Infrastructure investment performance
Infrastructure investment performance

Infrastructure equity performance
Key findings

- Listed infrastructure equities have remained fairly resilient despite recent global economic shocks.
- Listed infrastructure equities provide less volatile returns and more stable dividends than listed global equities.
- Unlisted infrastructure equities continue to outperform listed equities despite rising interest rates negatively impacting equity returns in the first half of 2022.
- Rising interest rates are negatively impacting valuations of all infrastructure equities; this is especially evident in 2022.
- Recent economic shocks have increased the risk premium of unlisted infrastructure equities after a declining trend since 2000.

- Infrastructure equities, and especially unlisted infrastructure equities, continue to offer lower risk than listed global equities across different time horizons, even after economic shocks and uncertainties.
- Unlisted infrastructure equities continue to provide the highest risk-adjusted returns, considered historically.
- Unlisted infrastructure equities in the transport sector exhibit higher risk-adjusted returns than returns in other sectors, as of June 2022.
Listed infrastructure equities have remained fairly resilient despite recent global economic shocks.

- Long-term performance trends show that investment in listed global equities including infrastructure equities has provided positive returns to investors.

- However, listed global equities and listed infrastructure equities have different risk and return factors, especially in the current context where global economic shocks such as rapid inflation, the war in Ukraine, and pandemic-related lockdowns have disrupted the global economy.
  - On average, listed global equities provided exceptionally high returns in 2020 and 2021, but fell drastically in the first half of 2022 by 20.0%, erasing all the gains of 2020 and 2021 and thus demonstrating high volatility.
  - In contrast, returns on listed infrastructure equities have increased consistently over time, albeit at lower levels than returns on listed global equities, but also with lower volatility. The pandemic temporarily stalled this trend in 2020, but it resumed in 2021. During the first half of 2022, returns on listed infrastructure equities remained fairly resilient.

- Inflation during the first half of 2022 has had relatively limited impact on the earnings of listed infrastructure companies (e.g. regulated utilities, and telecommunications and transport companies). Their earnings are typically linked to price changes, and even when prices increase, demand remains resilient for these essential services. As well, the value of infrastructure assets typically rises with inflation. Non-infrastructure companies listed on the stock exchange are unlikely to have similar protection against inflation.
Listed infrastructure equities provide less volatile returns and more stable dividends than listed global equities.

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

### Key factors driving listed infrastructure returns and risk relative to listed global equities

<table>
<thead>
<tr>
<th>Factor Weight</th>
<th>Standardised Relative to Listed Global Equities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk</td>
<td>1.0</td>
</tr>
<tr>
<td>(Lower volatility)</td>
<td></td>
</tr>
<tr>
<td>Dividend yield</td>
<td>0.8</td>
</tr>
<tr>
<td>(Cash flow paid out)</td>
<td></td>
</tr>
<tr>
<td>Momentum</td>
<td>0.6</td>
</tr>
<tr>
<td>(Rising stock)</td>
<td></td>
</tr>
<tr>
<td>Value</td>
<td>0.1</td>
</tr>
<tr>
<td>(Relatively inexpensive stocks)</td>
<td></td>
</tr>
<tr>
<td>Quality</td>
<td>-0.1</td>
</tr>
<tr>
<td>(Sound balance sheet)</td>
<td></td>
</tr>
<tr>
<td>Low size</td>
<td>-0.2</td>
</tr>
<tr>
<td>(Smaller companies)</td>
<td></td>
</tr>
</tbody>
</table>

- Risk (3 years) Dividend yield

| Listed global equities | 18.0% | 2.3% |
| Listed infrastructure equities | 15.9% | 3.8% |

Source: MSCI as of June 2022.

- Infrastructure is a non-cyclical industry and has stable and predictable revenues, which explains its lower risk relative to listed global equities and its resilience amid economic shocks. Consequently, listed infrastructure companies can provide higher dividend yields than listed global equities on a consistent basis.
- Momentum is a stronger factor for listed infrastructure equities than for listed global equities. Value is also a stronger factor for listed infrastructure equities than for listed global equities because the price of listed infrastructure equities is typically not inflated by speculative investing based on high growth expectations.
- Low company size is a relatively less favourable factor for listed infrastructure equities than for listed global equities. Lower size can be advantageous in terms of a lighter administrative burden and greater potential for growth, but listed infrastructure companies are larger by nature. Similarly, quality (soundness of balance sheet) is relatively unfavourable for listed infrastructure companies because they typically have higher leverage, which makes their balance sheets less sound than those of average listed companies.
Unlisted infrastructure equities continue to outperform listed global equities, despite rising interest rates negatively impacting equity returns in the first half of 2022.

- Unlisted infrastructure equities have provided positive returns to investors over time, outperforming listed global equities. The pandemic temporarily stalled this trend in 2020 but it resumed strongly in 2021. However, during the first half of 2022, rising interest rates negatively impacted equity returns, including unlisted infrastructure equity returns.

- Returns on unlisted equities declined slightly as their valuations fell due to rising interest rates in 2022. Investments that are highly leveraged (high debt-to-equity ratio) are negatively impacted in a rising interest rate environment. Infrastructure investments typically have a high debt-to-equity ratio of 80:20 or 60:40. According to the EDHECinfra (2022a), the sensitivity of the value of unlisted infrastructure equity investments to changes in the interest (discount) rate is about 10% on average; that is, a 1% increase in the discount rate would reduce the fair value of unlisted infrastructure equity investments by 10%, assuming the same future cash flows.

- The fall in returns on unlisted infrastructure equities is significantly less than the fall in listed global equity returns, and unlisted infrastructure equities continue to outperform listed global equities as expected.

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

Note: Annual returns are based on calendar year. The indices present aggregate performance levels. Unlisted infrastructure equities performance is measured by EDHECinfra’s infra300 equity index. Listed global equities performance is measured by the MSCI index.
Rising interest rates in 2022 are negatively impacting valuations of all infrastructure equities.

- EDHECinfra (2022c) has analysed the impact of increases in dividend forecasts, interest rates, and risk premiums on the net asset value (NAV) of global infrastructure equities. The analysis reveals that of all the factors, rising interest rates affected the valuation of infrastructure equities the most in the year preceding June 2022.

- The highly inflationary environment has triggered a substantial increase in the expected level of future dividends, which increased the NAV, but also in interest rates and risk premiums, which reduced the NAV.

- During the last year (June 2021 to June 2022), the net impact of the highly inflationary environment on the NAV of infrastructure assets has been negative. The NAV of global infrastructure equities has fallen by 11.1% due to higher interest rates and by 2% due to higher risk premiums. On the other hand, although valuation rose by 5.4% due to higher dividend forecasts, the rise was not enough to offset the negative impact of higher interest rates and higher equity risk premiums.

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

<table>
<thead>
<tr>
<th>Factor</th>
<th>% Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest rates</td>
<td>-11.1%</td>
</tr>
<tr>
<td>Equity risk premia</td>
<td>-2.0%</td>
</tr>
<tr>
<td>Dividend forecast</td>
<td>5.4%</td>
</tr>
</tbody>
</table>

Source: EDHECinfra (2022c). Data as of June 2022.
Note: ‘Net asset value’ is the market value of an investment or its equity, based on the value of the underlying assets less any liabilities. Data estimates are derived from a regression model based on the dividend discount model (DDM). A widely accepted method for equity valuations, the DDM model computes equity value from three factors: dividend forecast, interest rates, and risk premiums. This analysis shows the average change in net asset value (NAV) due to change in dividend forecast, interest rates, and equity risk premiums. It does not include any impact of paid-out dividends.
Recent economic shocks have increased the risk premium of unlisted infrastructure equities after a declining trend since 2000.

- The risk premium of unlisted infrastructure equities has long attracted investor attention. However, the greater recognition and maturity of infrastructure as an asset class almost halved the risk premium from 1,200 basis points in 2002 to 600 basis points by 2015. The premium stayed at that level until the outbreak of the pandemic, when it started to increase again.

- Economic shocks bring uncertainty and risk. During the financial crisis of 2008, the risk premium for unlisted infrastructure equities rose, but it fell back to lower levels over the next few years. Currently, the pandemic, the recent economic shocks, rising inflation and interest rates, and the war in Ukraine and associated supply chain disruptions have all increased the risk premium of unlisted infrastructure equities from 665 basis points in 2019 to 788 basis points in June 2022 – a level last seen in 2011.

Source: EDHECinfra (2022d).
Infrastructure equities, and especially unlisted infrastructure equities, continue to offer lower risk than listed global equities across different time horizons, even after economic shocks and uncertainties.

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

Note: Risk is measured through the annualised standard deviation of monthly gross returns data.
Unlisted infrastructure equities continue to provide the highest risk-adjusted returns historically.

- The lower risk and historically high returns of unlisted infrastructure equities means they have also generated higher risk-adjusted returns in all markets and regions, especially in Europe.
- Unlisted infrastructure equities shows the highest risk-adjusted returns in all markets and regions. The risk-adjusted returns of unlisted infrastructure equities are higher in developed markets than in emerging markets. Europe historically has provided higher risk-adjusted returns on unlisted infrastructure equities than have Asia-Pacific and the Americas.

- Risk-adjusted returns on listed infrastructure equities were also higher in developed markets than in emerging markets. However, by region, risk-adjusted returns on listed infrastructure equities in the Americas were significantly better than those in Europe and Asia Pacific, most likely because infrastructure financing in the Americas relies significantly on stock markets.

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

Note: Risk-adjusted return is measured by the Sharpe ratio, which is the ratio of excess returns to the standard deviation of returns, where excess return is total return minus risk-free return. These estimates are based on gross returns regardless of fees.

Fees to invest in the unlisted infrastructure asset class are higher than fees to invest in listed equities.
Unlisted infrastructure equities in the transport sector exhibit higher risk-adjusted returns than returns in other sectors, as of June 2022.

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

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

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

<table>
<thead>
<tr>
<th>Sector</th>
<th>Sharpe Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport</td>
<td>1.1</td>
</tr>
<tr>
<td>Utilities</td>
<td>1.0</td>
</tr>
<tr>
<td>Renewables</td>
<td>1.0</td>
</tr>
<tr>
<td>Social</td>
<td>0.8</td>
</tr>
</tbody>
</table>

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

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

Infrastructure debt performance
Key findings

Risk and return metrics

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

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

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

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

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

Credit risk metrics

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

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

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

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

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

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

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

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

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

• Infrastructure as an asset class continues to be an attractive investment option for portfolio optimisation, particularly for investors with low risk-appetite and long investment horizon.
In the last decade, returns on private infrastructure debt increased strongly. This trend temporarily stalled during the pandemic in 2020 and 2021, and global economic shocks negatively impacted returns in the first half of 2022.

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

Cumulative gross returns performance of private infrastructure debt (index)

Source: EDHECinfra (2022a) as of 2022.
Note: Unlisted infrastructure debt performance is measured by EDHECinfra’s InfraDebt 300 index. Gross returns is a measure of overall market performance of the index, captured through capital appreciation in market value plus net income accrual relative to the initial value of the asset.
Despite the decline in infrastructure investment returns, private investors are allocating more capital than ever to infrastructure to mitigate inflation risk.

- Despite rising interest rates driving down returns on infrastructure assets, the asset class remains attractive for private investors on account of its relatively stronger inflation-hedging potential than that of other investment options. High inflationary pressures in 2022 are driving private investors to allocate capital towards investment options that provide inflation protection. (Preqin, 2022b).

- Infrastructure investments provide a good hedge against inflation because the cashflows that underpin them are either inelastic or are indexed to inflation, providing a means to pass-through rising costs to the end-user (BlueOrchard, 2022). Most infrastructure assets have an explicit link to inflation through regulation, concession agreements or contracts. Infrastructure assets without an explicit link often have the pricing power to deliver a similar (or better) outcome reflecting their strong strategic position (Colonial First State, 2018).

- Infrastructure equities have historically proved capable of delivering returns well in excess of inflation. For 2011-2021, private infrastructure debt, listed infrastructure equities, and unlisted infrastructure equities have respectively delivered accumulated returns of 59%, 69% and 181%, well above the 27% accumulated world inflation over the period (World Bank, Global Development Indicators).

- In recent years, private infrastructure capital raised by funds increased to significant levels as investors with long time horizons sought high-quality infrastructure assets generating stable returns over the longer term, diversification towards sustainable assets, and attractive risk-adjusted basis performance. Even during the pandemic, infrastructure demand remained at an all-time high. In the last decade, private infrastructure capital raised per annum quadrupled from about USD30 billion in 2010 to USD128 billion in 2021.

- Despite the sluggish economic activity and the heightened uncertainty during the pandemic, and the decline in returns in the first half of 2022, investors are allocating more capital than ever towards the infrastructure asset class to mitigate inflation risk.

- In 2020 and 2021, private infrastructure capital raised by infrastructure funds reached a record USD122 billion and USD128 billion respectively, continuing the sustained growth. In 2022, the level of capital raised had already reached USD122 billion in the first half. If the trend continues, by the end of 2022 capital raised will be significantly higher, reaching a new record.
Even after private infrastructure debt returns declined due to global economic shocks in the first half of 2022, historically private infrastructure debt has provided attractive returns at low risk.

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

### Private infrastructure debt

- **Annualised total return (%)**
  - 3-year: -0.7
  - 5-year: 1.4
  - 10-year: 4.0

- **Annualised risk (%)**
  - 3-year: 5.0
  - 5-year: 4.2
  - 10-year: 4.0

- **Risk-adjusted return (Sharpe ratio)**
  - 3-year: Not available
  - 5-year: 0.2
  - 10-year: 0.9

Source: EDHECinfra as of June 2022.

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

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

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

<table>
<thead>
<tr>
<th>Market</th>
<th>Sharpe Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed markets</td>
<td>0.9</td>
</tr>
<tr>
<td>Emerging markets</td>
<td>0.7</td>
</tr>
<tr>
<td>Europe</td>
<td>0.9</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>0.9</td>
</tr>
<tr>
<td>Americas</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Source: EDHECinfra as of June 2022.

Note: Private infrastructure debt performance is measured by the InfraDebt300 index, which represents the performance of the most recent senior debt instruments issued by the constituents of the infra300® unlisted infrastructure equity index. Sharpe ratio is the ratio of excess returns to the standard deviation of returns adjusted for skewness and kurtosis.
Private infrastructure debt in the transport sector provided higher risk-adjusted returns than in other sectors over the last decade.

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

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

- **Transport**: 1.0
- **Renewables**: 0.9
- **Social**: 0.9
- **Utilities**: 0.6

Source: Data as of June 2022.
Note: Sharpe ratio is the ratio of excess returns to the standard deviation of returns adjusted for skewness and kurtosis. Sectors presented are based on MSCI GICS classification for listed infrastructure and EDHECinfra classification for unlisted infrastructure.
Cumulatively, default rates for infrastructure debt have been consistently lower than for non-infrastructure debt and this difference strengthened during 2020.

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


Note: Throughout this section, ‘infrastructure debt’ refers to unrated private / unlisted project finance debt. Cumulative default rates associated with Moody’s debt credit ratings for investment and non-investment grade securities are shown in the background of the default curves being Baa3 (BBB-) rating the frontier between investment and non-investment grade. This analysis of infrastructure credit risk metrics includes data to 2020. Therefore, the cumulative trends of the effect of the pandemic (2020) are analysed in this report.
Infrastructure debt performance continues to improve over time with newer infrastructure debt reaching investment grade faster than older infrastructure debt, particularly in the last decade.

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


Note: Considering that infrastructure debt default rates stabilise by approximately year 10 after debt origination, defaults may still occur for projects originated after 2010. Although these results may shift the three curves higher, the gaps between them will remain. Debt composition in terms of region, income group, and subsector did not change for the three curves.
Infrastructure debt performs better in high-income countries than in middle- and low-income countries, but better than non-infrastructure debt in all countries, and this improved during 2020 despite the shocks of the pandemic.

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

### 20-year cumulative default rate

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>High-income countries</td>
<td>4.8%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Middle- and low-income</td>
<td>6.5%</td>
<td>7.0%</td>
</tr>
</tbody>
</table>

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

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

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

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

### 20-year cumulative default rate

<table>
<thead>
<tr>
<th>Region</th>
<th>1983-2020</th>
<th>1983-2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle East</td>
<td>2.2%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Africa</td>
<td>1.8%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Western Europe</td>
<td>4.0%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Asia</td>
<td>5.2%</td>
<td>5.9%</td>
</tr>
<tr>
<td>North America</td>
<td>6.6%</td>
<td>6.8%</td>
</tr>
<tr>
<td>Oceania</td>
<td>10.1%</td>
<td>7.3%</td>
</tr>
<tr>
<td>Latin America</td>
<td>10.5%</td>
<td>10.3%</td>
</tr>
<tr>
<td>Eastern Europe (non-investment grade)</td>
<td>11.84%</td>
<td>11.82%</td>
</tr>
</tbody>
</table>

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

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

![20-year cumulative default rate by subsectors and income group](image_url)
Debt performance improved in most infrastructure sectors during the pandemic in high-income, as well as in middle-income and low-income countries.

- In 2020, infrastructure debt performance improved for all infrastructure sectors, which withstood the shocks of the pandemic successfully in high-income countries as well as in middle- and low-income countries.

- The exception was the telecommunications sector, in which risk increased in high-income countries resulting in the highest cumulative default risk compared to other sectors in high-income countries. This was partly due to the revenue decline generated by the lockdown mostly in Europe driven by a reduction in use of roaming functionality due to travel restrictions, a decline in equipment sales as a result of store closures, and the postponement of in-premise customer installations (International Telecommunication Union, 2020). In middle- and low-income countries, debt performance improved slightly for the telecommunications sector but still did not reach investment grade performance throughout the loan duration in 2019 and 2020. Disruptive innovations in this sector frequently result in greater need for investment to develop new infrastructure while lowering returns on older investments, which has added to default risk and debt stress.

- The most significant improvement in performance during the pandemic was in the social sector in middle- and low-income countries, as governments became more attentive to the needs of this sector. With the inclusion of 2020 data, the 20-year cumulative default rate fell from 9.0% to 5.9% in middle- and low-income countries and the number of years to achieve investment grade performance fell from 17 years to 12 years.

### 20-year cumulative default rate

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High-income countries</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>0.9%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Water</td>
<td>3.1% → 3.4%</td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td>5.3% ↓ 5.8%</td>
<td></td>
</tr>
<tr>
<td>Telecommunications</td>
<td>9.8% ↑ 9.1%</td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td>9.5% ↓ 10.2%</td>
<td></td>
</tr>
<tr>
<td><strong>Middle- and low-income countries</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td>5.4% ↓ 6.5%</td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>5.9% ↓ 9.0%</td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td>6.1% ↓ 6.1%</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>8.8% ↓ 9.6%</td>
<td></td>
</tr>
<tr>
<td>Telecommunications (non-investment grade)</td>
<td>14.0% ↓ 14.4%</td>
<td></td>
</tr>
</tbody>
</table>


Note: The study sample for telecommunications sector includes media distribution, which may also explain the worsened performance in 2020 amidst the pandemic.
Infrastructure debt default risk is lower for public-private partnerships (PPPs) than for non-PPPs. In 2020, default rates declined mostly for PPPs in middle- and low-income countries.

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

### 20-year cumulative default rate by contract and income group

<table>
<thead>
<tr>
<th>Years since debt origination</th>
<th>Cumulative default rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Non-investment grade</td>
<td></td>
</tr>
<tr>
<td>Non-PPP Middle- and low-income countries</td>
<td></td>
</tr>
<tr>
<td>Non-PPP High income countries</td>
<td></td>
</tr>
<tr>
<td>PPP Middle- and low-income countries</td>
<td></td>
</tr>
<tr>
<td>PPP High income countries</td>
<td></td>
</tr>
<tr>
<td>Investment grade</td>
<td></td>
</tr>
</tbody>
</table>

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

### 20-year cumulative default rate

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>High-income countries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPPs</td>
<td>3.9%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Non-PPPs</td>
<td>5.4%</td>
<td>5.8%</td>
</tr>
<tr>
<td>Middle- and low-income countries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPPs</td>
<td>4.2%</td>
<td>5.1%</td>
</tr>
<tr>
<td>Non-PPPs</td>
<td>7.0%</td>
<td>7.3%</td>
</tr>
</tbody>
</table>

**Source:** Moody’s (2022). Data as of 2020.
Ultimate recovery rates following default are higher for infrastructure debt than for non-infrastructure debt.

- Globally, infrastructure debt had a recovery rate of 83.6% in 2020, slightly higher than the 2019 rate of 83.3%. This recovery rate for infrastructure debt has been consistently and significantly higher than for non-infrastructure debt (67.8% in 2020).
- Recovery rates were roughly similar across country income groups in 2020. For high-income countries, the rate improved from 81.6% in 2019 to 83.7% in 2020 and declined slightly for middle- and low-income countries from 84.3% in 2019 to 83.3% in 2020.
- All regions except for Latin America and Eastern Europe have higher recovery rates for infrastructure debt than for non-infrastructure debt. This is especially true in Western Europe where the infrastructure debt recovery rate was 84.0% in 2020, while that of non-infrastructure debt was 52.1%.
- Although these recovery rates are based on unrated project finance debt, they also hold for recovery rates for rated infrastructure debt securities, which have also been consistently higher than for non-financial corporate debt.
- Performance data strongly suggest that infrastructure as an asset class is much less risky than other assets such as corporate debt and bonds.


Note: Trading recovery rates are estimated by the average trading prices on an issuer’s bonds 30 days after its initial missed payment or bankruptcy filing.
Expected losses from infrastructure debt defaults are low in high-income countries.

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

- The cumulative expected loss for high-income countries increased during the pandemic from the 2019 rate of 0.5% to 0.8% in 2020 (still lower than the 1.1% expected loss of an investment-grade security (A-rated)).

- In contrast, with the pandemic the cumulative expected loss for middle- and low-income countries declined from the 2019 rate of 2.5% (which was higher than that of any investment-grade security) to 1.1% in 2020 (similar to the 1.1% expected losses of an investment-grade security (A-rated)).

- Expected loss results are based on unrated project finance debt. Rated infrastructure debt is also less likely to incur credit losses than non-financial corporate debt. Over 10 years, credit losses as a percentage of face value were 0.5% for infrastructure debt and 8.9% for non-financial corporates.

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

<table>
<thead>
<tr>
<th></th>
<th>Over 5 years</th>
<th>Over 10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure debt</td>
<td>0.3%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Non-financial corporates</td>
<td>6.0%</td>
<td>8.9%</td>
</tr>
</tbody>
</table>

Infrastructure as an asset class continues to provide a wide range of attractive investment options.

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