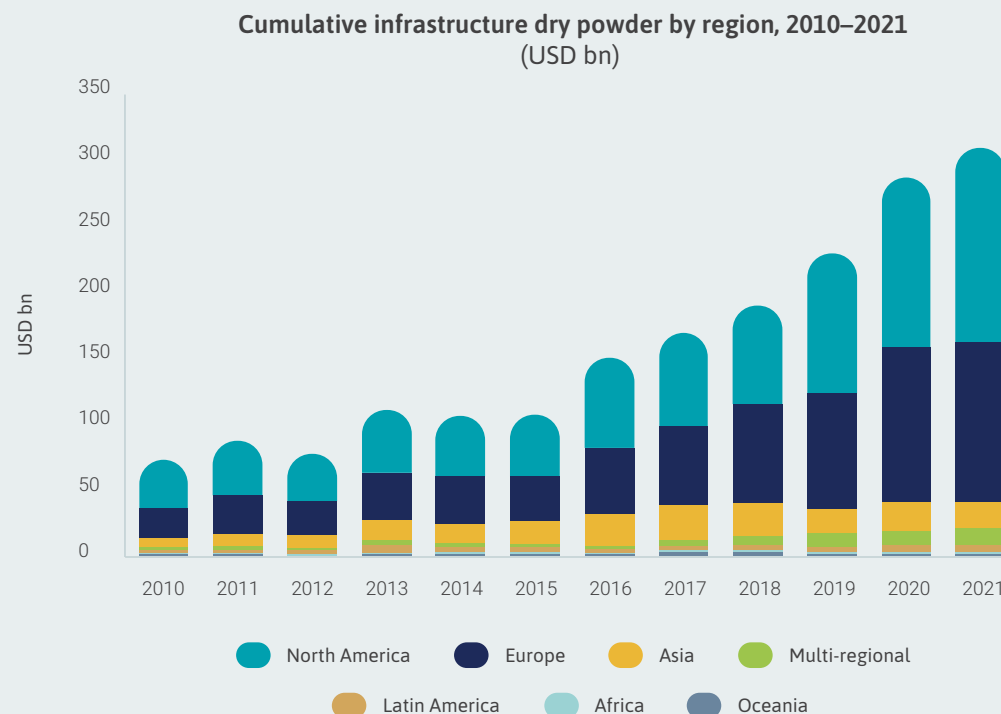


Source: Preqin (2022f), data as of 7 July 2022.
Note: Based on the location of investment focus.

Availability of private capital for infrastructure

Limited availability of projects and high hurdle rates have led to a significant accumulation of dry powder, mostly in North America and Europe.

- There are several possible reasons that available funds are not deployed:
 - The limited availability of bankable infrastructure projects creates a level of demand that exceeds supply of projects. A globally uneven distribution of bankable infrastructure projects exacerbates the shortage of projects.
 - High hurdle rates of infrastructure funds constrain fund managers from investing in infrastructure assets.
 - Trends in hurdle rates have not aligned with trends in returns over time. An analysis of 25 funds established between 2005 and 2021 inclusive, reveals that hurdle rates remained at 8% for over a decade across regions and sectors.
- North America and Europe have experienced a sustained increase in dry powder since 2010. Between 2010 and 2019 these two regions held around 80% of global infrastructure dry powder, a share that increased to more than 86% in 2020 and 2021.
- The current record levels of dry powder provide opportunities for the capital raised to be deployed more quickly as new infrastructure investment opportunities arise, especially in a post-pandemic era with rising interest rates. However, while dry powder represents possibility, it also signifies pressure to allocate those funds, which could lead to investing at elevated prices.



Source: Preqin (2022f), data as of 7 July 2022.

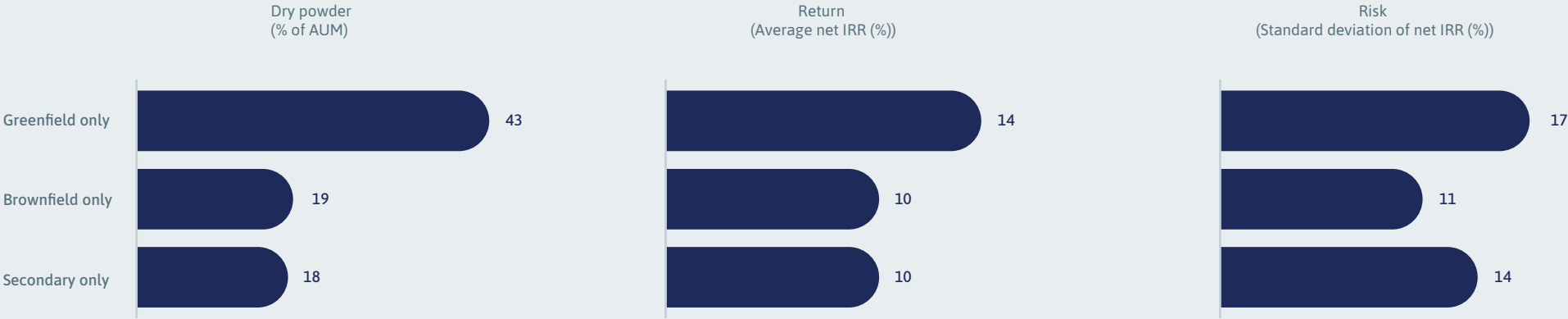
Availability of private capital for infrastructure

Private capital raised for greenfield infrastructure projects is harder to invest than capital raised for brownfield and secondary projects.

Globally, infrastructure funds that targeted only greenfield projects accumulated the highest share of dry powder in AUM over time, due to the lack of bankable and investment-ready infrastructure projects in the pipeline. Volatility in returns was greater for funds that focused on greenfield infrastructure investment than for funds that targeted only brownfield or secondary infrastructure investments. While greenfield projects offered higher returns, they also

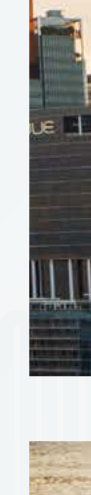
presented higher risk. This indicates that accelerating greenfield infrastructure investments requires more risk mitigation than is currently in place, as well as a higher level of support for infrastructure project preparation. A focus on project preparation can help optimise returns and reduce risks on greenfield projects.

Metrics for a sample of infrastructure funds by project stage



Source: Preqin (2022d).
Note: This analysis is based on 136 funds that were classified to be investing in only greenfield projects (41), only brownfield projects (47), and only secondary projects (48) within the infrastructure asset class and with similar average vintage year, as of June 2022. Outlier funds have not been considered, to avoid distorted results. Net internal rate of return (IRR) is the money-weighted return expressed as a percentage. Net IRR uses realised cash flows after fees and carry, distributions, and value of unrealised assets to derive return earned by a fund manager to date. The estimates were either reported directly by the fund or calculated by Preqin. Return is measured by the average of Net IRR earned by funds, while risk is measured by the standard deviation of the net IRR earned by all constituent funds within selected parameters (taken as a single group).

The role of MDBs in private investment in infrastructure



The role of MDBs in private investment in infrastructure

MDBs play an important role as financiers of private investment in infrastructure in middle- and low-income countries.

This role is particularly important in the current challenging context of stagnant private investment in infrastructure, significant public sector fiscal constraints, the COVID-19 pandemic recovery, recent global economic shocks, and the need to work towards achieving the UN SDGs.



The role of MDBs in private investment in infrastructure

Key findings

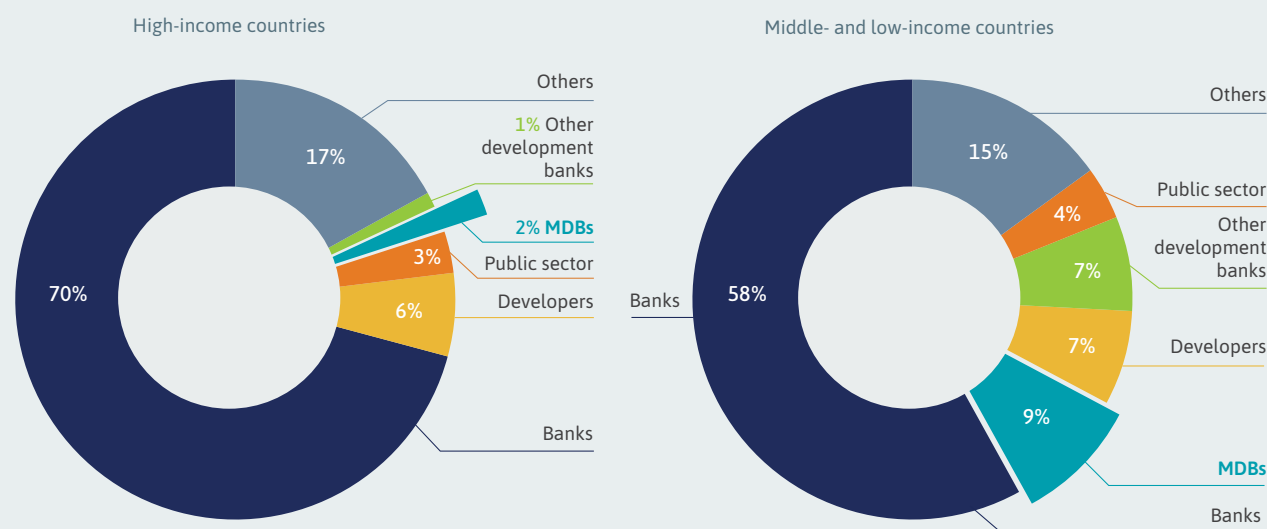
- Multilateral development banks (MDBs) continue to play a major role as financiers of private investment in infrastructure in middle- and low-income countries.
- MDB financing can be crucial in some regions. In Africa, for example, MDBs financed almost a fifth of the total value of private investment in infrastructure projects in 2021.
- MDB financing has mostly been channelled into the transport and renewable energy sectors, which attract almost three-quarters of total MDB financing.
- MDBs are playing a significant role in the global shift towards renewable energy. While financing of non-renewables still occurs, it is anticipated that it will decline to achieve global net-zero goals.
- As well as financing infrastructure projects and providing technical support, MDBs can also help crowd in more private capital to infrastructure. MDB participation signals the viability, stability, and creditworthiness of an infrastructure project, in turn reducing risk and attracting more private investment capital.
- MDB financing can facilitate the financing of larger private investments in infrastructure projects, as co-financing with an MDB helps reduce risk for private financiers.
- MDBs have significant potential to mobilise private financing directly and indirectly.

The role of MDBs in private investment in infrastructure

MDBs continue to play a major role as financiers of private investment in infrastructure in middle- and low-income countries.

- Although MDBs typically provide more financing and support to the public than to the private sector, their role in supporting private sector infrastructure investment is important in middle- and low-income countries.
- Direct financing is one way MDBs support private investment in infrastructure projects.
- In 2021, MDBs were the second largest financier in middle- and low-income countries, financing 9% of the total value of private investment in infrastructure projects in such countries. (Banks were the largest financier in middle- and low-income countries.) 27% of private investment in infrastructure in these countries involved an MDB as a co-financier in 2021.

Private investment in infrastructure projects by income group and financier type, 2021
(% of total value of private investment in infrastructure)



Source: Global Infrastructure Hub based on IJGlobal data.

Note: 'Others' includes institutions such as export credit agencies, insurance companies, pension funds, infrastructure funds, asset managers, and utilities. 'Banks' includes commercial banks, investment banks, and other financial service providers (not captured within other categories of financial institutions).

'Other development banks' includes bilateral development institutions, national development banks, and other development institutions not included within MDBs.

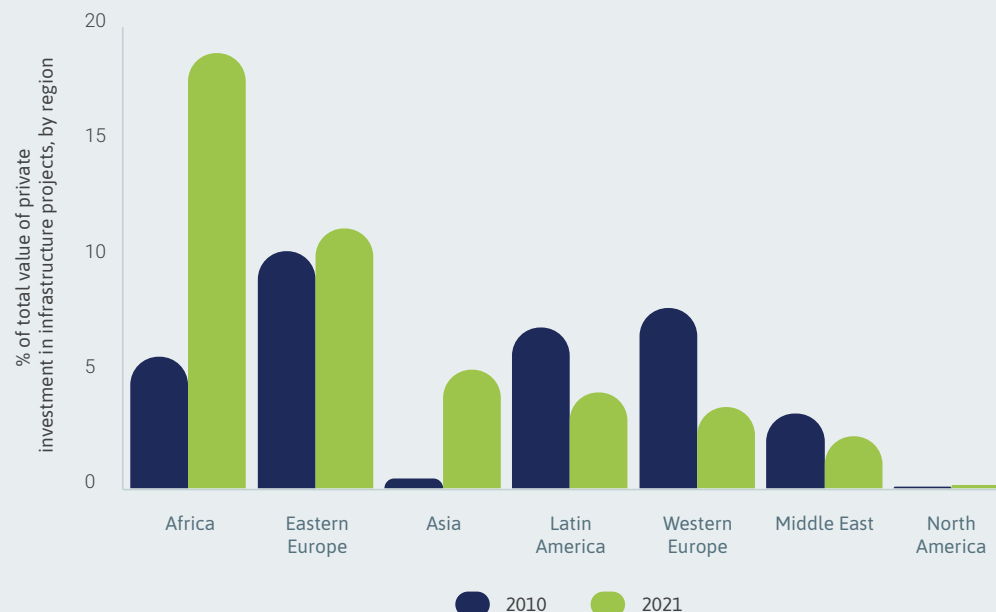
Figures for MDBs reflect data from 15 MDBs. Within the IJGlobal transactions database, all private investment in infrastructure projects receiving MDB financing is accompanied by additional financing from a private financier.

The role of MDBs in private investment in infrastructure

MDB financing can be crucial in some regions, such as in Africa, where MDBs financed almost a fifth of the total value of private investment in infrastructure projects in 2021.

- Although MDB financing for private investment in infrastructure projects is significantly lower than private sector financing, in middle- and low-income countries, it is highly relevant.
- Africa is the prime example. In Africa, while the overall level of private investment in infrastructure is low compared with other regions, MDB financing is more critical and becoming increasingly so over time. In 2010, MDBs financed 6% of the total value of private investment in infrastructure projects in Africa, increasing to 19% in 2021.
- In Asia, MDB financing is also becoming increasingly relevant. While in 2010 MDBs financed less than 0.5% of the total value of private investment in infrastructure projects, in 2021 this share rose to 5%.
- In contrast, in Latin America and Western Europe, the share of MDB financing has fallen over time, likely due to greater access to private financing in those countries.

MDB share of financing private investment in infrastructure projects, by region
(% of total value of private investment in infrastructure projects by region)



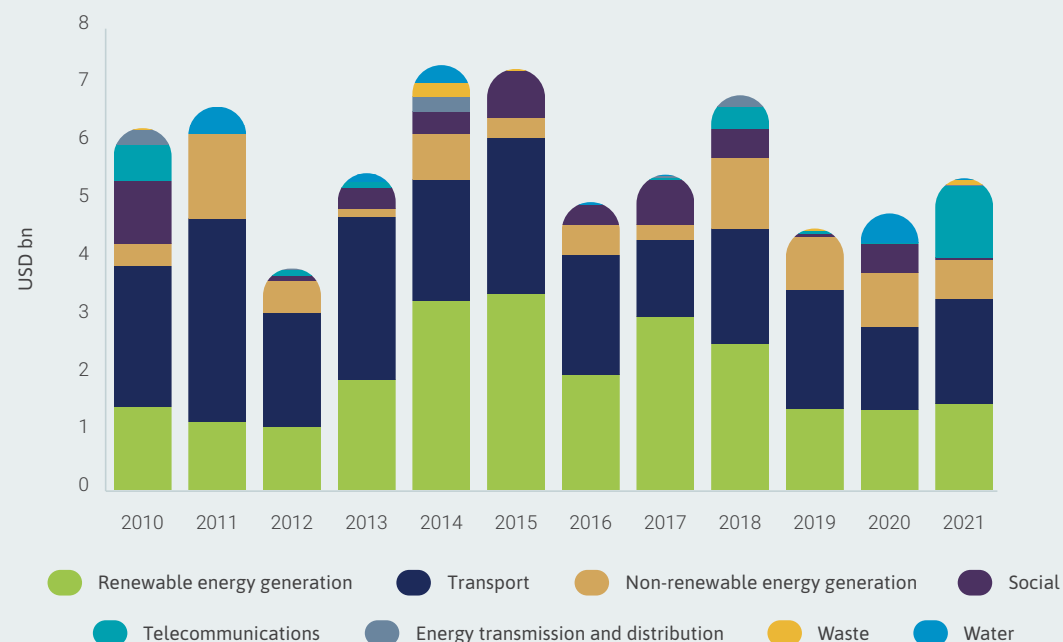
Source: Global Infrastructure Hub based on IJGlobal data.

The role of MDBs in private investment in infrastructure

MDB financing has mostly been channelled into the transport and renewable energy sectors, which attract almost three-quarters of total MDB financing.

- From 2010 to 2021, the largest shares of MDB financing of private investment in infrastructure projects went to the transport sector (38%) and the renewable energy sector (35%).
- While the prominence of those two sectors has continued, there has been a sectoral shift over time. Transport dominated at the start of the decade, with the focus gradually shifting towards renewables in line with the MDBs' commitment to supporting their clients' efforts to achieve the goal of the Paris Agreement. The transport share of MDB financing has fallen from a peak of 53% in 2011 to 34% in 2021, mirroring trends in overall global private investment in infrastructure projects.
- The role of MDBs in the transition to net zero greenhouse gas emissions is particularly critical in middle- and low-income countries. In high-income countries, most renewable energy projects are financed by the private sector alone, but this is not the case in middle- and low-income countries. From 2010 to 2021, 27% of private investment in renewable energy projects in middle- and low-income countries involved MDB financing – almost approaching the level of investment financed by the private sector alone during this period (32%).
- MDB financing of private investment in telecommunications projects spiked in 2021, highlighting the increasing importance of digital connectivity, which was further emphasised by the pandemic.

MDB financing of private investment in infrastructure projects by sector (USD bn)



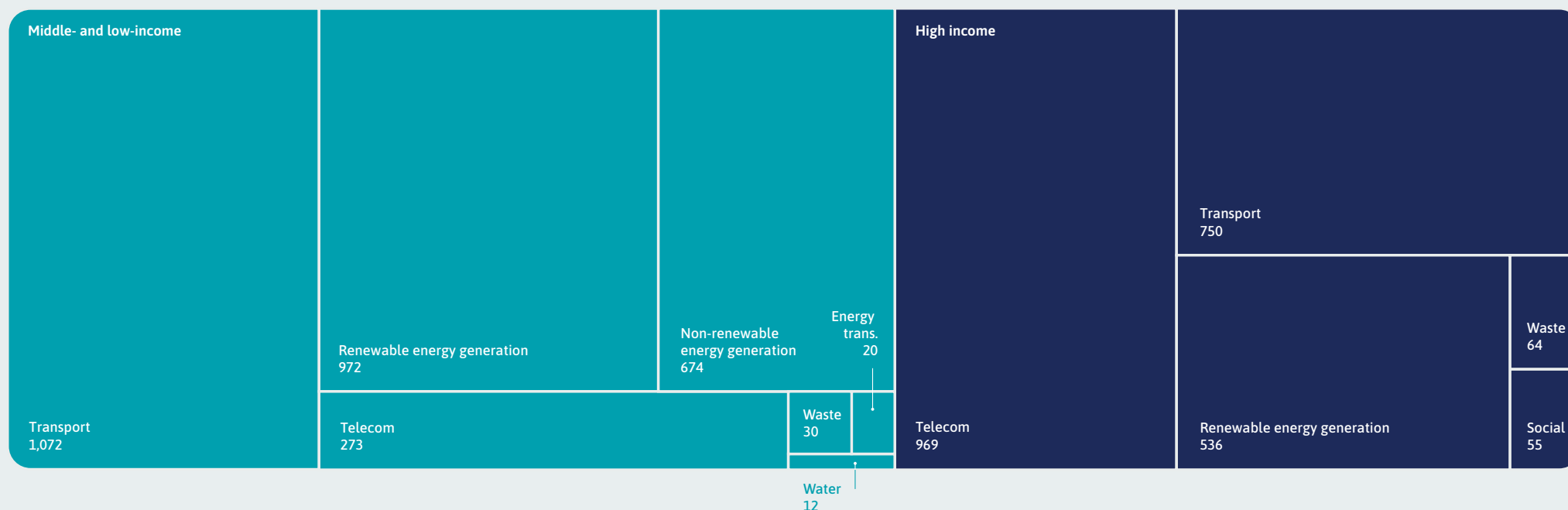
Source: Global Infrastructure Hub based on IJGlobal data.

The role of MDBs in private investment in infrastructure

Financing of non-renewables in middle- and low-income countries is anticipated to fall to reach global climate targets.

- Significant progress has been made in moving towards renewable energy, and MDBs have played a key role supporting the energy transition, but more needs to be done to tackle the climate crisis. While many MDBs have committed to ending financing for non-renewables, some fossil fuel projects continue to be financed.
- Financing of fossil fuel projects is anticipated to fall to reach climate targets. For example, the International Energy Agency (IEA) roadmap to net zero by 2050 calls for no new investments in oil, gas, or coal (IEA, 2021).

MDB financing of private investment in infrastructure projects by income group and sector, 2021
(USD m)



The role of MDBs in private investment in infrastructure

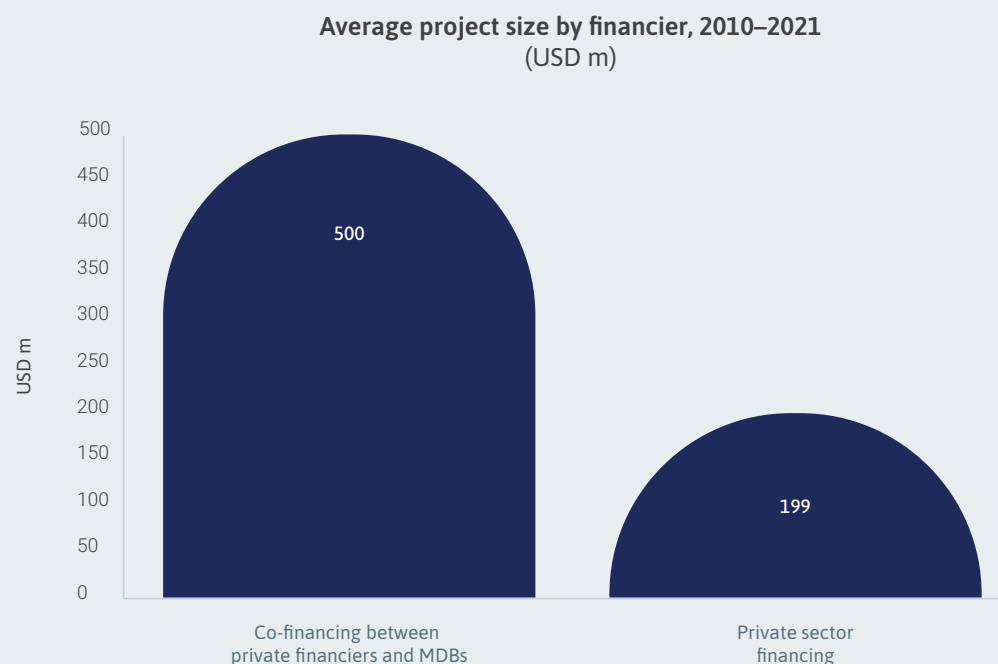
As well as financing infrastructure projects and providing technical support, MDB participation can crowd in more private investment capital to infrastructure.

MDB participation signals the viability, stability, and creditworthiness of an infrastructure project, in turn reducing risk and attracting more private capital.

The role of MDBs in private investment in infrastructure

MDB co-financing helps reduce risk for private financiers and can facilitate the financing of larger private investments in infrastructure projects.

- Transactions in which MDBs act as a co-financier tend to be larger than those financed by the private sector alone. From 2010 to 2021, transactions involving an MDB were, on average, around 2.5 times the size of those financed by the private sector alone.
- As project sizes increase, so do risks, particularly for the private sector. MDB co-financing can help reduce country, sector, and project risks, which facilitates financing larger transactions.
- Reduction in risk is a key benefit of MDB participation in the financing of private investment in infrastructure, particularly in middle- and low-income countries:
 - With their strong, long-term relationships with governments, MDBs can reduce political risk affecting infrastructure project execution, for example risk emerging from a changing political landscape.
 - MDBs also have extensive technical, country, and sector knowledge that can help reduce operational risk and lower the risk of a project becoming distressed.
- MDBs can help mobilise private sources of finance and leverage additional resources beyond the MDB's own lending capacity.



Source: Global Infrastructure Hub based on IJGlobal data.

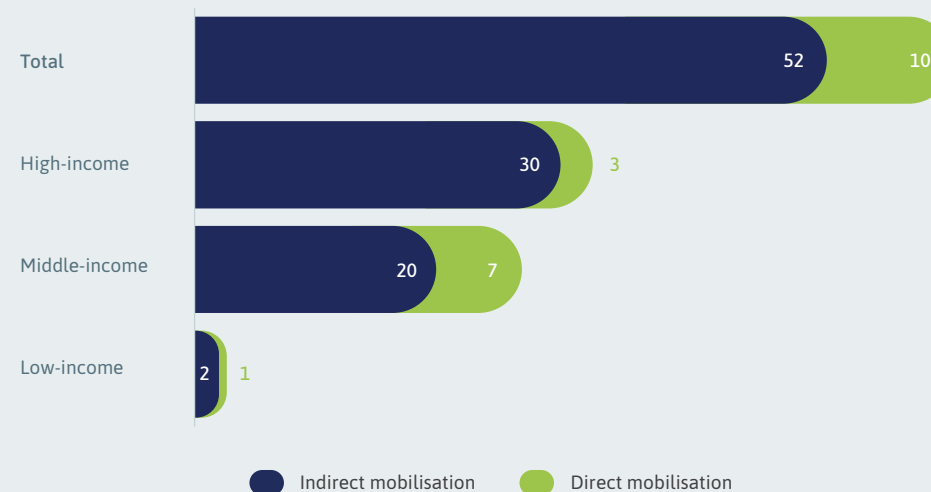
Note: Co-financing between private financiers and MDBs may also include other institution types such as national development banks, export credit agencies, or public sector institutions participating as co-financiers. 'Private sector financing' refers to transactions where the private sector is acting alone, without co-financing from public institutions.

The role of MDBs in private investment in infrastructure

MDBs have significant potential to mobilise private financing directly and indirectly.

- As well as providing financial and technical support for infrastructure projects, MDBs also directly and indirectly mobilise private capital. Direct mobilisation refers to the private financing generated by the active and direct involvement of an MDB, leading to commitment by private financiers. Indirect mobilisation refers to the private financing of projects similar to MDB-funded projects, but financed without direct MDB involvement in the project itself. The participation of MDBs in a particular market signals that market's viability, stability, and creditworthiness, subsequently reducing risks and attracting a higher volume of private capital to participate ([IFC, 2021](#)).
- The latest [Joint Report on Mobilization of Private Finance \(IFC, 2021\)](#) by the MDB Task Force on Mobilization estimates that in 2019 MDBs directly mobilised USD10 billion of private finance for infrastructure and indirectly mobilised USD52 billion.
- Levels of private indirect mobilisation tend to be significantly higher than levels of direct mobilisation. In 2019, the level of private indirect mobilisation was around five times that of direct mobilisation. In middle- and low-income countries it was three times that of direct mobilisation, and in high-income countries it was 12 times that of direct mobilisation. In middle- and low-income countries, major obstacles like excessive perception of risks and a lack of bankable projects continue to inhibit private financing.
- Other studies also estimate that MDBs mobilise significant levels of direct and indirect private investment. The Inter-American Development Bank (IDB) estimates an MDB indirect mobilisation multiplier for infrastructure at 2.1 over a three-year span ([IDB \(2022\)](#)).

MDB private direct and indirect mobilisation into infrastructure
by income group, 2019
(USD bn)



Source: International Finance Corporation (IFC) (2021).

Note: 'Private direct mobilisation' is defined as financing from a private entity on commercial terms due to the active and direct involvement of an MDB leading to commitment. 'Private indirect mobilisation' is defined as financing from private entities provided in connection with a specific activity for which an MDB is providing financing, where no MDB is playing an active or direct role that leads to the commitment of the private entity's finance. Figures reflect mobilisation from eight MDBs and one development finance institution (DFI).

Supplement: Environmental, social, and governance (ESG) factors in infrastructure

Note: This supplemental section was published in March 2023, following the publication of the original six sections of the *Infrastructure Monitor 2022* report.

ESG factors in infrastructure

Key findings

- Infrastructure assets are getting better at setting up ESG policies, plans, systems, and disclosure. In 2022, infrastructure assets improved in all three pillars of ESG (environmental, social, and governance).
- Among the alternative asset classes, infrastructure is the most transparent in its ESG disclosure.
- Improvements in ESG policies, plans, systems, and disclosure are encouraging because they indicate a willingness to improve the sustainability outcomes of infrastructure; however, these improvements do not themselves lead to improved sustainability outcomes.
- Although more infrastructure assets are setting GHG emission targets, still less than half have such targets, and very few have a zero target.
- In 2022, very few infrastructure assets had short-term zero targets and met them.
- To inform investment decisions and reduce infrastructure's significant carbon footprint, the infrastructure sector must capture data on the ESG outcomes of infrastructure assets.

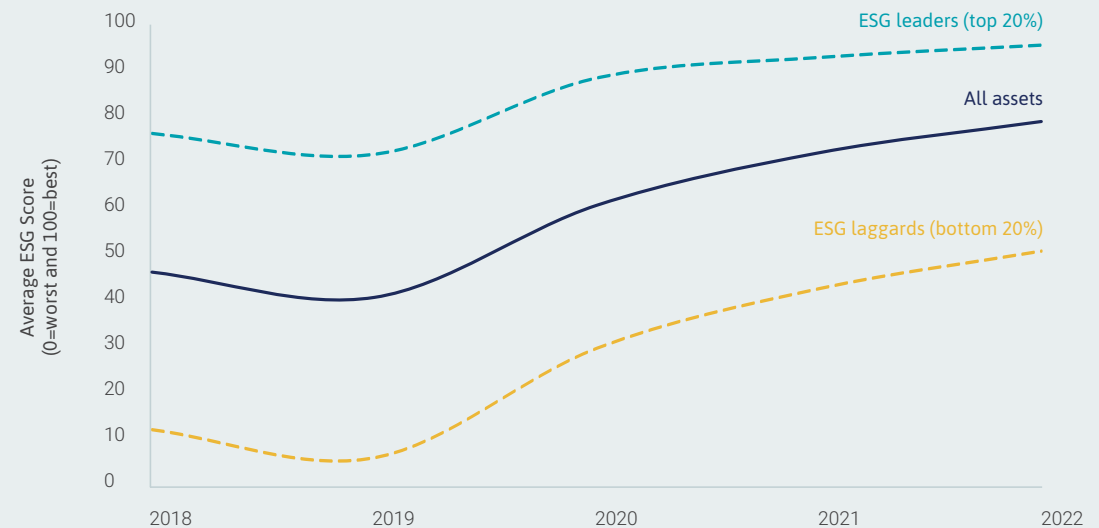
ESG factors in infrastructure

Infrastructure assets are getting better at setting up ESG policies, plans, systems, and disclosure.

GRESB is currently the market leading source of ESG data for infrastructure assets. Annually, GRESB collects data on ESG via its *Infrastructure Asset Assessment* and calculates an ESG Score using a bespoke methodology and framework. This ESG Score reflects the extent to which assets have ESG policies in place, manage ESG risk, report transparently on their most material ESG issues, and have current and future ESG targets.

According to GRESB's *Infrastructure Asset Assessment*, the average ESG Score for infrastructure assets continued to increase in 2022. This improvement was evident across all assets. ESG Leaders (top 20% of reporting assets) and ESG laggards (bottom 20% of reporting assets) have both increased their scores over time.

GRESB ESG Score for infrastructure assets, 2018–2022
(0=worst and 100=best)



Source: GI Hub analysis based on GRESB *Infrastructure Asset Assessment*.

Notes: Analysis presented in this section excludes some assets included in GRESB's assessment, as they are not considered as infrastructure by the GI Hub, such as oil, gas, and defence assets. It also excludes diversified/multi-sector assets. Also note that although ESG Scores have been subject to some methodological changes and changing component weights over time, they are still comparable across years.

ESG factors in infrastructure

In 2022, ESG Scores for infrastructure assets improved in all three pillars of ESG.

In 2022, the ESG Scores of infrastructure assets improved across all three pillars of ESG (environmental, social, and governance). However, on average, assets score better in the environmental and social pillars; scores in the governance pillar are lagging. This is primarily due to the Certification aspect of Governance, which assesses the asset's achievement and/or maintenance of ESG-related certifications and awards. The relatively low score for this aspect reflects the inherent difficulty and cost of obtaining ESG certification. Certifications typically involve lengthy application and verification processes, often for a fee.

The highest score on any individual aspect of ESG in 2022 was on Energy. The score for Energy reflects the extent to which an asset reports on and sets targets for energy sold or consumed. The next highest score on an individual aspect was on Health and Safety (the extent to which an entity reports on health and safety of employees and contractors, users, and the local community). These two aspects also had the highest scores in 2021.

Promisingly, this year the data reflect how ESG objectives are gradually expanding beyond a narrow focus on energy and GHG emissions. In 2022, scores improved significantly for Waste (the extent to which an asset reports on and sets targets for waste generation and disposal) and Biodiversity (the extent to which an asset reports on and sets targets for biodiversity impact, measured by net habitat gain). These were two of the lowest-performing aspects of ESG in 2021. The increasing scores in these areas reflect the rising prominence of these issues on ESG agendas, supported by increasing global action on this front (e.g. circular economy policies such as those led by the EU's Circular Economy Action Plan, and the establishment of the Taskforce on Nature-related Financial Disclosures [TNFD] framework).

ESG Scores for infrastructure assets by ESG pillar, 2021 vs. 2022
(0=worst and 100=best)



Source: GI Hub analysis based on GRESB *Infrastructure Asset Assessment*.

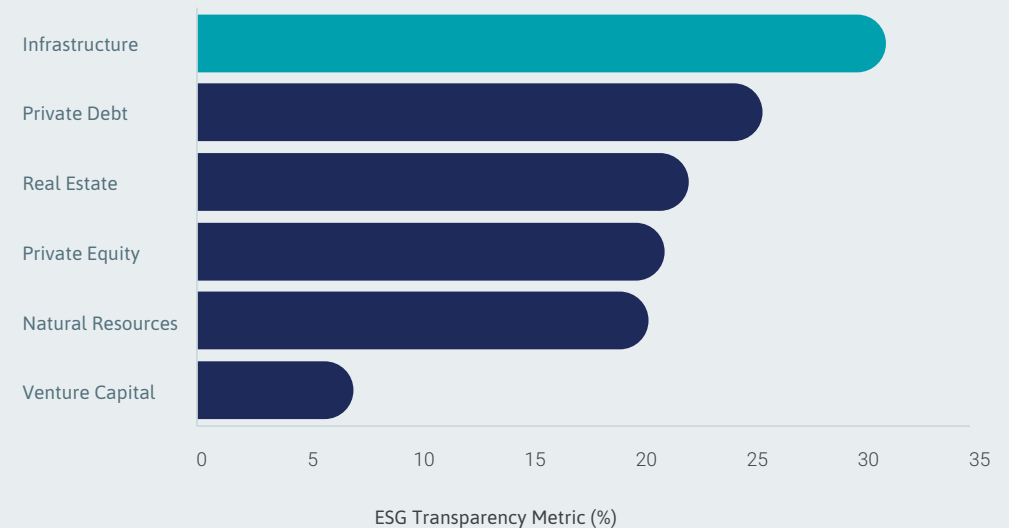
Note: The Policies and Risk Management components contribute to three pillars but have been included in the Governance pillar for the purpose of this chart.

ESG factors in infrastructure

Among the alternative asset classes, infrastructure is the most transparent in its ESG disclosure.

In addition to showing improvements in ESG policies, plans, systems, and disclosure over time, infrastructure assets also perform well when compared with other alternative asset classes (i.e. investments outside of traditional asset classes such as stocks, bonds, and cash). According to Preqin, infrastructure is the most transparent asset class on average and exhibits the highest level of disclosure on ESG issues.

Average ESG Transparency Metric across private capital fund managers by asset class, 2022
(0%=lowest transparency and 100%= highest transparency)



Source: Preqin (2022a).

Note: The ESG Transparency Metric is calculated as the percentage of ESG indicators (37 in total) that are publicly or privately disclosed to Preqin. The more indicators that are reported on, the higher the transparency metric.

ESG factors in infrastructure

Improvements in ESG policies, plans, systems, and disclosure are encouraging; they indicate a *willingness* to improve the sustainability outcomes of infrastructure.

However, these improvements do not themselves lead to improved sustainability *outcomes*.

For example, data on targets for GHG emissions shed some light on progress toward decarbonisation as an outcome.

ESG factors in infrastructure

Although more infrastructure assets are setting GHG emission targets, still less than half have such targets, and very few have a zero target.

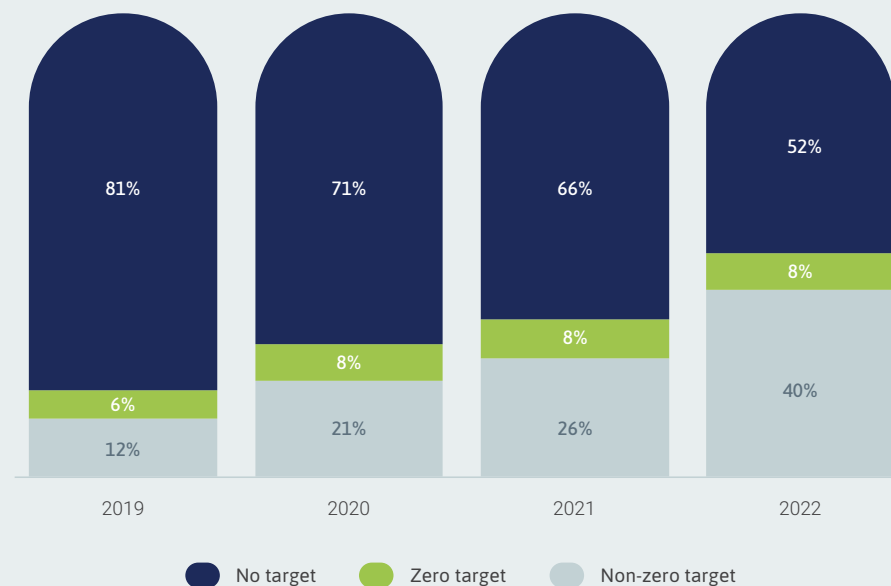
Data collected by GRESB on the existence of GHG emission targets for infrastructure assets show that the share of assets setting a long-term emission target covering both direct and indirect emissions has increased from 18% in 2019 to 48% in 2022.

Although this increase is encouraging, the fact remains that more than half of the assets that are reporting currently do not have a long-term target.

Moreover, among the infrastructure assets that have set long-term targets, only 16% have a target of zero emissions. This means that overall, only 8% of infrastructure assets are targeting zero.

Reviewing these data, it is clear that despite increased recognition of the need to reduce emissions, neither the level of target setting nor the ambitions of the targets being set are aligned with what is required to make economies more sustainable.

Long-term GHG emission target setting for infrastructure assets, 2019–2022
(% of total reporting assets)



Source: GRESB *Infrastructure Asset Assessment*.

Note: Targets refer to Scope 1, 2, and 3 GHG emissions. Scope 1 = Direct emissions from sources owned or controlled by the entity. Scope 2 = Indirect emissions created by the generation of purchased energy. Scope 3 = All other indirect emissions as a result of the entity's activities throughout its entire value chain.

ESG factors in infrastructure

In 2022, very few infrastructure assets had a short-term zero target and met it.

Data on short-term GHG emission targets are a window into immediate intentions and progress on emission reduction.

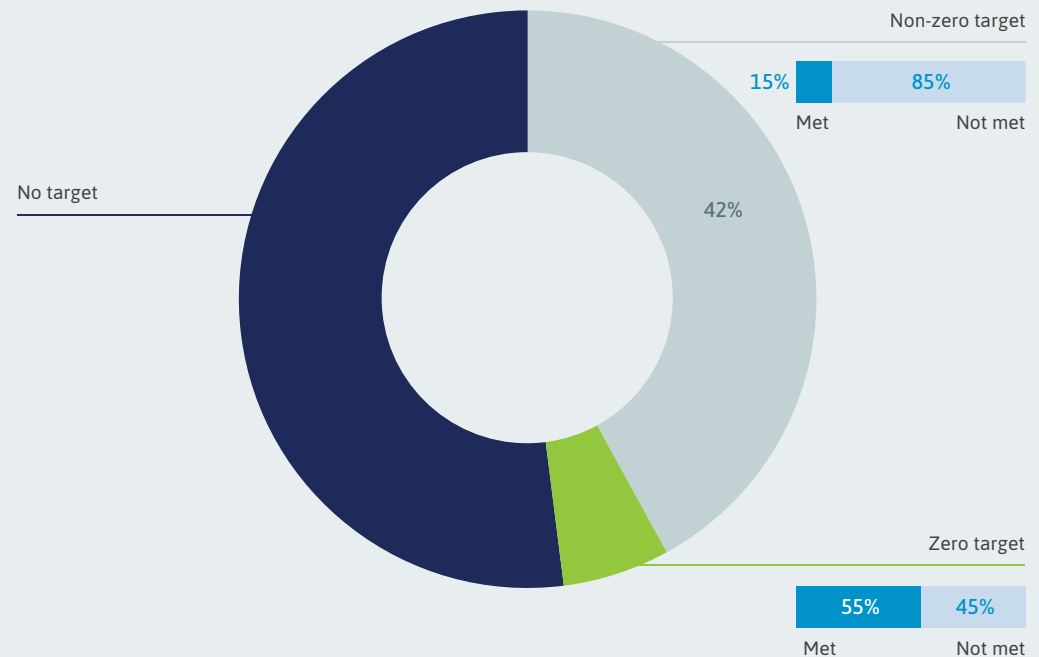
In 2022, less than half (48%) of infrastructure assets had a short-term GHG emission target. Among them, only 12% had a target of zero emissions. This means that overall, only 6% of infrastructure assets targeted zero in the short term.

And, few infrastructure assets are currently meeting their targets. In 2022, only 20% of short-term targets were met.

Interestingly, 55% of the zero targets set were met, compared with 15% of the non-zero targets. In other words, assets that have set a more ambitious target of zero are more likely to be meeting it. This could suggest that assets which are more determined to reduce emissions set more ambitious targets.

Overall, out of all infrastructure assets that reported in 2022, only 3% had a short-term zero emissions target and met it.

Infrastructure asset short-term GHG emission targets, 2022
(% of total reporting assets)



Source: GRESB *Infrastructure Asset Assessment*.

Note: Short-term targets are targets set for the current year (in this case, 2022). Targets refer to Scope 1, 2, and 3 GHG emissions.

Scope 1 = Direct emissions from sources owned or controlled by the entity. Scope 2 = Indirect emissions created by the generation of purchased energy. Scope 3 = All other indirect emissions as a result of the entity's activities throughout its entire value chain. 'Target met' indicates that the asset's reported GHG performance value for the current year matches its current year target.

ESG factors in infrastructure

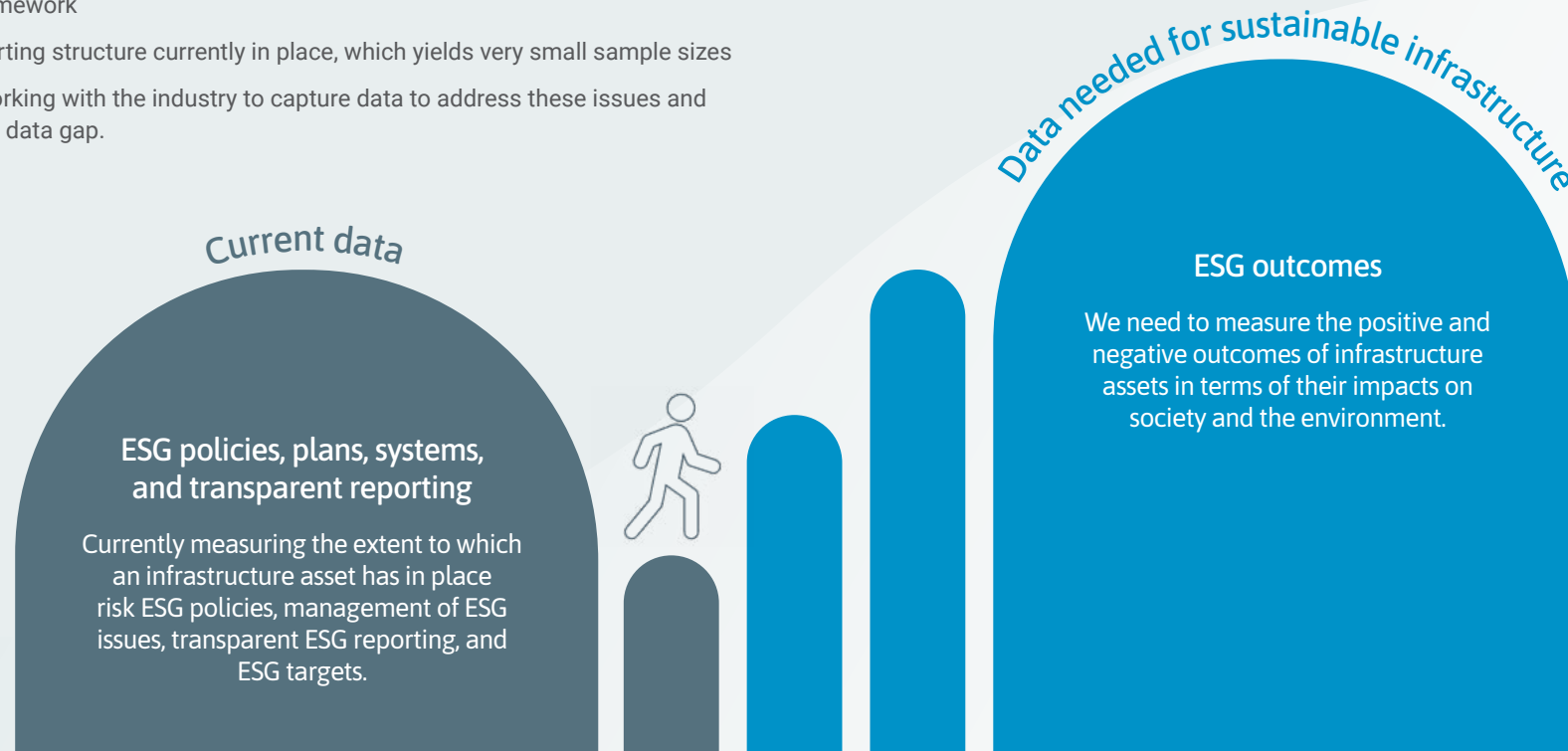
The infrastructure sector must move to capture data on the ESG outcomes of infrastructure assets.

To inform investment decisions and reduce infrastructure's significant carbon footprint, the sector must begin capturing data on the ESG outcomes of infrastructure. Currently, and across the majority of data providers, data on ESG in infrastructure generally reflect an entity's ESG management approach (e.g. policies, plans, and systems) and transparency of reporting.

Some quantitative performance data (such as data on GHG emissions) are collected. But evaluations of the ESG outcomes of infrastructure are not available because of:

- The difficulty of assessing performance in the absence of clear and agreed indicators and a standardised framework
- The voluntary reporting structure currently in place, which yields very small sample sizes

GRESB is currently working with the industry to capture data to address these issues and help close this critical data gap.



Appendices



Private investment in infrastructure projects

Acronym list

AUM	Assets under management
CDR	Cumulative default rate
IDB	Inter-American Development Bank
IEA	International Energy Agency
IFC	International Finance Corporation
IoT	Internet of Things
IRR	Internal rate of return
MDB	Multilateral development bank
NAV	Net asset value
PPP	Public-private partnership
PV	Photovoltaic, as in solar photovoltaic projects
SDGs	United Nations Sustainable Development Goals
UN	United Nations

Private investment in infrastructure projects

Financial close	Transaction stage where all financing documentation has been signed, all conditions precedent have been satisfied or waived, and initial drawdown is contractually possible. In transactions that involve no debt financing, IJGlobal considers the signing of project or transaction documentation as a proxy for financial close.
Primary market	Primary market transactions include investment in greenfield and brownfield infrastructure, as well as in projects involving privatisation of public sector assets.
Private infrastructure investment	Investment made by the private sector in infrastructure projects in primary markets (financed by private and public financiers). Investment values represent commitments made at the financial close of investment and not executed investment. It includes both debt and equity transactions.
Refinancing	The replacement of an existing debt obligation with a debt obligation bearing new and different terms.
Secondary market	Secondary market transactions include acquisitions, refinancing, securitisations, and financing for general corporate operations.
Securitisation	Transaction in which a pool of assets is collateralised into one vehicle of loan products for sale.

Income group classifications

High-income countries	Åland Islands, Andorra, Aruba, Australia, Austria, Bahrain, Belgium, Bermuda, Bouvet Island, British Virgin Islands, Canada, Cayman Islands, Croatia, Curaçao, Cyprus, Czech Republic, Denmark, Equatorial Guinea, Estonia, Falkland Islands, Faroe Islands, Finland, France, French Guiana, French Polynesia, Germany, Gibraltar, Greece, Guadeloupe, Guam, Hong Kong SAR (China), Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Kuwait, Liechtenstein, Luxembourg, Malta, Martinique, Monaco, Netherlands, New Zealand, Norway, Oman, Poland, Portugal, Puerto Rico, Qatar, Saint Helena, San Marino, Saudi Arabia, Singapore, Slovak Republic, Slovenia, South Georgia & The South Sandwich Islands, Spain, Svalbard & Jan Mayen Islands, Sweden, Switzerland, Taiwan, The Bahamas, Trinidad and Tobago, United Arab Emirates, United Kingdom, United States, Vatican City
Middle- and low-income countries	Afghanistan, Albania, Algeria, Angola, Argentina, Armenia, Azerbaijan, Bangladesh, Belarus, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Costa Rica, Côte d'Ivoire, Dem. Rep. Congo, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Eswatini, Ethiopia, Fiji, Gabon, Georgia, Ghana, Guatemala, Guinea, Guinea-Bissau, Guyana, Honduras, India, Indonesia, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kenya, Lao PDR, Latvia, Lebanon, Lesotho, Liberia, Libya, Lithuania, Madagascar, Malawi, Malaysia, Maldives, Mali, Marshall Islands, Mauritania, Mauritius, Mayotte, Mexico, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, North Macedonia, Pakistan, Palau, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Romania, Russia, Rwanda, Sao Tome and Principe, Senegal, Serbia, Seychelles, Sierra Leone, Solomon Islands, Somalia, South Africa, South Sudan, Sri Lanka, Sudan, Suriname, Syrian Arab Republic, Tanzania, Thailand, The Gambia, Timor-Leste, Togo, Tunisia, Turkey, Uganda, Ukraine, Uruguay, Uzbekistan, Vanuatu, Venezuela, Vietnam, West Bank and Gaza, Western Sahara, Yemen, Zambia, Zimbabwe

Private investment in infrastructure projects

Sector classifications

Energy transmission and distribution	Investment in energy transmission and distribution networks, district heating, and smart metres
Non-renewables energy generation	Investment in coal-, gas-, and oil-fired power plants; IWPP; nuclear; co-generation; and carbon capture and storage facilities
Renewables energy generation	Investment in biofuels, biomass, energy storage, geothermal, hydro, hydrogen, marine, offshore wind, onshore wind, photovoltaic solar, and thermal solar
Social	Investment in education, healthcare, social housing, fire and rescue, justice, leisure, and municipal infrastructure
Telecommunications	Investment in data centres, digital infrastructure, mobile, internet, satellite, and terrestrial infrastructure
Transport	Investment in airports, roads, bridges, tunnels, heavy rail, ports, maritime transport, urban transport, EV charging infrastructure, and car park facilities
Waste	Investment in waste management and treatment facilities, and waste-to-energy plants
Water	Investment in water distribution, treatment, and desalination facilities

Private investment in infrastructure projects

Region classifications

Africa	Algeria, Angola, Benin, Botswana, Bouvet Island, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Dem. Rep. Congo, Djibouti, Egypt, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gabon, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mayotte, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Saint Helena, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Tanzania, The Gambia, Togo, Tunisia, Uganda, Western Sahara, Zambia, Zimbabwe
Asia	Afghanistan, Bangladesh, Bhutan, Cambodia, China, Hong Kong SAR (China), India, Indonesia, Japan, Kazakhstan, Korea, Lao PDR, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Timor-Leste, Turkmenistan, Uzbekistan, Vietnam
Eastern Europe	Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Lithuania, Moldova, Montenegro, North Macedonia, Poland, Romania, Russia, Serbia, Slovak Republic, Slovenia, Ukraine
Latin America	Argentina, Aruba, Bolivia, Brazil, Cayman Islands, Chile, Colombia, Costa Rica, Curaçao, Dominican Republic, Ecuador, El Salvador, Falkland Islands, French Guiana, Guadeloupe, Guatemala, Guyana, Honduras, Jamaica, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, South Georgia and The South Sandwich Islands, Suriname, The Bahamas, Trinidad and Tobago, Uruguay, Venezuela
Middle East	Armenia, Azerbaijan, Bahrain, Georgia, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Turkey, United Arab Emirates, West Bank and Gaza, Yemen
North America	Bermuda, Canada, Mexico, United States
Oceania	Australia, Fiji, French Polynesia, Guam, Marshall Islands, New Zealand, Palau, Solomon Islands, Vanuatu
Western Europe	Åland Islands, Andorra, Austria, Belgium, British Virgin Islands, Cyprus, Denmark, Faroe Islands, Finland, France, Germany, Gibraltar, Greece, Iceland, Ireland, Italy, Latvia, Liechtenstein, Luxembourg, Malta, Martinique, Monaco, Netherlands, Norway, Portugal, San Marino, Spain, St. Martin (French part), Svalbard and Jan Mayen Islands, Sweden, Switzerland, United Kingdom, Vatican City

Infrastructure equity performance

Annual total return	Share price appreciation and income from regular cash distributions (cash dividend payments or capital repayments) reinvested on the intended date of such distributions, without consideration for withholding taxes.
Equity investment	Money that is invested in a company by purchasing shares of that company.
Factors explaining the risk premium of unlisted infrastructure equities	<p>Leverage is measured as the ratio of total senior liabilities over the total assets.</p> <p>Size is measured by total asset book value.</p> <p>Term spread is estimated as the difference between yields of a 20-year and a three-month public bond.</p> <p>Investment level is the ratio of capital expenditure as a share of total assets.</p> <p>Aggregate sector effects is a factor that controls for sectors (transport, social, power, utilities etc.) and business model (merchant, regulated, contracted) while estimating the contribution of four other factors.</p> <p>Profits is a factor that analyses equities' profits. Equities that earn large profits typically come with little risk, which reduces risk premiums.</p>
Listed global equities	Listed global equities performance is measured by the Morgan Stanley Capital International All Country World Index (MSCI ACWI), MSCI's flagship global equity index, designed to represent performance of the full opportunity set of large- and mid-cap stocks across 23 developed and 24 emerging markets. As of May 2022, it covers more than 2,933 constituents across 11 sectors and approximately 85% of the free float-adjusted market capitalisation in each market.
Listed infrastructure equities	Listed infrastructure equities are publicly traded on a stock exchange. Listed infrastructure equities performance is measured by the MSCI ACWI Infrastructure Capped Index (MSCI ACWI-IC), which comprises a global opportunity set of companies that are owners or operators of infrastructure assets, selected from MSCI ACWI, the parent index, which covers mid- and large-cap securities across 23 developed markets and 24 emerging markets, for five infrastructure sectors: telecommunications, utilities, energy, transport, and social.
Sharpe ratio	Ratio of excess returns to the standard deviation of returns, where excess return is total return minus risk-free return.
Listed infrastructure equities	Unlisted infrastructure equities are generally offered through private placements made by the project company signatory of the project or concession agreement. Unlisted infrastructure equities performance is measured by EDHECinfra's Infra300 equity index, which is designed as a representation of 6,800 investible unlisted infrastructure companies (often private equity funds) identified in 25 key markets by infrastructure sector, business model and corporate structure. The index is equally weighted with 300 constituents with market capitalisation of USD 250 billion.

Infrastructure equity performance

Income group classification

Developed markets	<p>MSCI ACWI includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the UK, and the US.</p> <p>EDHECinfra includes Australia, Austria, Canada, Chile, Finland, France, Germany, Ireland, Italy, Netherlands, New Zealand, Norway, Poland, Portugal, Singapore, Spain, Sweden, the UK, and the US.</p>
Emerging markets	<p>MSCI ACWI includes Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Korea, Kuwait, Malaysia, Mexico, Peru, Philippines, Poland, Qatar, Saudi Arabia, South Africa, Taiwan, Thailand, Turkey and United Arab Emirates.</p> <p>EDHECinfra includes Philippines, Brazil, and Malaysia.</p>

Infrastructure debt performance

Cumulative default rate (CDR)	Cumulative default rates are calculated from the weighted average marginal default rates (hazard rates) for all cohorts. The marginal default rate (hazard rate) is the ratio of the number of project defaults in a specific time period divided by the number of projects exposed to the risk of default at the beginning of that time period. For the purposes of this study, marginal default rates have been calculated on a monthly basis.
Expected loss	Expected loss is a function of the probability of default and ultimate recovery rates. It indicates creditworthiness of debt obligations.
Investment grade	Debt that is believed to have a lower risk of default and thus receives higher ratings by the credit rating agencies: Baa3 or higher (by Moody's) or BBB- or higher by S&P and Fitch.
Project finance	<p>A method of funding in which the lender looks primarily to the revenues generated by a single project, both as the source of repayment and as security for the exposure. This type of financing is usually for large, complex, expensive installations, which might include for example power plants, chemical processing plants, mines, transportation infrastructure, environment, and telecommunications infrastructure. Project finance may be used to finance the construction of a new capital installation, or to refinance an existing installation, with or without improvements.</p> <p>In such transactions, the lender is usually paid exclusively or almost exclusively out of the money generated by the contracts for the facility's output, including for example, electricity sold by a power plant. The borrower is usually an SPV that is not permitted to perform any function other than developing, owning, and operating the installation. The consequence is that repayment depends primarily on the project's cash flow and on the collateral value of the project's assets. In contrast, if repayment of the exposure depends primarily on a well-established, diversified, credit-worthy, contractually obligated end-user for repayment, it is considered a secured exposure to that end-user.</p>
Public-private partnerships (PPPs) and non-PPPs	<p>A PPP is 'a long-term contract between a public party and a private party, for the development and/or management of a public asset or service, in which the private agent bears significant risk and management responsibility through the life of the contract, and remuneration is significantly linked to performance, and/or the demand or use of the asset or service' (World Bank PPP Reference Guide). This broad definition can be used to distinguish PPPs as an alternative to conventional procurement.</p> <p>In multiple versions across the world, PPPs are a way to procure and deliver infrastructure and services (including finance, construction, operations and maintenance) with private finance participation. The respondents in Moody's global survey self-identify projects as PPPs. The definition of a PPP varies broadly and includes any form of association or co-operation between the public and private sectors.</p> <p>Projects done under non-PPP schemes are projects under other types of contract between a government and private companies including 'design-build' or turnkey contracts, financial lease contracts, management contracts, affermage contracts. The dataset does not include data on type of contract for non-PPPs.</p>
Ultimate recovery	<p>A default for which recoveries have been realised following emergence from default. For a loan that has defaulted, emergence from default is deemed to occur following any of the events set out below:</p> <ul style="list-style-type: none"> • Repayment of overdue interest • Restructuring with no subsequent default • Restructuring with lender excluded from the arrangement – for example, by repayment of the defaulted loan with no participation in a restructured debt facility • Material restructuring • Liquidation.

Infrastructure debt performance

Income group classification

High-income countries	The report includes countries classified by the World Bank Group as high-income, in 2019 and includes: Australia, Austria, The Bahamas, Bahrain, Belgium, Bermuda, Brunei, Canada, Cayman Islands, Chile, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Guam, Hong Kong, Hungary, Iceland, Ireland, Israel, Italy, Japan, Kuwait, Lithuania, Luxembourg, Macau, Malta, Mauritius, The Netherlands, New Zealand, Norway, Oman, Panama, Poland, Portugal, Puerto Rico, Qatar, Romania, Saudi Arabia, Singapore, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Taiwan, Trinidad and Tobago, Turks and Caicos Island, United Arab Emirates, United Kingdom, United States, Uruguay.
Middle- and low-income countries	The report includes countries classified by the World Bank Group as middle- and low-income, in 2019 and includes: Albania, Algeria, Angola, Argentina, Armenia, Azerbaijan, Bangladesh, Belize, Benin, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Cabo Verde, Cameroon, Chad, China, Colombia, Costa Rica, Democratic Republic of the Congo, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Ethiopia, Fiji, Gabon, Ghana, Guatemala, Guinea-Bissau, Guyana, Honduras, India, Indonesia, Iran, Ivory Coast, Jamaica, Jordan, Kazakhstan, Kenya, Laos, Lebanon, Lesotho, Liberia, Macedonia, Madagascar, Malawi, Malaysia, Mali, Marshall Islands, Mauritania, Mexico, Moldova, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Niger, Nigeria, Pakistan, Papua New Guinea, Paraguay, Peru, Philippines, Russia, Senegal, Serbia, Sierra Leone, Solomon Islands, South Africa, Sri Lanka, Syria, Tanzania, Thailand, Timor-Leste (East Timor), Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, Uzbekistan, Venezuela, Vietnam, Yemen, Zambia, Zimbabwe.

Sector classification

Energy	Construction and maintenance of renewable and non-renewable power plants, transmission and distribution, and oil refineries.
Infrastructure	Sectors and sub-sectors include water and waste, transportation (roads, bridges, tunnels, rail, and ports and terminals), media distribution and telecom, oil and gas refining, and power (transmission and distribution, renewable and non-renewable electricity generation).
Non-infrastructure	Construction and maintenance of chemicals production – petrochemicals and plastics, leisure and recreation (casinos, lodging and other, excluding real estate), manufacturing, media and telecom – media content (motion pictures, etc.), metals and mining – mining (ores, coal, etc.), metals and mining – processing (smelting, refining, foundries, etc.), oil and gas – biofuels, oil and Gas – exploration and production, oil and gas – LNG, oil and gas – other, oil and gas – storage, other.
Social	Construction and maintenance of facilities that support social services. Types of social infrastructure include healthcare (hospitals), education (schools and universities), and public facilities (community housing and prisons).
Transport	Construction and maintenance of roads, bridges, tunnels and rail services, and ports and terminals.
Water and waste	Includes water systems, water desalination, waste treatment, waste to energy.

Private infrastructure capital raised and invested by funds

Assets under management (AUM)	The total investment value of all the financial assets in a fund's portfolio plus the fund's dry powder. Investment value is the market value of the portfolio (including mark-to-market gains from investments in infrastructure assets). Dry powder is the capital committed by investors and available to fund managers but not yet invested or allocated (capital committed is the sum of unallocated capital and portfolio returns, minus any disbursements to investors).
Brownfield	Refers to an existing asset or structure that requires improvements, repairs, or expansion. The infrastructure asset or structure is usually partially operational and may already be generating income.
Capital invested	Capital invested is estimated using the capital called up data series. Capital called up refers to the capital committed by private investors that has been called up for investment.
Close-ended fund	A fund that issues a fixed number of shares through a single initial public offering (IPO) to raise capital for its initial investments.
Dry powder	Capital committed by investors that has not been invested or allocated. Capital committed is the sum of unallocated capital and portfolio returns, minus any disbursements to investors.
Greenfield	Refers to an asset or structure that does not currently exist, i.e. is yet to be designed and constructed. Investors fund the building of the infrastructure asset as well as the maintenance after it is designed, built, and operational.
Net internal rate of return (IRR %)	The net IRR earned by a fund to date, after fees and carry. The internal rate of return (IRR) is based upon the realised cash flows and the valuation of the remaining interest in the partnership. IRR is an estimated figure, given that it relies upon not only cash flows but also the valuation of unrealised assets. The IRR estimates shown are both those as reported by the fund's Limited Partners and/or General Partners and those that Preqin has calculated internally, based upon cash flows and valuations, provided for individual partnerships.
Unallocated capital	Capital received by fund managers and not yet allocated or invested.

Environmental, social, and governance (ESG) factors in infrastructure

Alternative asset classes	Alternative asset classes refer to investments outside the traditional asset classes of stocks, bonds, and cash. They include assets such as real estate, private equity, and infrastructure.
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Private investment in infrastructure

1. Data for private infrastructure investment are drawn from IJGlobal's transactions database, covering the period from 2010 to 2021, as of 30 June 2022.
2. Throughout this report, unless otherwise specified, 'private investment in infrastructure projects' refers to private sector investment in infrastructure projects in primary markets (financed by private and public financiers) including greenfield and brownfield infrastructure, as well as projects involving privatisation of public sector assets. Investment values represent commitments made at the financial close of investment, not executed investment values.
3. IJGlobal's dataset is focused on project-based private investment and does not capture most corporate private investment in infrastructure.
4. IJGlobal's database is the best available comparable data for global project-based private infrastructure investment. However, it is not exhaustive in its coverage of transactions. The estimates in this document are best interpreted as indicative of broad trends.

5. Investment in renewables:

- The significant increase in the level of private investment in renewables and its growing attractiveness as a destination for global private investment in infrastructure is indisputable. The renewables analysis in this report is based on IJGlobal transactions data, which underestimates the total level of private investment as it focuses mostly on project-based private investment. Project-based renewables investment accounts for around 30% of total private investment in renewables (CPI, 2022).
- While most direct private investment in infrastructure on corporate balance sheets is not included because these data are unavailable for most sectors, the data are more readily available for the renewables sector due to increased global efforts to improve data in support of the transition to sustainable energy.
- The BNEF (2022) report estimates total (public and private) investment in new renewables capacity to be USD366 billion in 2021, and the IEA (2022) report estimates total investment to be USD446 billion in 2021. IRENA and CPI (2020) estimate that private investment represents around 69% of total investment in renewables. Applying this to an average of the BNEF and IEA figures yields an estimate of USD280 billion for private investment in renewables in 2021. This is significantly higher than the USD86 billion of private investment in primary renewables in the IJGlobal database, indicating that private investment directly by companies would total around USD194 billion.

Comparison of estimates of the value of renewables investment

Source	Renewables investment (USD)
BNEF (public and private)	366 billion (2021)
IEA (public and private)	446 billion (2021)
CPI/IRENA (public)	100 billion (average of 2019 and 2020)
CPI/IRENA (private)	224 billion (69% of total public and private)
IJGlobal (private)	86 billion (2021)

6. IJGlobal's data on green bond issuances are not as exhaustive as data from some other data providers. Therefore, it is likely that the volume of green bonds for primary infrastructure included in this analysis is underestimated.
7. As well, there are data challenges related to all existing green bonds data, particularly around the use-of-proceeds: (i) green bonds data generally do not indicate whether proceeds are being earmarked for primary or secondary purposes, and (ii) reporting on actual use-of-proceeds is extremely limited. However, anecdotal evidence suggests that most green bonds are used to refinance existing assets rather than finance new assets (IRENA and CPI, 2020).

Infrastructure debt performance

Private infrastructure debt

- The performance of private infrastructure debt in terms of risk and return metrics is measured through the EDHECinfra infraDebt300 index. The index represents the performance of the most recent senior debt instruments issued by the 300 entities of the infra300® unlisted infrastructure equity index. It includes 370 instruments across 18 countries and 25 sectors with total market capitalisation of USD100 billion.

Rated private infrastructure debt securities

- This analysis is based on data drawn from Moody's (2021) data report on infrastructure default and recovery rates, 1983–2020.
- Data is based on instrument-level performance of \$2.0 trillion of infrastructure debt and preferred stock issued by 1200 distinct entities by year-end 2020, grouped by issuer and seniority. Estimated issuer-level performance of non-financial corporates (NFCs) is provided for comparison purposes.
- Over half of the rated infrastructure debt was in North America, one-third in Europe, Middle East and Africa, and the remaining 10% in other regions

Unrated project finance infrastructure debt

- This analysis is based on data on infrastructure debt performance drawn from Moody's 2022 report Examining Infrastructure as an Asset Class of the Data Alliance Project Finance Consortium of Moody's Analytics. The Data Alliance Project Finance Consortium is composed of leading project finance lenders and investors that provide historical portfolio and credit loss data to Moody's Analytics, for the purpose of creating an aggregate dataset. The dataset contains information from more than 80 global institutions (including commercial banks, insurance companies, asset managers, and other institutional investors) that participate in the Consortium.
- For the purpose of this analysis, the Global Infrastructure Hub (GI Hub) was provided with confidential default and recovery information on a total of 9,467 project finance loans that originated from 1983 to 2020, representing nearly 70% of all global project finance loans originating in that period. Of the total 9,467 project finance loans involving private sector participation analysed, 7,804 were infrastructure loans and 1,663 were non-infrastructure loans, which is the sample used in this report's analysis of infrastructure debt performance. Although the infrastructure loans sample includes construction, operations, and refinancing loans, construction loans account for 60% of all the loans in the sample.
- The sample distribution used in this report is presented by income group, region, sector, and contract. These distributions are compared to those of non-infrastructure loans. The income groups used are based on the World Bank Group's FY2020–2021 classification of countries as high-income, middle-income, or low-income on the basis of 2020 per capita income levels. This report analyses cumulative default rate curves, expected losses, and recovery rates for the period 1983–2020. Cumulative default rate curves were considered over a period of 20 years, and the horizontal axis in the charts presented corresponds to the year of default since loan origination. The analysis considers the 20-year period because, although the average maturity of infrastructure debt may be shorter, there are sectors and regions with higher debt maturities.

Environmental, social, and governance (ESG) factors in infrastructure

1. Data on infrastructure sector ESG performance are critical to catalysing more private investment in sustainable infrastructure. However, such data are currently very limited, particularly at the asset level.
2. For the analysis presented here, the GI Hub collaborated closely with GRESB to present findings from *GRESB's 2022 Infrastructure Asset Assessment*, currently the market leading source of ESG data for infrastructure assets.
3. GRESB's ESG Score encompasses management and performance measures, but does not reflect the ESG outcomes of infrastructure assets. Instead, scores reflect the extent to which assets have ESG policies in place, manage ESG risk, report transparently on their most material ESG issues, and have current and future ESG targets. In other words, an asset is assessed on *whether it reports on GHG emissions* rather than on *the amount of GHGs emitted*. GRESB is working with the infrastructure industry to reflect outcomes in the ESG Score in future years, to close this critical data gap.
4. Sample size: The analysis presented in this section excludes some assets included in GRESB's assessment, as they are not considered as infrastructure by the GI Hub, such as oil, gas, and defence assets. It also excludes diversified/multi-sector assets.
5. GRESB's data represent only a sample of the universe of infrastructure assets reporting on ESG. However, the data can still be interpreted as indicative of the broad market trends in ESG in infrastructure. The total number of assets included in the analysis is 553 in 2022, 475 in 2021, 346 in 2020, 318 in 2019, and 176 in 2018.
6. This section also draws on Preqin's ESG transparency data, collected from about 35,000 private capital fund managers. The ESG Transparency Metric is calculated as the percentage of ESG indicators (37 in total) that are publicly or privately disclosed to Preqin and is calculated as follows:

$$\text{Preqin ESG Transparency Metric} = \text{ESG KPIs disclosed} / \text{Total ESG KPIs}$$

Preqin's Transparency KPIs identify and track indicators relevant to ESG policies, practices, and initiatives and are selected from ESG frameworks and standards like the United Nations Principles for Responsible Investing (UNPRI) and Sustainability Accounting Standards Board (SASB).

7. Preqin's ESG data compare transparency among alternative asset classes. Alternative asset classes refer to investments outside the traditional asset classes of stocks, bonds, and cash. They include assets such as real estate, private equity, and infrastructure.

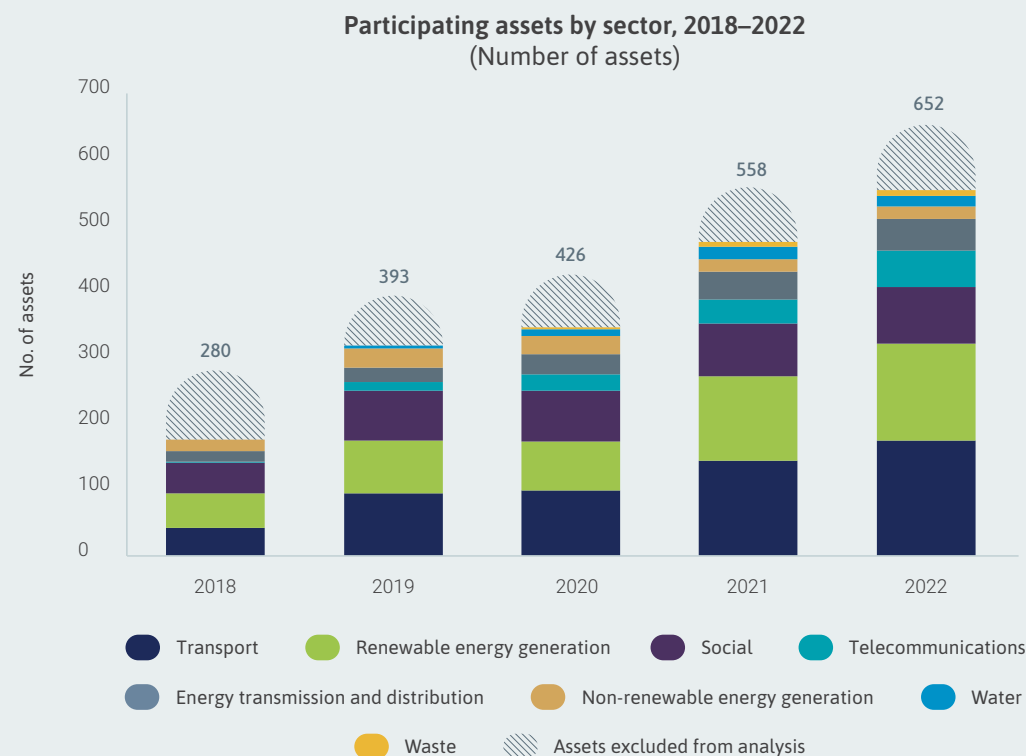
Environmental, social, and governance (ESG) factors in infrastructure

Sample distribution by sector

Transport was the most represented sector in GRESB's *Infrastructure Asset Assessment* in 2022, accounting for 31% of participating infrastructure assets, followed closely by the renewable energy sector at 27%. This trend in ESG reporting aligns with broader investment trends, with these sectors being the two leading sectors for private investment in primary infrastructure projects.

The social infrastructure sector – mostly health and education assets – is also a strong participant with 16% of reporting assets in 2022.

Consistent with the increasing global shift towards digital connectivity, there has also been a notable increase in the number of telecommunications assets reporting on ESG.



Source: GI Hub analysis based on GRESB *Infrastructure Asset Assessment*.

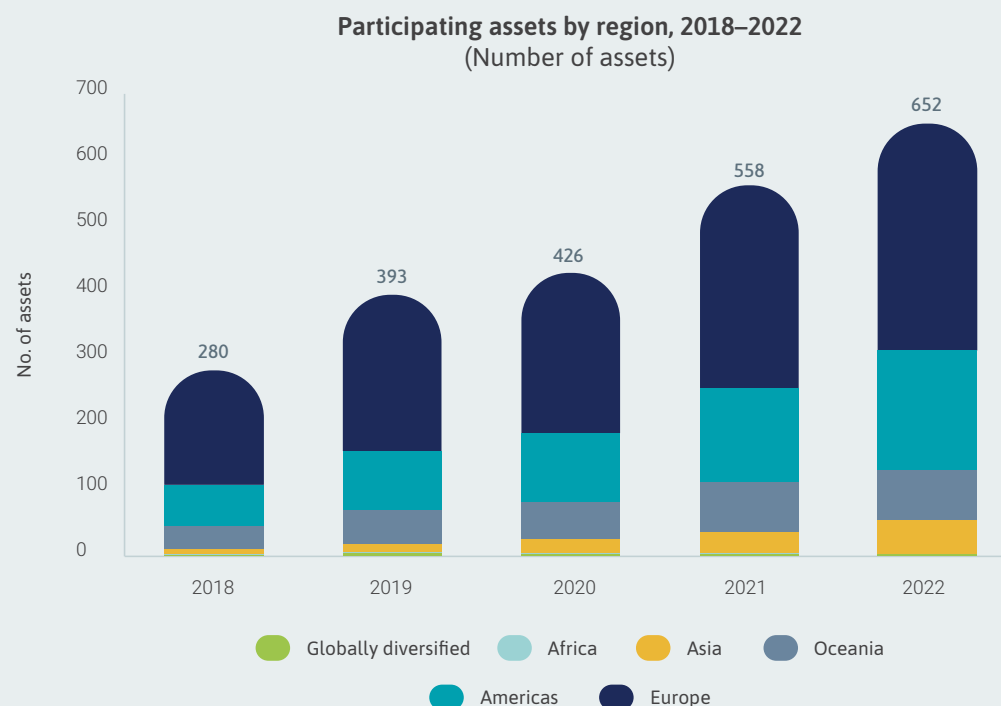
Note: Assets excluded from analysis are assets that are included in GRESB's assessment but are not considered as infrastructure by the GI Hub, such as oil, gas, and defence assets as well as diversified/multi-sector assets.

Environmental, social, and governance (ESG) factors in infrastructure

Sample distribution by region

Western Europe represented more than half of the participating GRESB assets in 2022 – more than double the second most prevalent region, North America. Western Europe is widely recognised as a global leader in ESG reporting and disclosure and has been the dominant participant in GRESB's *Infrastructure Asset Assessment* since its inception. This reflects the relatively more advanced development of regulations for ESG reporting and disclosure in Europe, such as the EU's Taxonomy and the Sustainable Finance Disclosure Regulation (SFDR).

While the number of participating assets outside these two regions remain relatively low, most regions have recorded greater participation over time – most notably Asia. Asia has traditionally lagged Western Europe and North America, as the region is more fragmented and lacks unified regulation and standards. Regional disclosure frameworks are not as well established, there is no single governing body that can help create a unifying taxonomy, and global ESG standards and frameworks are not universally adopted (Preqin (2022b)).



Source: GI Hub analysis based on GRESB *Infrastructure Asset Assessment*.

Appendix 3

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