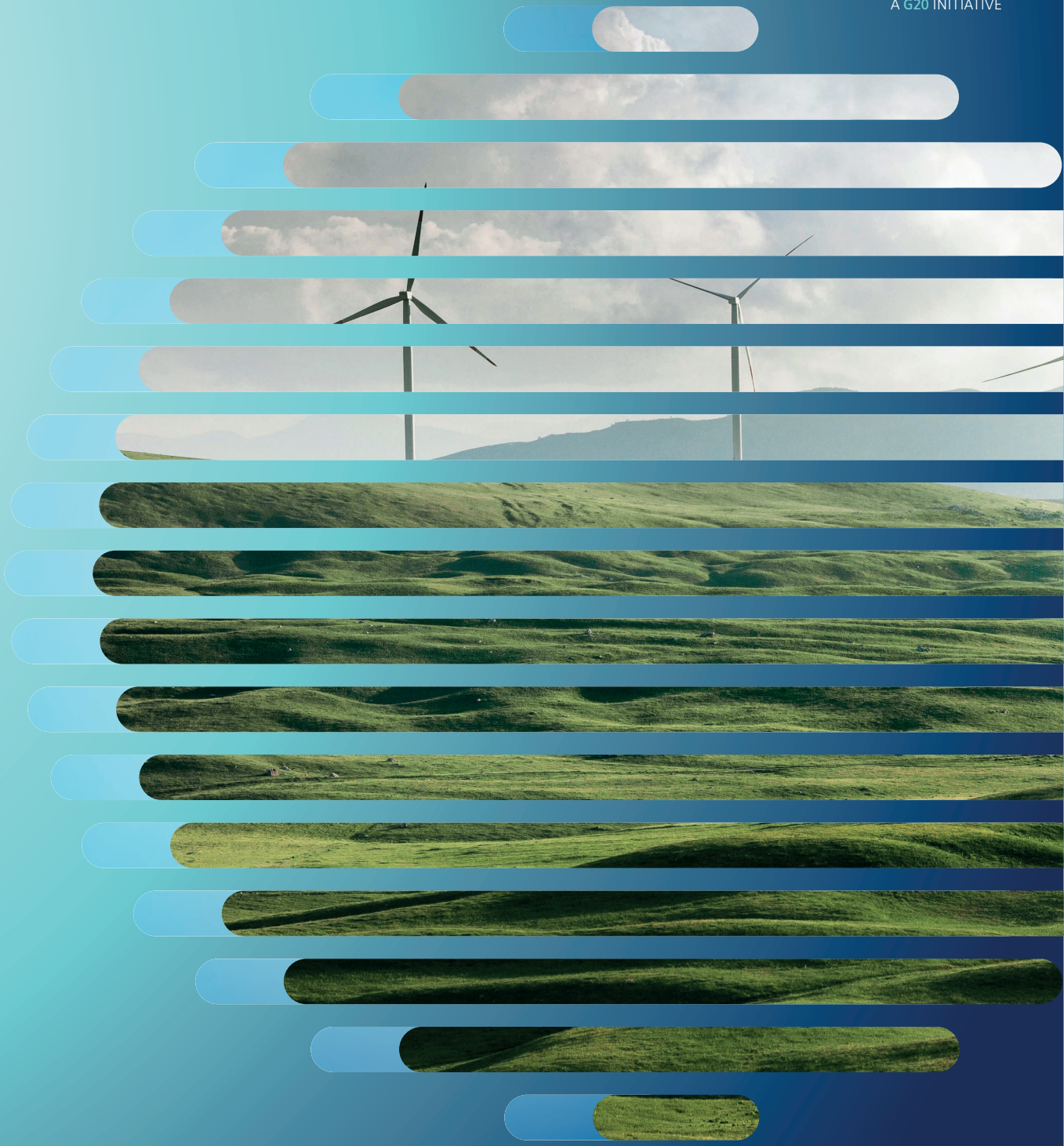
Global Infrastructure Hub

A G20 INITIATIVE

INFRASTRUCTURE MONITOR 2023

Global trends in private investment in infrastructure



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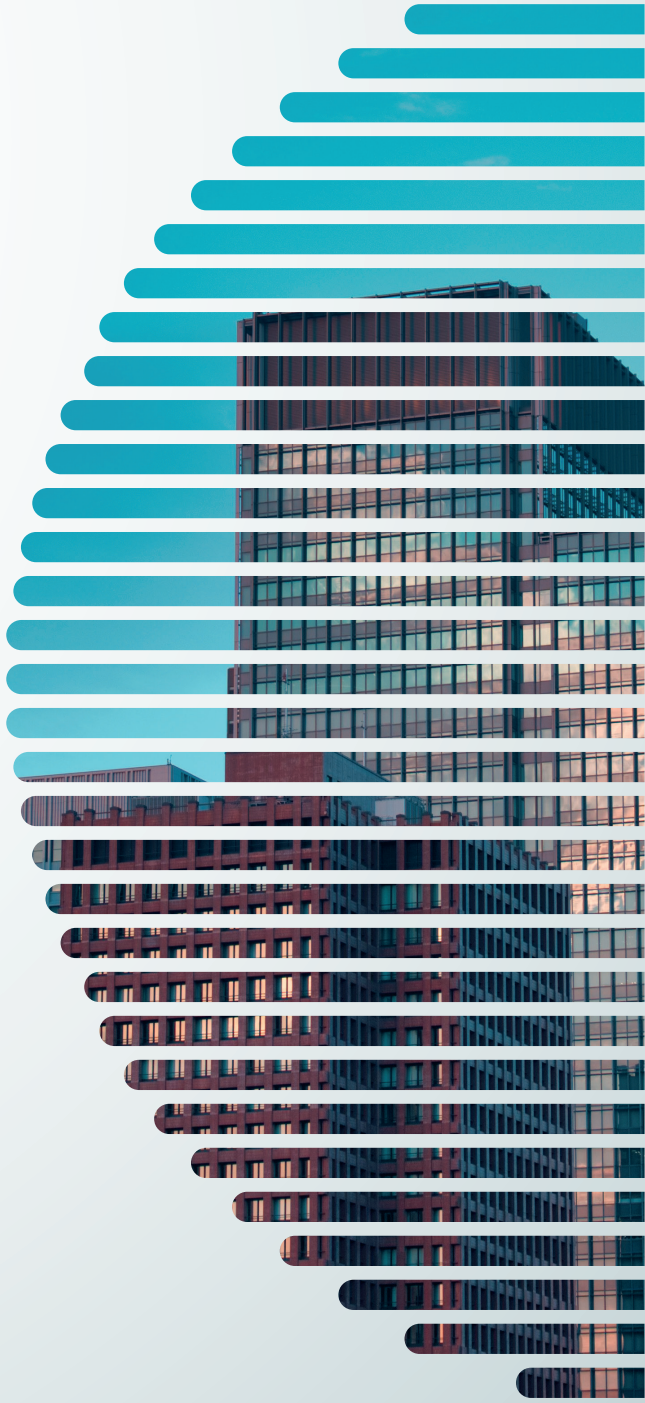


About

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 2023 report were gathered from our data partners Convergence, EDHECinfra, GRESB, MSCI, Moody's, and Preqin, and we received data from Realfin.

This report covers trends in: i) private investment in infrastructure projects; ii) infrastructure investment performance; and iii) availability of private capital for infrastructure. Additional sections on the role of blended finance in infrastructure investment and 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 a global evidence base and expert data insights on the state of private investment in infrastructure, in a single report.

We welcome your feedback on this year's edition and your suggestions for the 2024 edition.

About the GI Hub

The Global Infrastructure Hub (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, and 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

After a decade of stagnation, in 2022, private investment in infrastructure projects in primary markets recovered, and in some sectors, exceeded pre-COVID-19 levels. Transactions increased by 30%, with an overall value that was 41% higher than the five-year average.

- In 2022, after eight years of stagnation, private investment in infrastructure experienced a significant resurgence. Primary markets saw a substantial increase in transactions and overall value, marking a 30% rise in transactions and a 41% increase in value compared to the five-year average (2017–2021).
- This significant increase was the result of a post-COVID-19 recovery back to 2015–2019 levels (as a % of GDP), stronger growth in energy transmission and digital infrastructure, and a set of large airport transactions that pushed the level above their pre-pandemic averages. Renewables, especially solar energy, remained strong, with a clear shift toward cleaner energy across income groups. The secondary market also performed strongly due to growth in acquisitions. However, a single year of data is insufficient evidence to indicate a lasting shift in the trend.
- It should be noted that – compared with previous years' reports – the analyses draw on a bespoke new dataset developed in partnership with Realfin which has a more comprehensive coverage of transactions, particularly in developing markets. This new dataset almost doubles the value and number of transactions from previous GI Hub *Infrastructure Monitor* reports. Other datasets accessible to the GI Hub also show strong – albeit lower – growth.

Private investment in infrastructure projects in primary markets

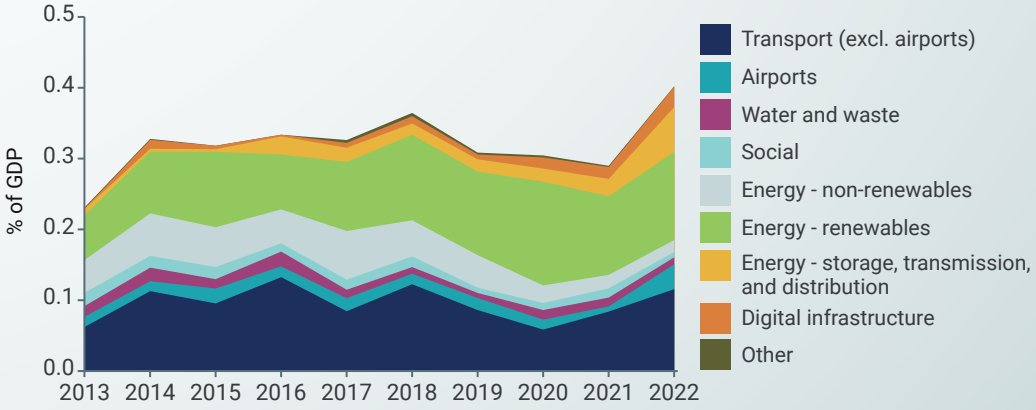
(USD billion, number of transactions, and % growth in value compared to five-year average)

Source: Global Infrastructure Hub based on Realfin data.

Note: Throughout this report, '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, unless otherwise specified. Investment values represent commitments made at the financial close of investment and not executed investment.

Private investment in infrastructure projects by sector

(% of GDP)



Source: Global Infrastructure Hub based on Realfin data.

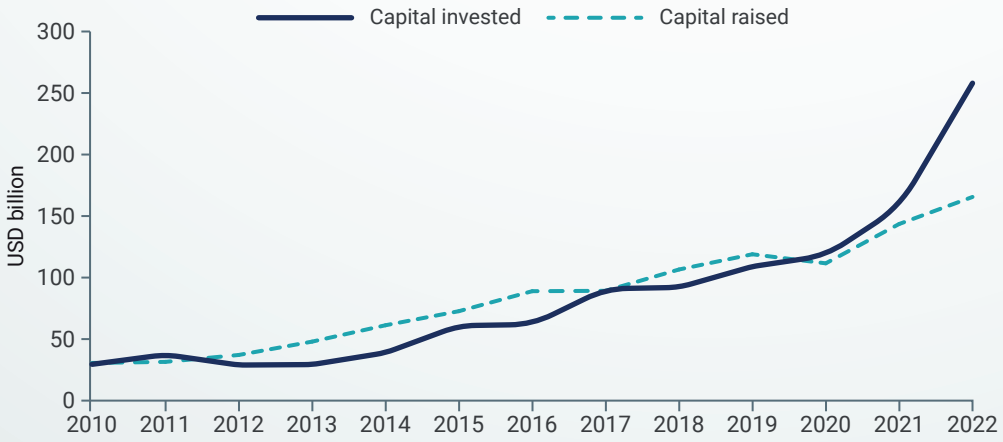
Note: 'Other' includes environment and infrastructure (general) sectors.

In 2022, the private infrastructure capital invested significantly outpaced the capital raised. Most of the private infrastructure capital raised and invested by funds has been concentrated in North America and Europe.

- In 2022, for the first time, private infrastructure capital invested grew by 64%, significantly outpacing the growth in private infrastructure capital raised (15%). The vast majority of capital raised (91%) and invested (78%) by funds in 2022 was concentrated in North America and Europe.
- Private capital raised for all asset classes including infrastructure had consistent growth before the COVID-19 pandemic before dropping in 2020 and recovering in 2021.
- With rising inflationary pressures and risk aversion coupled with intensified government plans for infrastructure investments, the private capital raised for infrastructure increased sharply to a record level (USD166 billion) in 2022, while the aggregate capital raised for all asset classes declined.

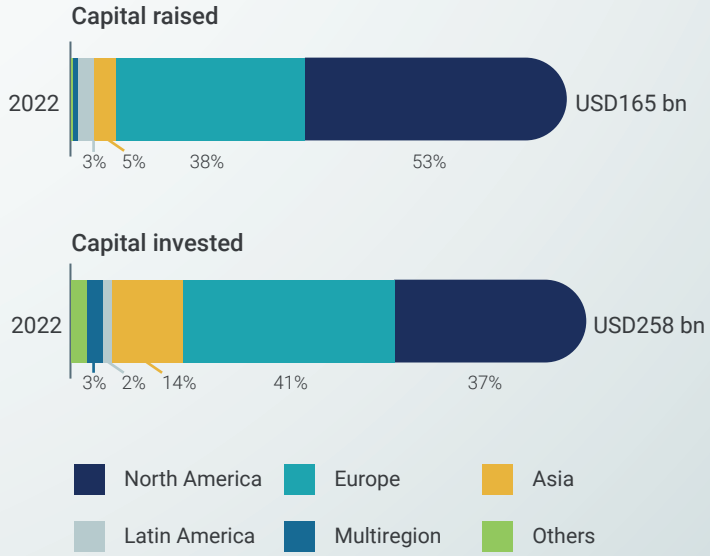
Annual private infrastructure capital raised and invested by funds

(USD billion, 2010–2022)



Private infrastructure capital raised and invested by funds by region in 2022

(% of total)



Source: Preqin data as of 13 October 2023.

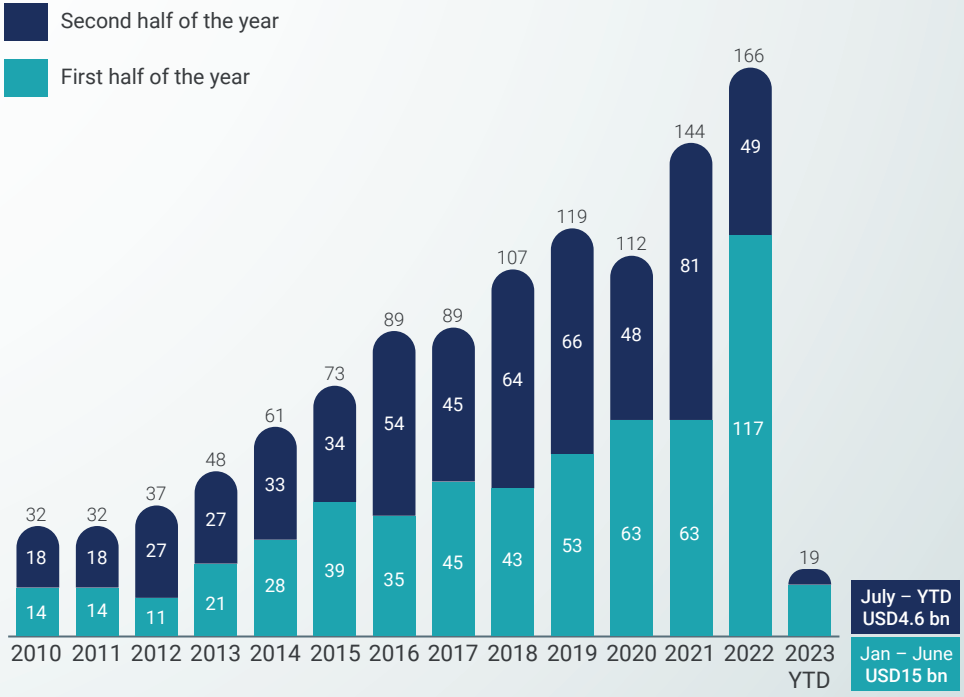
Note: Capital invested is measured by the annual capital called by the fund manager for investment in the infrastructure asset class.

In sharp contrast, 2023 has recorded the lowest levels of capital raised in a decade.

- While 2022 saw a record-high in infrastructure capital raised by funds, 2023 has shown a significant decline, highlighting the dynamic nature of private capital and the influence of economic conditions and global events.
- By July 2023, there was a decrease in dry powder, mainly due to the low funds raised and increased funds invested. This decrease, notably in North America, contrasted with rising dry powder in developing economies, signifying lower levels of private capital mobilisation and investment in these regions.
- The majority of private infrastructure capital raised and invested by funds, excluding 2023, concentrates in North America and Europe. Renewable energy ranks second after diversified funds, accounting for 16% of infrastructure capital raised in 2022. However, investments within the renewables sector often target low-risk opportunities that are categorised as secondary investments rather than greenfield projects.
- Interestingly, 70% of the private infrastructure capital raised by funds aims for lower-risk strategies while investing in the infrastructure asset class. This trend indicates a preference for lower-risk investment options within the infrastructure domain.

Private infrastructure capital raised by funds

(USD billion, 2010–2023)



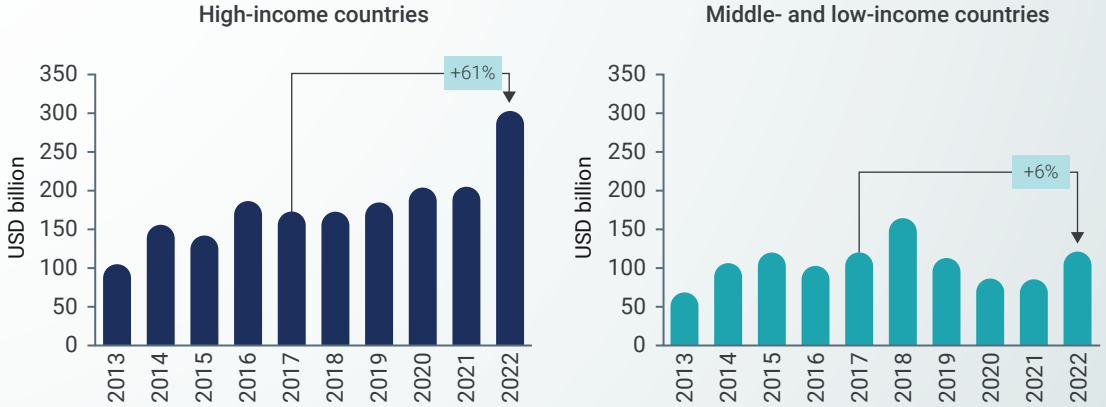
Source: Preqin data as of 13 October 2023.

The disparity between high-income and middle- and low-income countries persists as high-income nations continue to attract a much larger share of global infrastructure private investment.

- While high-income nations attracted the lion's share of global private infrastructure investment, middle- and low-income countries also experienced growth in 2022, albeit only 6% above their five-year average.
- Prior to 2022, private investment in infrastructure projects was on broadly similar levels in North America, Western Europe, and Asia. However, this was not the case in 2022. While investment increased globally in all regions except Oceania, growth was particularly strong in North America (up by 92%) and Western Europe (up by 89%).
- In North America, growth was fuelled by the transport sector with several large projects, notably airports in the US and light rail in Canada, reaching financial close. This significant increase may be related to strong policy support for infrastructure by the current US administration, such as the *Infrastructure Investment and Jobs Act (2021)*, which opened up investment opportunities in the US.

Private investment in infrastructure projects by income group

(USD billion and % growth compared to five-year average)



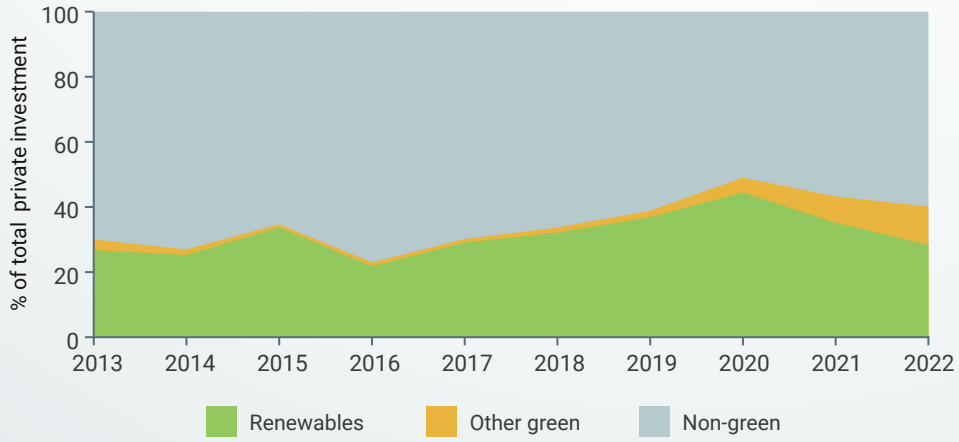
Source: Global Infrastructure Hub based on Realfin data.

The share of green investment has plateaued in recent years, but sustainable financing is increasingly being used to finance private investment in infrastructure.

- Debt remains the primary source of financing for infrastructure projects, with sustainable financing gaining traction in both income brackets, particularly in North America and Western Europe. In 2022, their use increased in both income groups, with North America and Western Europe still leading the way. Banks played a significant role in financing, with the public sector's share rising after years of decline.
- Overall, the share of green private investment in infrastructure has increased since 2016, aligned with the global clean energy transition. However, it has declined since 2020, when it was particularly high due to continued growth in renewables during the pandemic, while investment in other sectors - most notably transport - saw a significant drop. In 2022, non-green investment grew significantly (54%) outpacing growth in total green investment (35%).
- While green investment typically represents renewable energy generation projects, in 2022, growth in sectors outside renewables (Other Green) outpaced growth in renewables. This growth in Other Green primarily reflects energy transmission and battery storage projects.

Green and non-green private investment in infrastructure projects

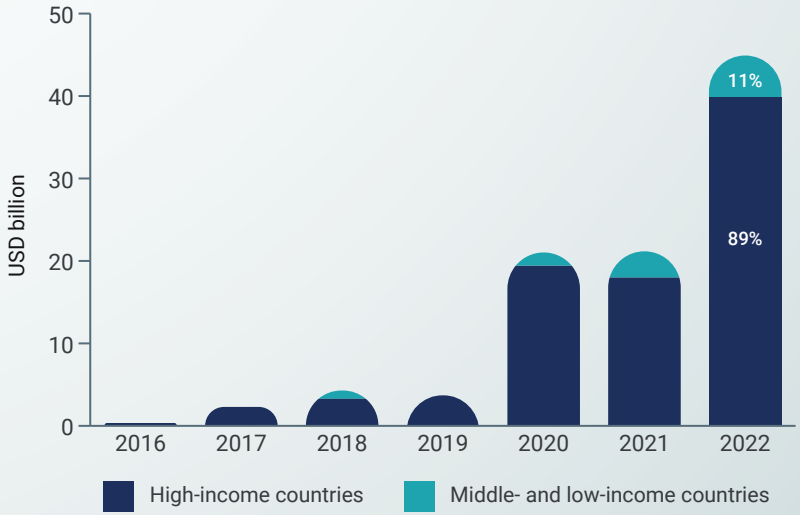
(% of total private investment in infrastructure projects)



Source: Global Infrastructure Hub based on Realfin data.

Sustainable financing of private investment in infrastructure projects

(USD billion, by income group)



Source: Global Infrastructure Hub based on Realfin data.

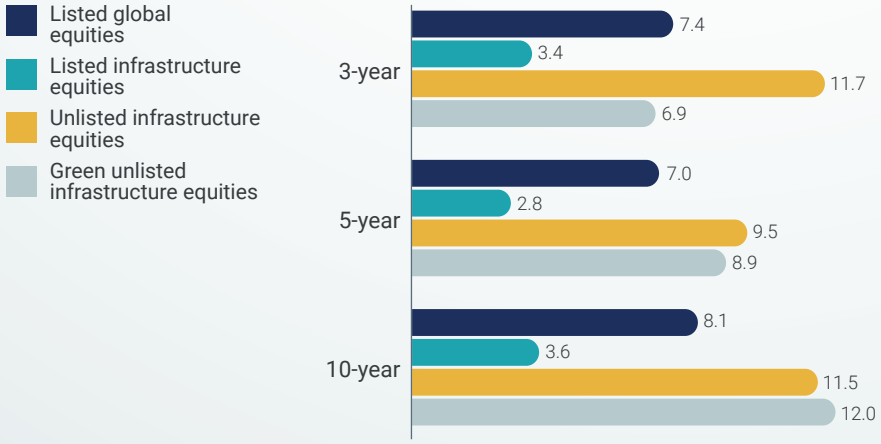
Note: Includes only transactions for which instrument details are available.

Recent shocks have affected returns for all equities, but unlisted infrastructure has proven much more stable than global equities.

- Infrastructure equities provided increasing returns to private investors for the decade prior to the COVID-19 pandemic. Unlisted infrastructure equities provided higher risk-adjusted returns to investors compared to other equities, including global listed equities.
- Annual returns on global infrastructure equities – listed and unlisted – declined from highly attractive levels in 2019 to nearly zero in 2020 due to the COVID-19 lockdowns. As the world recovered from the pandemic in 2021, so did infrastructure equities.
- The multiple crises of 2022 – rapid inflation, sharp interest rate hikes, supply chain shocks, and the Russia-Ukraine war – impacted global listed markets more severely than unlisted infrastructure equities.
- Infrastructure assets generally offer protection from inflation, but the sensitivity to interest rate changes varies by sector depending on the revenue model.
- Unlisted infrastructure equities demonstrate better downside protection and exhibit risk parameters similar to bonds, particularly from project finance structures as opposed to corporate structures. They provide attractive returns in both developed and emerging markets.

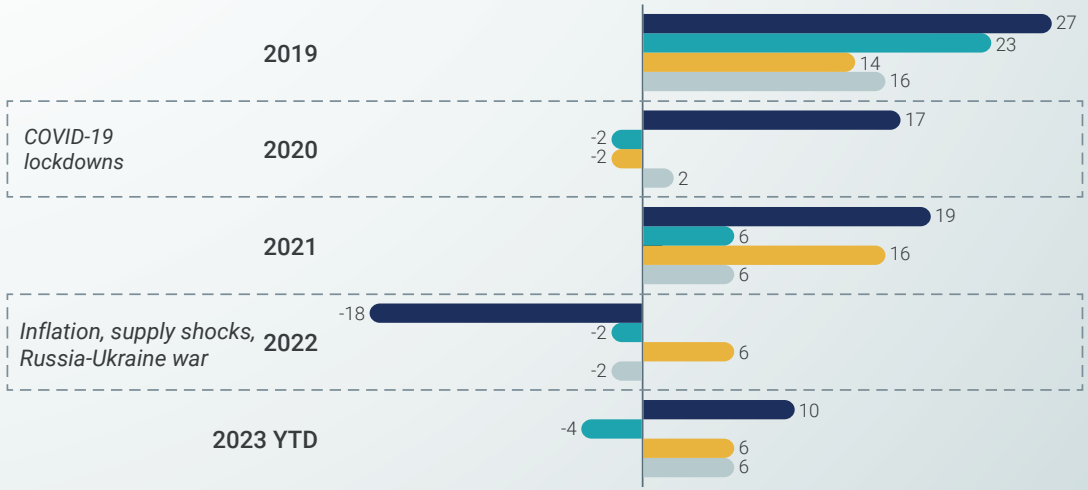
Annualised returns by type of equity

(%)



Annualised returns by type of equity

(%)



Source: MSCI and EDHECInfra (2023a) as of 30 September 2023.

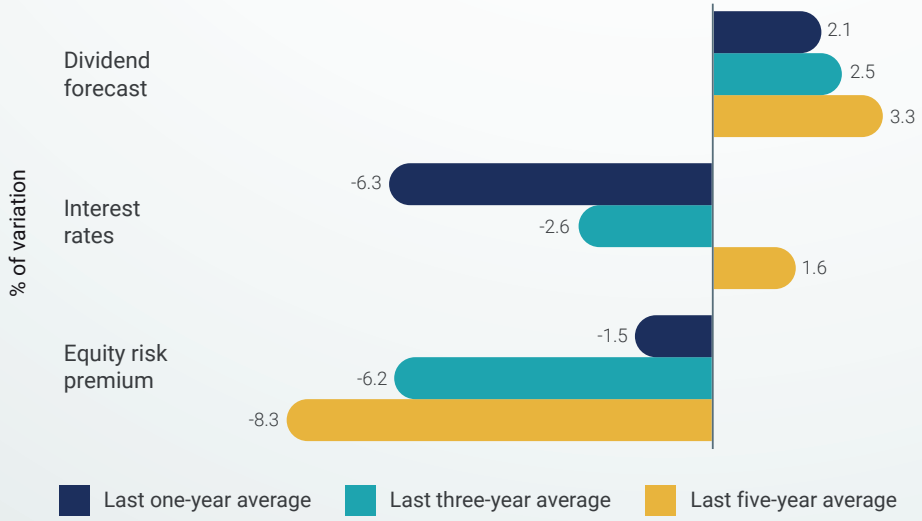
Note: Annual returns are based on monthly gross returns data in a calendar year. The indices present aggregate performance levels. Global equity performance is measured by the MSCI All Country World Index (MSCI ACWI). Listed infrastructure equity performance is measured by the MSCI ACWI Infrastructure Capped Index (MSCI ACWI-IC). Unlisted infrastructure equity performance is measured by the EDHECInfra Infra300 equity index. Green unlisted infrastructure equity performance is measured by the EDHECInfra InfraGreen index.

Infrastructure valuations face downward pressures from multiple shocks including a high risk premium during the COVID-19 pandemic, rapid interest rate hikes, and climate change.

- The net value of an infrastructure equity is negatively impacted by increases in the risk premium and interest rates. In 2021, the COVID-19 pandemic increased the risk premium from 665 basis points in 2019 to 770 basis points in 2021 – a level last seen in 2011. As the world recovered from the pandemic, the risk premium on infrastructure equities began to decline. However, it is still above the 2019 level. Currently, the valuation is being severely impacted by rapid interest rate hikes.

- Climate change poses a significant threat to infrastructure, as rising sea levels, extreme weather events, and increased temperatures can lead to the deterioration of infrastructure. Under existing climate scenarios, the potential consequences for infrastructure are significant. By 2050, the net value of an infrastructure asset is expected to reduce by 4.4% on average, and by 26.7% in the worst case, due to the increasing physical risks of climate change.

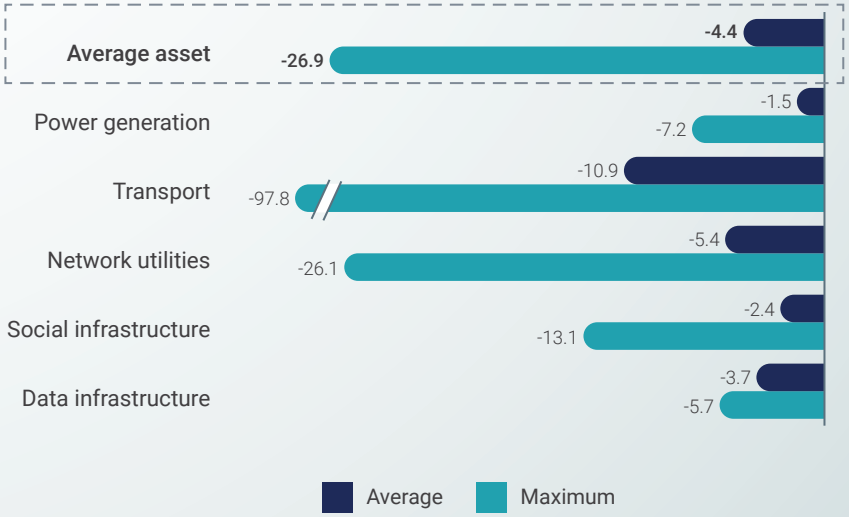
Average change in net asset value of global infrastructure equities due to increase in:



Source: EDHECInfra (2022a). Based on InfraMetrics 2022 data.

Potential infrastructure losses due to physical risks of climate change by scenario by 2050 in the current policy scenario

(% of net asset value loss by type of infrastructure asset)



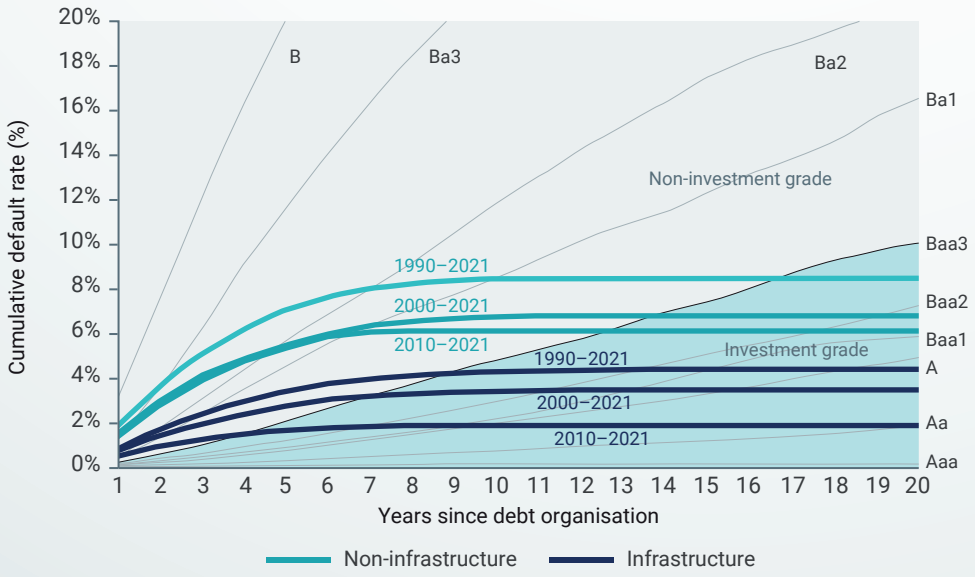
Source: EDHECInfra (2023b).

Note: The analysis is based on a representative sample of 700+ companies for which asset-level climate risk estimates are available in the EDHECInfra InfraMetrics platform. Portfolio loss was estimated by creating thousands of random portfolios using hundreds of assets for which net asset value loss was estimated.

Infrastructure loans consistently maintain lower default rates compared to non-infrastructure loans. With global recovery from the COVID-19 pandemic in 2021, the default rates reduced across all regions and sectors.

- With lower default and higher recovery rates, the average expected loss on infrastructure loans represents only a quarter of that for non-infrastructure loans, a trend observed in both high-income and middle- to low-income countries.
- Default rates on infrastructure loans have historically decreased in most regions, with the exception of Eastern Europe and Latin America. Notably, in 2021, default rates dropped across all regions. The default rates also reduced for all infrastructure sectors in 2021. Strong government support to prevent defaults during the COVID-19 pandemic played an instrumental role in reducing default rates for infrastructure projects.

20-year cumulative default rate by sector and origination year



Source: Moody's (2023a). Data as of 2021.

20-year cumulative default rates by origination year and region

(%)

Loan origination years:	1983–2019	1983–2020	1983–2021
Infrastructure	**5.4**	**5.0** ↓	**4.5** ↓
Africa	1.1	1.8 ↑	1.1 ↓
Middle East	1.2	2.2 ↑	2.0 ↓
Western Europe	4.6	4.0 ↓	3.6 ↓
Asia	5.9	5.2 ↓	4.7 ↓
North America	6.8	6.6 ↓	5.4 ↓
Oceania	7.3	10.1 ↑	9.2 ↓
Latin America	10.3	10.5 ↑	10.1 ↓
Eastern Europe	11.8	11.8	11.2 ↓

Source: Moody's (2023a). Data as of 2021.

Private investment in infrastructure

Introduction

This section presents data and analyses related to levels of private investment in infrastructure. Unless otherwise stated, the analyses 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 the privatisation of public sector assets.

Compared with previous years' reports, the analyses draw on a bespoke new dataset developed in partnership with Realfin which has a more comprehensive coverage of transactions, particularly in developing markets. The new dataset almost doubles the value and number of transactions from previous *Infrastructure Monitor* reports.

With this additional coverage, the Realfin dataset represents the best available comparable data for global project-based private investment in infrastructure. However, it is still not exhaustive, so figures presented in this section underestimate the true levels of global private investment in infrastructure. 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. The dataset 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. E.g. balance sheet financing is estimated to account for 70% of total private investment in renewable energy.

ii. Coverage of green, sustainable, and sustainability-linked bonds is limited, particularly as use-of-proceeds (intended and actual) are typically not reported and are 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.

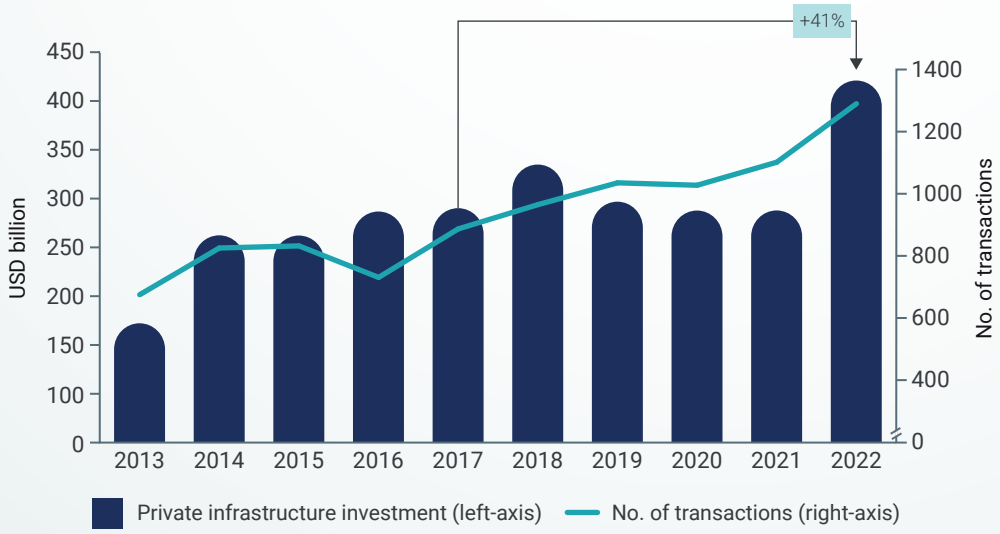
Key findings

- In 2022, after eight years of stagnation, private investment in infrastructure projects in primary markets increased significantly, with the number of transactions up 30% and the overall value 41% higher than the five-year average.
- The secondary market for infrastructure also performed strongly in 2022, driven by growth in acquisitions.
- In 2022, private infrastructure investment grew significantly in high-income groups. Middle-and low-income groups also saw an increase but only 6% above their five-year average. Disparity persists as high-income nations continue to attract a much larger share of global infrastructure private investment.
- While investment increased in all regions except Oceania in 2022, growth was particularly strong in North America and Western Europe where investment almost doubled.
- Investment growth in 2022 was led by the transport sector, with strong growth also seen in digital infrastructure and energy transmission.
- Private investment in infrastructure has experienced a post-COVID-19 recovery, with stronger growth in energy transmission and digital infrastructure pushing levels above their pre-pandemic averages.
- In 2022, private investment in non-green sectors showed stronger growth than renewables.
- There is a clear shift toward cleaner energy. While renewables have long been the preferred type of investment for energy generation in high-income countries, middle- and low-income countries are catching up.
- Solar is by far the most common type of energy generation across both income groups, but the energy mix varies.
- Private investment in infrastructure projects continues to be primarily debt-financed, and increasingly so.
- Sustainable financing is increasingly being used to finance private investment in infrastructure. In 2022, its use increased in both income groups, with North America and Western Europe still leading the way.
- In 2022, growth in private infrastructure investment was driven by banks, who continued to increase their role as financiers, as well as the public sector, whose share rose after years of decline.

In 2022, after eight years of stagnation, private investment in infrastructure projects in primary markets increased significantly, with the number of transactions up 30% and the overall value 41% higher than the five-year average.

Private investment in infrastructure projects in primary markets

(USD billion, number of transactions, and % growth in value compared to five-year average)



- In 2022, global private investment in infrastructure projects in primary markets increased by 46% to USD424 billion, ending an eight-year period of stagnation. Investment now sits well above pre-pandemic levels and is 41% higher than the past five-year average (2017–2021).
- Nevertheless, a single year of data is insufficient evidence to indicate a lasting shift in the trend. Also, if the prevailing macroeconomic conditions persist, or worsen, and interest rates remain elevated or continue to rise, the attractiveness of infrastructure investments may diminish, and infrastructure fundraising will continue to decline – as seen in 2023. This could impose constraints on investments in upcoming years.
- The number of transactions also continued to increase in 2022, rising by 18% to reach 1,293 transactions. However, with stronger growth in the value of infrastructure investment, the average transaction size increased overall in 2022, after three years of decline. This primarily reflects stronger investment in sectors with typically larger project sizes, notably transport and digital infrastructure.

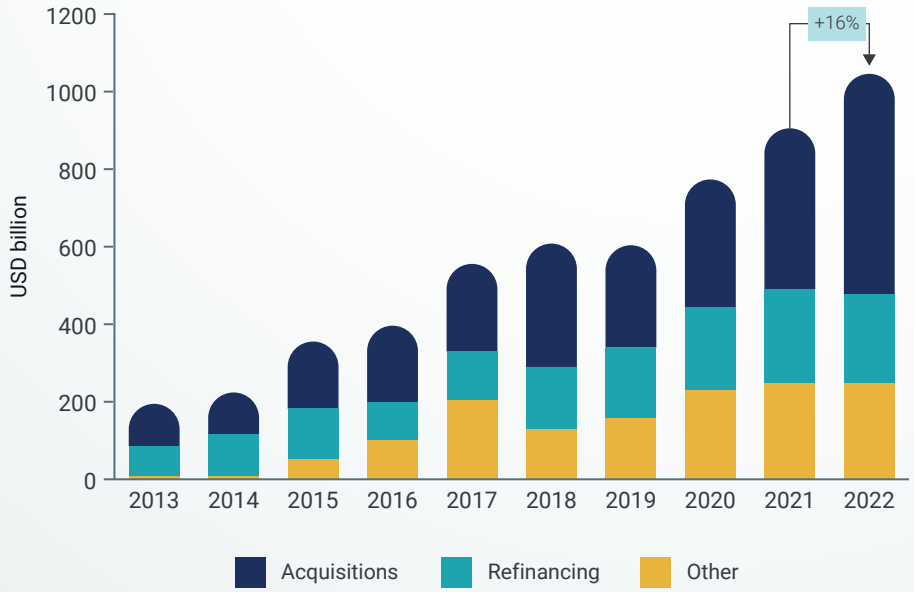
Source: Global Infrastructure Hub based on Realfin data.

Note: Throughout this report, '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, unless otherwise specified. Investment values represent commitments made at the financial close of investment and not executed investment.

The secondary market for infrastructure also performed strongly in 2022, driven by growth in acquisitions.

Private investment in infrastructure projects in secondary markets

(USD billion)



- Secondary private investment in infrastructure projects rose by 16% in 2022 to USD1 trillion across 1,892 transactions, continuing the trend from the past decade. Total secondary investment in infrastructure projects is now 73% higher in value than the pre-pandemic level in 2019.
- Growth in 2022 was driven by an increase in acquisitions, which rose by 37% to USD569 billion, representing 54% of total secondary investment in infrastructure (the highest since 2013). Acquisition growth is likely to reflect several factors, such as an increasing attraction toward the safe haven of secondary markets amid heightened global uncertainty, and the potential hedge that infrastructure assets can offer against rising inflation.
- Meanwhile, refinancing fell in 2022 for the first time since 2016 (down by 6%). Fewer investors opted for refinancing due to increasing interest rates which would result in considerably higher interest costs compared to their existing obligations.

Source: Global Infrastructure Hub based on Realfin data.

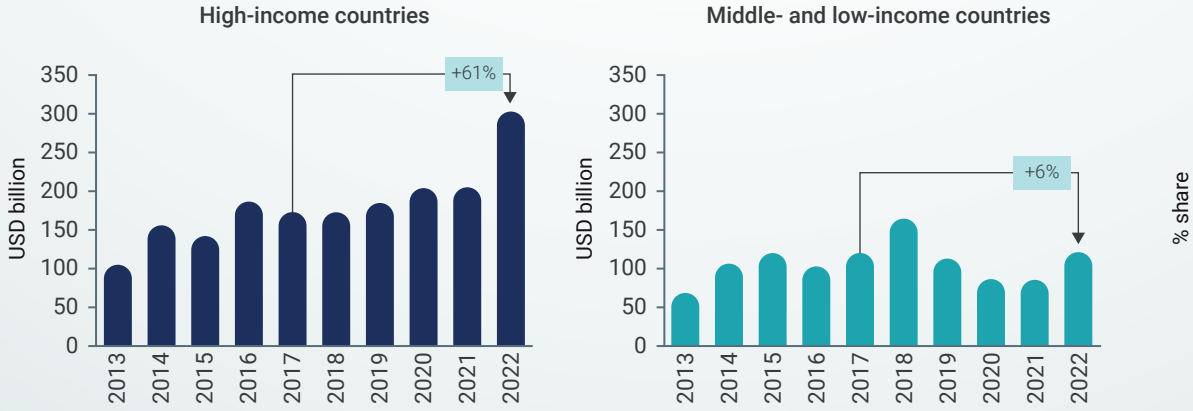
Note: 'Other' includes transactions such as securitisations and financing for infrastructure companies for general corporate purposes and ongoing operations.

In 2022, private infrastructure investment grew significantly in high-income groups. Middle- and low-income groups also saw an increase but only 6% above their five-year average. Disparity persists as high-income nations continue to attract a much larger share of global infrastructure private investment.

- In 2022, despite the multiple crises and shocks, private investment in infrastructure projects increased by 46% in high-income countries (HICs) and 42% in middle- and low-income countries (MLICs). Investment is now 61% higher than the past five-year average (2017-2021) in HICs and 6% in MLICs.
- Despite increases in both income groups, the gap between HICs and MLICs has notably widened since 2018. This continued in 2022, with HICs attracting 71% of global private investment in infrastructure projects while, even with a post-pandemic rebound, investment levels in MLICs lagged their pre-pandemic peak in 2018. Investment in MLICs comprises only about 40% of investment in HICs.
- This disparity is also evident on a share of GDP basis. In 2022, private investment in infrastructure projects represented 0.5% of GDP in HICs (the highest on record), and only 0.3% in MLICs. This highlights the urgency of channelling capital toward MLICs, particularly for sustainable infrastructure.

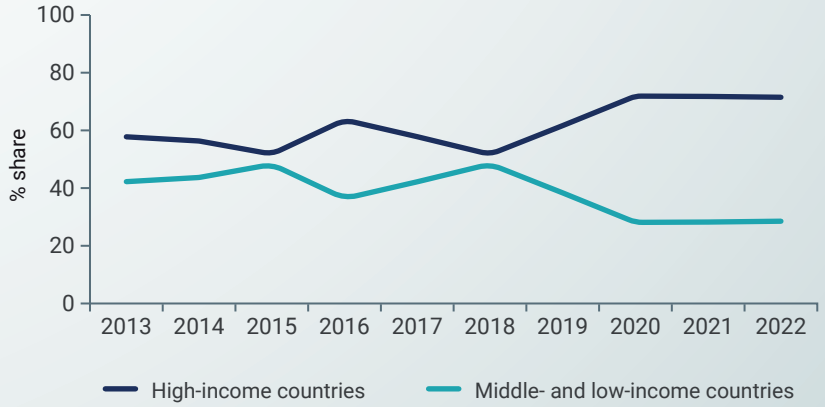
Private investment in infrastructure projects by income group

(USD billion and % growth compared to five-year average)



Private investment in infrastructure projects by income group

(% share of total value)



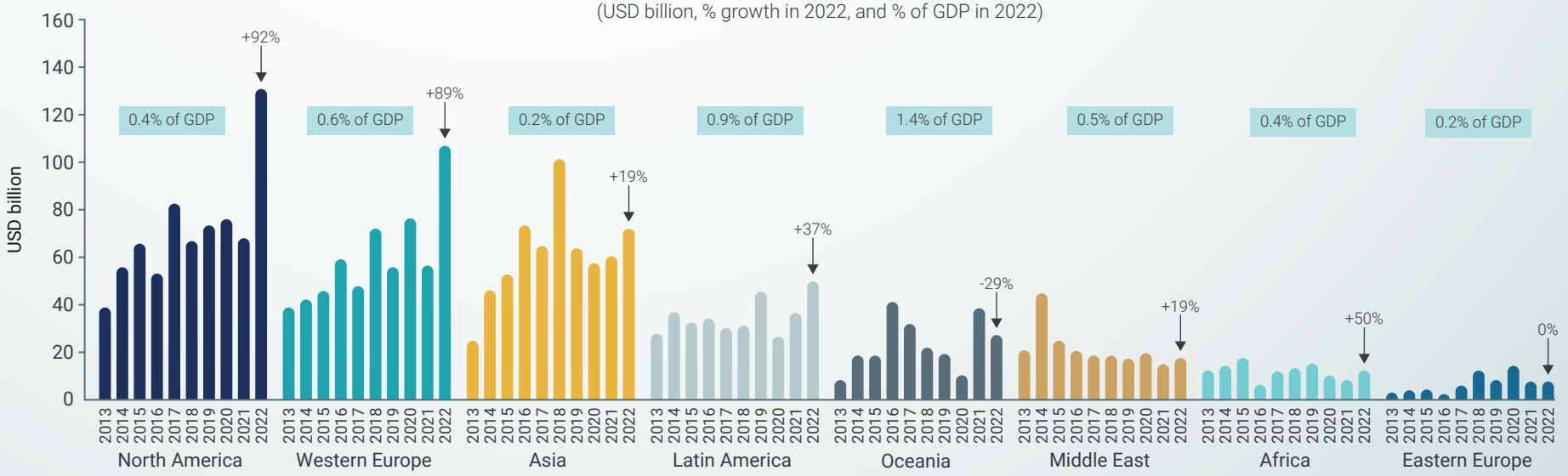
Source: Global Infrastructure Hub based on Realfin data.

While investment increased in all regions except Oceania in 2022, growth was particularly strong in North America and Western Europe where investment almost doubled.

- Prior to 2022, levels of private investment in infrastructure projects were broadly similar in North America, Western Europe, and Asia. However, this was not the case in 2022. While investment increased globally in all regions except Oceania, growth was particularly strong in North America (up by 92%) and Western Europe (up by 89%).
- In North America, growth was led by the transport sector with several large projects reaching financial close – notably airports in the US and light rail in Canada. This may be related to significant policy support for infrastructure by the current US administration, such as the *Infrastructure Investment and Jobs Act (2021)*, which opened up investment opportunities in the US.
- Meanwhile in Western Europe, growth was boosted by the continued rollout of fibre optic broadband networks, particularly in the UK, with investment in the digital infrastructure sector in Western Europe more than doubling (up by 151%) in 2022.
- Private investment in infrastructure continued its post-pandemic recovery in Asia and Latin America, increasing for the second consecutive year. The Middle East and Africa saw strong growth, albeit from low levels, to be broadly in line with their pre-pandemic averages. Investment in Eastern Europe was flat, with Poland emerging as the dominant country in the region after the onset of the Russia-Ukraine war in 2022, which brought investment to a standstill in Russia.

Private investment in infrastructure projects by region

(USD billion, % growth in 2022, and % of GDP in 2022)



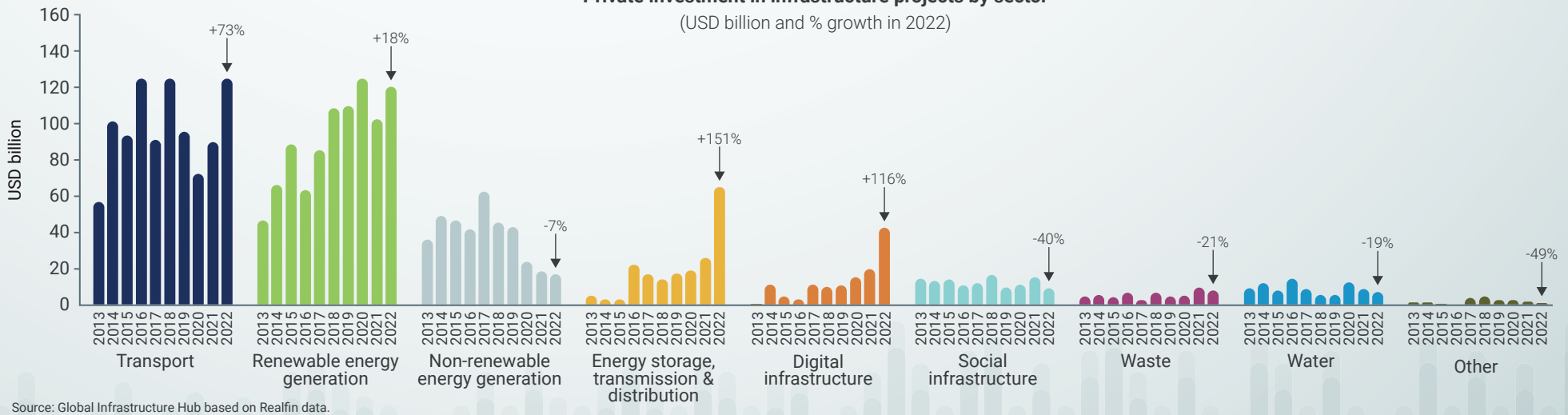
Source: Global Infrastructure Hub based on Realfin data.

Investment growth in 2022 was led by the transport sector, with strong growth also seen in digital infrastructure and energy transmission.

- Transport and renewable energy sectors typically dominate private investment in infrastructure projects, each attracting roughly a third of the total value of investment over the 10-year period from 2013 to 2022 (35% and 31%, respectively). While these two sectors continued to attract the most private investment in 2022, transport investment surpassed renewables investment for the first time since 2018. However, based on the number of projects, renewable energy continues to be the leading sector for private investment in infrastructure, accounting for 55% of all projects in 2022.
- While North America led the way with an almost sixfold increase in transport investment, the increase in transport was more widespread, with all regions except Oceania and Africa experiencing a rise. Asia saw the largest increase after North America, with transport investment more than doubling in 2022, largely reflecting a surge in investment in roads in India due to a favourable regulatory environment and the introduction of innovative structures such as the toll-operate-transfer (TOT) model. Even excluding the record levels of investment seen in airport and light rail projects in 2022 (as noted previously), investment in the transport sector – the most impacted sector during the COVID-19 pandemic – has now recovered to 2% above its pre-pandemic average (2017–2019).
- In the renewable energy sector, investment increased by 18% in 2022, with all regions except Asia and the Middle East recording a rise. Renewables investment in Asia increased for several years, but since 2020, has been declining. 2020 saw investment in some particularly large offshore wind projects in several Asian countries, such as South Korea, Taiwan, and Japan, which have since tapered out.
- Following a period of steady growth, the energy storage, transmission and distribution sector and the digital infrastructure sector saw growth skyrocket in 2022, albeit from low bases. Western Europe continues to dominate investment in digital infrastructure (90% of the sector's total investment in 2022), while transmission projects in both Western Europe and North America supported growth in the energy storage, transmission and distribution sector. Notwithstanding the surge in grid investment in 2022, total energy sector investment has remained at relatively stable levels since 2017. In a positive sign, non-renewable private investment declined for the fifth consecutive year, highlighting the continued shift in investor preferences toward cleaner energy.
- Social infrastructure, waste, water, and other sectors continue to attract the lowest levels of private investment, all of which declined in 2022.

Private investment in infrastructure projects by sector

(USD billion and % growth in 2022)

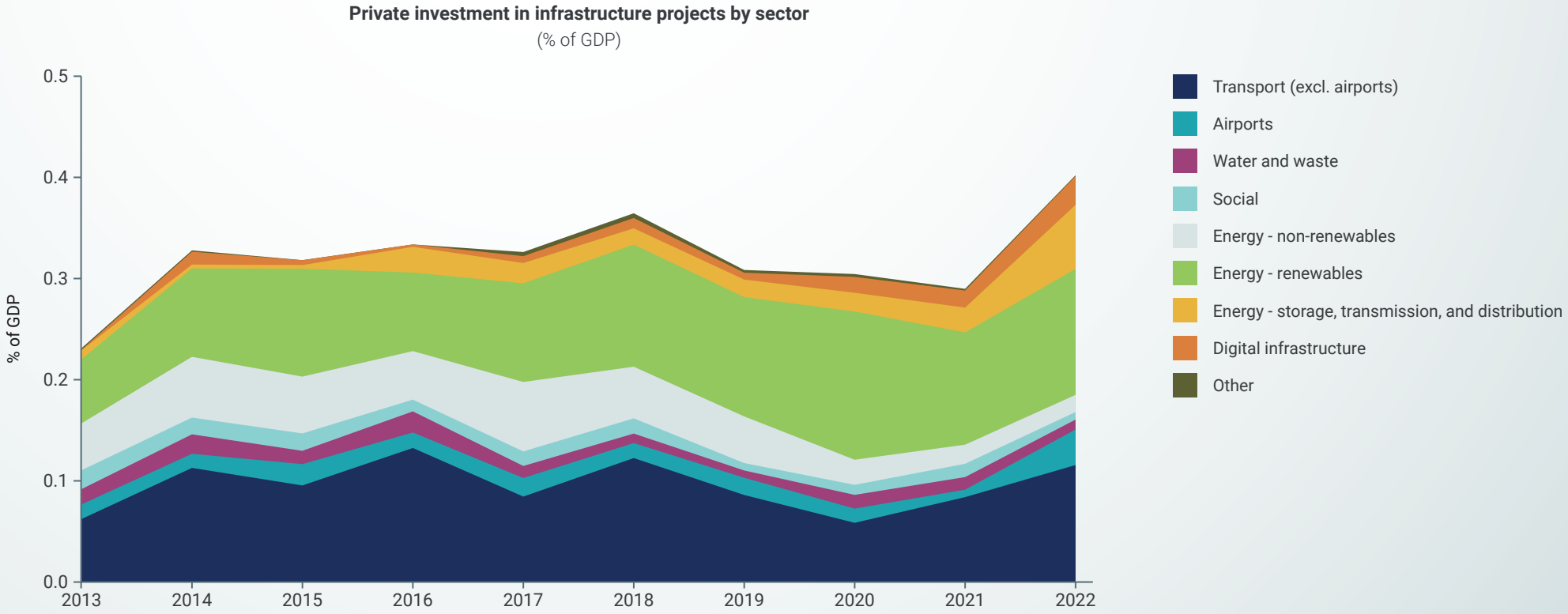


Source: Global Infrastructure Hub based on Realfin data.

Note: 'Other' includes environment and infrastructure (general) sectors.

PRIVATE INVESTMENT IN INFRASTRUCTURE

Private investment in infrastructure has experienced a post-COVID-19 recovery, with stronger growth in energy transmission and digital infrastructure pushing levels above their pre-pandemic averages.



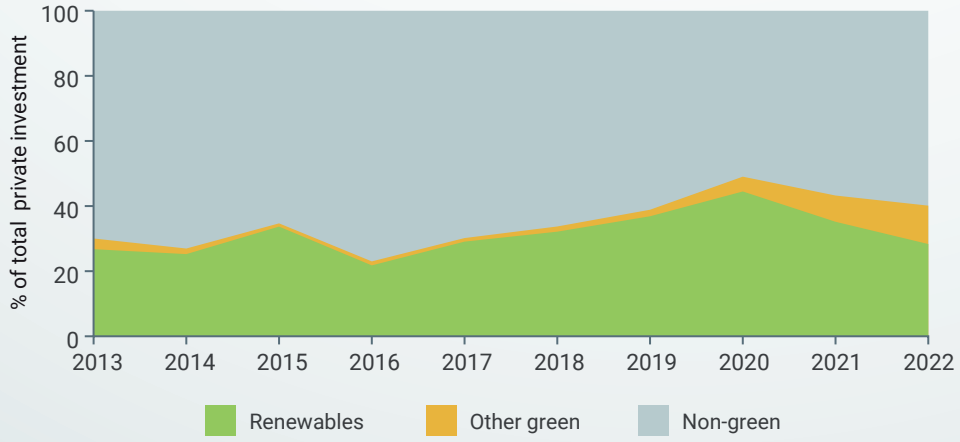
Source: Global Infrastructure Hub based on Realfin data.
Note: 'Other' includes environment and infrastructure (general) sectors.

In 2022, private investment in non-green sectors showed stronger growth than renewables.

- Overall, the share of green private investment in infrastructure has increased since 2016 in alignment with the global clean energy transition and driven by the demand for renewables. However, this share of green private investment has been declining since its peak in 2020, when it was particularly high due to continued strong investment in renewables during the COVID-19 pandemic, while investment in non-green sectors – most notably transport – was heavily impacted and saw a significant drop. Transport investment has since recovered, with only 6% considered green in 2022.
- While green investment typically represents renewable energy generation projects, in 2022, growth in sectors outside of renewables (Other Green) outpaced that of renewables. This primarily reflects growth in energy transmission and battery storage projects. Non-green investment also grew significantly in 2022 (54%), outpacing total green investment growth (35%).
- While non-green investment increased in both HICs and MLICs in 2022, growth in HICs (64%) outpaced that in MLICs (38%). HICs also led the growth in Other Green investment, accounting for 90% of the increase in 2022, mostly in energy transmission and storage projects.
- On a regional basis, investment in North America and Western Europe has been the greenest over the past five years, averaging 51% and 50% of their total private investment in infrastructure from 2018 to 2022. In 2022, these two regions continued to account for the majority of green private investment (37% in North America and 27% in Western Europe). 2022 also saw Africa and Eastern Europe experience a significant surge in green investment, reaching 74% and 70% respectively of total private infrastructure investment in those regions. In contrast, green private investment in Asia has been on a sharp decline since the COVID-19 pandemic, with an increasing focus on transport, and declining investment in renewables. While its share of green private investment fell to 13% in 2022, Asia is still the third largest destination for green private investment, behind North America and Western Europe.

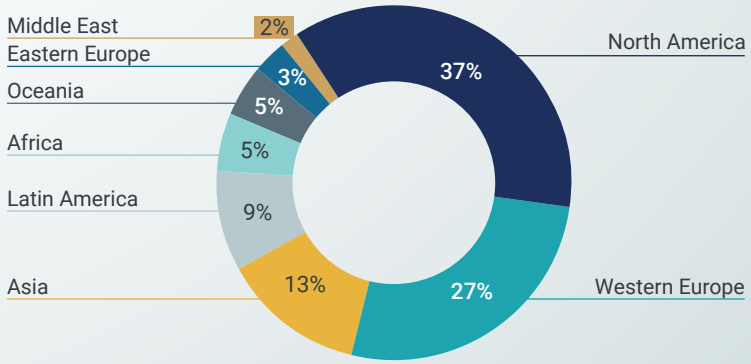
Green and non-green private investment in infrastructure projects

(% of total private investment in infrastructure projects)



Green private investment in infrastructure by region

(% of total green investment, 2022)



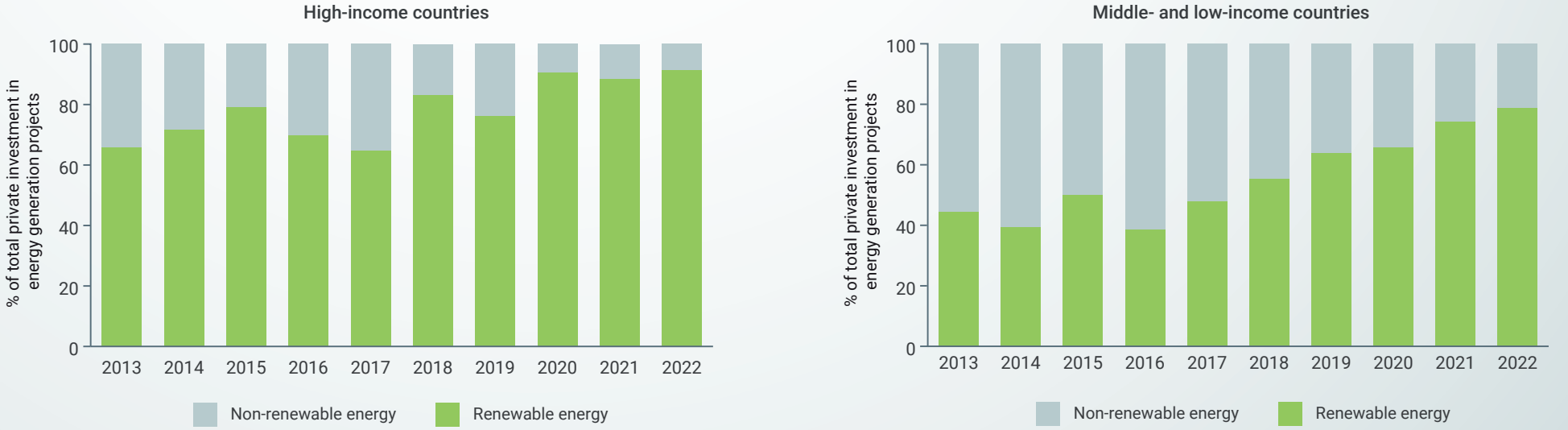
Source: Global Infrastructure Hub based on Realfin data.

There is a clear shift toward cleaner energy. While renewables have long been the preferred type of investment for energy generation in high-income countries, middle-and low-income countries are catching up.

- Globally, the trend away from non-renewable energy generation continued in 2022, as noted previously, with non-renewables representing only 12% of total private investment in energy generation in 2022, compared with 44% a decade ago (2013). However, it is discouraging that new investment in non-renewable energy generation persists, even in high-income countries (where it represented 9% of total energy generation investment in 2022).
- Encouragingly, in middle- and low-income countries, the share of renewables in energy generation projects has been notably increasing since 2016 and continued to do so in 2022, reaching 79% of total energy generation investment.

Private investment in non-renewables and renewables, by income group

(% of total private investment in energy generation projects)



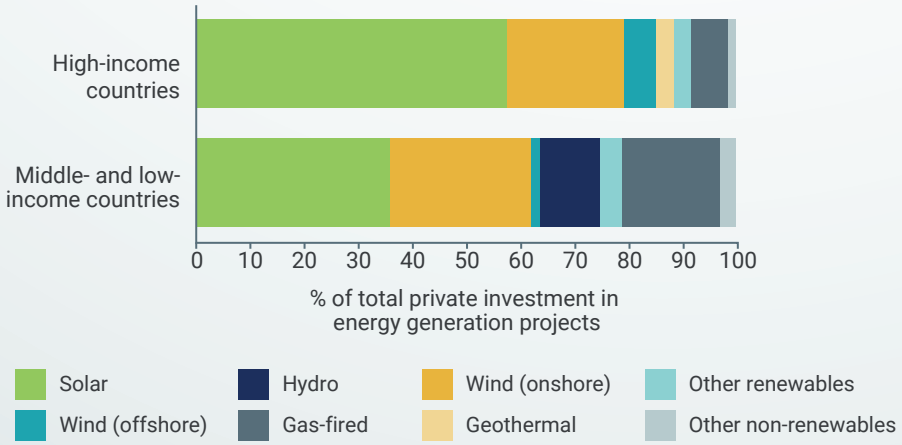
Source: Global Infrastructure Hub based on Realfin data.

Solar is by far the most common type of energy generation across both income groups, but the energy mix varies.

- Among energy generation projects, solar is the most preferred type of energy for private investors. This is true for both HICs and MLICs, although it is relatively more dominant in HICs, where it represented 58% of total energy generation investment in 2022 (compared with 36% in MLICs). Following solar, wind energy (both onshore and offshore) attracted relatively similar shares of energy generation projects in both income groups (27% in HICS and 28% in MLICs). The attractiveness of wind and solar is consistent with significant cost reductions in clean energy technology over the past decade. According to the IEA (2023), the costs of key clean energy technologies – solar PV, wind, heat pumps, and batteries – fell by almost 80% between 2010 and 2022.
- MLICs also have a notably higher share of energy generation investment in both gas-fired power plants and hydropower. While investment in coal-fired power plants saw a steep decline from 38% of total energy generation projects in 2016 to virtually zero in 2022, this was not the case for gas. The share of gas-fired power plants remains at about 18% – on par with the 10-year average.

Private investment in energy generation projects by income group

(% of total private investment in energy generation projects, 2022)



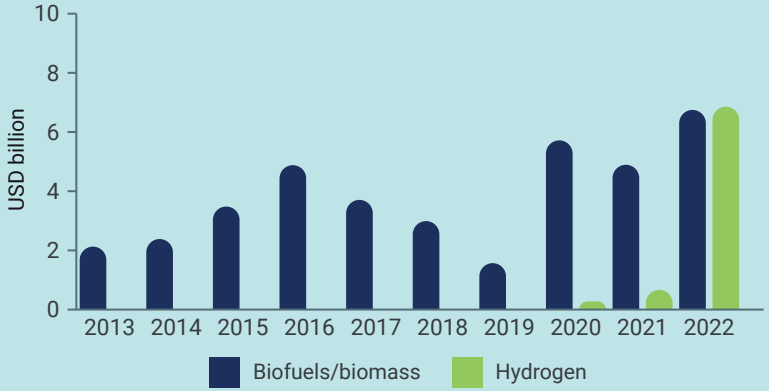
Source: Global Infrastructure Hub based on Realfin data.

Fuel production

While production of both conventional (such as oil and gas) and alternative fuels (such as biofuels and hydrogen) are excluded from estimates of private investment in infrastructure as they are not considered within the GI Hub's definition of infrastructure, such data are still captured. The data show that while biofuels have attracted private investors throughout the past decade, investment in the past three years (2020–2022) has been elevated – at levels almost double (92%) the average of the preceding seven years (2013–2019). Private investment in hydrogen also emerged strongly in 2022, and early data for 2023 indicate that this trend will continue and strengthen.

Private investment in alternative fuel projects

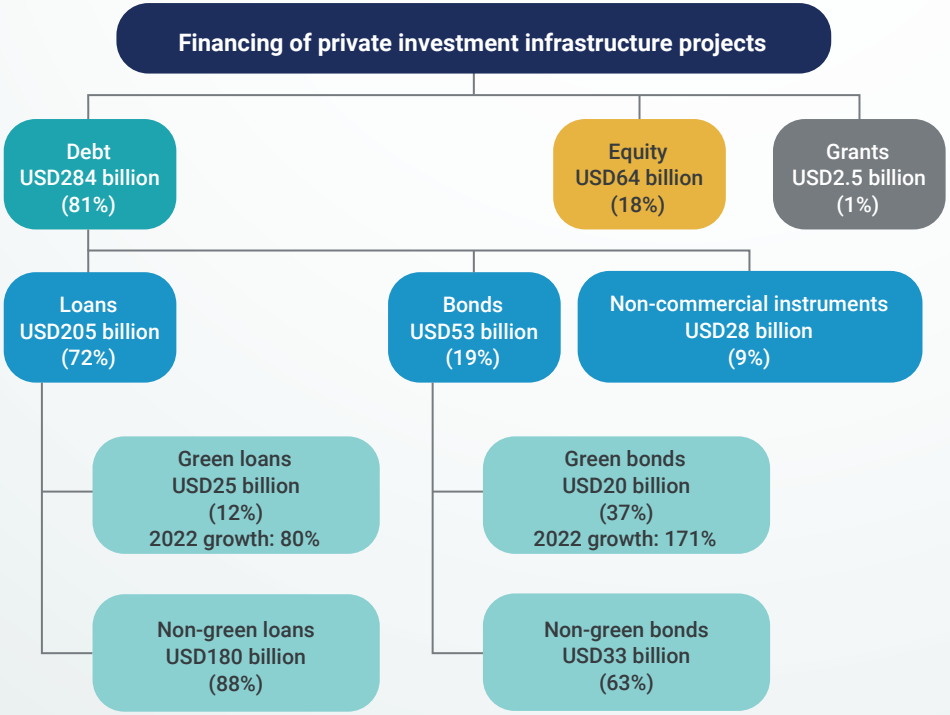
(USD billion)



Private investment in infrastructure projects continues to be primarily debt-financed, and increasingly so.

Financing of private investment in infrastructure projects by instrument

(USD billion and % of total value, 2022)



Source: Global Infrastructure Hub based on Realfin data.

Note: Includes only transactions for which instrument details are available. In this analysis, sustainability-linked bonds are included in the green bonds category.

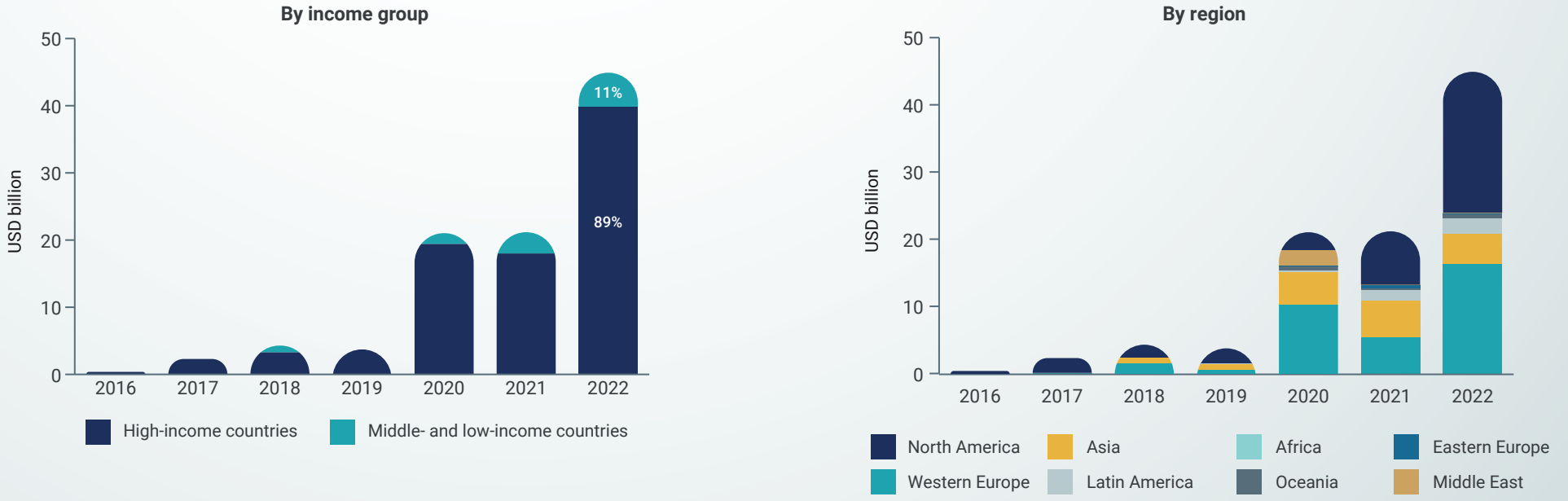
- In 2022, the share of debt financing of private investment in infrastructure projects continued its trend, increasing from 63% in 2016 to 81% in 2022. This increase has been most apparent in Western Europe, where the share increased from 63% in 2016 to 86% in 2022.
- Within debt financing, the use of loans dominates. Moreover, sustainable instruments, primarily green bonds and green loans, continue to grow strongly. In 2022, 13% of the total financing of private investment in infrastructure projects was through either green bonds or green loans.
- Note that there are several challenges related to data on green bond issuances, particularly around the use-of-proceeds:
  i. Green bond data generally do not indicate whether proceeds are being earmarked for primary or secondary purposes.
  ii. Data on actual use-of-proceeds are extremely limited. However, anecdotal evidence suggests that some green bonds are used to refinance existing assets rather than to finance new assets (CPI/IRENA, 2020).

Sustainable financing is increasingly being used to finance private investment in infrastructure. In 2022, its use increased in both income groups, with North America and Western Europe still leading the way.

- While most sustainable financing of private investment in infrastructure projects occurs in HICs (89%), its use increased in both HICs and MLICs in 2022. Growth in MLICs was almost entirely driven by Brazil, while the US led growth in HICs. Nevertheless, sustainable financing still represents a relatively small portion of the overall market (13% of the total value of private investment in infrastructure).
- Sustainable financing continues to grow in prevalence in more regions, with its use expanding in five out of eight regions in 2022. However, North America and Western Europe remain the clear leaders, accounting for 83% of all sustainable financing in 2022.

Sustainable financing of private investment in infrastructure projects

(USD billion)



Source: Global Infrastructure Hub based on Realfin data.

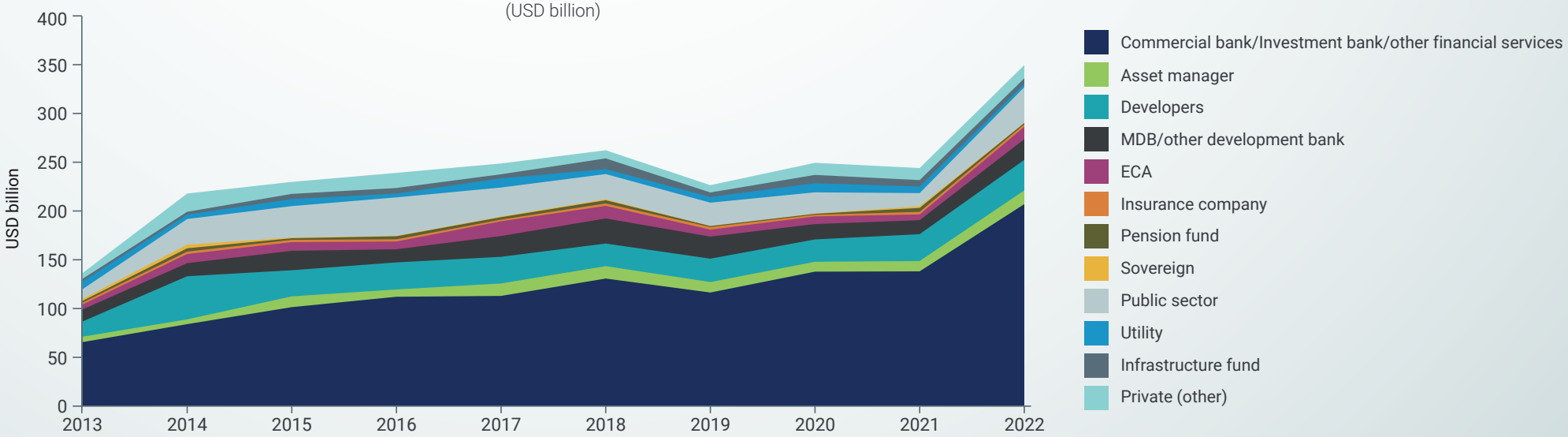
Note: Includes only transactions for which instrument details are available.

Growth in private infrastructure investment in 2022 was driven by banks, who continued to increase their role as financiers, as well as the public sector, whose share rose after years of decline.

- In 2022, financial service institutions – primarily commercial and investment banks – increased their share of financing of private investment in infrastructure projects to 59%. This continued the trend of the past decade, which saw their share increase steadily from 48% in 2013.
- While banks are the most prominent financier type in both HICs and MLICs, their dominance is more pronounced in HICs, accounting for 66% of total financing in 2022, compared with only 38% in MLICs. Projects in MLICs rely more on financing from public institutions. E.g., in 2022, a third of projects in these countries involved an MDB or other development institution as a financier, accounting for around 15% of total financing of private investment in infrastructure.
- Notably, the share of financing contributed by the public sector – which includes government agencies and state-owned entities and banks – increased from 6% to 10% in 2022 after a period of decline since 2016. This may reflect the heavy involvement of state-owned banks such as the State Bank of India and Union Bank of India, in several Indian highway public-private partnerships (PPPs) in 2022.

Financing of private investment in infrastructure projects by financier

(USD billion)



Source: Global Infrastructure Hub based on Realfin 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 bank' 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. Analysis excludes transactions for which financier details are not available

The graph is based on an average of 82% of primary infrastructure transactions, given that data for financiers was not available for all the transactions.

Infrastructure investment performance

Infrastructure equity performance

Key findings

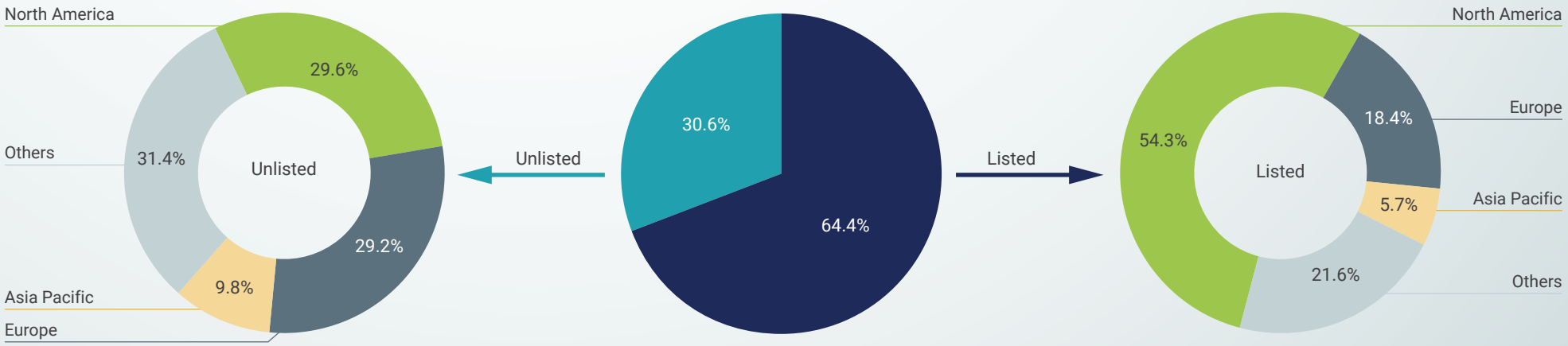
- The performance of listed and unlisted infrastructure equities makes them an attractive investment opportunity, and their different risk exposures can complement each other.
- Recent shocks negatively affected returns on all equities globally. Unlisted infrastructure equities were less affected, providing better downside protection than listed equities and exhibiting risk characteristics similar to those of bonds.
- Unlisted infrastructure equities have consistently provided higher risk-adjusted returns than listed equities.
- Listed infrastructure equities are less common in emerging markets and also perform better in developed markets.
- With their low risk and greater liquidity, listed infrastructure equities have continued to attract investors, even though they bring lower returns than unlisted equities.
- Recent crises led to an increase in the risk premium associated with infrastructure equities. Risk premiums have gradually declined since 2021 but remain higher than 2019 levels.
- Sharp interest rate hikes in 2022 and 2023 intensified downward pressure on the value of infrastructure equities.
- Although infrastructure generally offers inflation protection to investors – with varying degrees of protection – all sectors are sensitive to changes in interest rates.
- By 2050, the physical risks posed by climate change could reduce the value of infrastructure assets by up to 27%.

The performance of listed and unlisted infrastructure equities makes them an attractive investment opportunity, and their different risk exposures can complement each other.

- Global infrastructure assets traded in equity markets were valued at USD10 trillion at the end of 2021, representing between 20% and 50% of global infrastructure assets, according to the Global Listed Infrastructure Organisation (GLIO).
- Governments own the majority of other infrastructure assets, limiting the depth and maturity of the infrastructure asset class. This results in higher liquidity risk for private investors, who may be unable to secure attractive financing terms despite the large collateral provided by the asset.
- Listed markets accounted for 70% of the traded value of infrastructure assets. The infrastructure assets traded in listed markets are mainly regulated utilities and user-pays assets.
- Unlisted markets accounted for 30% of the traded value of infrastructure assets. Infrastructure assets traded in unlisted markets are mainly schools, universities, hospitals, government facilities, and telecommunications assets.
- Listed markets are most mature in North America, which accounted for more than half the total value of infrastructure assets traded in listed markets. In other regions, unlisted infrastructure equities are traded at volumes closer to listed infrastructure equities.

Global infrastructure assets traded in equity markets by region

(USD billion)



Source: GLIO (2023).

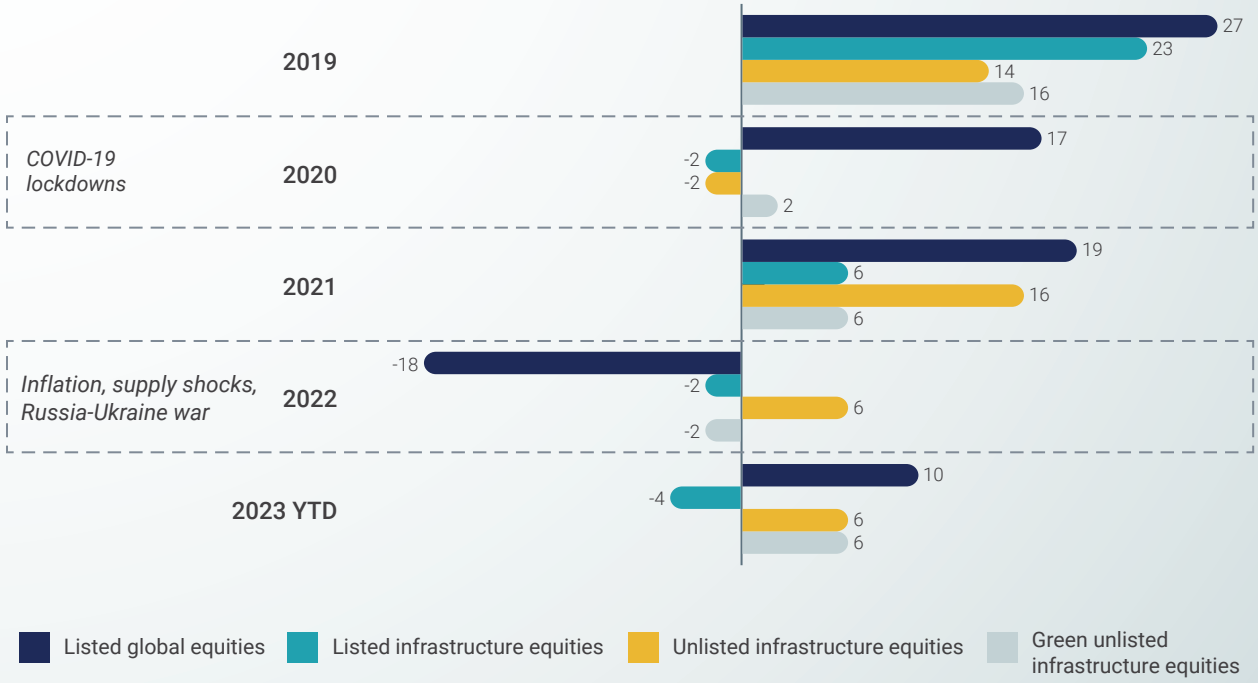
Note: Assets traded in the past 10 years and available to private buyers are included in these estimates. Unlisted infrastructure assets are less likely to be traded.

Recent shocks negatively affected returns on all equities globally. Unlisted infrastructure equities were less affected, providing better downside protection than listed equities and exhibiting risk characteristics similar to those of bonds.

- Annual returns on global infrastructure equities – listed and unlisted – declined from highly attractive levels in 2019 to nearly zero in 2020, due to COVID-19 lockdowns. The average return in global listed markets overall also declined in 2020 but remained closer to 2019 levels.
- As the world recovered from the COVID-19 pandemic in 2021, so too did infrastructure equity performance.
- The economic crises of 2022 – including rapid inflation, supply chain shocks, and the effects of the Russia-Ukraine war – impacted global listed equities more severely than infrastructure equities, reversing the gains that global listed equities made in 2021.
- In contrast, although unlisted infrastructure equity returns were negatively impacted by these economic crises, they remained positive.
- With inflationary pressures reducing in 2023, global listed equity market returns are recovering. Unlisted infrastructure equities – often backed by inflation-indexed contracts – continue to deliver positive returns.

Annualised returns by type of equity

(%)



Source: MSCI and EDHECInfra (2023a) as of 30 September 2023.

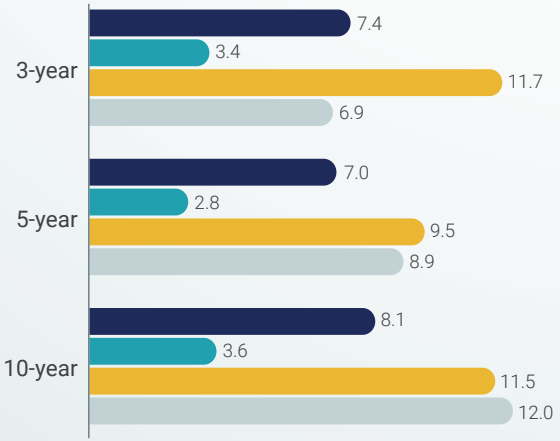
Note: Annual returns are based on monthly gross returns data in a calendar year. The indices present aggregate performance levels. Global equity performance is measured by the MSCI All Country World Index (MSCI ACWI). Listed infrastructure equity performance is measured by the MSCI ACWI Infrastructure Capped Index (MSCI ACWI-IC). Unlisted infrastructure equity performance is measured by the EDHECInfra Infra300 equity index. Green unlisted infrastructure equity performance is measured by the EDHECInfra InfraGreen index.

Unlisted infrastructure equities have consistently provided higher risk-adjusted returns than listed equities.

- Unlisted infrastructure equities have historically provided higher risk-adjusted returns than other equities, including global listed equities. Although listed equities provide high returns, their higher risk reduces their risk-adjusted returns.
- The lower risk of infrastructure equities (listed and unlisted) has meant stable returns for investors. In recent years, investors wanting to reduce their portfolio risk have sharpened their focus on the infrastructure asset class, making the market more competitive and driving up prices.
- Annual returns on unlisted infrastructure equities remain higher than returns on listed equities but fell from 11.5% over the last 10 years to 9.5% over the five years preceding June 2023.
- However, it is worth noting that the most recent returns on unlisted infrastructure equities in the three years preceding September 2023 increased to 11.7%. This is likely a result of telecommunications and social infrastructure projects performing well during the COVID-19 crisis. These projects comprise a sizeable share of unlisted infrastructure assets.
- Green unlisted infrastructure equities have become an attractive option for investors, with average returns and risk-adjusted returns similar to those of unlisted equities over the 10-year period preceding June 2023. In recent years, however, returns and risk-adjusted returns on green unlisted infrastructure equities reduced. An increase in demand, driven by the performance of these assets and the need to meet climate change commitments, may have increased competition and therefore reduced returns.

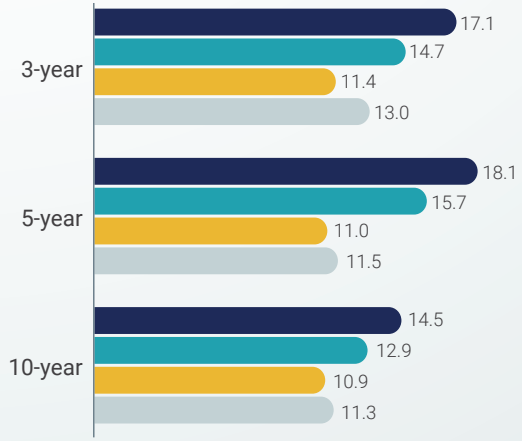
Annualised returns by type of equity

(%)



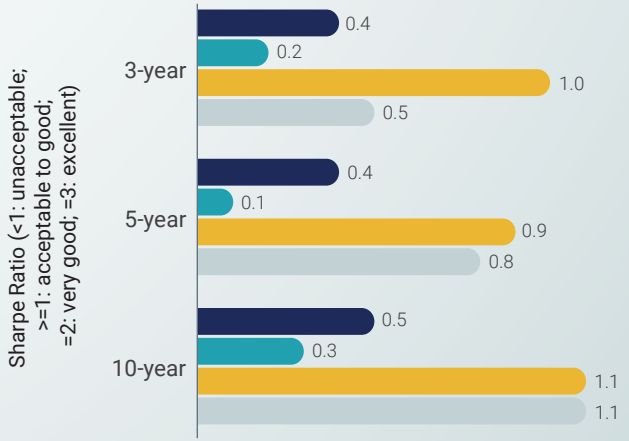
Annualised risk by type of equity

(%)



Risk-adjusted return by type of equity

(Sharpe ratio)



Source: MSCI and EDHECInfra (2023a) as of 30 September 2023.

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.

Unlisted infrastructure equities provided better downside protection than listed equities and exhibited risk characteristics similar to those of bonds.

Total return performance metrics: government bonds, corporate bonds, unlisted Infrastructure equities, listed equities, 2000–2022

Closest value to the unlisted infrastructure equities values is highlighted in yellow.

Metric	What does it measure?	Government bonds	Corporate bonds	Unlisted infrastructure equities	Listed equities
Annualised risk	Volatility of returns	5.09%	6.12%	8.26%	14.09%
Skewness	Deviation from symmetric normal distribution	-0.01	-0.66	-0.57	-0.69
Kurtosis	How often outliers occur	2.91	5.24	3.27	4.77
Average drawdown	Average drop from peak value until a new peak is reached	0.03	0.03	0.05	0.07
Worst drawdown	Maximum drop from peak value until a new peak is reached	0.12	0.16	0.15	0.47
Average drawdown length	Length of any peak-to-peak period	6.24	6.32	6.23	8.81
Average drawdown recovery	Extent of recovery from one peak to another	3.36	2.88	3.54	5.30
Conditional drawdown (5%)	Average of the worst 5% of drawdowns over a given time period using the average and maximum drawdown as boundaries	0.05	0.06	0.11	0.17

Source: EDHECInfra (2022a).

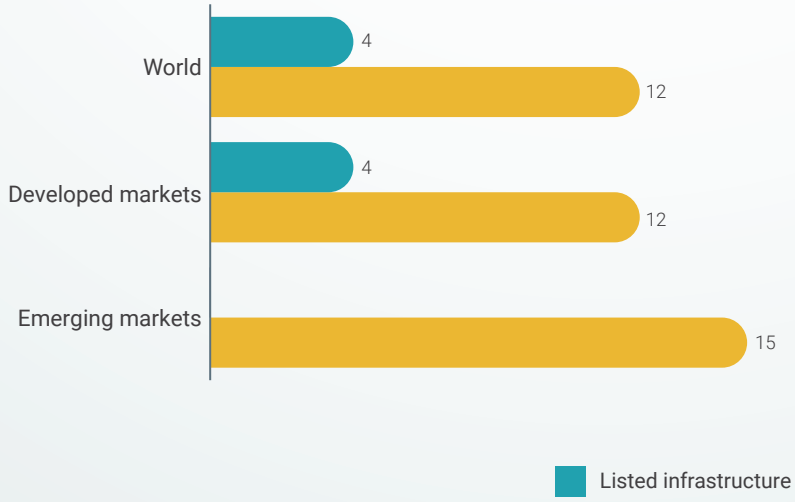
Note: Monthly local currency total returns data was used for estimation. Reference benchmarks for listed equities, government bonds, and corporate bonds were built as representative proxies covering the geographical composition of infra300 index, the EDHECInfra index for unlisted infrastructure equity.

Listed infrastructure equities are less common in emerging markets and perform better in developed markets.

- The annualised 10-year return on unlisted infrastructure equities in emerging markets (15%) was higher than that in developed markets (12%).
- However, unlisted infrastructure equity risks are higher, and so the annualised 10-year risk-adjusted return (measured by the Sharpe ratio) is lower in emerging markets (0.7) than in developed markets (1.1).
- Listed infrastructure equities are less common in emerging markets and their performance was also significantly worse than that of unlisted infrastructure equities.

Annualised 10-year return by region and type of equity

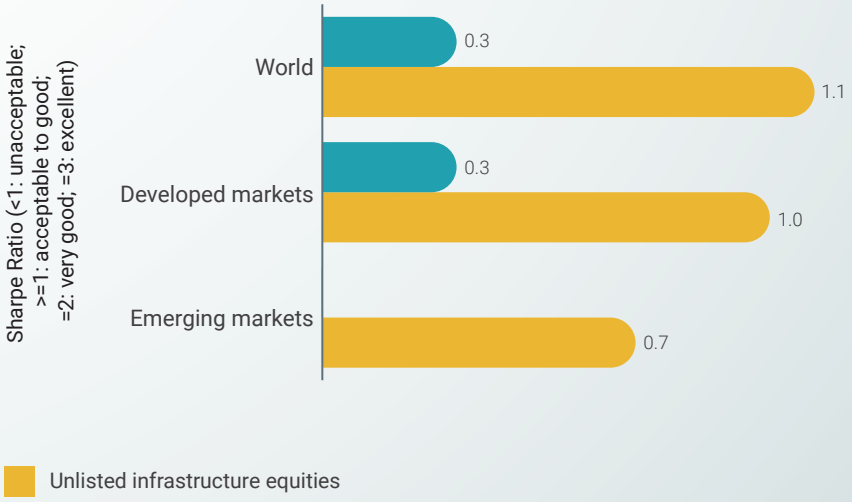
(%)



Source: MSCI and EDHECInfra (2023a) as of 30 September 2023.

Annualised 10-year risk-adjusted return by region and type of equity

(Sharpe ratio)



Source: MSCI and EDHECInfra (2023a) as of 30 September 2023.

With their low risk and greater liquidity, listed infrastructure equities have continued to attract investors, even though they bring lower returns than unlisted equities.

Graph

- Lower risk, i.e. lower volatility in returns, is the factor that most drives the attractiveness of listed infrastructure equities across all markets globally.
- In developed markets, dividend yield is also a critical factor.
- Higher growth expectations in emerging markets, indicated by the greater weight of the momentum factor, support higher price-to-earnings ratios for listed infrastructure equities.

Table

- In emerging markets, the price-to-book-value ratio for infrastructure equities was higher than that for other equities. This was not the case in developed markets.

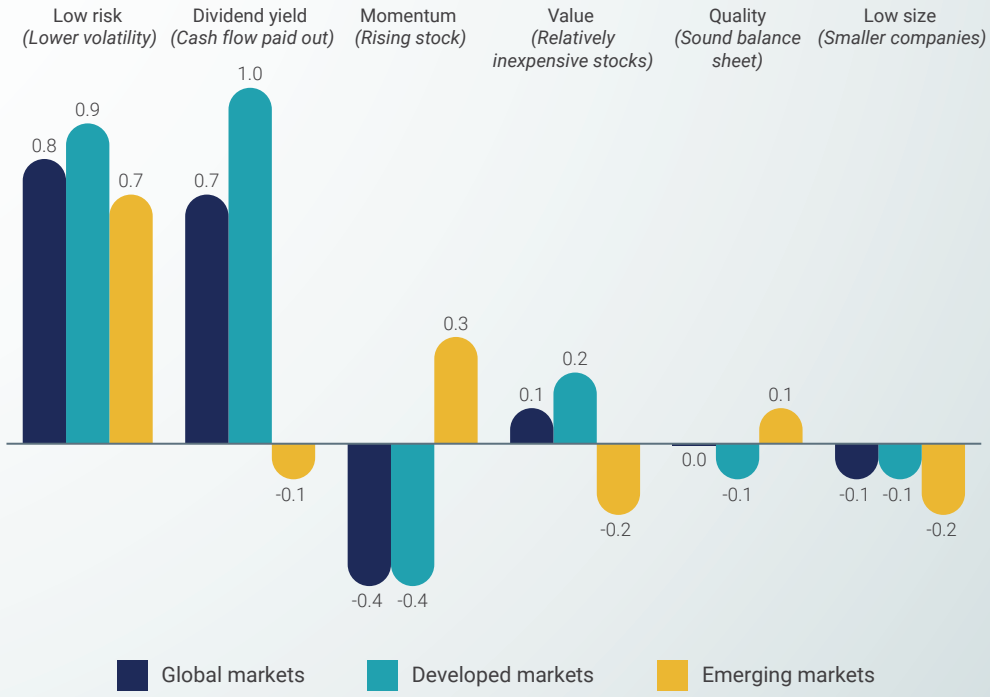
Key factors explaining the value of listed equities by type of market

	Dividend yield (%)	Price to earnings ratio	Price to future earnings ratio	Price to book value ratio
Listed equities in developed markets				
All sectors	2.1%	19.5	16.1	2.9
Infrastructure	4.7%	15.3	12.6	1.8
Listed equities in emerging markets				
All sectors	3.1%	14.1	11.6	1.6
Infrastructure	3.3%	26.2	13.8	1.8

Source: MSCI (2023) as of September 2023.

Key factors that drive return of listed infrastructure equities

(weightage)



Source: MSCI (2023).

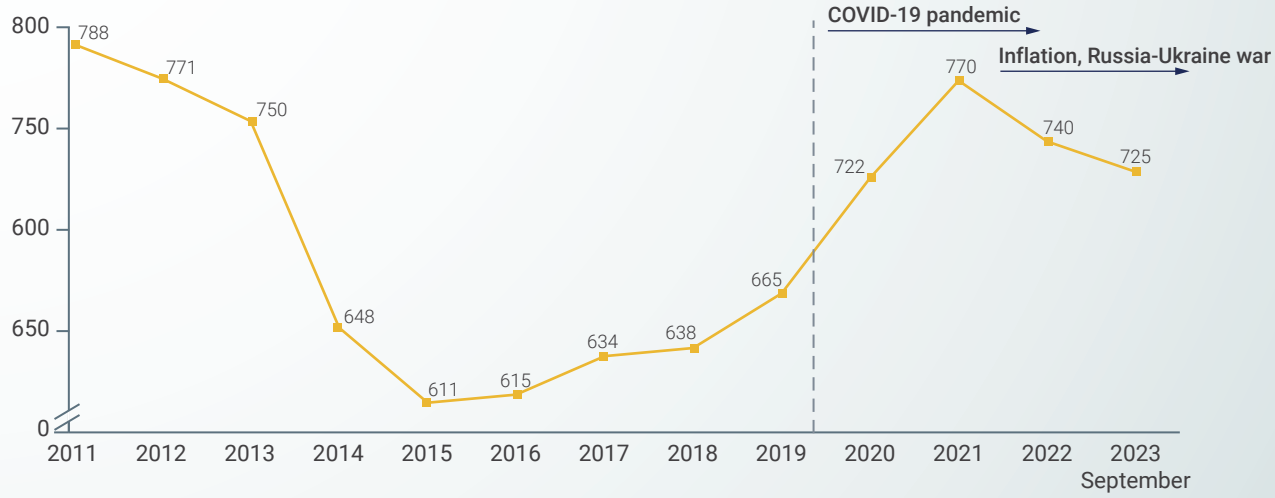
Note: Neutral line = 0 represents factor weights in the global equity universe determined by the MSCI Investable Market Index (IMI). Weight is the degree to which a factor is a driver of risk and return of listed infrastructure equities relative to the global equity universe. 'Overweight' means that the factor is more favourable for listed infrastructure equities relative to listed global equities. 'Underweight' means that the factor is less favourable for listed infrastructure equities relative to listed global equities. Research identifies these factors as the key drivers of risk and return, which are measured using 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 are from January 1999 to 30 June 2023.

Recent crises led to an increase in risk premiums associated with infrastructure equities. Risk premiums have gradually declined since 2021 but remain higher than 2019 levels.

- The risk premium impacts asset valuation and private investor demand. The COVID-19 pandemic increased the risk premium of unlisted infrastructure equities from 665 basis points in 2019 to 770 basis points in 2021 – a level last seen in 2011. The heightened uncertainty regarding demand for infrastructure services and the expected trajectory of the economy increased the risk premium investors demanded for infrastructure equity investments.
- As the world recovered from the COVID-19 pandemic, the risk premium on infrastructure equities began to decline. However, it remains above the 2019 level (pre-pandemic). Since 2022, the valuation of infrastructure equities has been impacted by rapid interest rate hikes, which resulted from economic shocks like rising inflation and geopolitical conflicts, and associated supply chain disruptions.

Risk premium of unlisted infrastructure equities

(basis points)

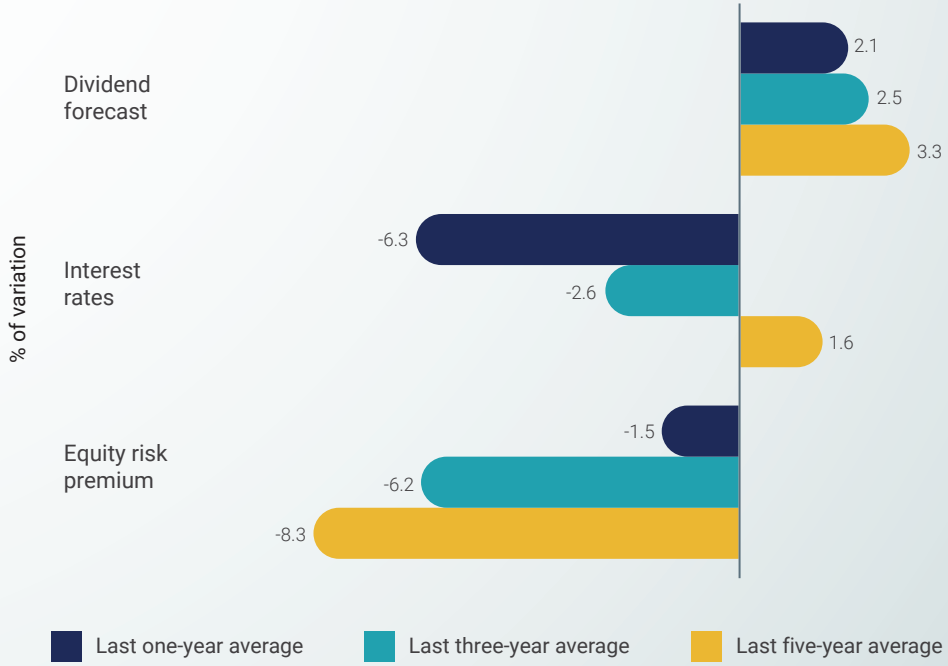


Source: EDHECInfra (2023a) as of 30 September 2023.

Sharp interest rate hikes in 2022 and 2023 intensified downward pressure on the value of infrastructure equities.

- The net value of an infrastructure equity can be estimated using a discounted dividend model in which dividend forecasts positively impact valuations. A discount factor – a combination of risk premium and interest rates – negatively impacts valuations.
- A rising risk premium during the COVID-19 pandemic negatively impacted the net value of infrastructure equities. The net impact on value of an infrastructure equity due to increase in equity risk premium averaged -6.2% per year during 2019 to 2022. As the risk premium declined in 2022, the negative impact reduced to -1.5% in 2022.
- However, overall recovery of the value of infrastructure equities has been hampered by sharp interest rate hikes. The negative impact of the rate hikes on the net value of an infrastructure equity increased to -6.3% in 2022, a sharp jump from -2.6% average impact over the three-year period, 2019–2022.
- The resilient cash flows of infrastructure equities help in maintaining stable dividend payouts. This resilience arises from contractual inflation indexation and/or from the intrinsically essential nature of infrastructure assets i.e. demand for infrastructure is not significantly impacted even when prices increase.
- Inflation shocks and recession expectations in 2022 had a marginal negative impact on dividend forecasts. These forecasts continued to positively increase the value of infrastructure equities at levels similar to previous years. Changes in dividend forecasts increased the net value of infrastructure equities by an annual average of 2.5% in the three years preceding 2022, declining to 2.1% in 2022.

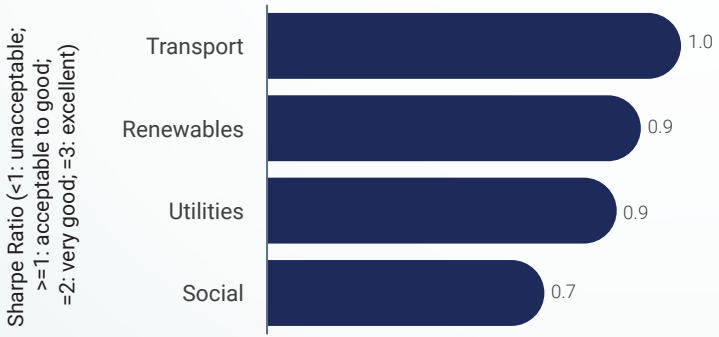
Average change in net asset value of global infrastructure equities due to increase in:



Source: EDHECInfra (2022a). Based on InfraMetrics 2022 data.

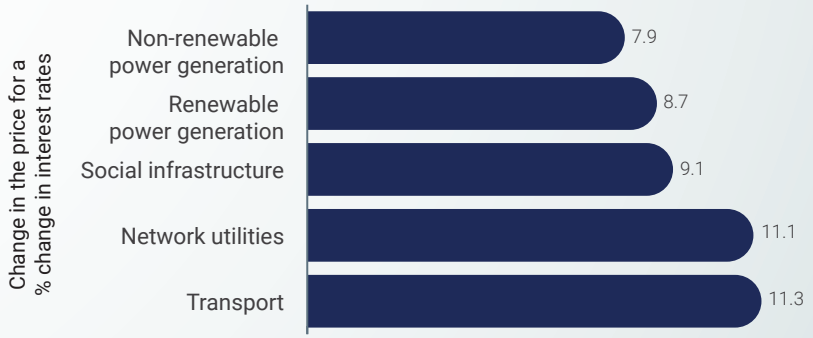
Although infrastructure generally offers inflation protection to investors – with varying degrees of protection – all sectors are sensitive to changes in interest rates.

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



Source: EDHECInfra (2023a) as of September 2023.

Average interest rate sensitivity of unlisted infrastructure equity value by sector
(Five-year average, 2017–2022)



Source: ARES (2022).

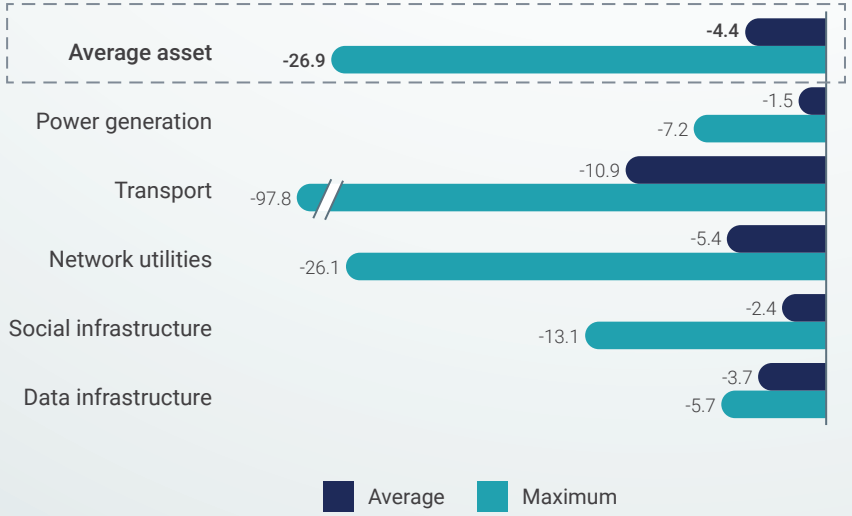
- Infrastructure assets can hedge against inflation shocks when their contracts are indexed to the consumer price index (CPI) or other related metrics. Although they both move in the same direction, interest rate changes usually lag inflation.
- The sensitivity of infrastructure equity prices to changes in interest rates varies by infrastructure sector.
- Data for unlisted infrastructure equities show that the transport sector offers the highest risk-adjusted returns, and that it is also the most sensitive to interest rate changes. The renewables sector also offers good risk-adjusted returns and exhibits relatively lower sensitivity to interest rate changes.
- The sensitivity of certain infrastructure assets to changes in inflation and interest rates reflects their business model.
- Contracted infrastructure models are often used in power generation projects, where revenues increase with inflation, so they are less sensitive to shocks.
- Merchant infrastructure models are often used in the transport sector and – compared to other sectors – are usually more exposed to fluctuations in demand in response to price increases.
- Although some transport services may have more flexibility than others to increase their prices in response to inflation, demand will be driven by how essential consumers consider services to be.
- Infrastructure equities in the transport sector are more sensitive to inflation and interest rate rises than in other sectors because the short-term impact on revenues is uncertain. However, the transport sector has historically yielded the highest annualised 10-year risk-adjusted returns, suggesting that revenues recover in the long-term.

By 2050, the physical risks posed by climate change could reduce the value of infrastructure assets by up to 27%.

- Climate change poses a significant threat to infrastructure. Rising sea levels, extreme weather events, and increased temperatures can all contribute to the deterioration of assets.
- Using currently available scenarios, the potential impact of climate change on infrastructure is significant. By 2050, the net value of infrastructure assets is expected to reduce by an average of 4.4%, and – in a worst-case scenario – by 26.7%.
- Negative impacts are expected across all infrastructure sectors. Transport assets are likely to be the most severely impacted, losing almost all (97.8%) of their value in a worst-case scenario. We expect that more value will be depleted in developed markets due to the higher value of assets in those markets.
- Infrastructure investors could see their portfolios reduce in value by an average of 7% by 2050. In a worst-case scenario, the value of portfolios could reduce to less than half of their current values.
- Most infrastructure investors with direct stakes in assets have less than 20 investments in their total portfolio. For these investors, the concentration of physical risk is high. Less diversification by holding a larger proportion of transport investments, which have higher potential devaluation (-10.9%), will result in higher portfolio losses. Even if the average increase in global temperatures by 2050 stays below 2ºC, portfolio losses associated with the physical risks of climate change could average 3% and the loss could be 27% in the worst case.

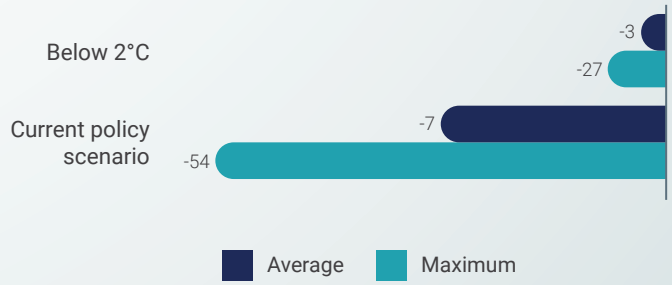
Potential infrastructure losses due to physical risks of climate change by scenario by 2050 in the current policy scenario

(% of net asset value loss by type of infrastructure asset)



Potential investor portfolio value loss due to physical risks of climate change by scenario by 2050

(% of value loss)



Source: EDHECInfra (2023b).

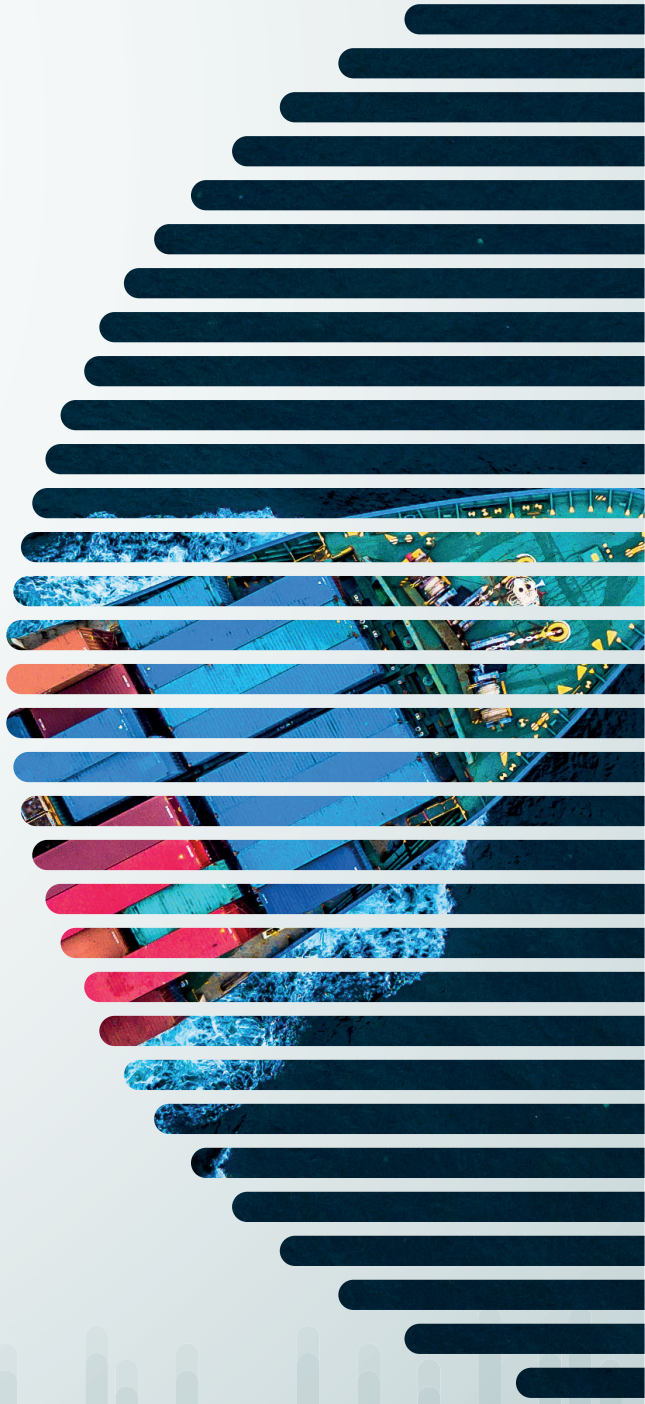
Note: The analysis is based on a representative sample of 700+ companies for which asset-level climate risk estimates are available in the EDHECInfra InfraMetrics platform. Portfolio loss was estimated by creating thousands of random portfolios using hundreds of assets for which net asset value loss was estimated.

Infrastructure investment performance

Infrastructure debt performance

Key findings

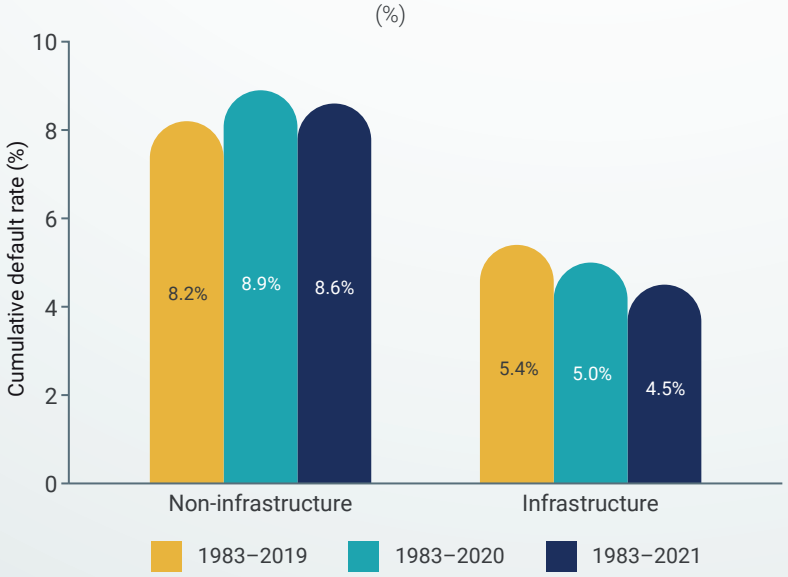
- Default rates on infrastructure loans are lower than non-infrastructure loans, and as they continue to improve, the disparity between infrastructure and non-infrastructure loan default rates continues to widen.
- Considering lower default and higher recovery rates, average expected loss on infrastructure loans is just a quarter of average expected loss on non-infrastructure loans.
- Infrastructure loan default and recovery rates are strong in all countries, regardless of income level.
- Default rates on infrastructure loans are on a declining trend in most regions – Eastern Europe and Latin America are the exceptions.
- In 2021, default rates declined across all regions.
- Despite disparities in default rates, all regions exhibit higher recovery rates and lower expected losses than non-infrastructure debt.
- Default rates are on a declining trend for infrastructure loans in economic infrastructure subsectors but are on an increasing trend for loans in the social infrastructure subsector.
- In 2021, default rates declined across all infrastructure subsectors.
- Almost all infrastructure subsector loans have higher recovery rates and lower expected losses than non-infrastructure debt. Energy has a particularly high recovery rate.
- Green energy projects have a significantly lower default rate than conventional energy projects.
- Renewables are increasingly being supported by the export credit and investment insurance industry, and they have strong recovery potential.
- Still in all regions except Europe, recovery support for non-renewable energy exceeds renewable energy.



Default rates on infrastructure loans are lower than non-infrastructure loans, and as they continue to improve, the disparity between infrastructure and non-infrastructure loan default rates continues to widen.

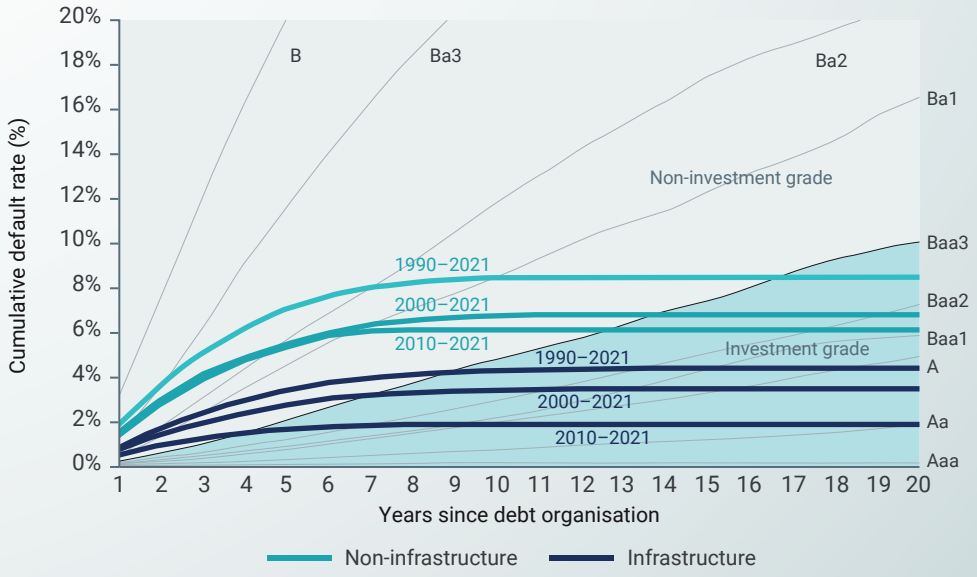
- In 2021, the average 20-year cumulative default rate (CDR) for infrastructure continued to decline despite the ongoing shocks of the COVID-19 pandemic. In contrast, the CDR for non-infrastructure projects increased.
- Infrastructure debt typically reaches investment grade more quickly than non-infrastructure debt. An examination of loans that originated from 2010 onward shows that infrastructure debt reached investment grade eight years earlier on average than non-infrastructure debt.
- While government support for infrastructure projects during the COVID-19 pandemic may have helped reduce infrastructure loan default rates, they had been trending down for some time.
- Infrastructure debt performance has been improving over time because newer infrastructure debt is reaching investment grade faster than older infrastructure debt. This has been particularly true in the last decade. Infrastructure loans that originated from 2010 onward reached investment grade three years sooner than infrastructure loans that originated from 2000 onward. As a result, the 20-year CDR reduces from 3.5% to 1.8% when the loan origination year cut-off is shifted from 2000 to 2010.

20-year cumulative default rate by sector



Source: Moody's (2023a). Data as of 2021.

20-year cumulative default rate by sector and origination year



Source: Moody's (2023a). Data as of 2021.

Considering lower default and higher recovery rates, average expected loss on infrastructure loans is just a quarter of average expected loss on non-infrastructure loans.

- The superior performance of infrastructure loans is attributable to the combination of lower default rates and more robust recovery rates. When an infrastructure loan defaults, the average recovery rate is typically high.
- For infrastructure loans that originated from 1983 to 2021, the global average recovery rate was 83.8% – significantly higher than the 68.2% average recovery rate of non-infrastructure loans.
- For infrastructure loans that originated from 1983 to 2021, the 20-year average expected loss after default was 0.7%, while that of non-infrastructure loans was 2.7%.

Average recovery rates
(% of total loan value, 1983–2021)

Source: Moody's (2023a). Data as of 2021.

Average 20-year expected loss
(% of total loan value, 1983–2021)

	Expected loss (%) = (Over 20 years)	Default rate (%) (Cumulative over 20 years)	X	Loss given default rate (%) (1 - Recovery rate)
Infrastructure	0.7	4.5		16.2 (= 1-83.8%)
Non-infrastructure	2.7	8.6		31.8 (= 1-68.2%)

Source: Moody's (2023a). Data as of 2021.
Note: Expected loss is the proportion of debt value expected to be lost from potential infrastructure debt defaults.

Infrastructure loan default and recovery rates are strong in all countries, regardless of income level.

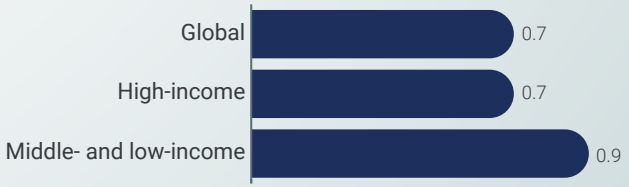
- The 20-year CDR for infrastructure loans fell in high-, middle-, and low-income countries in 2021.
- In high-income countries, the rate dropped from 5.2% in 2019 to 4.3% in 2021.
- In middle- and low-income countries, the rate dropped from 7.0% in 2019 to 5.9% in 2021.
- This decline may be attributable to one or more of these causes:
  - Government support during the COVID-19 pandemic may have helped save infrastructure projects from default.
  - The increasing maturity and sophistication of public-private partnerships (PPPs) for infrastructure development should lead to declining default rates.
  - The heightened risk aversion of private investors and the banking sector may have brought about a reduction in average default risk on private infrastructure loans. Private investors seek low-risk projects to avoid the potential large losses associated with large infrastructure projects.
  - Meanwhile, banking regulations – especially the Basel III reforms introduced in 2017 – apply higher than actual performance risk weights on infrastructure projects, meaning that debt financing from banks tends to flow to lower-risk projects.
- Although default risk is slightly higher in middle- and low-income countries, recovery rates are similar across countries. The average recovery rate on defaulted infrastructure loans remained stable at around 84% in both income groups.
- For infrastructure loans, the average expected loss after default was 0.7% in high-income countries and 0.9% in middle- and low-income countries over a 20-year loan tenure. Widespread use of credit-risk mitigation instruments and development finance is also likely to have supported higher recovery rates in middle- and low-income countries.

20-year cumulative default rate by income group
(%)

Origination years:	1983–2019	1983–2020	1983–2021
Global	5.4	5.0	4.5
High-income	5.2	4.8 ↓	4.3 ↓
Middle- and low-income	7.0	6.5 ↓	5.9 ↓

Average recovery rate by income group
(% of total loan value, 1983–2021)

Average 20-year expected loss by income group
(% of total loan value, 1983–2021)

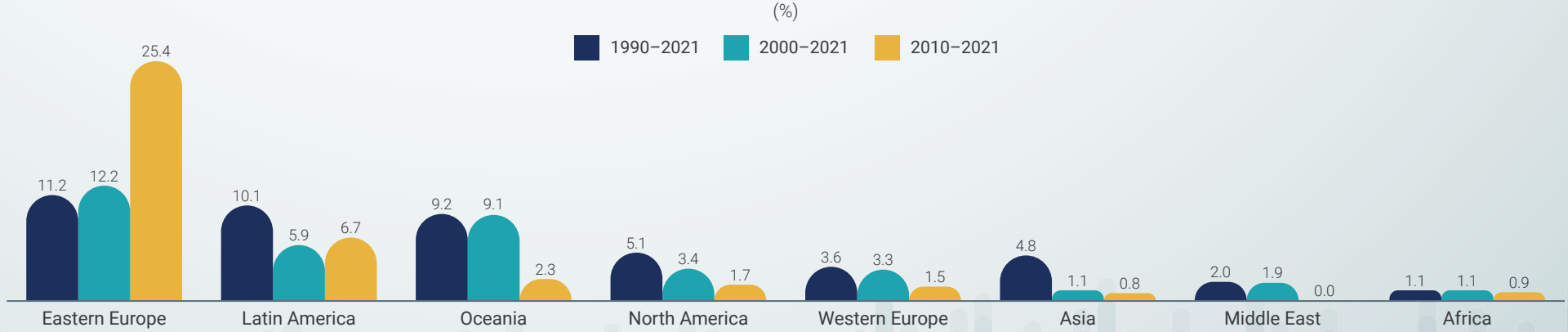


Source: Moody's (2023a). Data as of 2021.

Default rates on infrastructure loans are on a declining trend in most regions – Eastern Europe and Latin America are the exceptions.

- Eastern Europe and Latin America have the highest default rates on infrastructure loans globally, and rates in both regions worsened last decade (2010–2020).
  - CDR generally spikes during economic or financial crises that severely impact government balances.
  - In the 2010s, the default rate in **Eastern Europe** more than doubled after foreign capital inflows – which the region heavily relied on – collapsed as a result of the 2007–2008 Global Financial Crisis (GFC) and the eurozone crisis (EIB, 2017). However, it is important to note that the sample size in Eastern Europe is small and may suffer from selection bias, given the banks contributing the data. It is also notable that recovery rates on defaulted infrastructure loans were close to 100%, which reduced losses to below the global average.
  - **Latin America**'s debt crisis in the 1980s and banking crisis in the 1990s may have caused its high default rates prior to the 2000s. The banking crisis was mainly caused by a combination of macroeconomic imbalances, incomplete financial liberalisation, and lack of adequate bank supervision. As the crisis receded, 20-year CDR declined significantly from 10.1% for loans originating 1983–2021, to 5.9% for loans originating from 2000 onward. However, for loans originating from 2010 onward, CDR increased again to 6.7%.
- All other regions have shown an appreciable reduction in default rates.
- **Oceania** has shown the most remarkable reduction in default rates since 2010. The 20-year CDR reduced from over 9.0% for loans originating before 2010 to 2.3% for loans originating after 2010. Experts indicate that these markets have evolved to rely on more conservative forecasts for infrastructure projects.
- In **North America and Western Europe**, CDRs have almost halved since 2010, aided by the economic recovery after the 2007–2008 GFC.
- **Asia** had high default rates for loans originating before 2000, before the 1997 Asian financial crisis. CDR has reduced significantly since the 2000s.
- **The Middle East's** default rates have dropped to zero. There has been no default since 2010, probably as a result of strong support for infrastructure development by creditworthy governments.
- **Africa's** default rates have hovered around 1% for decades. Projects in the region that gain private sector capital typically have strong support from development finance institutions (DFIs) and a low risk profile.

20-year cumulative default rate by origination year and region



Source: Moody's (2023a). Data as of 2021.

In 2021, default rates declined across all regions.

- The global average CDR for infrastructure loans declined in 2020, but this decline was driven by Asia, North America, and Western Europe – which have more than 80% of total infrastructure loans.
- CDRs actually increased in 2020 in Africa, Eastern Europe, Latin America, the Middle East, and Oceania. The increase was most marked in Oceania, which implemented very strict measures to stop the spread of COVID-19. The Middle East had the second highest increase in default rates. It also implemented strict pandemic containment measures in 2020 (OECD, 2020).
- 2021 was undisputedly the year of default rate recovery across all regions. In several regions, average default rates in 2021 were even lower than in 2019. These results may be attributable to government support of infrastructure projects. If this support is offered, regardless of the market risk that is contractually allocated to the private sector, even projects positioned at the higher end of the risk spectrum may become less susceptible to default.

20-year cumulative default rates by origination year and region

(%)

Loan origination years:	1983–2019	1983–2020	1983–2021
Infrastructure	**5.4**	**5.0 ↓**	**4.5 ↓**
Africa	1.1	1.8 ↑	1.1 ↓
Middle East	1.2	2.2 ↑	2.0 ↓
Western Europe	4.6	4.0 ↓	3.6 ↓
Asia	5.9	5.2 ↓	4.7 ↓
North America	6.8	6.6 ↓	5.4 ↓
Oceania	7.3	10.1 ↑	9.2 ↓
Latin America	10.3	10.5 ↑	10.1 ↓
Eastern Europe	11.8	11.8	11.2 ↓

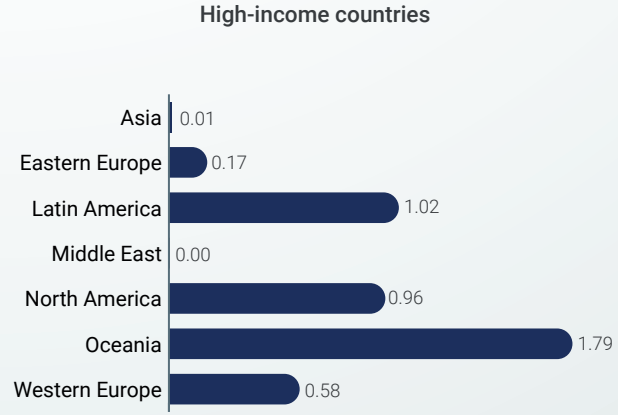
Source: Moody's (2023a). Data as of 2021.

Despite disparities in default rates, all regions exhibit higher recovery rates and lower expected losses than non-infrastructure debt.

- Infrastructure loans that originated from 1983 to 2021 have an average recovery rate of 83.8% globally.
- During this period, infrastructure loans in the **Middle East** had recovery rates of 100%, while those in **Eastern Europe** and **Asia** were 98% and 88%, respectively.
- **Oceania** and **Latin America** had average recovery rates of nearly 80%.
- In all regions, infrastructure loan recovery rates are higher than the average global recovery rate for non-infrastructure loans, which was 68.2% for loans that originated from 1983 to 2021.
- The average expected loss after default over 20 years is lower than that for non-infrastructure project loans at 2.7% for 2021. Nonetheless, there are some disparities among income groups and regions. Most regions have extremely low levels of average expected loss on infrastructure loans at less than 1% over the loan origination period 1983–2021. Latin America has the highest default rates and the lowest recovery rates, which drove Latin American expected losses to high levels at 1.02% in its high-income countries and 2.8% in its middle- and low-income countries. High-income countries in Oceania also showed above average expected losses at 1.79%.

Average recovery rate by region
(% of total loan value, 1983–2021)

Average 20-year expected loss by income group
(% of total loan value, 1983–2021)



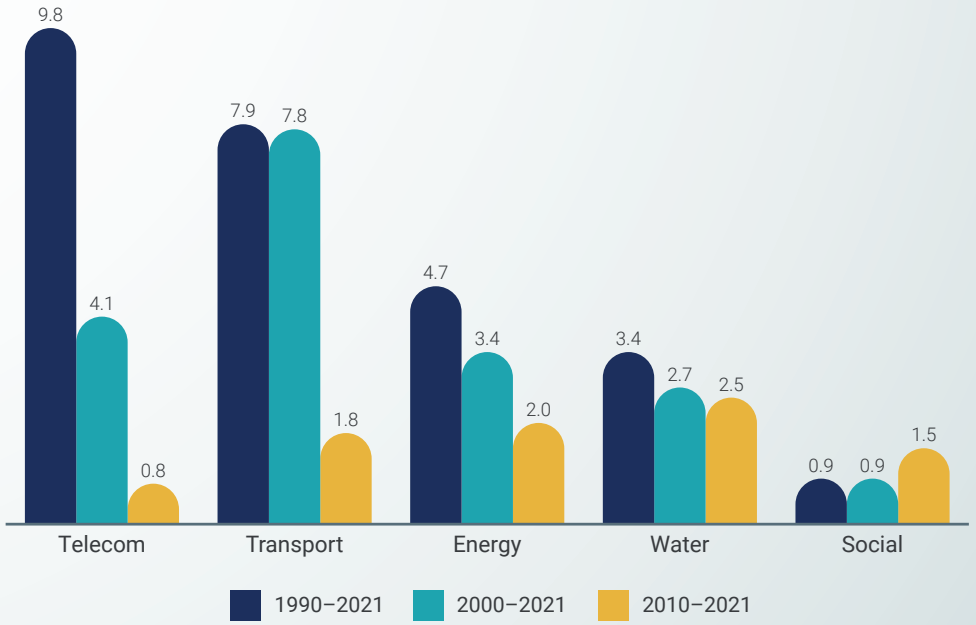
Source: Moody's (2023a). Data as of 2021.

Default rates are on a declining trend for infrastructure loans in economic infrastructure subsectors but are on an increasing trend for loans in the social infrastructure subsector.

- Default rates decreased most substantially in the telecommunication and transport subsectors.
  - Default rates on infrastructure loans in **telecommunication** have dropped drastically over time. When the subsector was liberalised and technology started to advance quickly in the 1990s, private investors were highly optimistic and invested heavily into a fast-evolving market. Since then, the subsector has matured significantly, the policy and regulatory environment has improved, and demand has grown rapidly due to innovative product offerings. Since the 2010s, telecommunication project loans have had the lowest default rate in the infrastructure sector.
  - Privatisation has been a strong trend in **transport**, particularly since the 2010s. With more mature markets and more mature regulatory and contractual arrangements, the subsector has seen its 20-year CDR fall significantly, from more than 7.8% for loans originating before the 2010s to 1.8% for loans originating after the 2010s.
- Default rates on **social infrastructure** loans crept up to 1.5% for loans that originated from 2010 onward, compared to rates that had been as low as 0.9% historically.
  - Social infrastructure loans have historically had the lowest default rate at 0.9%. This low rate may be attributable to the revenue stability conferred by availability payments, which are more common in this subsector, and to public sector participation in social infrastructure, which can help increase guarantees and reduce defaults. Nonetheless, within time the default rate of infrastructure loans within social sector has increased up to 1.5% for those loans that originated from 2010 onwards – still one of the lowest rate across sectors.

20-year cumulative default rate by origination year and sector

(%)



Source: Moody's (2023a). Data as of 2021.

In 2021, default rates declined across all infrastructure subsectors.

- Default rates declined for all infrastructure subsectors in 2021. Strong government support to prevent defaults during the COVID-19 pandemic was instrumental in this.
- In 2021, the **telecommunications** subsector showed the most significant reduction in 20-year CDR in both high-income and middle- and low-income countries. This is attributable to strong demand for telecommunication services during the COVID-19 lockdowns. In high-income countries, the 20-year CDR average reduced from 9.8% in 2020 to 8.6% in 2021. In middle- and low-income countries, CDR reduced from 14.0% in 2020 to 12.9% in 2021.
- In high-income countries, **transport** showed the biggest reduction in default rates, albeit from a high level of 10.2% in 2019 to 8.4% in 2021. This CDR of 8.4% is still higher than the CDR of 5.0% on transport infrastructure loans in middle- and low-income countries. The historical high default rates in the transport subsector were due to high demand risk in the contractual arrangements for transport infrastructure projects, especially in high-income countries. During the pandemic, government support to mitigate the demand shocks of pandemic-related lockdowns prevented defaults.
- The **social** and **water** subsectors in high-income countries have historically been the least risky, as they are underpinned by mature markets and enabling environments, strong government support, and higher consumer income levels. Recent challenges encountered by water assets may impact this trend moving forward. In middle- and low-income countries, where markets are less mature and there is more political pressure to make services affordable to consumers, these subsectors are riskier.
- The **energy** subsector saw an appreciable decline in default rates during the pandemic. This could be due to the growing share of renewable energy projects in this subsector, as those projects tend to have lower default rates than non-renewable energy projects.

20-year cumulative default rates by origination year, sector, and income group

(%)

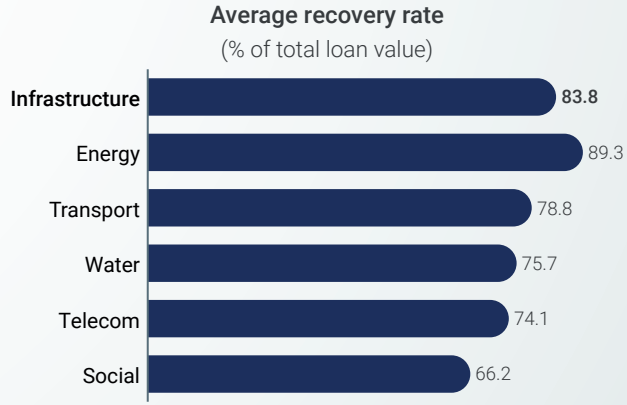
Loan origination years:	1983–2019	1983–2020	1983–2021
High-income countries			
Social	0.9	0.9	0.8 ↓
Water	3.4	3.1 ↓	2.8 ↓
Energy	5.8	5.3 ↓	4.7 ↓
Transport	10.2	9.5 ↓	8.4 ↓
Telecom	9.1	9.8 ↑	8.6 ↓
Middle- and low-income countries			
Transport	6.5	5.4 ↓	5.0 ↓
Energy	6.1	6.1	5.3 ↓
Social	9.0	5.9 ↓	5.4 ↓
Water	9.6	8.8 ↓	8.0 ↓
Telecom	14.4	14.0 ↓	12.9 ↓

Source: Moody's (2023a). Data as of 2021.

Almost all infrastructure subsector loans have higher recovery rates and lower expected losses than non-infrastructure debt. Energy has a particularly high recovery rate.

- Among infrastructure loans that originated from 1983 to 2021, **telecommunication** loans had the highest expected losses, due to this subsector's historically high default rates and lower recovery rates. With the drastic decline in default rates in the 2010s and exceptional demand growth for telecommunications services in the aftermath of COVID-19 lockdowns, expected losses on telecommunications are expected to be much lower.
- The **transport** subsector showed high expected losses at 1.7%. However, the significant fall in 20-year CDR to more than 7.8% for loans originating before 2010s to 1.8% for loans originating after 2010s suggests that the expected losses can be lower on newer infrastructure loans for the transport sector.
- Historically, **social** infrastructure loans have consistently had the lowest default rates. Although they have also had the lowest recovery rates, their expected losses have been the lowest out of all infrastructure subsectors due to their low default levels.
- **Energy** infrastructure loans had the highest recovery rates following default. This drives down the subsector's expected losses to 0.5%, which is less than the average across all other infrastructure subsectors.

Infrastructure loans (1983–2021)

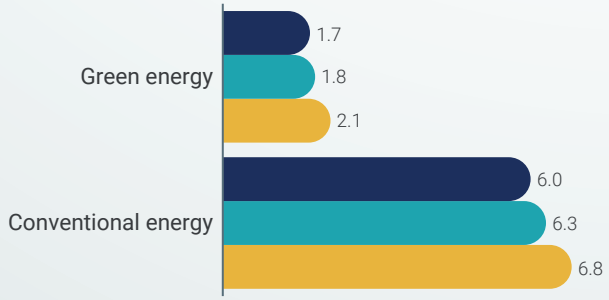


Source: Moody's (2023a). Data as of 2021.

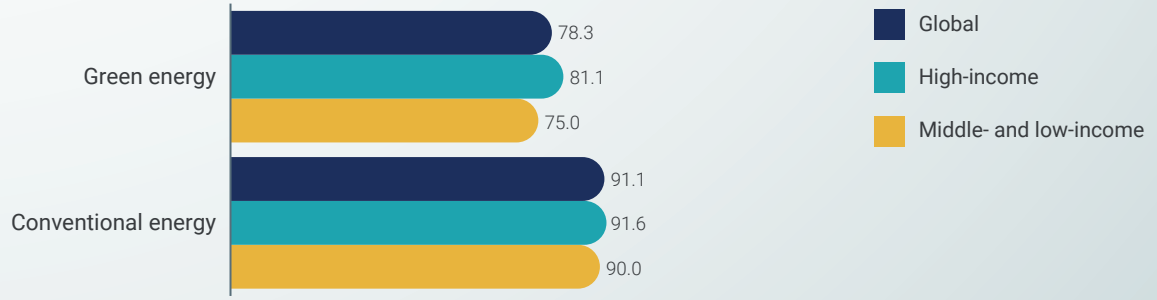
Green energy projects have a significantly lower default rate than conventional energy projects.

- Energy projects have a significantly high recovery rate. In particular, energy projects that align with the green transition have a lower default rate than those that do not align with the green transition. While sustainability may help with getting financial support, it is not the main driver of the default or recovery rate. Other drivers include contractual arrangements, credit cycle phase, jurisdiction, industry, project-specific risks, country, and industry events, among others.
- For instance, the 10-year average CDR for green energy projects was 1.7%, whilst it was 6.0% for conventional (non-green) energy projects. This may be explained by several factors including a lower marginal cost of production and strong appetite from users, governments, and investors to buy electricity from green energy sources. Conversely, the conventional energy industry is not only facing transition risks, but its marginal production costs have been impacted by volatility in prices of inputs like coal, natural gas, etc.
- Prior to 2010, the availability of green energy projects was quite limited, so the sample mostly reflects conventional energy projects before 2010 and includes green energy projects from 2010 onwards. This may have played a significant role in reducing the default rate for energy investments.
- To illustrate this, when considering a 20-year CDR for energy projects from 1990 to 2021, the default rate was 4.7%. The default rate decreased substantially to 2% when we narrowed our focus to projects exclusively within the period from 2010 to 2021.
- Globally, the average recovery rate for green energy projects is 78.3% – lower than the recovery rate for conventional energy projects (91.1%).
- This is consistent across both country income groups. In high-income countries, the average recovery rate for green energy projects is 81.1%, and 91.6% for conventional energy projects. The gap is wider in middle- and low-income countries – where green energy markets are still at a relatively early stage of maturity – with an average recovery rate for green energy projects of 75%, and 90% for conventional energy projects.

10-year cumulative default rate by energy subsector and country group
(%, 1983–2020)



Average recovery rates by energy subsector and country group
(% of total loan value, 1983–2020)



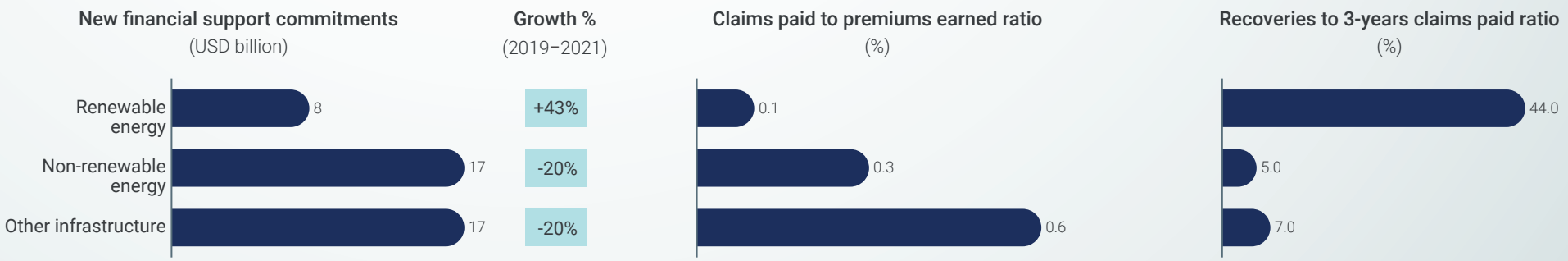
Source: Moody's (2023b).

Note: Estimates are based on Moody's definition and methodology for default and recovery. Green energy includes renewable energy projects including solar, hydro, wind as well as other energy efficiency projects. High-income country group is proxied by European Economic Area countries and OECD member states in this graph. Middle- and low-income country group follows the World Bank Group classification.

Renewables are increasingly being supported by the export credit and investment insurance industry, and they have strong recovery potential.

- Looking at performance across the global export credit and investment insurance industry, renewable energy projects have more potential for recovery compared to non-renewable energy projects. However, in developing economies, renewable energy markets are still underdeveloped, and non-renewable energy markets are larger.
- In 2021, new commitments for export credit insurance in the non-renewable energy sector totaled USD16.8 billion, whilst new commitments in the renewables sector were only USD8.0 billion. The new commitments for renewable energy projects in 2021 recorded the strongest growth so far, of 43%.
- As the renewable energy sector has lower default risk than the non-renewable energy sector, its claims ratio (0.1%) is also lower than that of non-renewables (0.3%). Renewable energy's 44% recovery rate is considerably higher than the recovery rate for non-renewable energy, which is only 5%.

Export credit insurance market: Financial support by sector, 2021



Source: Berne Union (2022).

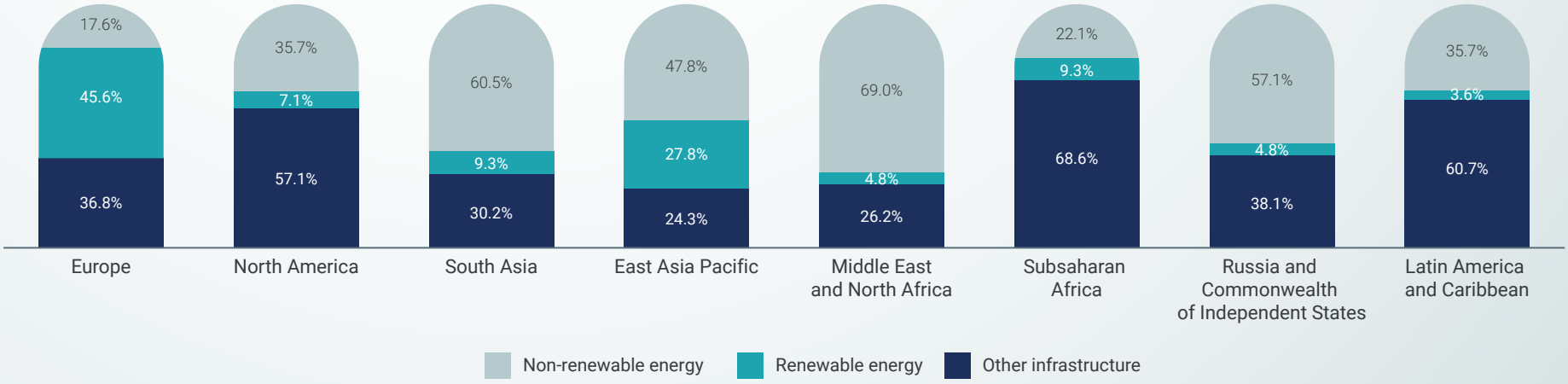
Note: Medium and long-term insurance, guarantee and lending for export credit, political risk insurance and other cross-border credit are included. New commitments: insurance/guarantee/loan/etc. commitments issued to support recovery.

In all regions except Europe, the export credit and investment insurance industry's support for non-renewable energy still exceeds renewable energy.

- In all other regions except Europe, non-renewable energy projects recorded significantly higher levels of new export credit insurance commitments than renewable energy projects. The differences vary between regions, with the biggest difference recorded in the Middle East and North Africa (69.0% non-renewables vs. 4.8% renewables).
- East Asia Pacific and Sub-Saharan Africa recorded the smallest differences, and a large uptick in new commitments for renewables in 2021.
- Climate goals and the renewable energy sector's higher recovery potential is expected to increase coverage and availability of these supporting instruments in all regions in the near future. In Europe, renewable energy projects already have better recovery rates (93.3%) than non-renewable energy projects (89.8%).

Export credit insurance market: New financial support commitments by sector

(Share in total value of new financial support commitments, 2021)



Source: Berne Union (2022)

Note: Medium and long-term insurance, guarantee and lending for export credit and political risk insurance are included.

Private capital availability

Key findings

- Although 2022 was a positive year for the infrastructure sector with capital raised by funds reaching a record high, there was a notable downward shift in 2023, reflecting the dynamic nature of the private capital landscape and its sensitivity to economic conditions and global events.
- In 2022, for only the second time in a decade, infrastructure capital investment materially outpaced the infrastructure capital raised.
- Most of the private infrastructure capital raised and invested by funds has been concentrated in North America and Europe.
- Renewable energy was the most popular sector, accounting for 16% of the private infrastructure capital raised in 2022.
- Capital within the renewable sector mainly targets low-risk investment opportunities, which are often classified as secondary or brownfield investments rather than greenfield investments.
- 70% of the private capital raised by funds for infrastructure investment targets lower-risk strategies.
- 2023 saw a substantial decline in capital raised for infrastructure investments.
- Dry powder decreased in 2023, mainly due to the record low level of funds raised and the recent surge in funds invested.
- In 2023, North America led the decrease in dry powder.
- In other regions, dry powder increased in the first half of 2023, reflecting persistently low levels of private capital mobilisation and investment.

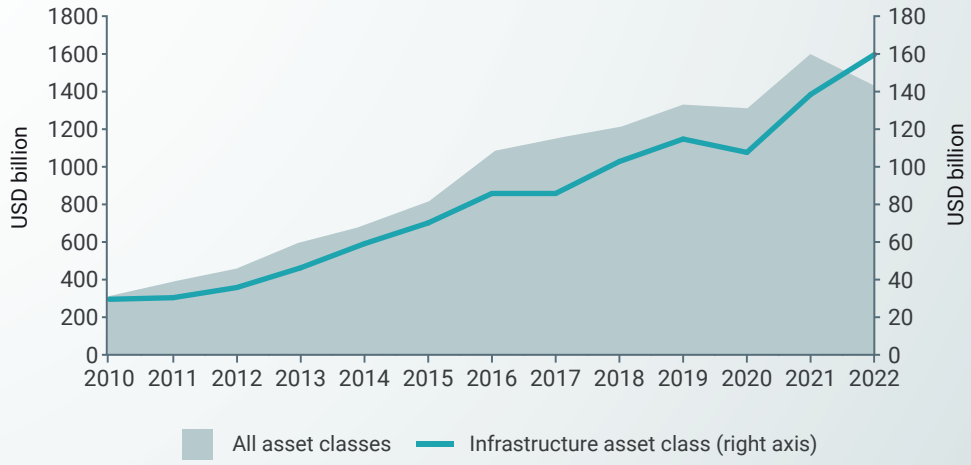
PRIVATE CAPITAL AVAILABILITY

Although 2022 was a positive year for the infrastructure sector with capital raised by funds reaching a record high, there was a notable downward shift in 2023, reflecting the dynamic nature of the private capital landscape and its sensitivity to economic conditions and global events.

- Prior to the COVID-19 pandemic, private capital raised by funds for all asset classes showed consistent growth, before falling in 2020 and recovering in 2021. The inflation crisis in 2022 led to another fall across all asset classes.
- In line with this, private capital raised by funds for infrastructure experienced consistent growth before the COVID-19 pandemic. There was a temporary decline in 2020 with a strong recovery in 2021 – not only fully recovering from the previous drop but reaching a record level (USD144 billion).
- However, in 2022, in contrast to the amount of private capital raised by funds for all other asset classes, funds raised for infrastructure increased sharply to a record level (USD166 billion). During this period of elevated inflation, infrastructure investments may have been attractive as a means of protection.
- Infrastructure accounted for around 8% of the total funds raised in the decade preceding 2021. This share grew to 11% in 2022, during a period where multiple economic shocks – rising inflation, geopolitical tensions, and a global energy crisis – increased investors' risk aversion and preference for infrastructure as a low-risk asset class. The boost in private capital allocation to infrastructure may also be due to investor efforts and government plans to invest in sustainable infrastructure, especially in developed economies.
- Whilst sharp interest rate hikes have increased returns on private debt in 2023, private debt is the only main asset class from which most private investors expect to earn higher returns in 2024 and to which they intend to increase long-term allocations. Core infrastructure is the other popular target among private investors due to the inflation-indexation and stability of its cash flows. For all other asset classes, rising interest rates, asset valuations, and commodity price volatility are the main challenges impeding positive return expectations for next year. (Preqin, 2023d).

Annual private infrastructure capital raised by funds

(USD billion, 2010-2022)



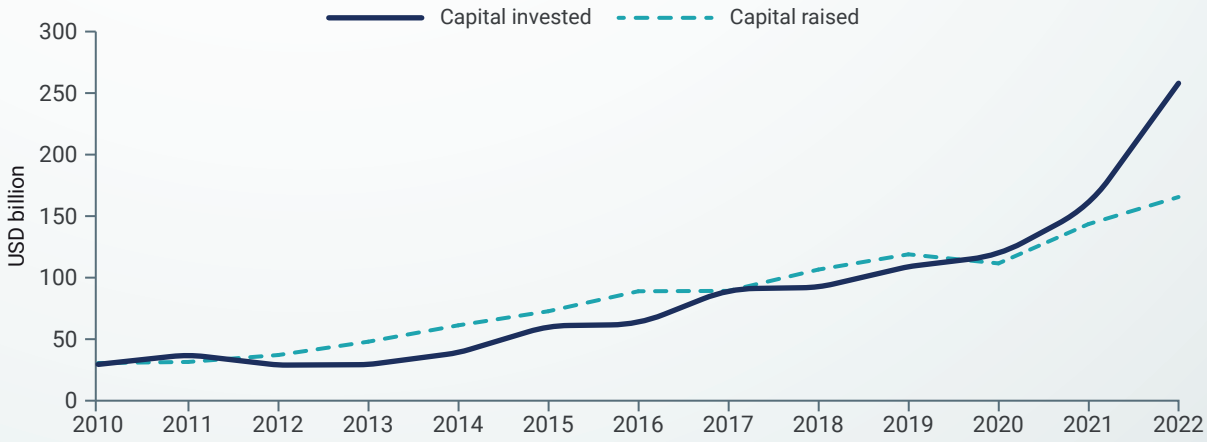
Source: Preqin data as of 13 October 2023.

In 2022, for only the second time in a decade, infrastructure capital investment materially outpaced the infrastructure capital raised.

- Over the last 10 years, the annual private capital raised for infrastructure generally outpaced the private capital that was invested in infrastructure (except in 2017).
- In 2022, for the first time, the private infrastructure capital that was invested by funds grew significantly and outpaced the growth in private infrastructure capital that was raised by funds. Funds raised grew significantly in 2022 (15%), but the funds invested grew by 64%.
- The positive trend in investment shows that although infrastructure is one of the top choices for hedging inflation risks, there was also an unprecedented shift within infrastructure markets – suggesting that there were many new investment opportunities available that year.

Annual private infrastructure capital raised and invested by funds

(USD billion, 2010–2022)



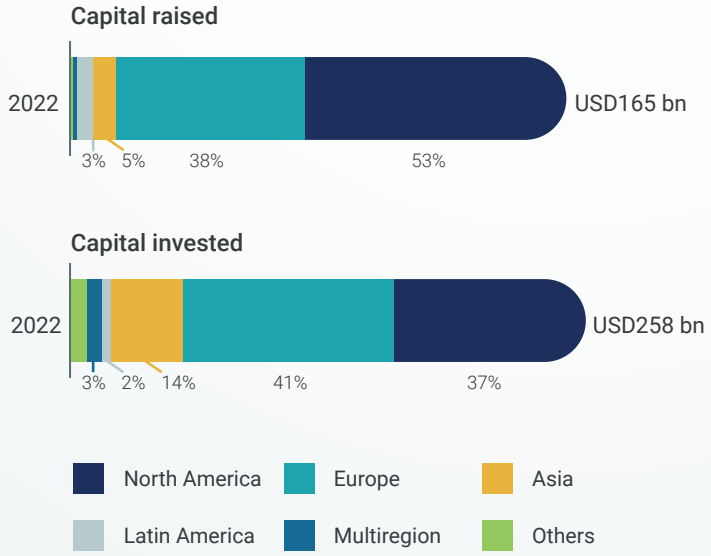
Source: Preqin data as of 13 October 2023.

Note: Capital invested is measured by the annual capital called by the fund manager for investment in the infrastructure asset class.

Most of the private infrastructure capital raised and invested by funds has been concentrated in North America and Europe.

Private infrastructure capital raised and invested by funds by region in 2022

(% of total)



Source: Preqin data as of 13 October 2023.

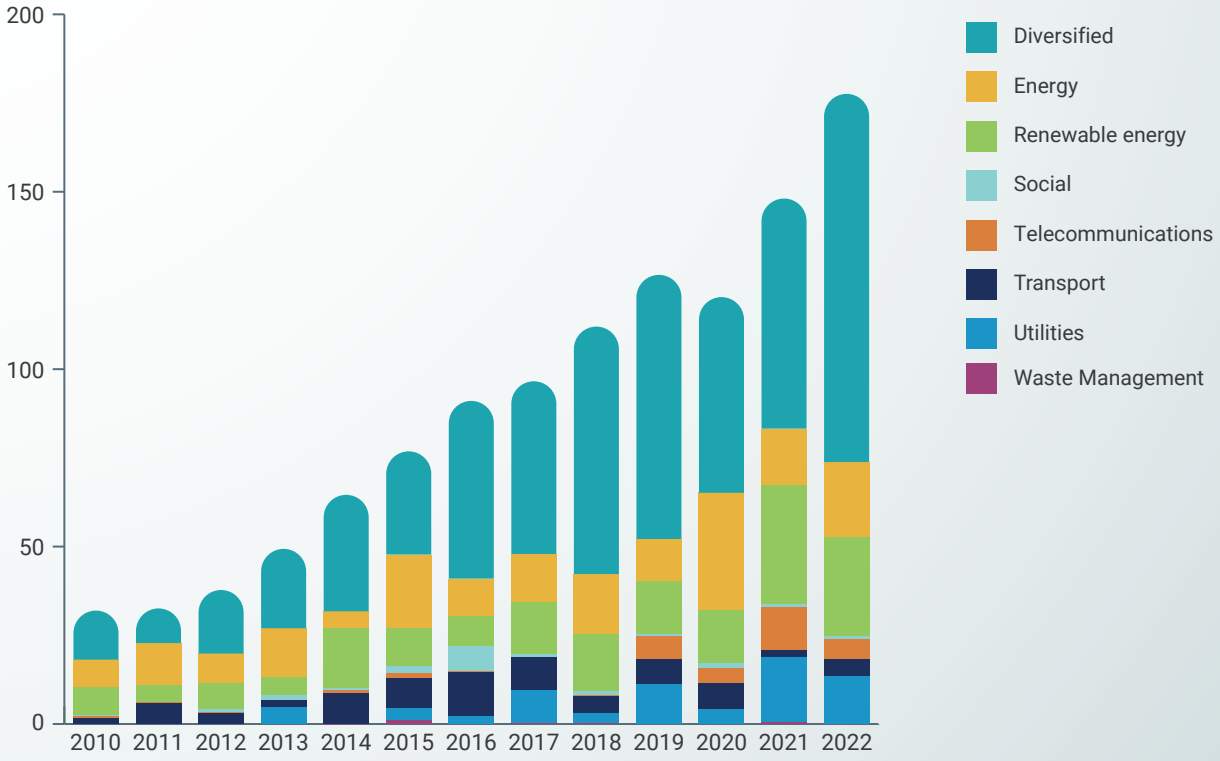
- Historically, North America and Europe account for most of the private infrastructure capital raised and invested by funds.
- The capital raised has increased over time, and in 2022, was mostly from North America (53%), followed by Europe (38%).
- The amount of private infrastructure capital invested more than doubled after the COVID-19 pandemic, and in 2022, was mostly from Europe (41%) and North America (37%).
- North America and Europe are concentrating more opportunities and less risk compared to emerging markets and developing economies (EMDEs), where the challenges from recovering from the COVID-19 pandemic persist and economic shocks are hitting harder. The levels of capital raised and invested in EMDEs have not shown a significant change compared to pre-pandemic levels.
- In 2022, Europe took the lead and raised USD106 billion, almost tripling its pre-pandemic level of USD39 billion. This may be associated with the opportunities raised by post-pandemic recovery plans and strong commitments to the climate transition, which also generated a robust pipeline of infrastructure investment opportunities, particularly in renewable energy assets.
- In 2022, North America caught up, increasing funds raised to USD96 billion, more than double its pre-pandemic level of USD46 billion. This boost may have been intensified by recent US government announcements, such the *Infrastructure Investment and Jobs Act (2021)* and the *Inflation Reduction Act (2022)*, both of which opened up investment opportunities for the substantial pool of North American capital.
- In a recent study, 80% of private investors listed the United States as a preferred market for infrastructure investment, whilst 50% listed Western Europe as a preferred market (Preqin 2023c).

Renewable energy was the most popular sector, accounting for 16% of the private infrastructure capital raised in 2022.

- Historically, most of the private capital invested by funds in the infrastructure asset class is diversified across a mix of infrastructure sectors.
- Diversification is a key reason cited by investors for allocating funds toward infrastructure.
- Other than the need to diversify, the availability of a pipeline of operational infrastructure assets with no or low construction risk, and the potential return, dictate which infrastructure sectors fund managers decide to invest in.
- In 2022, renewable energy was the most popular sector, with 16% of the capital targeting this sector. The popularity of renewable energy has increased over time, with private capital raised by funds for this sector nearly doubling from USD15 billion in 2019 to USD28 billion in 2022. Optimistic expectations of the future of the renewable energy sector and the stable revenues of utilities have encouraged investors to prioritise these sectors during inflationary conditions.
- As the energy transition matures, the renewable energy sector is expected to continue its evolution from a niche sector to a mature sector targeted by mega funds.

Private infrastructure capital raised by funds, by sector

(USD billion, 2010–2022)



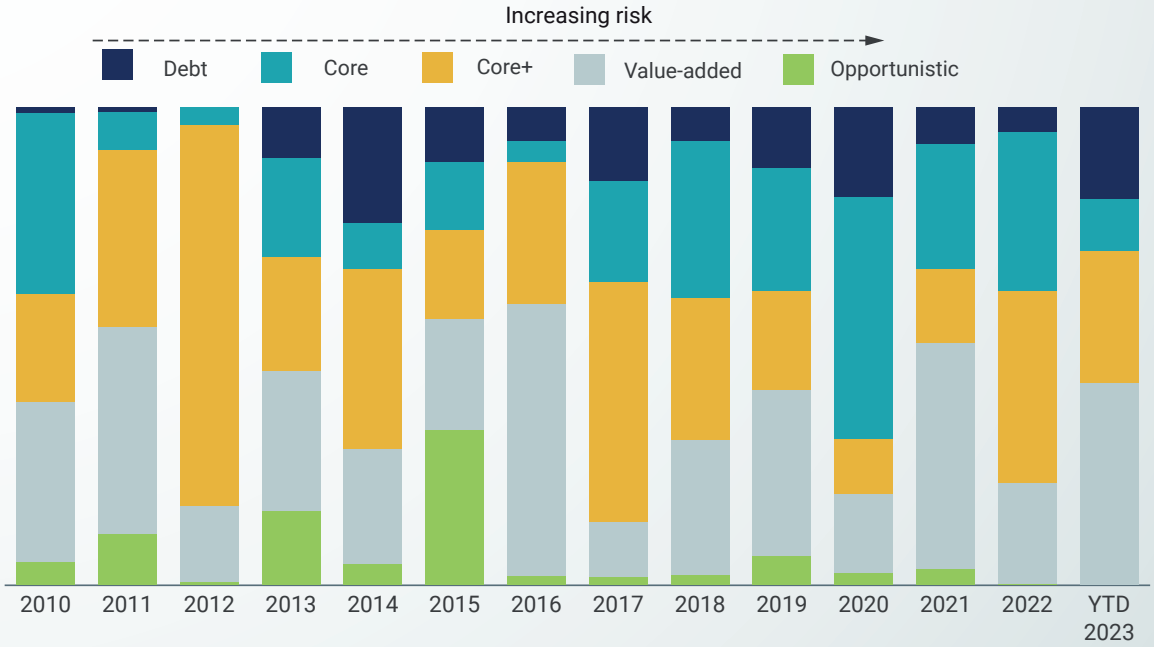
Source: Preqin data as of 9 October 2023.

The capital raised within the renewable sector mainly targets low-risk investment opportunities, which are backed by business models with low demand and/or price risk.

- The renewable energy sector has shown remarkable and constant growth in fundraising during recent years.
- On average, from 2010 to 2023 (YTD), 82% of the annual private infrastructure capital raised by funds for renewables targeted debt, core, and core+ as investment strategies, which typically aim to invest in business models with low demand and/or price risk.
- From 2019 to 2023 (YTD), the average share of total investment driven by the value-added investment strategy remained low. This strategy typically seeks opportunities featuring enhancements to existing assets and business models with low demand and price risk. In 2023 however, the value-added strategy featured more prominently for renewable energy (increasing to 42% YTD).

Renewable energy: private infrastructure capital raised by funds, shares by investment strategy

(%, 2010–2023)



Source: Preqin data as of 9 October 2023.

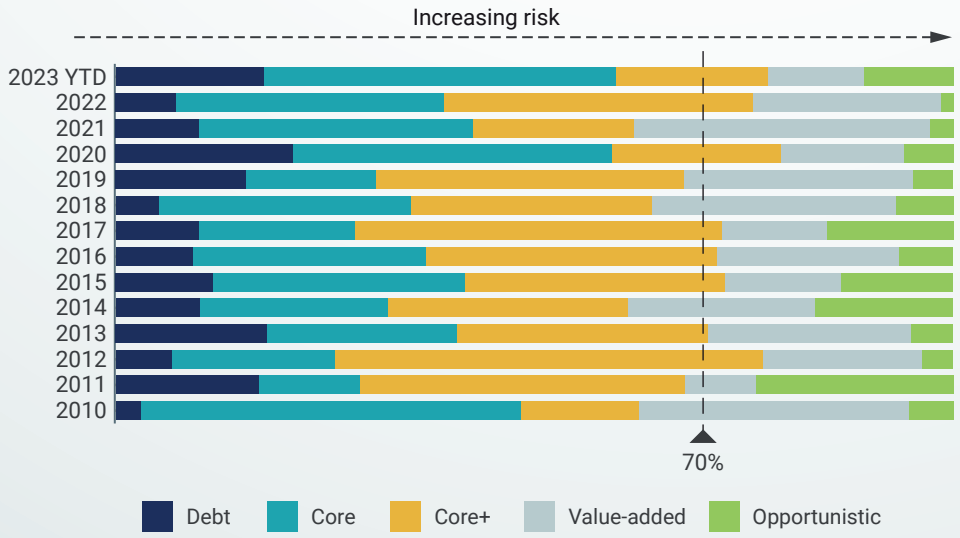
Note: Funds can be mapped to five infrastructure investment strategies according to their risk appetite. See the Glossary for a detailed definition of each strategy.

70% of the private capital raised by funds for infrastructure investment targets lower-risk strategies.

- From 2010 to 2022, on average, 70% of the private infrastructure capital raised by funds was invested according to core (26%) and core+ (32%) investment strategies, reflecting a preference for low-risk assets.
- On average, funds targeting secondary projects had the lowest share of dry powder (11%), while greenfield projects had the highest share (45%).
- The value-added investment strategy focuses on infrastructure assets that actively pursue enhancements to boost usage or demand. This is the third most popular investment strategy and is followed by 21% of funds. Funds that apply this strategy typically target brownfield projects which, on average, have the second lowest share of dry powder (12%).
- Although private investors remain mostly equity providers to funds, providing lending facilities is a strategy that features in 11% of private capital raised.
- The least popular strategy among funds is the opportunistic infrastructure investment strategy, which focuses on the potential future growth in asset value and not on recurrent cash flows. This strategy is only followed by 9% of funds.

Private infrastructure capital raised by investment strategy

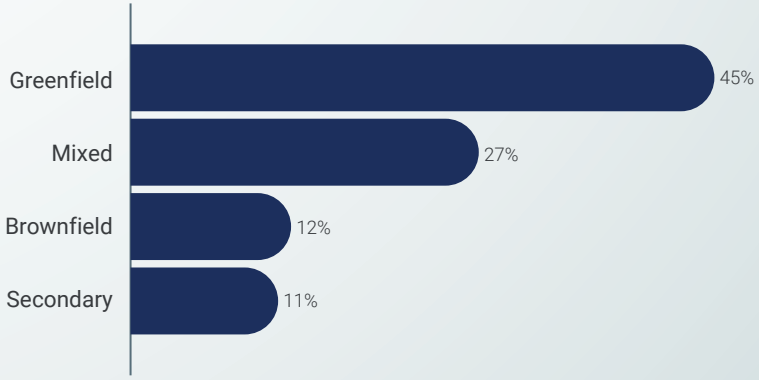
(% of capital raised, 2010–2022)



Source: Preqin data as of 13 October 2023.

Dry powder by type of investment

(% of cumulative private infrastructure capital)



Source: Preqin data as of 5 July 2023.

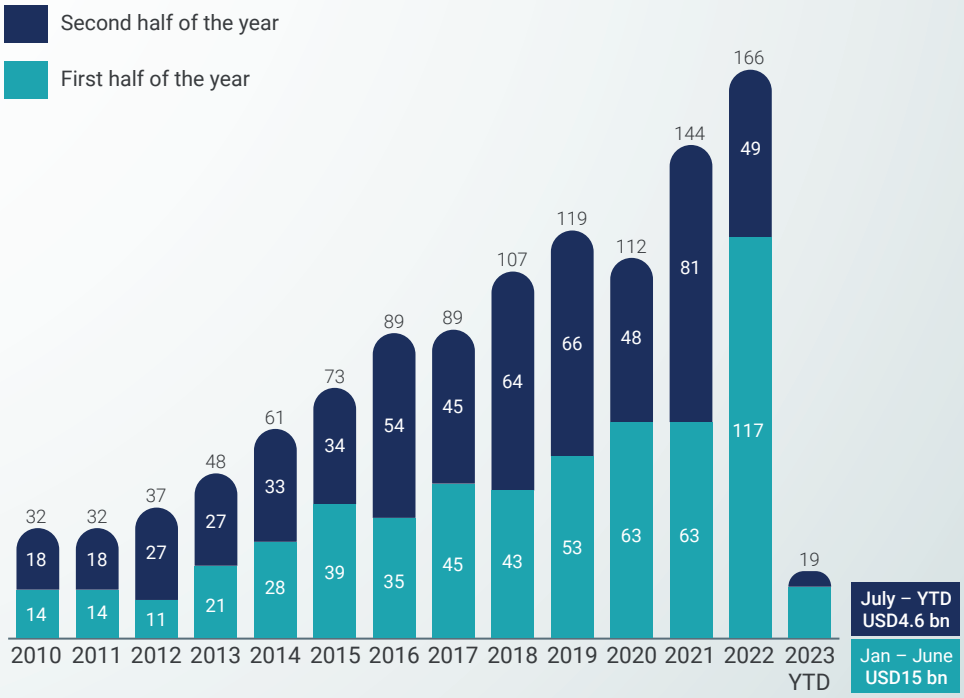
Note: Mixed covers funds investing in more than one project stage.

2023 saw a substantial decline in capital raised for infrastructure investments.

- In 2023, the fundraising environment for private infrastructure capital has been more challenging than at any other point over the past decade. Funds raised in the first half of 2023 reached only USD15 billion, considerably less (-87%) than the level raised in the first half of 2022. Not only was the strong growth from previous years reversed in 2023, but the level of capital raised was the lowest in a decade.
- This sharp decline is a reversal of the record growth that was seen in 2021 and 2022, and potentially due to the deteriorating financial and macroeconomic environment. Much of 2022's infrastructure fundraising success can be attributed to decisions that were made before the current market turmoil. Hopes are fading that increases in inflation and interest rates are transitory, and this is putting downward pressure on asset valuations. The proportion of investors that cite interest rates as a key challenge for return generation increased from 12% in 2020 to 56% in 2022 (Preqin 2023a), and this is reflected in the 2023 data.
- In addition to economic conditions and their impact on asset valuations, there are other key challenges. Limited Partners (LPs) are approaching, have reached, or have exceeded their infrastructure allocation targets, and face competition for assets, an unfavourable geopolitical landscape, and regulatory restrictions (Preqin 2023c). Political risks, such as government pressure to lower the prices charged for infrastructure services are also higher during inflationary periods, e.g. some countries introduced energy price caps in 2023 due to an affordability crisis.
- In more positive news, 58% of investors expect to increase their capital allocations to the infrastructure asset class in the longer term (Preqin 2023c). However, this will depend on the macroeconomic trajectory. So long as inflation remains high and monetary policy continues to tighten, investors are likely to remain cautious or hesitant to invest.

Private infrastructure capital raised by funds

(USD billion, 2010–2023)



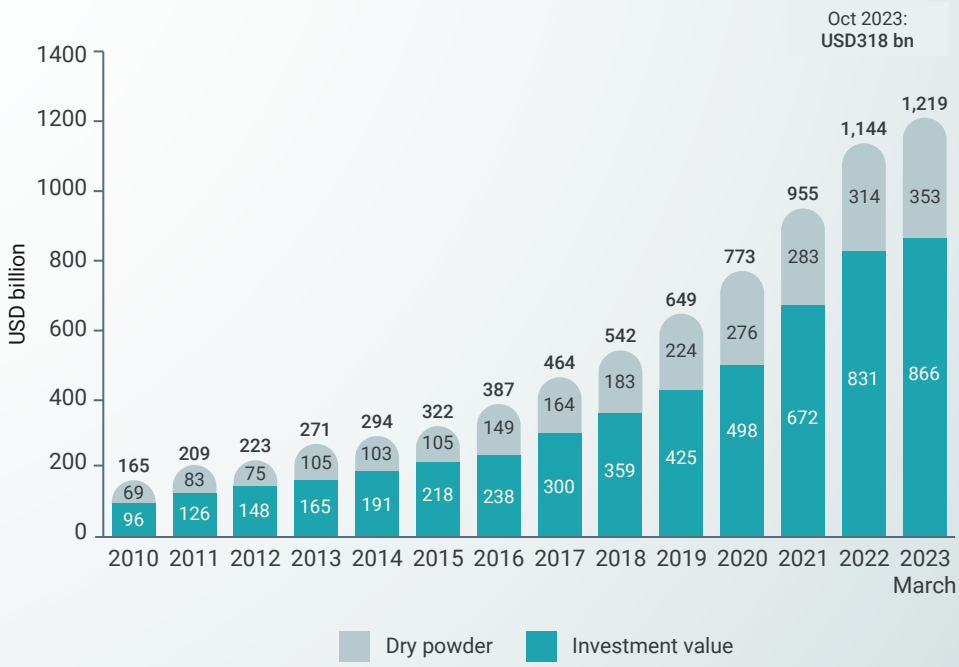
Source: Preqin data as of 13 October 2023.

Dry powder decreased in 2023, mainly due to the record low level of funds raised and the recent surge in funds invested.

- From 2010 to 2022, the cumulative total value of private infrastructure capital increased sevenfold from USD165 billion to USD1,144 billion.
- Since 2010, the investment value component has grown ninefold, and since 2019, it has nearly doubled.
- The dry powder component also increased consistently from 2010 to 2022, due to the faster rate of capital raised compared to the rate of capital invested during the previous decade.
- As capital invested outpaced capital raised in 2021 and 2022, the investment value component increased from 65% in 2019 to 73% in 2022, while the dry powder component decreased from 35% in 2019 to 27% in 2022. This suggests a new array of available investment opportunities – also seen in transaction trends.
- Dry powder decreased in 2023 from USD353 billion at the start of the year to USD318 billion as of October 2023. This can be attributed to the reduced availability of funds, mainly due to the record low levels of funds raised in 2023, and the recent surge in funds invested. This has resulted in increased overall deployment while simultaneously diminishing dry powder.

Cumulative private infrastructure capital by component

(USD billion, 2010–2023)



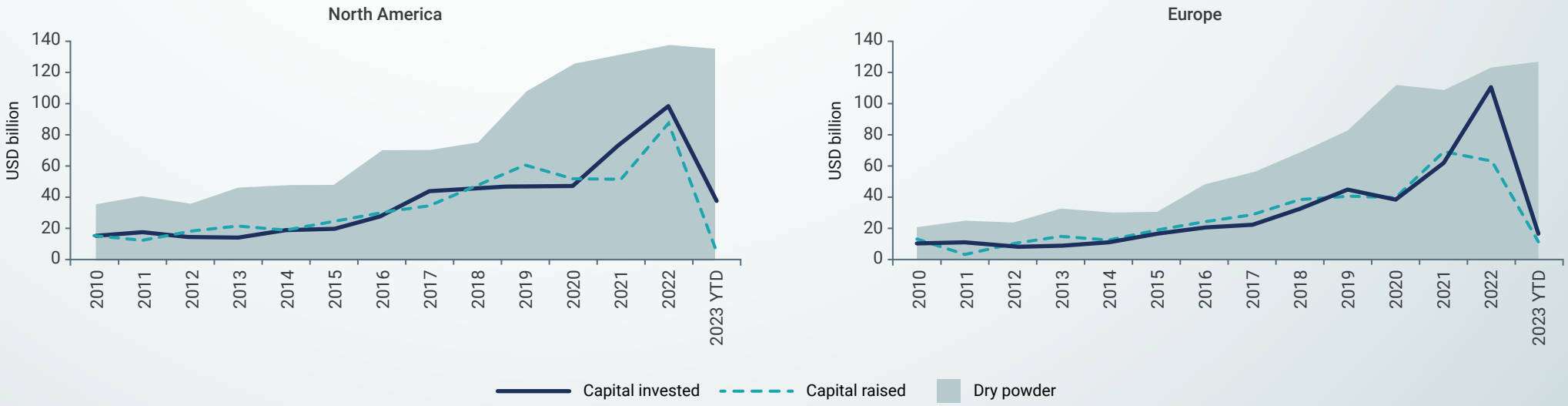
Source: Preqin data as of 13 October 2023.

Note: Capital committed is the sum of unallocated capital and portfolio returns, minus any disbursements to investors.

In 2023, North America led the decrease in dry powder.

- The global decline in dry powder in 2023 was mainly led by the decline in dry powder of funds targeting North America.
- In North America, the decline in annual capital raised by funds from USD87.5 billion in 2022 to USD5.5 billion as of October 2023 was much sharper than the decline in annual capital invested (USD98.1 billion in 2022 to USD36.9 billion as of March 2023). This was driven by the extraordinary overall market growth in 2022 and by an investment momentum that was stronger than the fundraising momentum.
- While large investment opportunities (such as airports) and recent US infrastructure stimulus have strengthened the investment momentum, the fundraising momentum is being negatively affected by the deteriorating macroeconomic environment, especially sharp interest rate hikes.
- In Europe, the annual private infrastructure capital investments by funds doubled every year during the COVID-19 pandemic from USD38.4 billion in 2019 to USD111 billion in 2022, driven by a heavy emphasis on accelerating the clean energy transition. In 2023, due to deteriorating macroeconomic and geopolitical conditions, Europe suffered a sharp fall in capital raised and in capital invested.

Annual private infrastructure capital raised and invested by funds, and cumulative dry powder, by region, 2010–2023

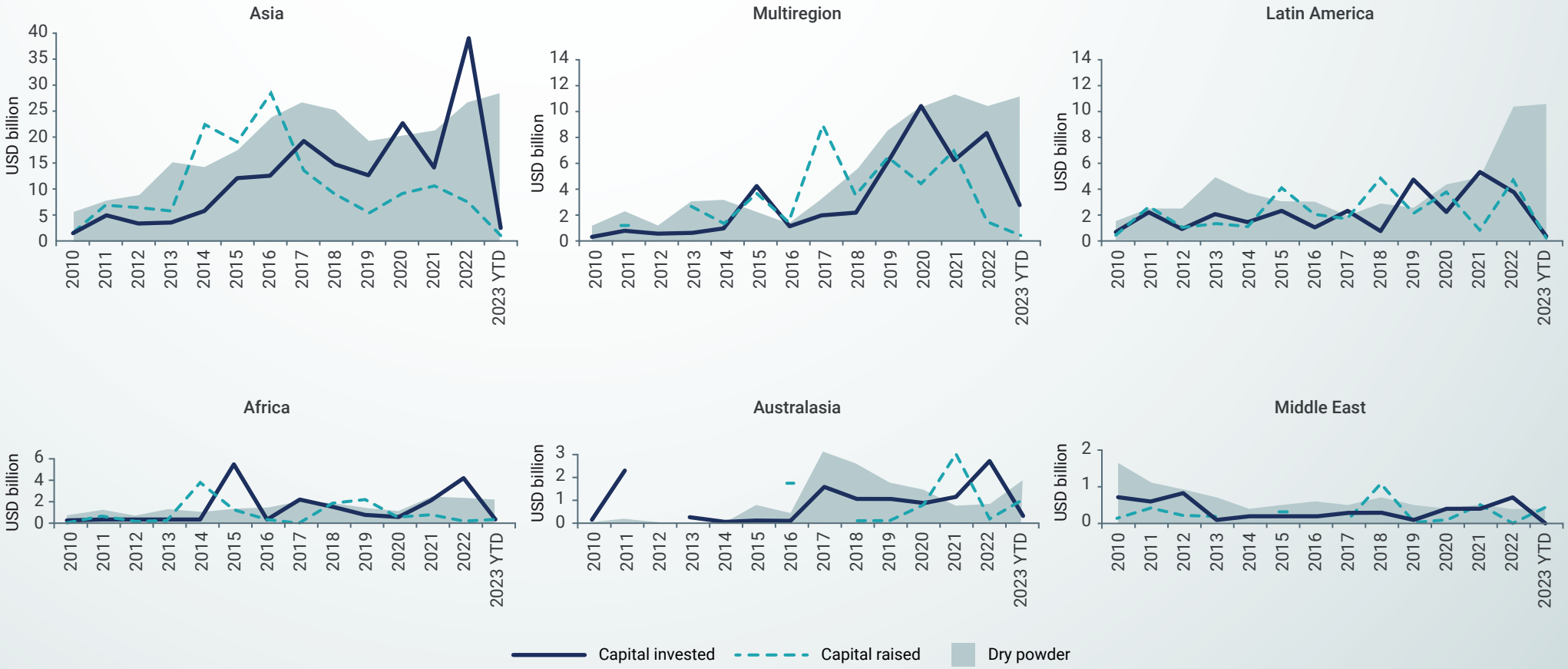


Source: Preqin data as of 13 October 2023 for annual capital raised and dry powder, as of March 2023 for annual capital invested.

Note: The gaps in the charts represent regions and years for which data is currently unavailable.

In other regions, dry powder increased in the first half of 2023, reflecting persistently low levels of private capital mobilisation and investment.

Annual private infrastructure capital raised and invested by funds, and cumulative dry powder, by region, 2010–2023



Source: Preqin data as of 13 October 2023 for annual capital raised and dry powder, as of March 2023 for annual capital invested.

Note: The gaps in the charts represent regions and years for which data is currently unavailable.

Blended finance in infrastructure

Note: This supplemental section was published in February 2024, following the publication of the original three sections of the *Infrastructure Monitor 2023* report. It has been developed in partnership with Convergence, drawing on data from Convergence's historical deals database.

Key findings

- On average, commercial capital represented 73% of the financing of blended finance infrastructure deals. Private and non-private sources contributed equally to commercial capital.
- Project finance was the preferred financing structure used in blended finance infrastructure deals.
- Blended finance deals were concentrated in the renewable energy sector, but most of the renewable energy deals were of lower value compared to the non-renewable energy deals.
- In total deal value, private capital had a majority share in the communications sector, followed by energy storage, transmission, and distribution. MDB capital had a larger share than private capital in the transport, renewable energy, and social sector.
- Sub-Saharan Africa attracted the largest share of blended finance infrastructure deals, followed by Latin America and the Asia-Pacific region.
- Infrastructure deals attracted $0.4 of private capital for every dollar worth of blended finance approaches, as measured by the central value (median). About 10% of the deals demonstrated exceptional performance mobilising more than $2.
- Across structures, bonds/notes and facilities had higher private capital mobilisation ratios.
- Across sectors, energy storage, transmission and distribution, communications, and renewable energy generation had higher private capital mobilisation ratios.
- Across regions, Latin America had the highest private capital mobilisation ratio.

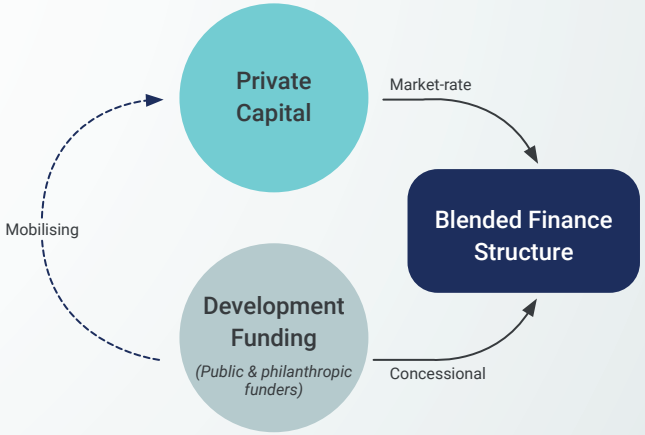
Blended finance is the use of catalytic capital from public or philanthropic sources to increase private sector investment in sustainable development.

What is blended finance?

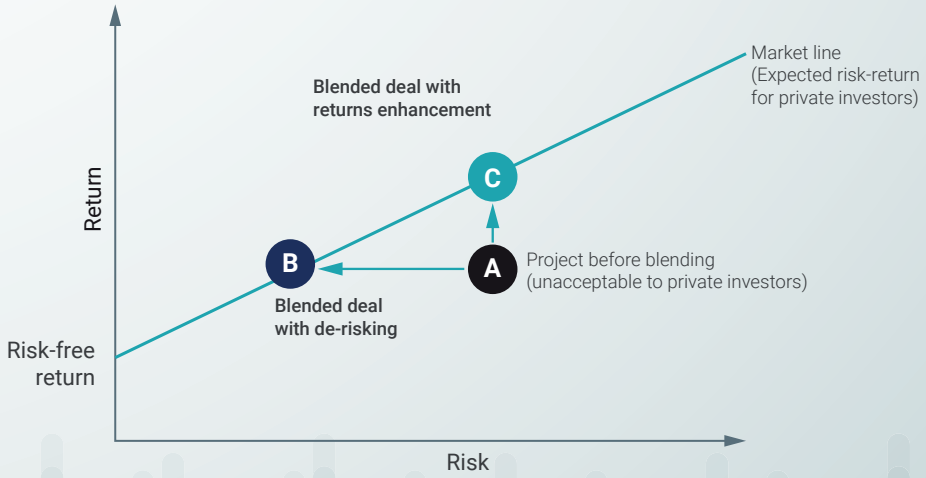
Blended finance is a structuring approach that allows public, private, and philanthropic to work together to address the investment barriers while achieving their own objectives. The main barrier to private investment is unattractiveness of risk-adjusted return. Blended finance approaches either enhance returns by providing concessional capital or grants or reduce risks by providing grants and guarantees.

Scope of analysis

The analysis of blended finance infrastructure deals presented in this section is based on details captured from 162 deals in the Convergence historical deals database. Only deals launched from 2013 to 2022 were included in the sample. The sample was selected based on data availability on financing amounts by instrument and provider. Collectively, the sample includes deals with a total financial commitment of USD 34 billion. The database only covers emerging markets. See the methodology appendix for further details.



Blended finance improves the risk-return profile of an investment



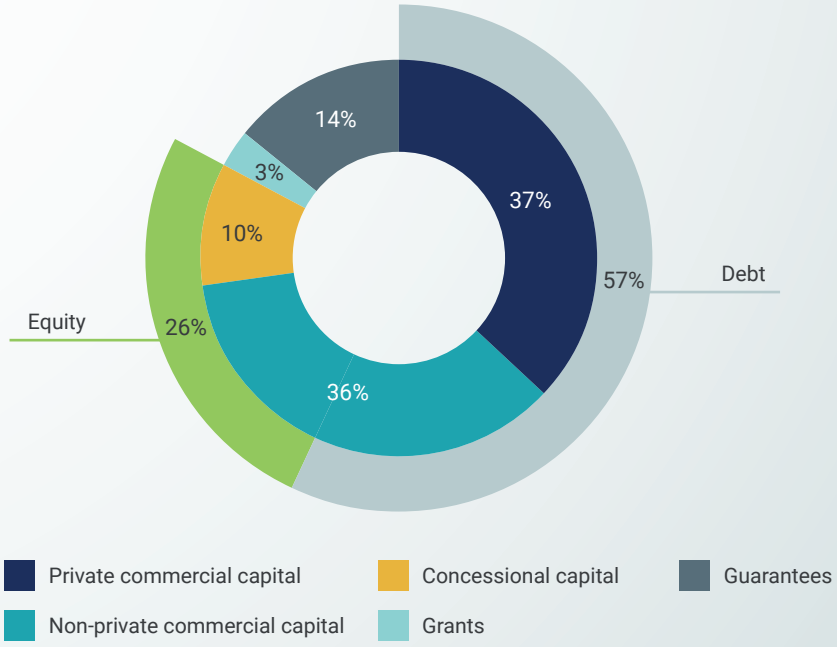
Source: Convergence.

# On average, commercial capital represented 73% of the financing of blended finance infrastructure deals. Private and non-private sources contributed equally to commercial capital.

- Within financial commitments for blended finance infrastructure deals, debt had the largest share (57%), followed by equity (26%), guarantees (14%), and grants (3%). The debt-to-equity ratio was 69:31.
- Investment capital in the form of commercial debt or equity was provided by private and non-private (public or philanthropic) investors in equal proportions – 37% by private investors and 36% by non-private investors. Non-private investors also provided concessional debt and equity but represented only 10% of the total financial commitments.
- In total, 86% of the financial commitments were for actual investments, including financing (debt or equity) and grants, and 14% were in the form of guarantee or insurance (14%). Guarantees were provided in 33% of the deals.
- Support through grants represented 3% of the total financial commitments.

Blended finance infrastructure deals

Shares in total financial commitments by finance type



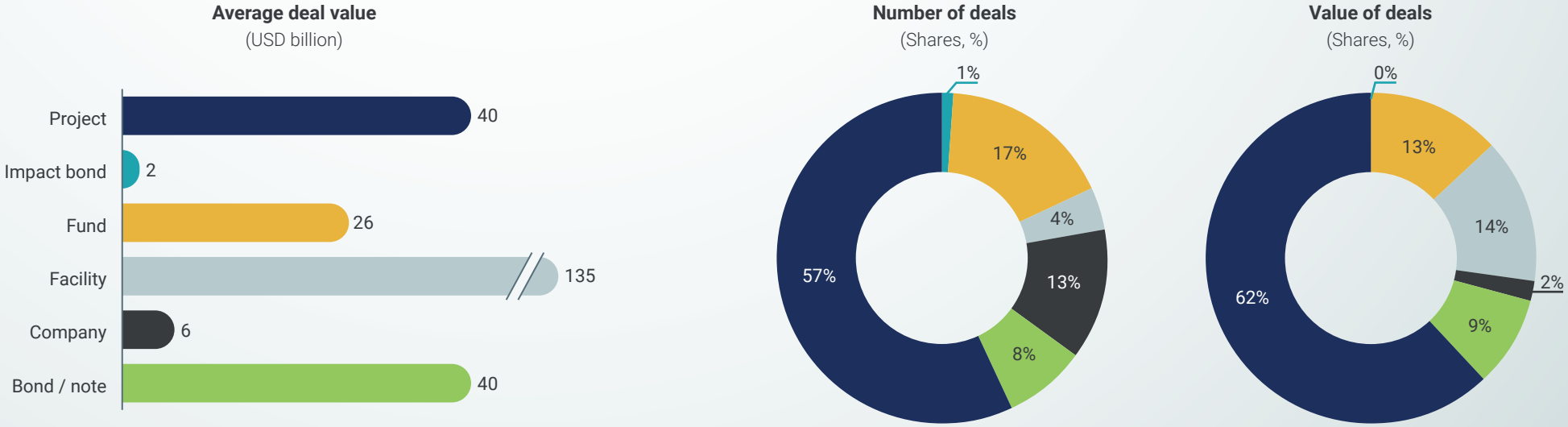
Source: Global Infrastructure Hub analysis based on Convergence database.

Project finance was the preferred financing structure used in blended finance infrastructure deals.

Project finance was used in the majority of blended finance infrastructure deals because it is the most optimal structure to develop and manage an infrastructure asset. By treating one asset development and management as one project, the large size of financing and competing priorities can be clearly managed. It allows optimal structuring of financing, risk allocation, and responsibilities between key participants in an infrastructure project including private contractor, government sponsor, and financiers.

Deals structured as facilities had the largest deal size among all blended finance infrastructure deals: the size was USD 135 billion on average, but the facility structure was used in only 4% of the deals. Fund was the second most popular structure used by 17% of the deals and had an average size of USD 26 billion. Bond / note was also a popular structure used in 8% of the deals with an average size of USD 40 billion.

Blended finance infrastructure deals by structure



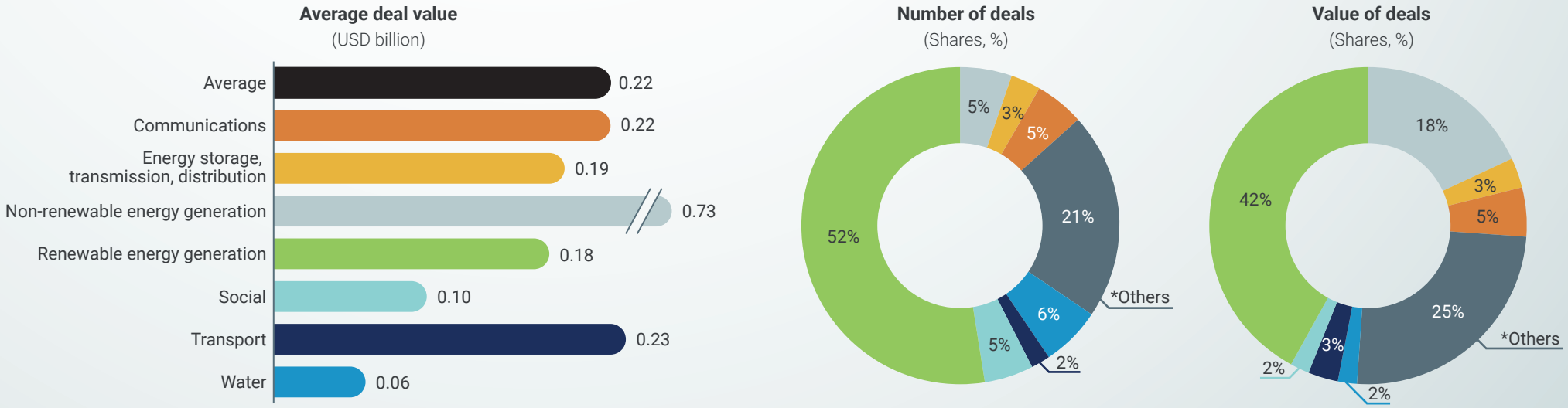
Source: Global Infrastructure Hub analysis based on Convergence database.

Blended finance deals were concentrated in the renewable energy sector, but most of the renewable energy deals were of lower value compared to the non-renewable energy deals.

About half of the blended finance infrastructure deals were in renewable energy generation sector, but the average size of deals in the sector was lower at USD 0.18 billion, so the sector's share in total value of deals was 42% - still the highest of all infrastructure sectors. In contrast, the non-renewable energy generation sector had a significantly higher average deal size at USD 0.73 billion, so its share in total value of deals was 18% while its share in total number of deals was 5%.

Blended finance infrastructure deals in the social and water sectors had lower deal values than other infrastructure sectors, which translated into lower shares in the total deal value. Social and water sectors had an 11% share in total number of deals, but only 4% share in the total value of deals.

Blended finance infrastructure deals by sector



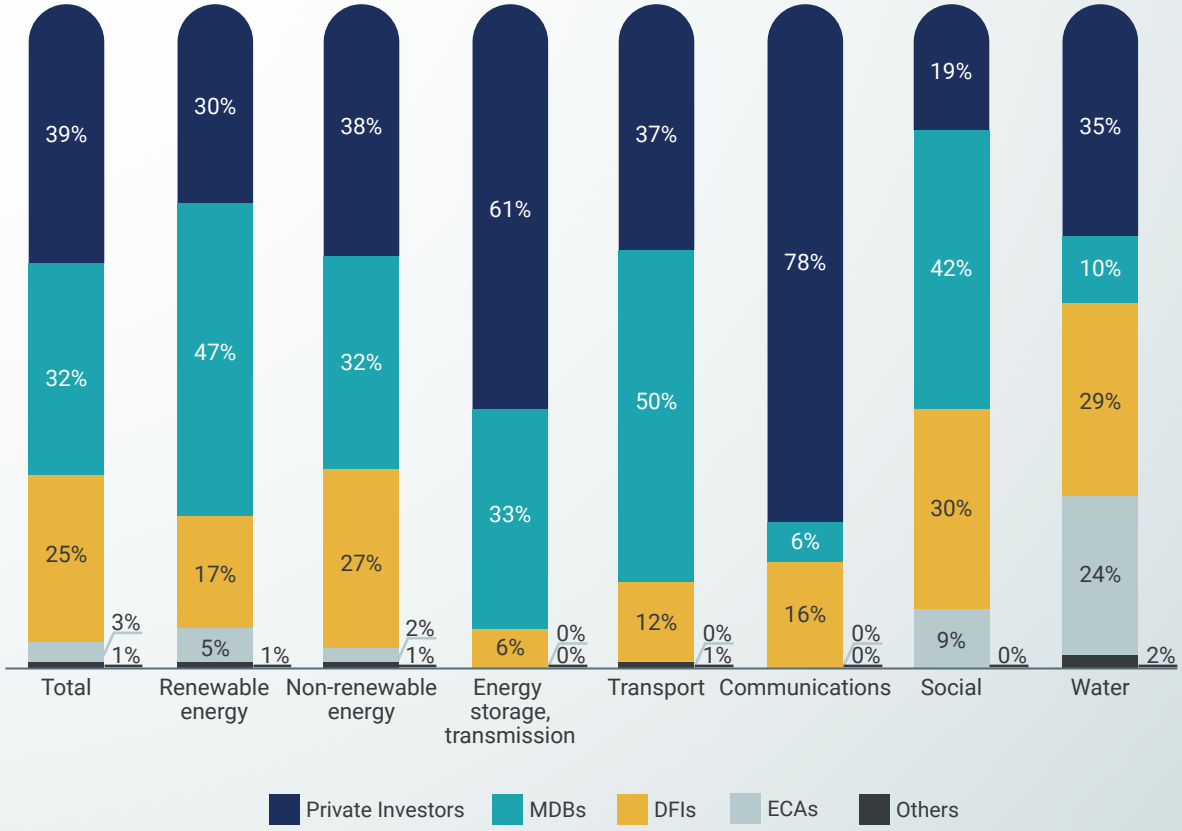
Source: Global Infrastructure Hub analysis based on Convergence database.

Note: Others include deals focusing on multiple sectors e.g. environment, broader energy sector or for which the sector is not specified.

In total deal value, private capital had a majority share in communications, followed by energy storage, transmission, and distribution. MDB capital had a larger share than private capital in transport, renewable energy, and the social sector.

- Private capital was the most invested form of capital in blended finance infrastructure deals, followed by Multilateral Development Bank (MDB) and Development Finance Institutions (DFI) capital. The communications sector saw the largest amount of private capital (78% of total investment was private capital) followed by energy storage, transmission, and the distribution sector (61% of total investment was private capital).
- MDB capital accounts for half of the financial commitments in a blended finance infrastructure deal for the transport sector. DFI and Export Credit Agencies (ECAs) capital is more widely used in deals in the social and water sector.
- For deals in the renewable energy sector, MDBs had the largest share in total financial commitments, while private capital mobilisation ratio was still attractive. This is because the private sector is investing in more deals of smaller value and MDBs are leading the deals of larger value.

Blended finance infrastructure deals by sector and investor

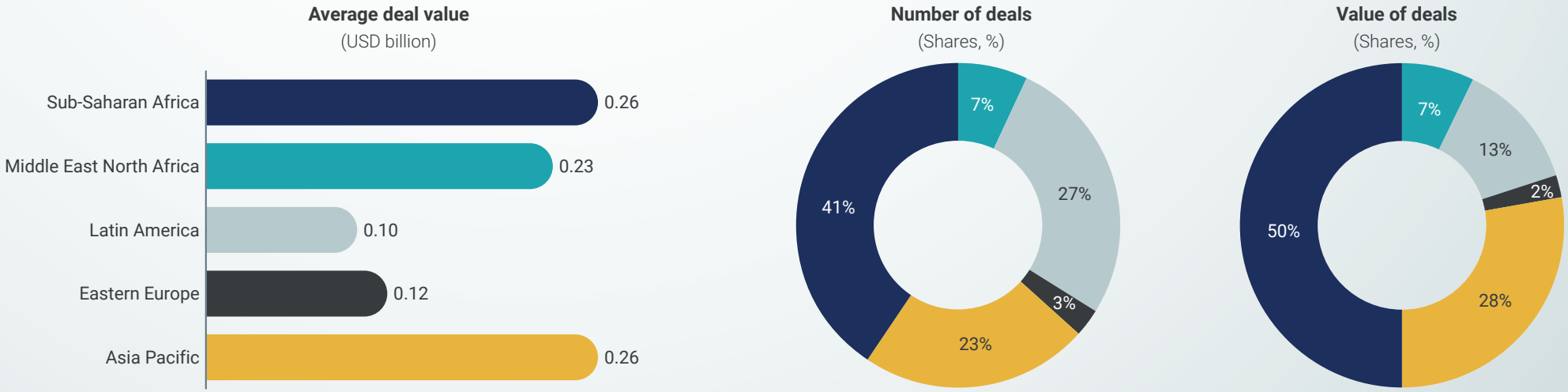


Source: Global Infrastructure Hub analysis based on Convergence database.

Sub-Saharan Africa attracted the largest share of blended finance infrastructure deals, followed by Latin America and the Asia-Pacific region.

- Sub-Saharan Africa attracted 41% of the global blended finance infrastructure deals with an average value of USD 0.26 billion, increasing the region's share in total value of deals to 50%.
- Latin America attracted the second largest share of deals at 27% but the average deal value was low at USD 0.10 billion, reducing its share in total value of deals to just 13%.
- The Asia-Pacific region had the third largest share in the number of deals (23%) but the second largest share in the value of deals (28%) because of higher average deal value at USD 0.26 billion.

Blended finance infrastructure deals by region



Source: Global Infrastructure Hub analysis based on Convergence database.

Infrastructure deals attracted $0.4 of private capital for every dollar worth of blended finance approaches, as measured by the central value (median). About 10% of the deals demonstrated exceptional performance mobilising more than $2.

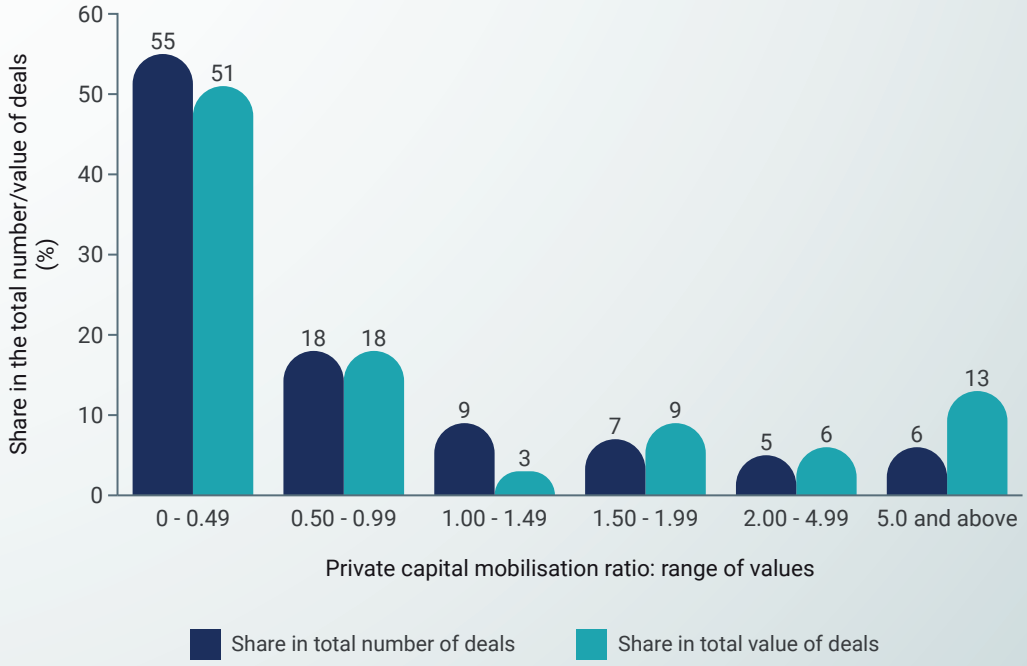
The majority of infrastructure deals attracted less than half a dollar of private capital for every dollar worth of blended finance approaches, including public or philanthropic debt or equity, grants and guarantees. For blended finance infrastructure deals, the median private capital mobilisation ratio was 0.4, while the average was 2.3 due to the exceptional success of some deals in mobilising private capital.

The notable features of successful deals include:

- Clear revenue stream broken down into affordable amounts payable by several users, by enabling recognition of future revenue streams or assets as collateral.
- Critical nature of the asset implying implicit government guarantee.
- Early-stage technical assistance, design grants or first loss equity to develop proof-of-concept, launch greenfield projects and infuse investor confidence.
- Involvement of a trusted entity, like the World Bank, through an explicit guarantee or a first-loss investment, that boosts investor confidence, participation, and investment value.

Private capital mobilisation ratio for a blended finance infrastructure deal indicates how much private capital was mobilised by using blended finance approaches. It is estimated by dividing capital (debt or equity) invested by private investors (commercial and impact investors) by non-private debt or equity plus grants and guarantees in a deal.

Blended finance infrastructure deals by private capital mobilisation ratio



Source: Global Infrastructure Hub analysis based on Convergence database

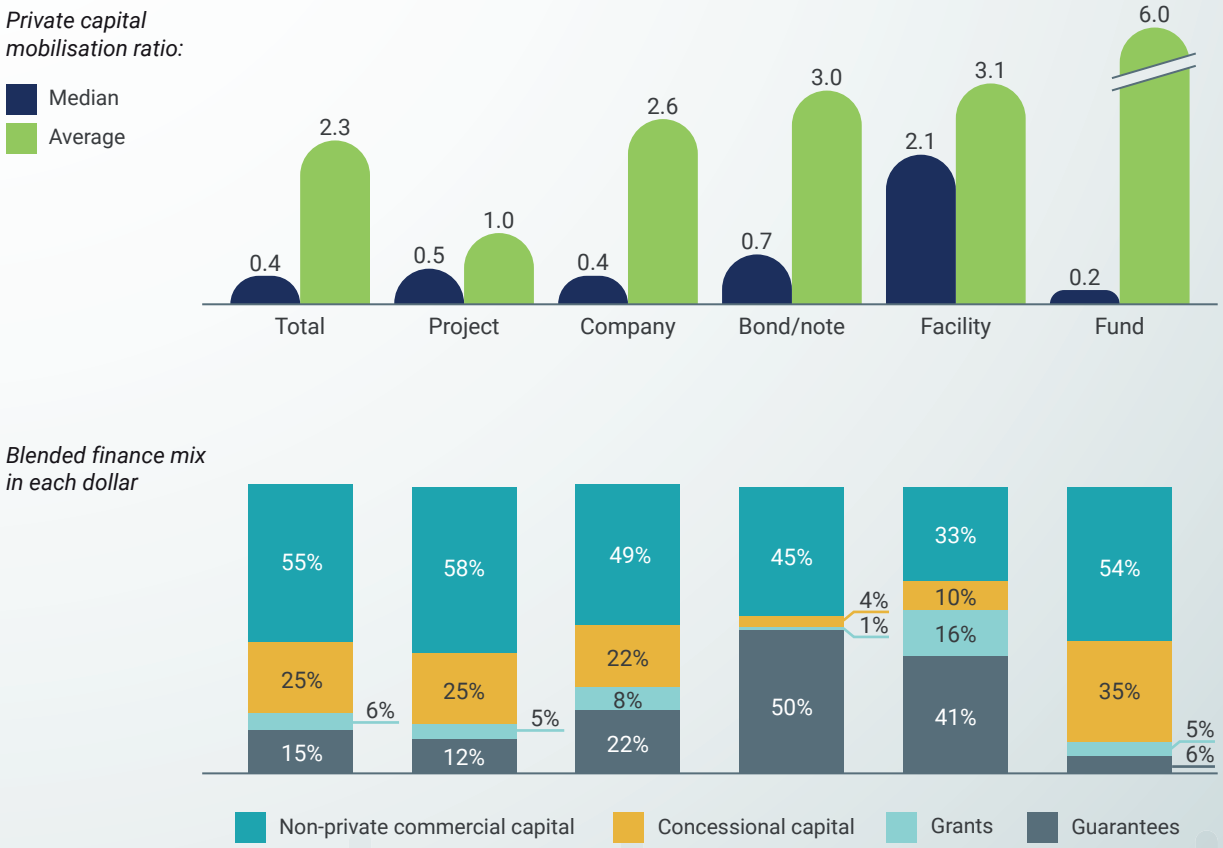
Across structures, bonds/notes and facilities had higher private capital mobilisation ratios.

- The deals structured in the form of bonds/notes and facilities had higher median private capital mobilisation ratios at 0.7 and 2.1, respectively. For these structures, guarantees constituted the highest share in total blended finance support at 50% and 41%, respectively.
- Project finance structures were used in majority of the blended finance infrastructure deals, but their private capital mobilisation ratios were not necessarily more superior than other structures. In fact, project finance structures rarely feature among deals with exceptional private capital mobilisation ratios. Regulatory frameworks for these structures are less conducive for attracting private investment. Guarantees particularly have an unfavourable treatment in regulatory frameworks for commercial banks and MDBs. Therefore, in project finance structures, 80% of the blended finance support was in the form of non-private commercial or concessional debt or equity. Only 12% of the support was through guarantees.
- A few funds had extraordinary success in mobilising private capital in the presence of blended finance approaches, but the median private capital mobilisation ratio at 0.2 was quite low. 90% of blended finance was in the form of non-private commercial or concessional debt or equity.

Blended finance infrastructure deals by structure

Private capital mobilised for every dollar of blended finance mix

Where the mix includes non-private commercial capital, concessional capital, grants and guarantee



Source: Global Infrastructure Hub analysis based on Convergence database.

Note: Average is the sum of all values divided by the total number of values. Median is the middle value from which half of the values are larger and half are smaller.

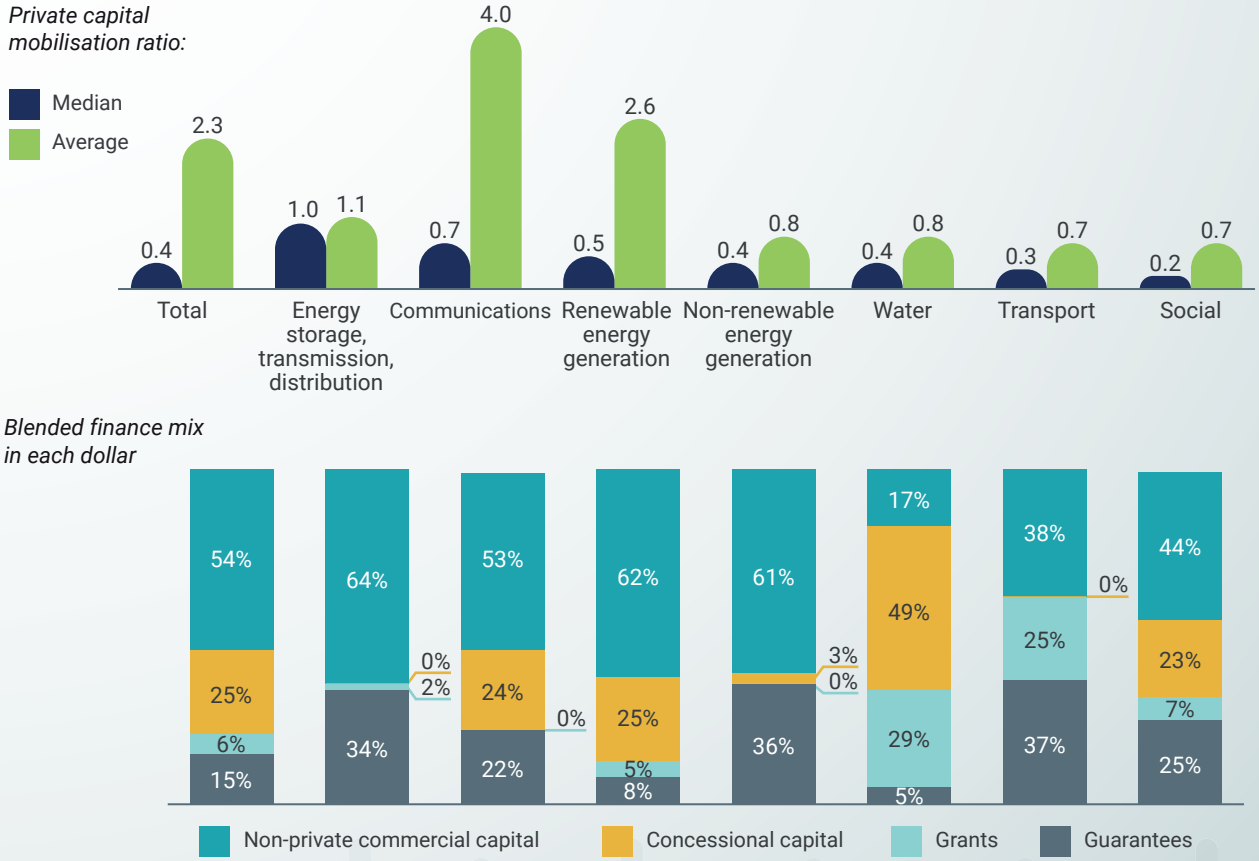
Across sectors, energy storage, transmission and distribution, communications, and renewable energy generation had higher private capital mobilisation ratios.

- The median private capital mobilisation ratios for energy storage, transmission and distribution, communications, and renewable energy generation sectors at 1.0, 0.7, and 0.5 respectively, were higher than the median ratio of 0.4 across all sectors. These sectors also had majority of blended finance support in the form of non-private commercial debt or equity predominantly from MDBs, DFIs, and ECAs.
- Nearly half of the blended finance support for water infrastructure projects was in the form of concessional debt or equity. The water sector relied more heavily on grants than other sectors, followed by transport.
- Guarantees constituted over one-third of blended finance support in transport, non-renewable energy generation, energy storage, transmission and distribution sectors.

Blended finance infrastructure deals by sector

Private capital mobilised for every dollar of blended finance mix

Where the mix includes non-private commercial capital, concessional capital, grants and guarantee



Source: Global Infrastructure Hub analysis based on Convergence database.

Note: Average is the sum of all values divided by the total number of values. Median is the middle value from which half of the values are larger and half are smaller.

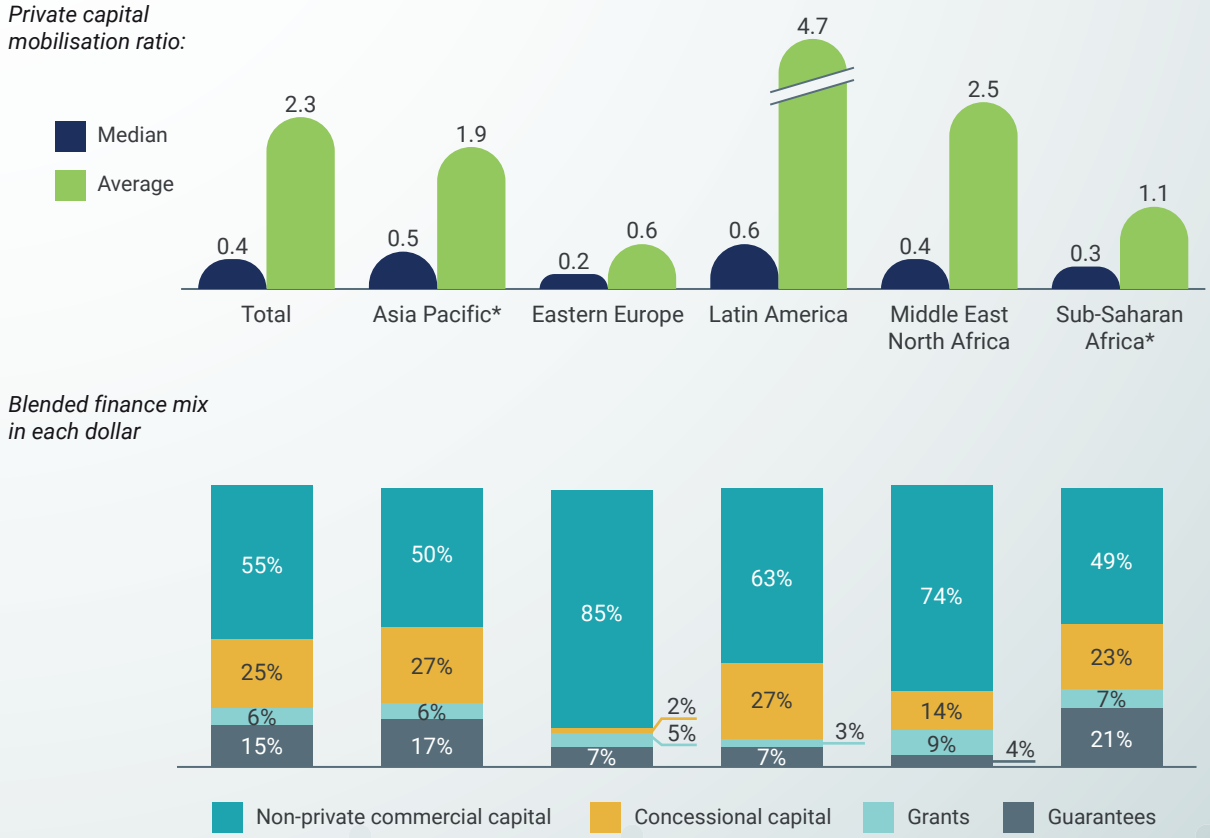
Across regions, Latin America had the highest private capital mobilisation ratio.

- The median private capital mobilisation ratios for Latin America and Asia Pacific at 0.6 and 0.5 respectively, were higher than the global median ratio of 0.4.
- In the Middle East and North Africa region, 74% of the blended finance support was in the form of non-private commercial debt or equity. While the median private capital mobilisation ratio in the region was close to the global median ratio, the ratios were outstanding for some deals, including the ones with project finance structure.
- Non-private commercial debt or equity had the highest share in Eastern Europe at 85% of the total blended finance support. Eastern Europe also had the lowest private capital mobilisation ratios.
- Guarantees constituted 21% and 17% of blended finance support in Sub-Saharan Africa and Asia Pacific, higher than the global average of 15%.

Blended finance infrastructure deals by region

Private capital mobilised for every dollar of blended finance mix

Where the mix includes non-private commercial capital, concessional capital, grants and guarantee



Source: Global Infrastructure Hub analysis based on Convergence database.

Note: Average is the sum of all values divided by the total number of values. Median is the middle value from which half of the values are larger and half are smaller.

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

Note: This supplemental section was published in February 2024, following the publication of the original three sections of the *Infrastructure Monitor 2023* report. It has been developed in partnership with GRESB, drawing on data from GRESB's annual *Infrastructure Asset Assessment*.

Key findings

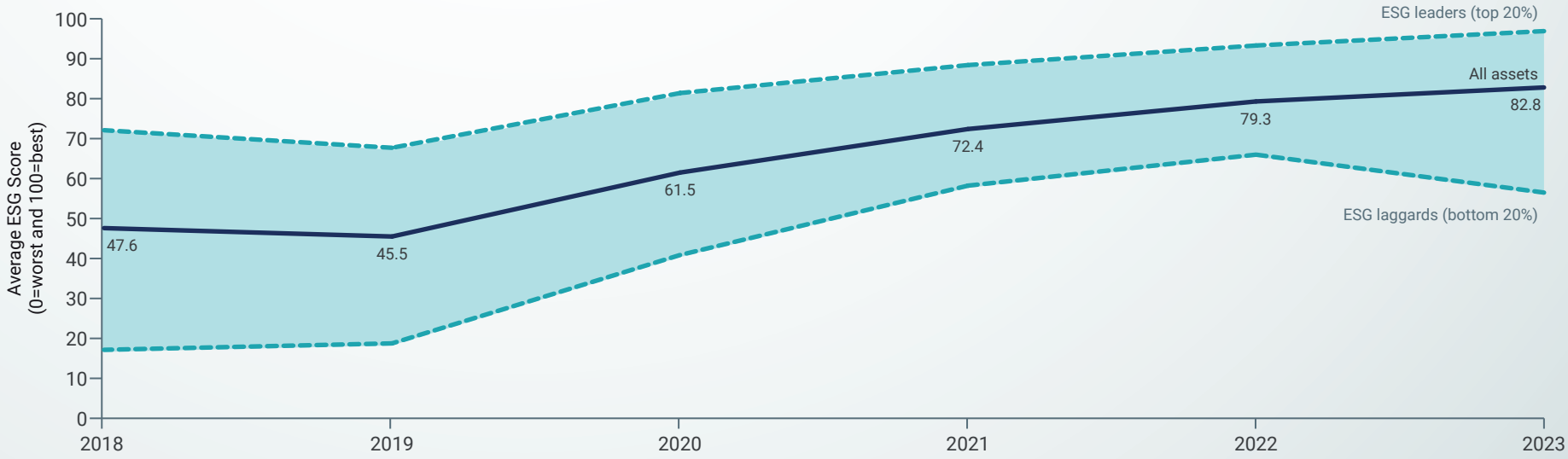
- In 2023, infrastructure assets continued to improve their ESG policies, practices, and disclosure, across all three pillars (environmental, social, and governance). While Governance saw the most improvement, overall, it still lags behind the Social and Environment pillars.
- 60% of infrastructure assets currently have a net zero target, but only have one that is science-based or aligned to a net zero target-setting framework.
- Net zero targets are more likely to be location-based, rather than market-based, and capture only Scope 1 and 2 emissions. However, regional variances exist with Europe leading the way in Scope 3 and market-based targeting.
- Most infrastructure assets have a systematic process for identifying and assessing the financial impact of physical climate risks, with more than two-thirds concluding that there are material direct or indirect financial impacts.
- Transition risks are also widely identified and assessed, with policy and legal risks the most widely recognised and the most likely to have a material financial impact on infrastructure assets.
- 92% of infrastructure assets have an individual responsible for Diversity, Equity, and Inclusion (DEI) issues, although only 68% have set a specific DEI objective.

In 2023, infrastructure assets continued to improve their ESG policies, practices, and disclosure.

- GRESB is currently the market leading source of ESG data for infrastructure assets, collecting data via its annual *Infrastructure Asset & Fund Assessments* and calculating 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 has been increasing steadily since 2019 and continued to do so in 2023, rising from 79.3 in 2022 to 82.8 in 2023. The 2023 increase was despite a poorer performance amongst ESG laggards (bottom 20% of reporting assets), whose average score fell for the first time since the assessment's inception.

GRESB ESG Score for infrastructure assets

(0=worst and 100=best, 2018-2023)



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

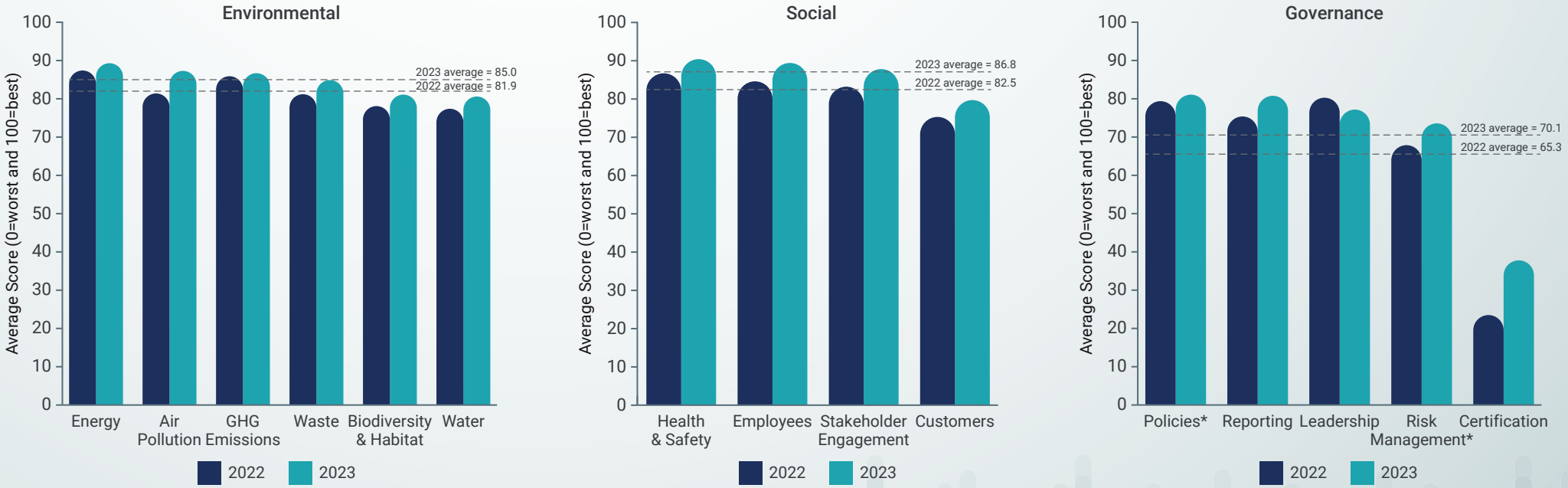
Notes: While ESG Scores have been subject to some methodological changes and changing component weights over time, they are still comparable across years.

ESG Scores for infrastructure assets improved in all three pillars of ESG in 2023. While Governance saw the most improvement, overall, it still lags behind the Social and Environment pillars.

- In 2023, the ESG Scores of infrastructure assets improved across all three pillars of ESG (environmental, social, and governance), with Governance seeing the most improvement, albeit from the lowest base. This improvement in Governance was driven by significant progress in Certification, which may be in part due to ESG certifications becoming more widespread and mainstream. However, Certification scores remain the lowest by far owing to the inherent difficulty and costs associated with acquiring ESG certification.
- Historically, Energy has typically been the highest scoring individual aspect, reflecting the extent to which assets report on and sets targets for energy sold or consumed. However, for the first time in 2023, this was not the case, with Energy surpassed by both Health and Safety (the extent to which the entity reports on health and safety of employees and contractors, users, and the local community) and Employees (reflecting employee engagement and extent of reporting on diversity and inclusion).
- Notably, scores in Leadership fell in 2023, and was the only aspect to see a decline. However, this primarily reflects updated methodology and the introduction of new – and more challenging – indicators around Diversity, Equity, and Inclusion (DEI) objectives and net zero commitments. In general, GRESB assessments are likely to become increasingly challenging in future years to better differentiate top performers.

ESG Scores for infrastructure assets by ESG pillar

(0=worst and 100=best, 2022 vs 2023)

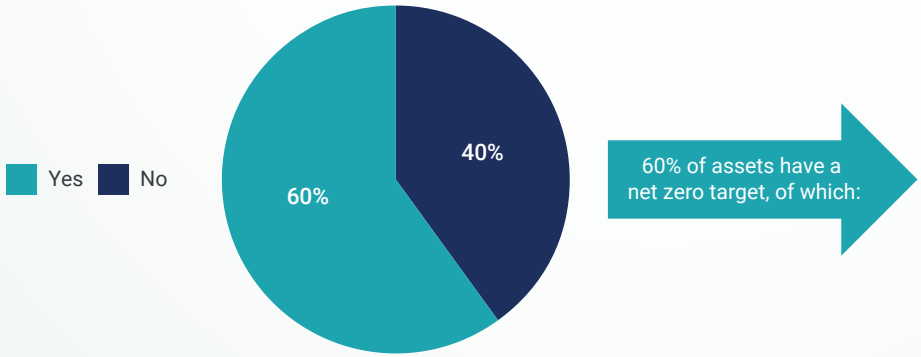


Source: GI Hub analysis based on GRESB *Infrastructure Asset Assessment.*

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.

60% of infrastructure assets currently have a net zero target, but only one third have one that is science-based or aligned to a net zero target-setting framework.

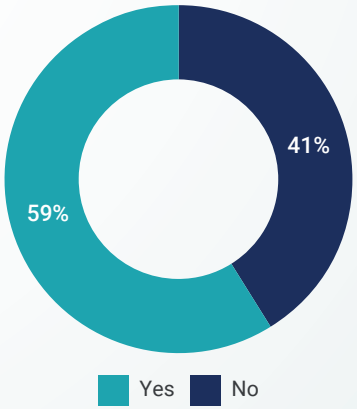
Infrastructure assets that have a GHG emissions target aligned with net zero
(% of reporting assets)



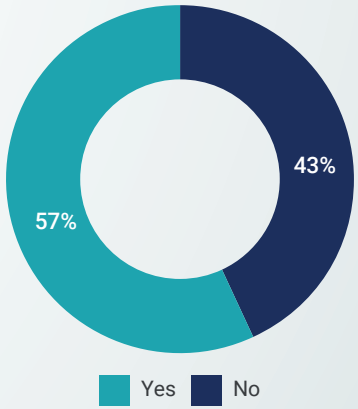
Source: GI Hub analysis based on GRESB *Infrastructure Asset Assessment.*

- For the first time in 2023, GRESB's infrastructure assessment captures whether assets have set a net zero target, and the characteristics of these targets. While target setting itself does not reflect an improvement in sustainable outcomes, they do reflect a willingness to improve, and highlights progress towards the decarbonisation of infrastructure assets.
- The assessment shows that only 60% of reporting infrastructure assets currently have a greenhouse gas (GHG) emissions reduction target aligned to net zero. Furthermore, this is likely to be an overestimate of the actual figure as those voluntarily reporting to GRESB are arguably more sustainability-focused and more likely to have a target.
- The data also suggest that the targets may not be sufficiently ambitious. While most targets are transparent and publicly communicated, only 35% of all reporting assets have a target that is aligned to a net zero target-setting framework (most commonly the Science Based Targets initiative), and only 34% have one that is science-based. Furthermore, only 56% of assets that have set a net zero target have also set an interim target – suggesting that many assets may not yet have defined a pathway to net zero.

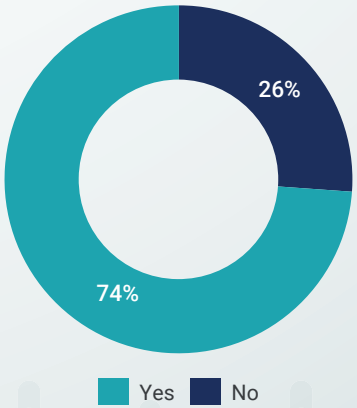
Aligned with a net zero target-setting framework
(% of targets)



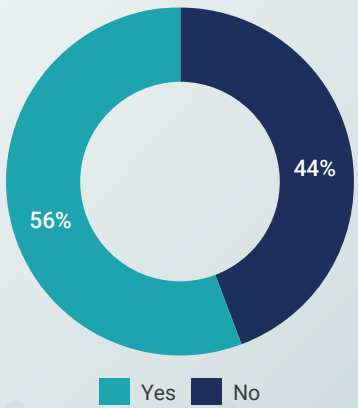
Science-based
(% of targets)



Publicly communicated
(% of targets)



Includes interim target
(% of targets)



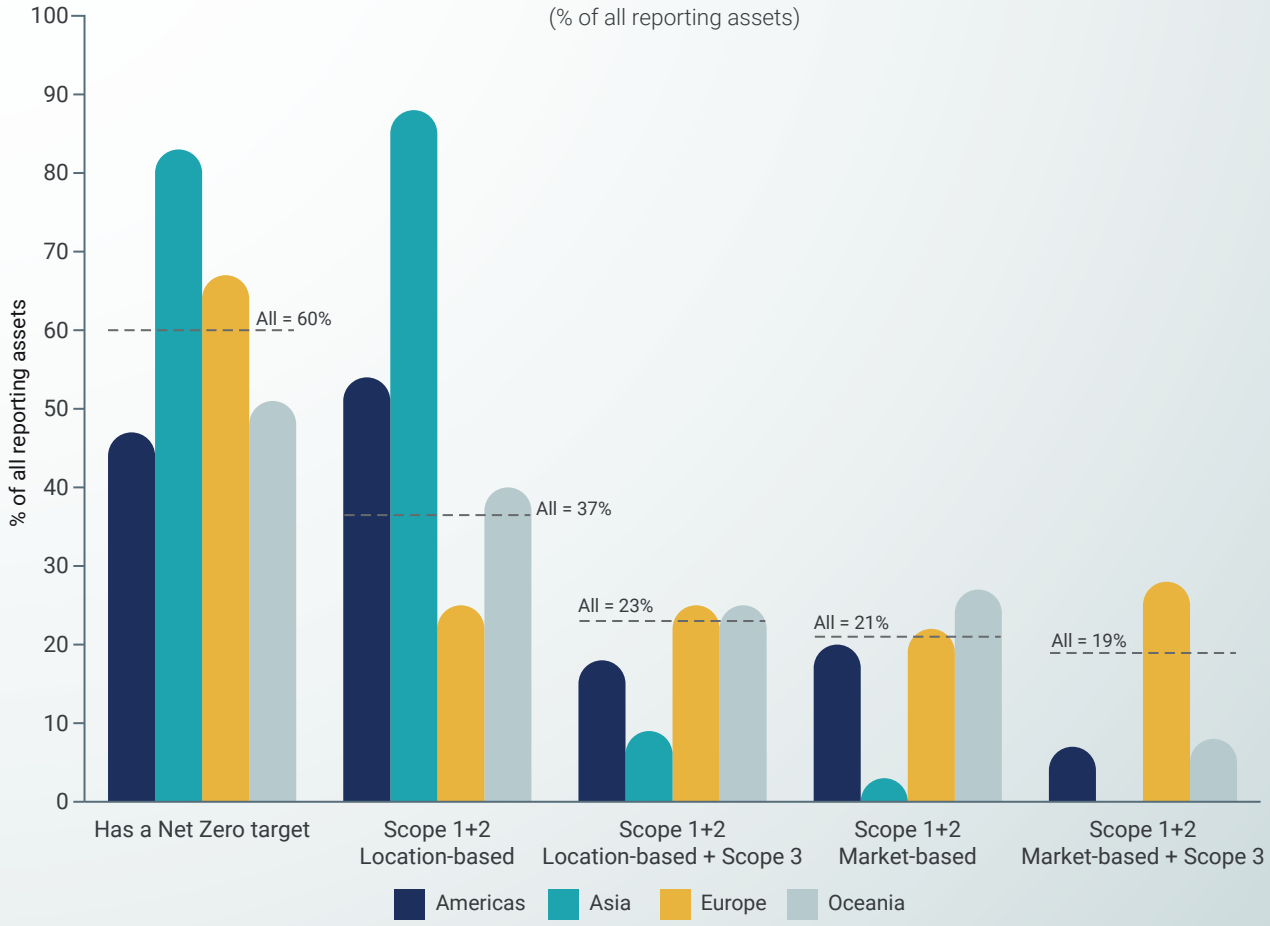
Source: GI Hub analysis based on GRESB *Infrastructure Asset Assessment.*

Net zero targets are more likely to be location-based, rather than market-based, and capture only Scope 1 and 2 emissions. However, regional variances exist with Europe leading the way in Scope 3 and market-based targeting.

- Amongst all infrastructure assets that have a net zero target, location-based targets (60%) are more common than market-based ones (40%), regardless of the scope of emissions. This is true in all regions except Europe, where there is a 50-50 split between location and market-based targets.
- Not only is Europe leading the way in market-based targeting, but it is also the only region where Scope 3 emissions targeting is more prevalent than Scope 1+2 targeting. 53% of net zero targets in Europe capture Scope 3 emissions, well ahead of the global average (42%).
- While the sample size is relatively small in Asia (n = 40 in 2023), infrastructure assets in this region are most likely to have a net zero target. In line with this finding, Asia is also the top performing scorer in the GHG emissions aspect, which reflects the extent of targeting and reporting on GHG emissions. However, only 9% of net zero targets in Asia capture Scope 3 emissions. Overwhelmingly, targets are location-based and capture only Scope 1 and 2 emissions (88%).
- Assets in the Americas are the least likely to have a net zero target, but follow global trends (i.e.more likely to be location-based and Scope 1 + 2). In 2023, more than 80% of these assets were located in North America, with a limited sample size in Latin America.

Net zero targeting by type and region

(% of all reporting assets)



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

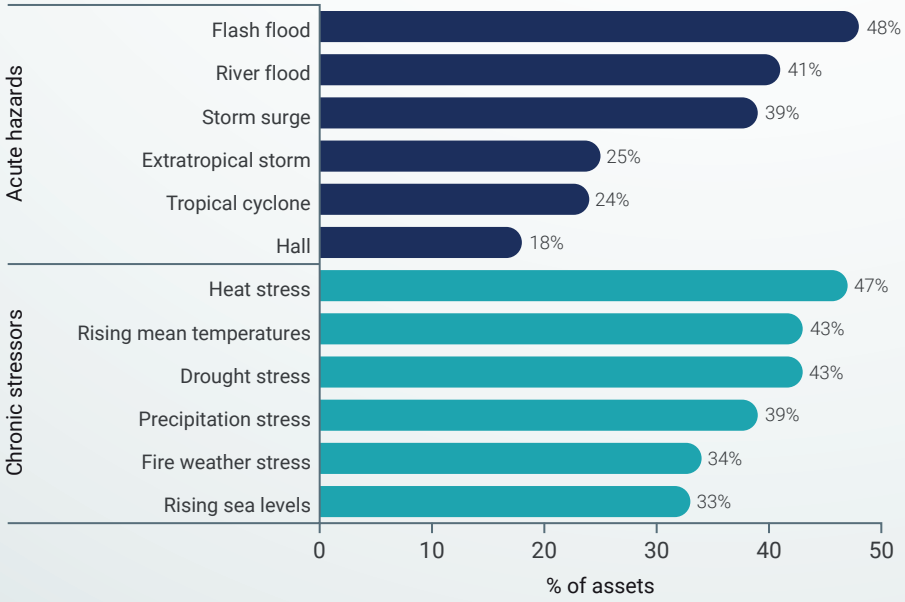
Note: Currently, participants can only select one type of net zero target in their response, even though some may have multiple targets.

Most infrastructure assets have a systematic process for identifying and assessing the financial impact of physical climate risks, with more than two-thirds concluding that there are material direct or indirect financial impacts.

- By 2050, the physical risks posed by climate change could reduce the value of infrastructure assets by up to 27% (EDHEC*infra*, 2023b). The criticality of understanding these risks appears well-understood, with most infrastructure assets assessed by GRESB having a systematic process for identifying physical risks (88% of reporting assets) and for assessing their material financial impact (78%).
- The most commonly identified risks are flash flooding (acute) and heat stress (chronic), with almost half of respondents indicating that their infrastructure assets are exposed to these risks. However, these results may also reflect to some extent the type of infrastructure assets reporting to GRESB (both sector type and geographical location).
- For assets that have a process for assessing the financial impact of physical risks, 67% conclude that there are material direct impacts on the asset (mostly through increased capital costs) and 70% conclude that there are material indirect impacts (most commonly through increased operating costs).

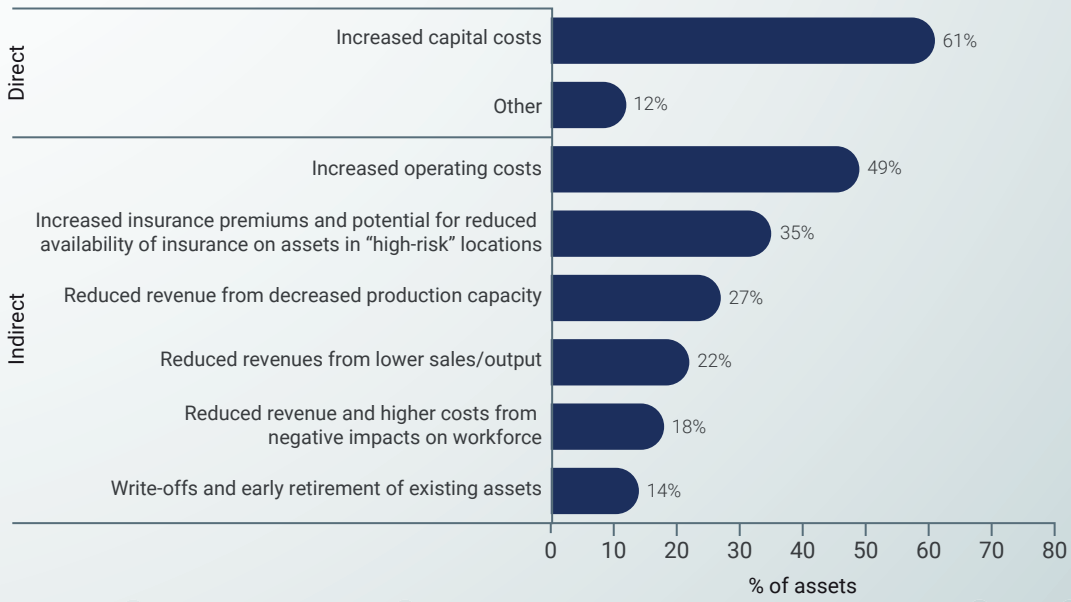
Physical risk identified, by risk type

(% of reporting assets that identify physical risk)



Material financial impacts identified, by impact type

(% of reporting assets that assess impact of physical risk)



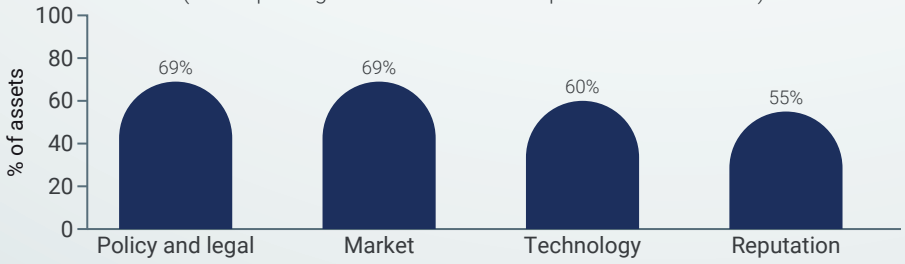
Source: GI Hub analysis based on GRESB *Infrastructure Asset Assessment*.

Transition risks are also widely identified and assessed by infrastructure assets, with policy and legal risks the most commonly identified and the most likely to have a material financial impact.

- Most infrastructure assets assessed by GRESB also have a systematic process for identifying transition risks (84% of reporting assets) and for assessing their material financial impact (77%), marginally lower than the equivalent shares for physical risks.
- Overall, policy and legal risks were the most commonly identified transition risks and also the most likely to have a material financial impact on infrastructure assets, together with market risks. Among the assets with a process for identifying transition risks, 85% identified a policy and legal risk. This risk most commonly relates to enhanced obligations for emissions reporting, as well as mandates and regulations on existing products and service. 69% of those assessing impact concluded that policy and legal risks would have a material financial impact, most commonly through increased operating costs.
- Market, reputation, and technology risks were also widely identified by infrastructure assets, particularly the risk of changing customer behaviour (64%), increased stakeholder concerns (57%), and the costs of transitioning to lower emissions technology (57%). Market risks were most likely to have a financial impact through reduced demand for goods and services (due to shift in consumer preferences), reputation risks through reduced revenue from decreased demand for goods and services, and technology risks through the costs to adopt or deploy new practices and processes.

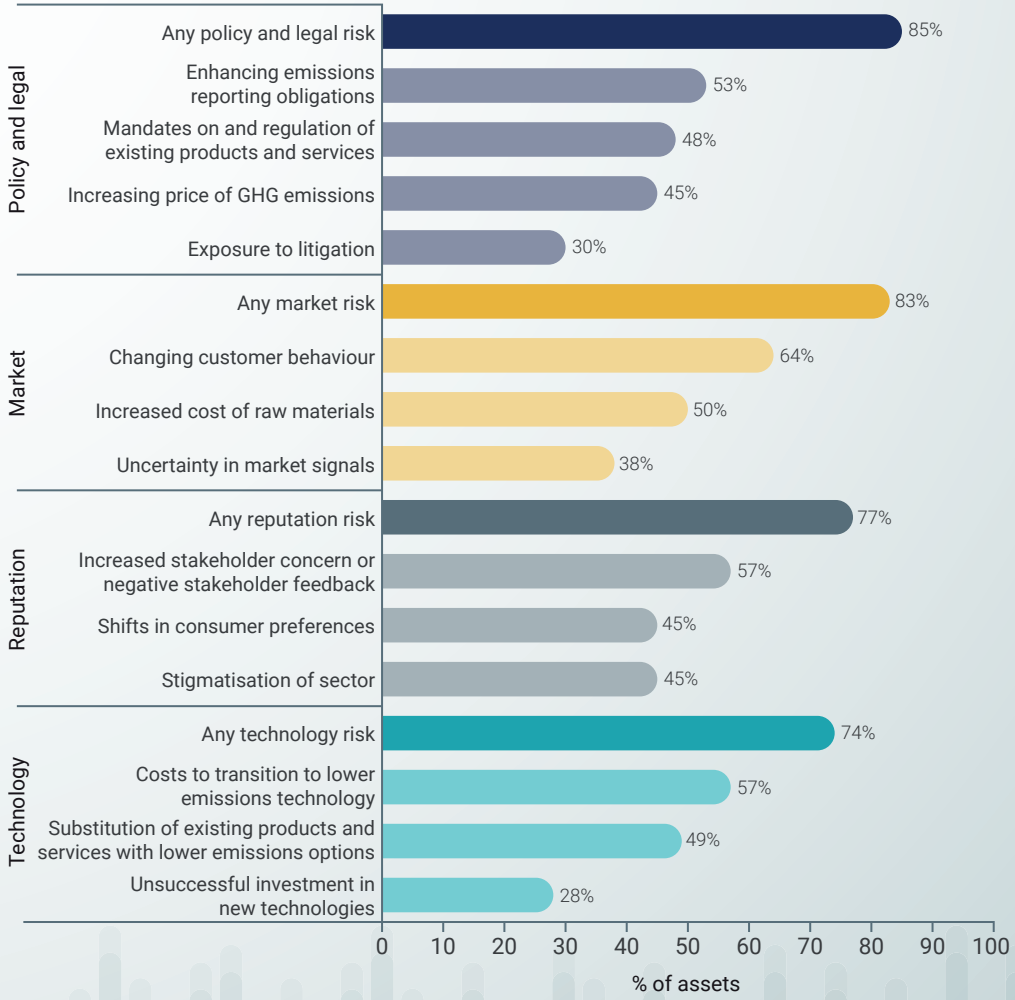
Material financial impacts identified, by transition risk type

(% of reporting assets that assess impact of transition risk)



Transition risk identified, by risk type

(% of reporting assets that identify transition risk)



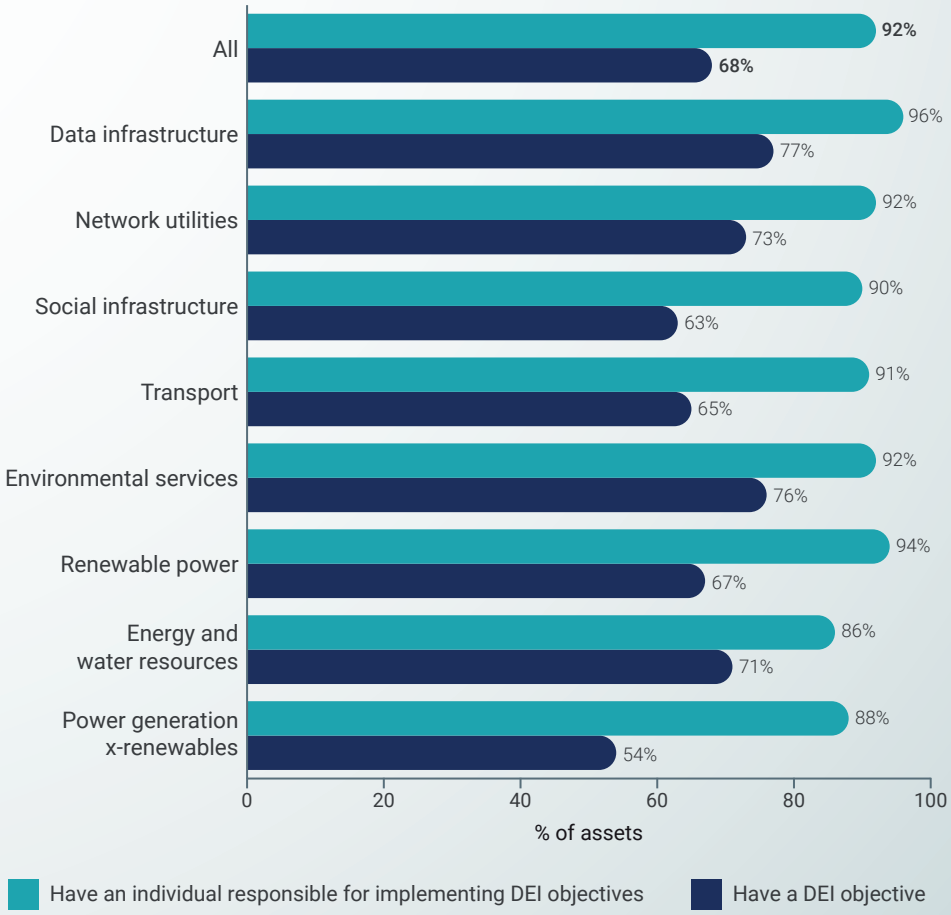
Source: GI Hub analysis based on GRESB *Infrastructure Asset Assessment.*

92% of infrastructure assets have an individual responsible for Diversity, Equity, and Inclusion (DEI) issues, although only 68% have set a specific DEI objective.

- Compared with previous years, GRESB's 2023 Infrastructure Assessment includes a broader range of metrics to evaluate infrastructure assets' DEI commitments and objectives, and how responsibilities for making decisions relating to DEI are assigned.
- In 2023, 68% of infrastructure assets reporting to GRESB had a DEI objective. However, most assets (92%) have designated an individual responsible for DEI issues, even in the absence of a specific DEI objective. In most cases, the designated individual is not exclusively tasked with DEI responsibilities, as only 47% of assets have a dedicated person for DEI. The presence of a person solely dedicated to DEI enhances the likelihood that objectives and performance on DEI will be effectively managed. As these DEI indicators are new and part of the broader suite of DEI metrics implemented in 2023, no comparison can be made to previous years.

Commitment to Diversity, Equity, and Inclusion (DEI), by sector

(% of reporting assets)



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

Note: Sectors with fewer than 25 reporting assets have been excluded (i.e.Other and Diversified), but are included in the calculation of "All".

Appendix

Private investment in infrastructure

Financial close	The transaction stage where all financing documentation has been signed, all conditions precedent have been satisfied or waived, and initial drawdown is contractually possible.
Primary market	Transactions including investment in greenfield and brownfield infrastructure, as well as in projects involving the 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.

Private investment in infrastructure

Income group classifications

High-income countries	Åland Islands, Andorra, Aruba, Australia, Austria, Bahrain, Belgium, Bermuda, Bouvet Island, British Virgin Islands, Canada, Cayman Islands, Chile, Croatia, Curaçao, Cyprus, Czech Republic, Denmark, Equatorial Guinea, Estonia, Falkland Islands, Faroe Islands, Finland, France, French Guiana, French Polynesia, Germany, Gibraltar, Greece, Guadeloupe, Guam, Guyana, Hong Kong SAR, China, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Kuwait, Liechtenstein, Luxembourg, Malta, Martinique, Monaco, Netherlands, New Zealand, Norway, Oman, Panama, Poland, Portugal, Puerto Rico, Qatar, Romania, Saint Helena, San Marino, Saudi Arabia, Singapore, Slovak Republic, Slovenia, South Georgia & The South Sandwich Islands, Spain, Svalbard and Jan Mayen Islands, Sweden, Switzerland, Taiwan, The Bahamas, Trinidad and Tobago, Uruguay, 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, 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, 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, Papua New Guinea, Paraguay, Peru, Philippines, 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, Türkiye, Uganda, Ukraine, Uzbekistan, Vanuatu, Venezuela, Vietnam, West Bank and Gaza, Western Sahara, Yemen, Zambia, Zimbabwe.

Private investment in infrastructure

Sector classifications

Energy storage, transmission, and distribution	Investment in energy storage, transmission, and heat networks.
Non-renewables energy generation	Investment in coal-, gas- and oil-fired power plants, nuclear, and co-generation power.
Renewables energy generation	Investment in geothermal, hydro, marine, offshore wind, onshore wind, photovoltaic solar, and thermal solar.
Social	Investment in education, healthcare, social housing, student accommodation, justice, recreational facilities, tourism, arts and culture, and municipal infrastructure.
Digital infrastructure	Investment in mobile and internet infrastructure.
Transport	Investment in airports, roads, bridges, tunnels, heavy rail, ports, maritime transport, urban transport, electric vehicle charging infrastructure, and car park facilities.
Waste	Investment in waste management and treatment facilities, waste-to-energy plants, and recycling and waste minimisation solutions.
Water	Investment in water distribution, treatment, and desalination facilities.
Environment	Investment in carbon capture and storage, energy efficiency, or environmental protection/management projects.
Infrastructure (general)	Investment in infrastructure for which no further details are available e.g. urban redevelopment projects.

Private investment in infrastructure

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, Türkiye, 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) that are reinvested on the intended date, without considering withholding taxes.
Annualised risk	The volatility (extent of fluctuation) in the value of an investment over a given period.
Annualised risk-adjusted return	Measured by the Sharpe ratio, which is the ratio of excess returns to the standard deviation of returns, where excess returns are total returns minus risk-free returns.
Equity investment	Money that is invested in a company by purchasing shares.
Risk premium	The excess return investors expect to earn from their investments in addition to the prevailing risk-free return.
Duration	The sensitivity of the price of an instrument to a change in interest rates.
Physical risks	Risks arising from the physical impacts of climate change and environmental degradation.

Infrastructure debt performance

Cumulative default rates (CDR)	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 were calculated on a monthly basis.
Expected loss	A function of the probability of default and ultimate recovery rates to indicate the 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 as Baa3 or higher (by Moody's) or BBB- or higher (by S&P and Fitch).
Project finance	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, and expensive installations. This can include power plants, chemical processing plants, mines, transportation infrastructure, environment, and telecommunication infrastructure. Project finance can include financing the construction of a new capital installation, or refinancing an existing installation, with or without improvements. In project finance transactions, the lender is usually paid solely or almost exclusively out of the money generated by the contracts for the facility's output. This includes the 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, and contractually obligated end user for repayment, it is considered a secured exposure to that end user.
Public-private partnership (PPPs) and non-PPPs	Defined in the *World Bank PPP Reference Guide* as '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. PPPs can be used as an alternative to conventional procurement. PPPs are one way to procure and deliver infrastructure (including finance, construction, operations, and maintenance) with private finance participation. It has multiple variations across the globe. The interpretation of PPP varies broadly as any form of association or co-operation between the public and private sectors. Projects under non-PPP schemes refer to other types of contracts between the government and private companies like design-build, turnkey contracts, financial lease contracts, management contracts, and affermage contracts, among others. The dataset does not provide the type of contract for non-PPPs.

Infrastructure debt performance

Ultimate recovery	Recoveries following emergence from default. Emergence from default occurs after any of the following events: • Repayment of overdue interest • Restructuring with no subsequent default • Restructuring with the lender taken out of the deal e.g. by repayment of the defaulted loan with no participation in a restructured debt facility • Material restructuring • Liquidation.

Income group classification

High-income countries	The report includes countries classified by the World Bank Group as high-income, in 2019. These include: 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. These include: 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, Türkiye, Turkmenistan, Uganda, Ukraine, Uzbekistan, Venezuela, Vietnam, Yemen, Zambia, Zimbabwe.

Infrastructure debt performance

Sector classification

Energy	Project loans for the construction and maintenance of renewable and non-renewable power plants, transmission and distribution, and oil refineries.
Infrastructure	These comprise selected subindustries within water, waste, transportation (roads, bridges, tunnels, rail, and ports and terminals), media distribution and telecommunications, and oil and gas refining and power (transmission and distribution, renewable and non-renewable electricity generation).
Non-infrastructure	Project loans for the construction and maintenance of chemicals production including petrochemicals and plastics, leisure and recreation (casinos, lodging and other – not 'real estate'), manufacturing, media, and telecommunications – 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	Project loans for the 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	Project loans for the construction and maintenance of roads, bridges, tunnels and rail services, and ports and terminals.
Water and waste	Project loans for the construction and maintenance of water systems, water desalination, waste treatment, waste to energy.

Private capital availability

Private infrastructure capital raised by funds	Aggregate capital raised by funds with a commitment to invest in the infrastructure asset class.
Private infrastructure capital invested by funds	Capital invested is estimated using the 'capital called up' data series, which refers to capital committed by private investors that has been called up for investment.
Cumulative private infrastructure capital	The total investment value of all the financial assets in a fund's portfolio plus the fund's dry powder.
Investment value	The market value of the portfolio (including mark-to-market gains from investments in infrastructure assets).
Dry powder	Capital committed by investors that is available to fund managers but has not yet been invested or allocated ('capital committed' is the sum of unallocated capital and portfolio returns, minus any disbursements to investors).
Greenfield	An asset or structure that does not currently exist and needs to be designed and constructed. Investors fund the building of the infrastructure asset as well as the maintenance once the asset has been designed and built and is operational.
Brownfield	An existing asset or structure that requires improvements, repairs, or expansion. The asset or structure is usually partially operational and may already be generating income.
Secondary stage	Involves a fully operational asset or structure that requires no investment for development.

Private capital availability

Infrastructure investment strategies

Core	Strategies targeting essential assets with no operational risk, where the asset is already generating returns. These are typically secondary stage assets in developed countries with transparent regulatory and political environments. Key features of the underlying assets include a monopoly position, demonstrated demand, and long-term stable cash flows that are forecastable with a low margin for error.
Core+	Strategies targeting assets exhibiting similar characteristics to those of core assets. They are exposed to demand and market risk but are more affected by and correlated with the economic cycle. These assets have features that act to limit these risks, including long-term contracts, long-term government or regulatory price support, and/or high barriers to entry for competitors.
Debt	Strategies using debt or issuing debt securities to fund investment activities. These strategies tend to be less risky than other infrastructure strategies, targeting assets and/or infrastructure developers/owners producing regulated revenues for essential services or user revenues from assets with a monopoly position, as well as contracted assets. The risk/return exposure of these strategies depends on the type of debt provided; however, most infrastructure assets are typically financed by senior debt and have simple capital structures.
Value-added	Strategies that are deemed moderate- to high-risk, targeting assets where enhancements are being made, and where growth in usage of such assets or demand for the service provided or produced is the focus. These are typically greenfield or brownfield assets, potentially involving new or unproven technologies that do not have pricing power at the time of the investment but that can be developed over time to provide pricing power in the future. 'Pricing power' refers to a business's ability to adjust and control the prices of its products or services in response to various factors, such as changes in demand, costs, or market conditions.
Opportunistic	These strategies have the highest risk/return profile of infrastructure strategies, focusing less on stable cash flows and more on capital growth via the value of the underlying assets. Assets targeted by these strategies typically do not have an existing cash flow.

Blended finance in infrastructure

Blended finance	The use of catalytic capital from public or philanthropic sources to increase private sector investment in developing countries to realise the Sustainable Development Goal (SDGs). It should consist of three components: (i) leverage from concessional capital should be used to mobilise commercial capital, (ii) the project must target an SDG in a developing country and (iii) the project should generate an enhanced rate of return compared to if it were financed with only commercial capital.
Concessional capital	Funds provided on below-market terms within the capital structure (i.e. concessional debt or equity) to lower the overall cost of capital or to provide an additional layer of protection to private investors.
Design-Stage Grant	Project preparation or design-stage grants.
Guarantee	A credit enhancement tool in which a guarantor agrees to pay part of or the entire value of a loan, equity, or other instrument in the event of non-payment or loss of value.
Private Capital Mobilisation Ratio	This ratio indicates how much private capital was mobilised by using blended finance approaches. It is estimated by dividing capital (debt or equity) invested by private investors (commercial and impact investors) by non-private debt or equity plus grants and guarantees in a deal.
Technical Assistance Funds	Grant-funded technical assistance facility that can be utilised pre- or post-investment to strengthen commercial viability and developmental.

Blended finance in infrastructure

Regional classification

Asia Pacific	Afghanistan, Australia, Bangladesh, Cambodia, China, Fiji, India, Indonesia, Kazakhstan, Lao PDR, Kiribati, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Timor-Leste, Tonga, Tuvalu, Vanuatu, Uzbekistan, Vietnam.
Eastern Europe	Bosnia and Herzegovina, Georgia, Montenegro, Serbia, Ukraine.
Latin America	Argentina, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Peru, Uruguay.
Middle East and North Africa (MENA)	Armenia, Egypt, Jordan, Kosovo, Lebanon, Morocco, Tunisia, Türkiye, West Bank and Gaza.
Sub-Saharan Africa	Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Chad, Côte d'Ivoire, Democratic Republic of Congo, Djibouti, Ethiopia, Gabon, Ghana, Guinea-Bissau, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritius, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

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

Diversity, Equity, and Inclusion (DEI)	Diversity, Equity, and Inclusion (DEI) is a cross-cutting term which can be broken down into 3 elements. "Diversity" refers to the presence of differences within a given setting; in the workplace, that may mean differences in race, ethnicity, gender, gender identity, sexual orientation, age, and socioeconomic background. "Equity" is the act of ensuring that processes and programs are impartial, fair, and provide equal possible outcomes for every individual. "Inclusion" is the practice of making people feel a sense of belonging at work.
Location-based emissions	A method to calculate scope 2 emissions, reflecting the average emissions intensity of grids on which energy consumption occurs (using mostly grid-average emission factor data) (definition based on the GHG Protocol).
Market-based emissions	A method to calculate scope 2 emissions, reflecting emissions from electricity that the entity has purposefully chosen (or their lack of choice). It derives emission factors from contractual instruments (definition based on the GHG Protocol).
Scope 1 emissions	Direct emissions from sources owned or controlled by the entity.
Scope 2 emissions	Indirect emissions created by the generation of purchased energy.
Scope 3 emissions	All other indirect emissions as a result of the entity's activities throughout its entire value chain.

Private investment in infrastructure

1. Data for private infrastructure investment is drawn from a new, bespoke dataset developed in partnership with Realfin. Data is as at 30 September 2023.
2. Compared with previous *GI Hub Infrastructure Monitor* reports, the dataset has increased coverage of transactions, particularly in developing markets and China. The new dataset almost doubles the value and number of transactions from previous reports.
3. 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 the privatisation of public sector assets. Investment values represent commitments made at the financial close of investment, not executed investment values, and are in real terms.
4. The Realfin dataset is focused on project-based private investment and does not capture most corporate private investment in infrastructure.
5. The dataset is the best available comparable data for global project-based private infrastructure investment. However, the list of transactions it covers is not exhaustive. The estimates in this document are best interpreted as indicative of broad trends.
6. While Realfin's data for middle-and low-income countries is broadly consistent with the World Bank's Private Participation in Infrastructure (PPI) dataset, key differences exist. Most notably, PPI data includes divestitures as well as some non-commercial transactions which are not included in the GI Hub's analyses.
7. Not all transactions have tranche level details for instruments and financiers. Such transactions have been excluded for these analyses.
8. Investment in renewables:
    i. 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 Realfin 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).
    ii. While most direct private investment in infrastructure on corporate balance sheets is not included because this data is unavailable for most sectors, it is more readily available for the renewables sector due to increased global efforts to improve data in support of the transition to sustainable energy.
9. Realfin's data on green bond issuances is 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.
10. There are also data challenges in relation to the use of green bonds, as outlined below:
    i. Green bonds data generally do not indicate whether proceeds are being earmarked for primary or secondary purposes.
    ii. Reporting on actual use of proceeds is extremely limited. However, anecdotal evidence suggests a portion of green bonds are used to refinance existing assets as opposed to financing new assets (IRENA and CPI, 2020).

Infrastructure equity performance

Private investors can invest in the infrastructure asset class through equity markets. Equity investments can be in listed markets where listed infrastructure equities are publicly traded on a stock exchange. Alternatively, they can be in unlisted or private markets where investment opportunities are generally offered through private placements made by the company signatory of the project or concession agreement. The channel of investment is materially correlated with financial performance. The following indicators were used to analyse the performance of infrastructure equity investments:

- **Listed infrastructure equities:** Performance is measured by the Morgan Stanley Capital International All Country World Index Infrastructure Capped Index (MSCI ACWI-IC), comprising a global opportunity set of companies that are owners or operators of infrastructure assets that are selected from the parent index – Morgan Stanley Capital International All Country World Index (MSCI ACWI) – covers mid- and large-cap securities across 23 developed markets and 24 emerging markets for five infrastructure sectors: telecommunications, utilities, energy, transport, and social.
- **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 a market capitalisation of USD250 billion.

Performance is compared against a benchmark of listed global equities. Listed global equity performance is measured by the MSCI ACWI, MSCI's flagship global equity index which is designed to represent the performance of the full opportunity set of large- and mid-cap stocks across 23 developed and 24 emerging markets. In May 2022, it covered more than 2,933 constituents across 11 sectors and approximately 85% of the free float-adjusted market capitalisation in each market.

In addition, green unlisted infrastructure equity performance was analysed to assess the relative performance of sustainable and climate-aligned investments. The performance is measured by the EDHECInfra InfraGreen index, which tracks investments in solar and wind projects worldwide and provides a unique view of the renewable energy sector's performance. The InfraGreen equity index tracks 100 investments and goes back 10 years.

Infrastructure debt performance

Infrastructure project loans

- This analysis is based on data on infrastructure project loans drawn from Moody's 2023 report Examining Infrastructure as an Asset Class of the Data Alliance Project Finance Consortium of Moody's Analytics. The Data Alliance Project Finance Consortium comprises 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 therefore 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 GI Hub was provided with confidential default and recovery information on a total of 10,054 project finance loans that originated from 1983 to 2021, representing nearly 70% of all global project finance loans that originated in that period. Of the 10,054 project finance loans that were analysed, 8,340 were infrastructure loans and 1,714 were non-infrastructure loans, all involving private sector participation. This sample was used in our analysis of infrastructure debt performance. Although the infrastructure loans sample includes construction, operations, and refinancing loans, construction loans account for 60% of all 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 non-infrastructure loans. The income groups used are based on the World Bank Group's 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 1983–2021. Cumulative default rate curves were considered over a period of 20 years, and the horizontal axes in all the charts presented correspond 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.

Longer-tenor business: Export credit and investment insurance

The International Union of Credit and Investment Insurers (Berne Union) includes government-backed export credit agencies, private credit and political risk insurers, and multilateral institutions from across the globe who provide direct and indirect support for international trade and cross-border investments through insurance, guarantees, and various direct financing instruments. The Berne Union holds the most comprehensive data set on the business of export credit and investment insurance. Members submit data on their business activities twice annually, covering activity up to the end of the second quarter, and for the full year.

The following two types of products are relevant for the infrastructure asset class and are included in our analysis:

- **Medium and long-term export credit:** insurance, guarantees, and lending for export/trade-finance credit of which the repayment term is greater than 360 days.
- **Political risk insurance:** insurance or guarantees that indemnify an equity investor or a bank financing the equity investment for losses incurred to a cross-border investment, as a result of political risks.

The three metrics analysed in our report are explained below:

New commitments	'Flow' item, showing the total volume of new insurance/guarantee/loan/ etc. commitments issued during the half-year for which commitment has been confirmed. This Includes the full amount of new commitments issued during the half-year, even if disbursements are to take place later.
Claims paid	'Flow' item recording the total volume of claims paid or non-performing loans, categorised by the type of loss event (political or commercial).
Claims ratio	Claims paid as a percentage of premiums earned.
Recoveries	'Flow' item recording the total volume of recoveries collected, categorised by the type of loss event (political or commercial).

Private capital availability

Private infrastructure capital raised and invested by funds

This includes infrastructure capital raised and invested for core, core+, debt, value-added and opportunistic strategies.

Secondaries funds were excluded because they invest in pre-existing infrastructure assets by acquiring interests in private capital funds from the original investors.

Funds of funds were excluded because they represent the acquisition of interests in other funds.

Cumulative private infrastructure capital: analysis by strategy, project stage, dry powder, return, and risk

The analysis uses the Preqin Pro database and is based on data relating to 656 funds that originated in or after the year 2000 and followed infrastructure investment strategies. A liquidated fund with an extreme net internal rate of return (IRR) value of 448% was excluded from the analysis because it created a material bias in the value of all metrics.

Blended finance in infrastructure

For the analysis presented here, the GI Hub collaborated closely with Convergence. The data used in this section was taken from Convergence's historical deals database.

Convergence maintains the largest and most detailed database of historical blended finance transactions in the market. While this database is not fully comprehensive, it does give a sense of the scale of blended finance. Convergence is continually building out this database to draw better insights about the market.

Data is collected from i) credible public sources like press releases, ii) data sharing agreements, and iii) validation exercises with Convergence members. To be included in Convergence's database, a deal must meet three main criteria:

1. The transaction attracts financial participation from one or more commercial investors that would otherwise not have invested in the opportunity
2. The transaction uses catalytic capital in one of the following ways:
    - Public/philanthropic investors are concessional within the capital structure
    - Public/philanthropic investor provided guarantees or risk insurance priced below market-rate
    - Transaction design or preparation is grant funded
    - Transaction is associated with a Technical Assistance facility
3. The transaction intends to create development impact related to the SDGs in developing countries, or directly impacts beneficiaries in developing countries

All annual data (deal count and aggregate financing) is based on launch year rather than commitment date. Launch date refers to the date of financial close of the deal. In the case of a fund with multiple closes, launch data refers to the date of first close. Only deals launched from 2013 onwards were included in the sample.

The sample selection for this analysis was guided by data availability. The deals for which data was available on the contributions of public, private, and philanthropic financing providers by financing type – commercial or concessional debt or equity, grants, guarantees, were selected. The deals with major inconsistencies or gaps in data availability were excluded from the sample. For example, if the deal size split by financing providers or financing type was unknown for more than half of the total deal size, then the deal was excluded. Where there were minor inconsistencies between the sum of financial amounts by provider or financing type and the total reported deal size, the former was considered to allow accuracy in mapping the financial amounts to different providers and types of financing.

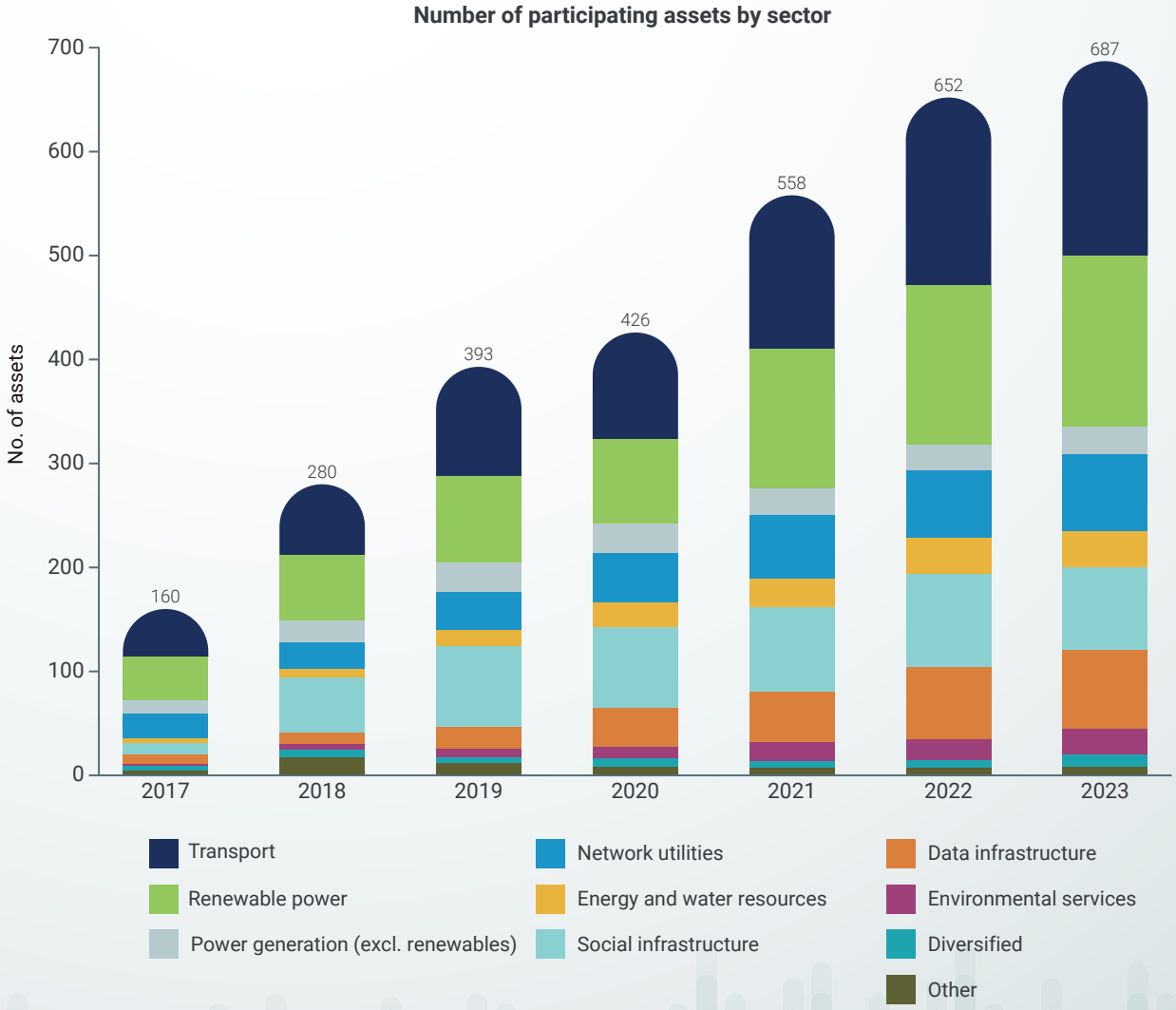
For data estimates by region and sector, only deals solely focusing on the specific region or sector were considered. Deals covering multiple regions or sectors were not considered in the estimates by region and sector.

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, data is currently very limited in quality and coverage, particularly at the asset level
2. For the analysis presented here, the GI Hub collaborated closely with GRESB to present findings from GRESB's 2023 *Infrastructure Asset Assessment*, currently the market leading source of ESG data for infrastructure assets
3. GRESB's ESG Scores reflect the extent to which entities have ESG policies in place, manage ESG risk, report transparently on their most material ESG issues, and have current and future ESG targets. It focuses on the disclosure of management and performance data, with a limited assessment of ESG outcomes and impact. 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 for future years, to close this critical data gap
4. GRESB's data represents 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
5. More detail on GRESB's methodology can be found in the following reference guides: 2023 Infrastructure Asset Standards and Reference Guide and 2023 Infrastructure Asset Scoring Document.

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

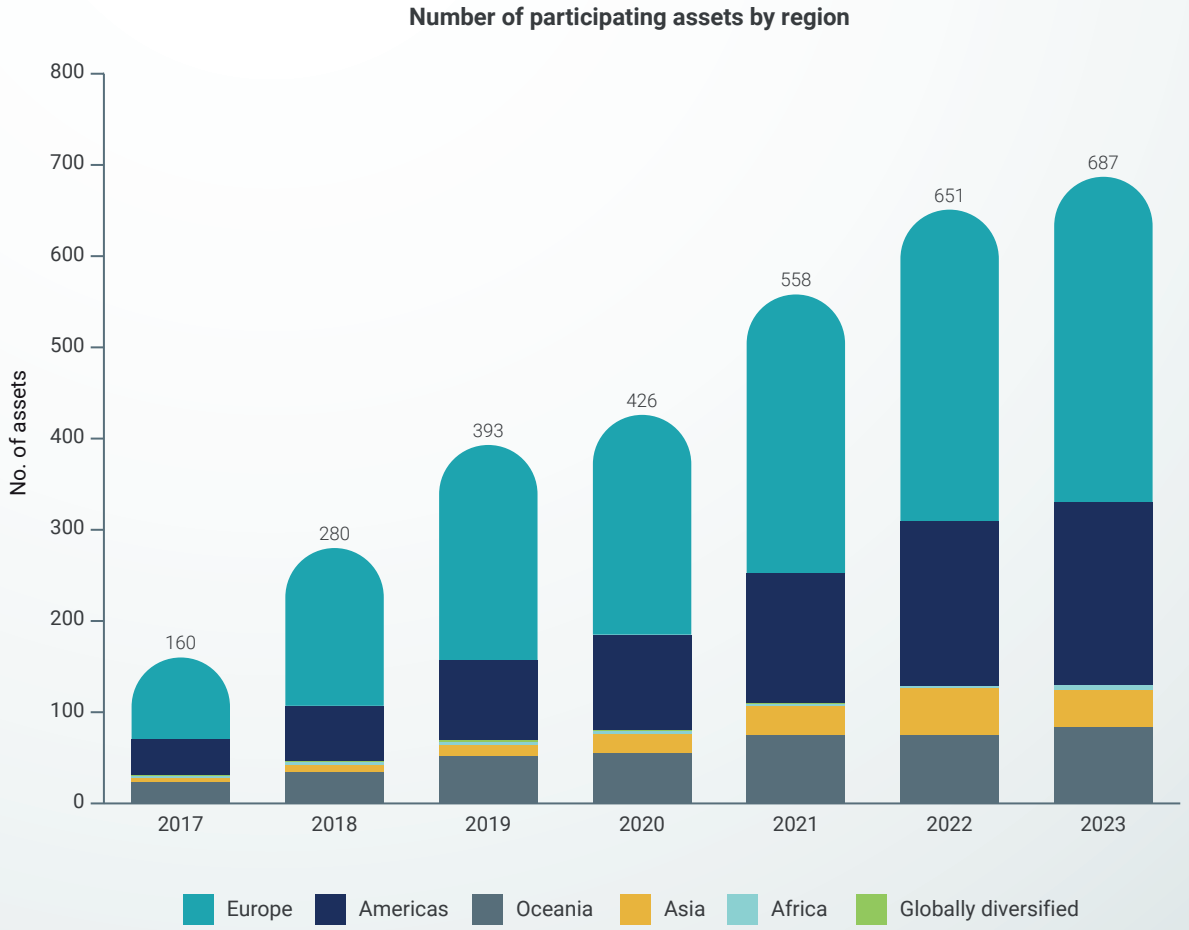
Sample distribution by sector



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

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

Sample distribution by region



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

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