INFRASTRUCTURE

CAPITAL MARKETS ASSUMPTION

Russell Investments

RUSSELL INVESTMENTS RESEARCH

Infrastructure: Capital markets assumption

Overview of Infrastructure

The infrastructure asset class consists of varied types of infrastructure investments, which are typically classified into the following categories based on their risk-return profile:

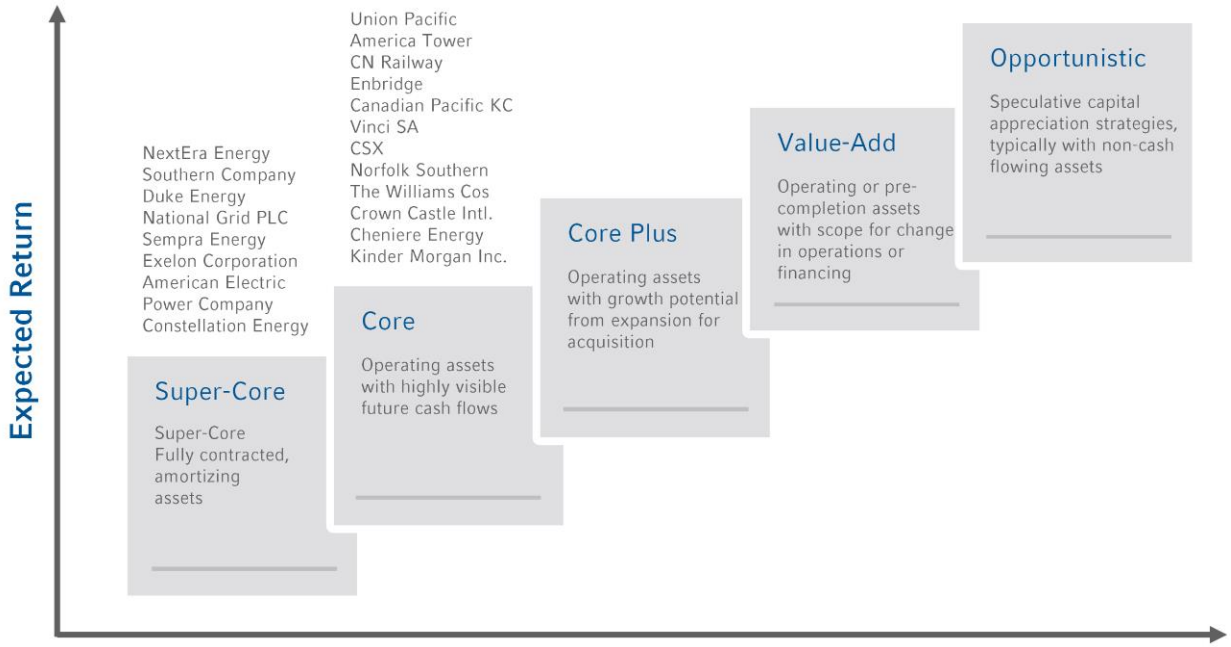
- Core and super-core infrastructure represent the most stable, low-risk assets, such as water utilities and electricity transmission networks, offering highly predictable, inflation-linked returns.
- Core-Plus adds slightly more risk by incorporating less regulated sectors or assets needing operational improvements, resulting in moderate returns.
- Value-Add infrastructure focuses on assets requiring active management or expansion, offering higher risk and potential returns through both income and capital growth.
- Opportunistic infrastructure targets high-risk, high-reward projects, such as new developments or emerging markets, with a focus on significant capital appreciation.

Exhibit 1: Characteristics of different infrastructure categories

	CORE	CORE-PLUS	VALUE-ADD	OPPORTUNISTIC
Return drivers	Mainly income	Income with some capital appreciation	Income and capital appreciation	Mainly capital appreciation
Typical holding period	7-10+ years	6-9 years	5-7 years	3-5 years
Yield profile	60%+ of total return	50% of total return	0-20% of total return	0-10% of total return
Investment profile	Brownfield assets with long-term contracts with governments or creditworthy counterparties	Mostly brownfield assets with long-term contracts with greater scope for capital appreciation	Brownfield or greenfield assets with shorter-term contracts or less creditworthy counterparties: reliant on capital expenditure	Brownfield or greenfield assets with long-term contracts in developing markets or with revenue volatility
Typical Subsectors	• Gas, electric, utilities • Contracted, renewable power • Top-tier airports, seaports or toll roads in major markets	• Thermal power • Renewable power generation with development risk • Oil and Gas midstream • Toll roads, airports or seaports with limited population coverage	• Greenfield assets under construction • Early-stage Oil and gas midstream • Data centers and fiber-optic networks	• Assets in developing markets • Special or distressed situations • Merchant power generation
	Lower risk ←			→ **Higher risk**

Investors can access infrastructure through listed and unlisted investments. Listed infrastructure includes publicly traded companies or funds that own and operate essential infrastructure assets. With a total market capitalization of nearly $3 trillion, these investments are generally mature, stable sectors that offer predictable revenue streams and are easily tradable (super-core and core). Conversely, unlisted infrastructure, with an estimated market size exceeding $10 trillion[1], encompasses a broader range of assets (from core to opportunistic) and provides investors with direct control over operations.

Exhibit 2: Types of infrastructure investments and where largest listed infrastructure companies operate



Listed and unlisted infrastructure investments also differ in sector composition (Exhibit 3), with unlisted infrastructure generally being more diversified. Rather than viewing listed and unlisted infrastructure as substitutes, we view them as complementary[2].

Exhibit 3: Sector composition for listed and unlisted infrastructure[3]

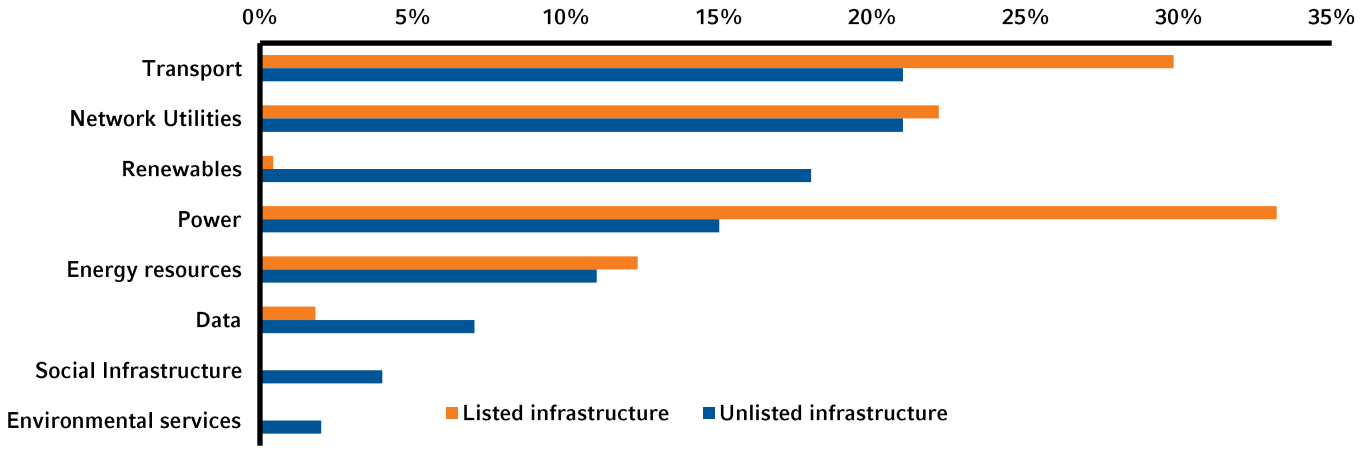
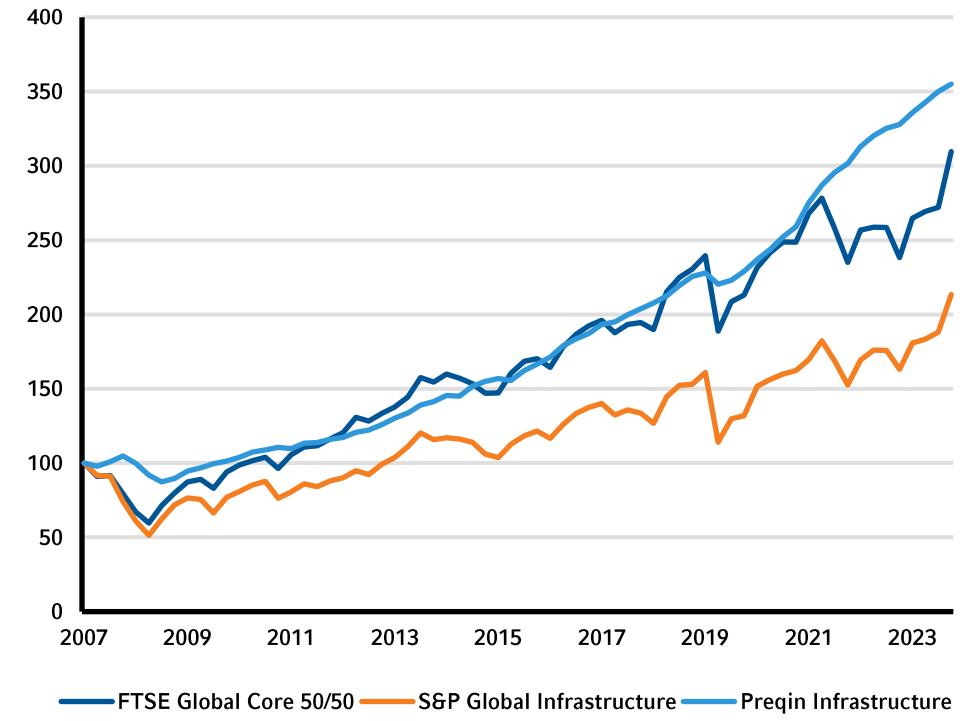


Exhibit 4 compares historical returns across infrastructure investments. For listed infrastructure, we use the FTSE Global Core 50/50 Index and the S&P Global Infrastructure Index[4], while unlisted infrastructure is represented with Preqin's Private Infrastructure Index[5]. Overall, unlisted infrastructure has outperformed listed infrastructure, although its returns have been close to those of the FTSE Global Core.

Exhibit 4: Historical returns of infrastructure



As of December 31, 2007 to September 30, 2024.

Meanwhile, volatility has been notably lower in unlisted infrastructure. Historical data indicate that the Preqin Index registered a figure of 4.7%, compared with 14.6% and 17.7% for the FTSE and S&P indices, respectively. However, infrequent trading, limited data, and appraisals valuations present challenges when using this metric as a proxy for investment risk in unlisted infrastructure and, more broadly, private assets. Unlike public assets—where price movements reflect economic and business risks on a mark-to-market basis—this measure fails to provide a useful indication of an asset's underlying risks. While investors may appreciate the "smoothed" experience, this metric should not be used to evaluate relative risk against public markets.

> *Overall, unlisted infrastructure has outperformed listed infrastructure, although its returns have been close to those of the FTSE Global Core.*

Long-term Return Drivers

For both listed and unlisted infrastructure[6], we build a return forecast from underlying components that sum to a total return estimate[7]. Exhibit 5 summarizes these components along with their underlying assumptions. We subsequently describe each component and explain the rationale behind its assumptions.

Exhibit 5: Infrastructure Return Drivers in Equilibrium (geometric)

RETURN SOURCE	LISTED INFRASTRUCTURE (CORE)	UNLISTED INFRASTRUCTURE (CORE-PLUS)
1. **Income yield**	3.50%	4.00%
2. **Inflation pass-through**	2.25%	2.00%
3. **Real revenue growth**	0.50%	1.50%
4. **Operational improvements**	0.00%	0.50%
5. **GP fees**	0.00%	-1.00%
6. **Multiple expansion**	0.00%	0.00%
Total return	**6.25%**	**7.00%**

Reference: Our equilibrium (geometric) return for Global equities UH is 6.8%

For both listed and unlisted infrastructure, we build a return forecast from underlying components that sum to a total return estimate.

Details of Return Drivers

1. Income yield

Income yield comes from companies' dividend payments, whereas in unlisted infrastructure it typically comes from the asset's cash distributions. Depending on the type of infrastructure—whether core, core-plus, or value-add—the income component can account for a significant portion of the total return. For example, in core and core-plus strategies, income may contribute half or more of the overall return (see Exhibit 1 above).

For listed infrastructure, we base our forward-looking income yield assumption on historical dividend yields, which have averaged around 3.5%. Data on historical cash yields for unlisted infrastructure is more limited; however, market practitioners typically expect an income yield between 4% and 6%, depending on the sector[8]. For our analysis, we have therefore adopted a conservative estimate of 4%.

Historically, the income yield component has been high and stable. Overall, we expect this component to be less susceptible to economic cycles than other return drivers, making it a reliable source of return.

2. Inflation pass-through

This component refers to the ability of infrastructure companies to adjust prices in response to rising inflation, helping to preserve revenue levels. However, not all infrastructure assets are created equal. Some have more direct inflation pass-through mechanisms than others.

We can group the mechanisms in three categories:

1. **Contracted:** Assets under this mechanism offer the highest degree of inflation protection, as they operate under long-term contracts with explicit clauses allowing regular adjustments based on inflation indices. This ensures that revenue streams keep pace closely with inflation, making these assets highly effective for maintaining real value. Examples of this are renewable energy projects with power purchase agreements (PPAs) and waste management facilities with long-term municipal contracts.
2. **Regulated:** Regulated assets also provide inflation pass-through, although it depends on periodic reviews by regulatory bodies, which can introduce delays or partial adjustments[9]. While regulators typically allow for inflationary increases, the timing and extent may vary, making regulated assets slightly less consistent than contractual assets in terms of inflation protection. Water utilities, electricity distribution networks, and natural gas distribution are examples of assets that are subject to regulatory oversight and tariff adjustments based on inflation.
3. **Merchant:** These assets lack explicit inflation adjustments. Revenues are determined by market conditions, so inflation pass-through depends on the asset's pricing power, market demand, and competitive environment, making inflation protection less predictable. Most airports and ports, where fees are influenced by demand and competition, are examples of a merchant revenue structure model.

Exhibit 6 summarizes the inflation pass-through mechanisms to revenues across main infrastructure sectors.

Exhibit 6: Typical Inflation Pass-Through Mechanisms to Revenues Across Infrastructure Sectors

SECTOR	INFLATION PASS-THROUGH TO REVENUE	PASS-THROUGH MECHANISM	LAG	RISK OF ACHIEVING PASS-THROUGH
Utilities	High	Regulators set pricing, the determination of which usually incorporated either inflation or interest rates	3-5 years	Political
Towers	High	Long-term contracts with indexed revenue	1 year	Credi
Social	High	Long-term contracts with indexed revenue	<1 year	Credit
Transportation	Mixed	Asset-Specific, some assets have more fixed revenue with government, others take more volume risk. Assets like toll roads are often exhibit higher pass through and adjust more quickly	<1 year	Commercial
Energy	Mixed	Asset-specific; typically revenue over time is more sensitive to energy commodity price inflation and volume than general economic inflation	Variable	Commercial
Renewables	Mixed	Subsidies are sometimes indexed (e.g. UK); commercial power purchase agreement structures vary but are usually fixed price for term	<1 year	Political / Commercial
Fiber	Mixed	Short-term contracts which rely on low customer churn to pass through higher prices	1-2 years	Commercial
Data Centers	Low	Asset-specific; retail colocation is often short-term contracts, and rents are ultimately market-driven	1-5 years (retail) To 10-20 years (hyperscale)	Commercial / Credit
Ports	Low	Ability to raise prices often dependent on market conditions	1-2 years	Commercial

For listed infrastructure, which has a large weight in sectors with high pass-through mechanisms, we assume that the inflation pass-through component aligns closely with our expectations for future inflation. In contrast, unlisted infrastructure features a more diverse sector allocation, meaning its capacity to translate mechanically higher inflation into increased revenues is less uniform[10]. To capture this variation, we assume its inflation pass-through operates at approximately 85% of the level seen in listed infrastructure.

From a cyclical perspective, we expect infrastructure assets to have inflation-hedging properties. Although equities are typically seen as a long-term store of value against inflation[11], the revenue models in infrastructure assets provide greater confidence that profits will be shielded from both sharp inflation spikes and ongoing cyclical inflation[12]. Consequently, we expect infrastructure returns to correlate more strongly with inflation—exhibiting a higher inflation beta—than those of broad equities.

3. Real revenue growth

In addition to inflation, infrastructure assets generate revenue through demand growth, capacity expansions, and enhancements in service offerings.

For our return assumptions, we assign a real revenue growth rate of 0.5% to listed infrastructure. This reflects its focus on core assets that operate in regulated environments with limited scope for significant volume increases. In contrast, unlisted infrastructure—following a core-plus strategy—is assumed to grow revenues at 1.5% in real terms. This rate is below our equity growth assumption of 2%, which aligns with our broader GDP growth expectation, emphasizing the more conservative nature of core-plus strategies relative to riskier approaches such as value-add.

We expect this return driver to fluctuate over the medium term as demand growth moves with the health of the economy. This cyclical sensitivity varies considerably across infrastructure sectors and strategies, with core assets typically exhibiting less volatility.

Consequently, we expect infrastructure returns to correlate more strongly with inflation—exhibiting a higher inflation beta—than those of broad equities.

4. Operational improvements

Operational improvements refer to targeted actions aimed at enhancing an asset's day-to-day performance, ultimately driving higher profit margins. These actions may include cost reduction initiatives, productivity enhancements, and process optimizations, all of which boost cash flows independently of changes to revenue.

While margin expansion has its limits, our modelling of unlisted infrastructure assumes that active management will generate operational improvements over time. Through the strategic acquisition, development, and eventual divestment of assets, managers can capture additional returns driven by increasing profit margins. It is important to note that while operational improvements focus on cost efficiencies and margin expansion, revenue growth is a distinct driver.

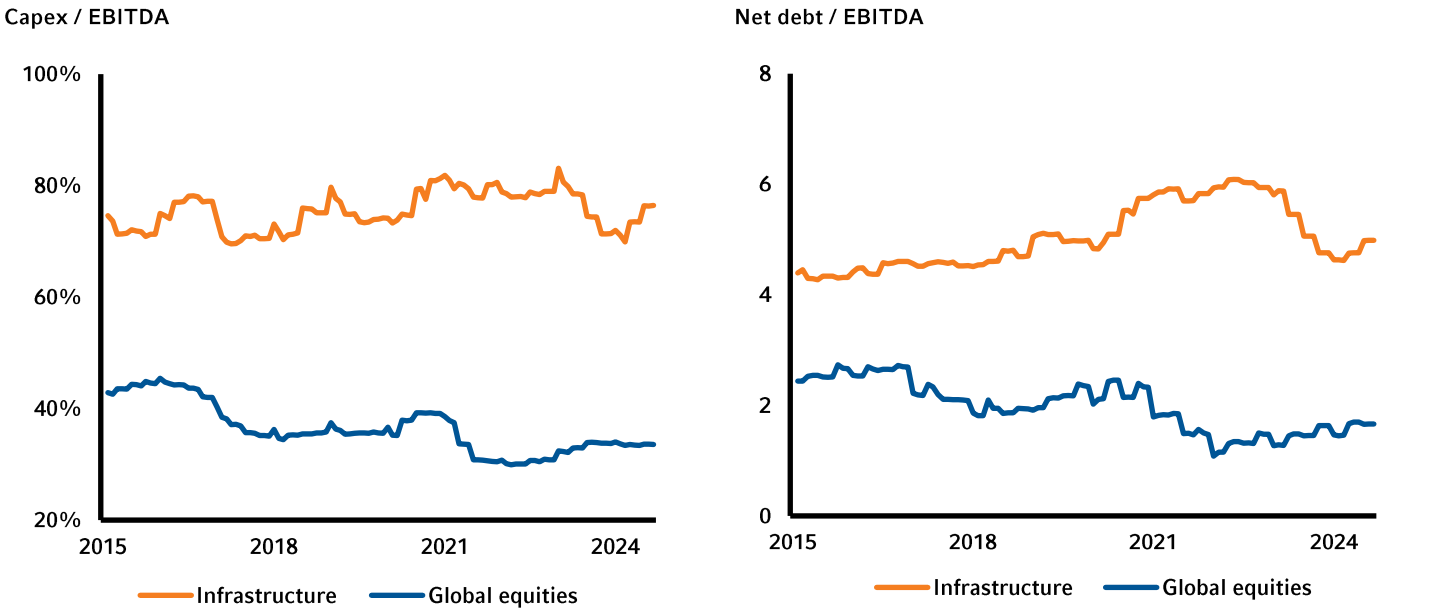
Although data on this component is limited, industry reports suggest that the combined effect of operational improvements (which drive margin expansion) and organic revenue growth contributes roughly 2% to total returns—about 25% of overall return[13]. Therefore, we assume that this component contributes roughly 0.5% to returns for unlisted infrastructure.

For listed infrastructure, we assume that, in equilibrium, operational improvements have a minimal impact on returns. Margins cannot expand indefinitely, and unlike private investments—where managers actively buy, improve, and sell assets to capture margin expansion—ownership in listed companies does not involve such a dynamic management cycle. Consequently, while our return forecast for unlisted

infrastructure incorporates operational improvements, listed infrastructure is expected to yield stable, equilibrium margins over time.

Over a cyclical horizon, there are many factors that can impact margins that investors should be aware of. Infrastructure investments are typically capital-intensive and heavily reliant on debt financing, making them particularly susceptible to inflation-driven increases in costs such as maintenance, growth capex, and interest expenses. Even though revenues increase with inflation, higher costs can lower profits. The recent inflationary environment and rapid rise in interest rates have highlighted this vulnerability, with many infrastructure companies facing higher capex and debt servicing costs, which put downward pressure on profit margins. Therefore, interest rates and input-cost inflation medium-term views are important factors to monitor and evaluate.

Exhibit 7: Infrastructure is Capital Intensive and Usually Highly Levered



Data as of February 27, 2015 to October 31, 2024

5. Fees

This component covers the costs associated with managing and operating the fund. It includes expenses related to sourcing and managing investments, administrative tasks, and maintaining investor relations. In our analysis, we exclude performance-related fees, as these are evaluated separately based on a manager's ability to generate excess returns.

For unlisted infrastructure, we assume a management fee of 1%. In contrast, listed infrastructure no-management fees are charged since these assets are publicly traded and do not involve a General Partner structure.

1 Institutional Investor, 2022 "The Infrastructure Opportunity: Listed Versus Unlisted"
2 Russell Investments 2024 "Listed vs unlisted infrastructure: A misunderstood rivalry?"
3 Listed infrastructure is proxied with FTSE Global Core 50/50 Index and unlisted infrastructure with EDHECinfra sector universe (2020)
4 For a discussion on which index best represents listed infrastructure, see Atlas Infrastructure 2020 report "Listed Infrastructure Investment Characteristics"
5 Preqin Private Capital Indices are time-weighted return indices that capture the quarterly returns earned by investors in their portfolios based on the actual amount of money invested in private capital partnerships.
6 We used the FTSE Global Core 50/50 Infrastructure Index to model returns for listed infrastructure, as it primarily reflects core assets and serves as a suitable benchmark for this strategy. For unlisted infrastructure, we modelled returns as core-plus, believing this better represents the broader opportunity set of this category.
7 This is the same sum-of-parts framework we use in our equity forecasts. For further information see Russell Investments 2024 "Overview of Russell Investment's Forecasting Model".
8 For example, JPM AM expects long-term cash yields for Utilities to be 3-6% while Digital Infrastructure to be 4-7%. See JPM AM's "Private Infrastructure Outlook 2024" report. Meanwhile, Hamilton Lane states that core-plus investments target a 3-5% of income yield. See HL's "Infrastructure: A Primer" report.
9 In 2022 Ofgem (the UK regulator) cut the baseline annual rates of return by nearly 2% to keep costs lower for consumers.
10 For more detailed discussion on these distinctions, you can refer to the Meketa Investment Group April 2020 white paper "Infrastructure", which discusses how core strategies dominate in terms of inflation protection compared to core-plus, and to Hamilton Lane's "Infrastructure: A Primer" report which outlines the differences in risk and cash flow stability between core and core-plus investments.
11 GMO white paper, 2021. "What to do in the case of sustained inflation?".
12 2022 demonstrated this dynamic. Over this rising-inflation period listed infrastructure stocks outperformed global equities.
13 BCG. "Infrastructure Strategy 2024: Creating Value Through Operational Excellence"

QUESTIONS?

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