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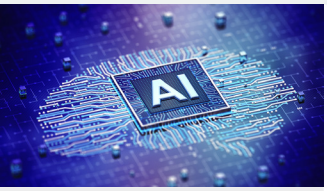
Investment Insights

Paving the Way: Expanded Opportunities in Infrastructure Investment

June 2024



Artificial Intelligence


Demographics


Infrastructure


Security


Polycrisis

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The range and characteristics of infrastructure investments have changed significantly in the past decade. From steady and stable yielding investments to growth equity-like returns, traditional operating assets to transformative ones, the physical world to the digital world and aging assets to modern ones, the opportunity set is greater than ever.

Navigating the landscape: How has infrastructure evolved? Infrastructure is the backbone of our economy and society—it includes areas like utilities, transportation, energy and power, and communications, as well as social infrastructure (see side bar). Traditionally, most of the infrastructure investment opportunity focused on stable, predictable, downturn-resilient and income-yielding assets like toll roads and utilities. Today, the space has since dramatically expanded, thanks to structural changes in the economy via rapid innovation, decarbonization and digitalization, offering exposure to areas that display more capital appreciation and growth potential. This has likewise caused the proliferation of private market opportunities that are well poised to take advantage of these trends.

Investors today have the opportunity to lean on infrastructure for the steady and reliable return of traditional infrastructure assets, but thanks to transformation of the opportunity set, they can also venture farther onto the risk-return continuum, including through investing in capital appreciation-oriented strategies, often through the private markets. Today, we consider the opportunity set to be broader than ever.

Why infrastructure, Why now? Key macro trends have driven the expansion of the infrastructure opportunity set and alongside the need to modernize aging infrastructure, provide a compelling investment backdrop.

Amidst possibly the largest collective effort in human history, nearly $1.8 trillion was invested in the **energy transition** globally in 2023 (Exhibit 1) but the opportunity lands at more than triple that—around $6.5 trillion per year.[1] It is undoubtedly an urgent challenge and potentially one of the most significant investment opportunities

[1] TPG, Inc. As of April 2024.

INFRASTRUCTURE AREAS

Utilities
- Centralized infrastructure
- Electric
- Water
- Gas
- Storage
- Distribution
- Waste Treatment
- Recycling
- Smart Grid

Transportation
- Airports
- Marine ports
- Roads
- Rails
- Terminals
- Mass transit
- Parking

Social
- Courthouses
- Schools
- Municipal buildings
- Hospitals
- Senior living

Energy & Power
- Power generation from fossil fuels
- Gas pipelines
- Distribution
- Processing
- Storage
- Renewable power
- Geothermal
- Biomass
- Batteries

Digital & Communications
- Cellular towers
- Fiber cables
- Data Centers
- Satellites
- Cloud Computing

Source: Goldman Sachs as of 2023, adapted from Meketa Investment Group as of May 2020 latest available.

of this decade and beyond, as investors could lead innovation and enhancement of infrastructure to create a more sustainable and technology-enabled future. This is supported by the business case and national security benefits of renewables, along with supportive policies that provide additional momentum. Renewable energy now outcompetes fossil fuels globally—about 86% of the newly commissioned renewable electricity capacity in 2022 cost less than fossil fuel generated electricity.[2] Even more, renewables are becoming more critical in efforts to bolster national security and energy independence. Recent geopolitical conflicts have galvanized government leaders around the world to secure additional energy sources, many of which are renewable, so that their countries can rely less on imported energy. This not only makes energy more secure but also diversifies the cost base. While the economic and security benefits of renewables stand on their own, supportive policies are widespread: in the U.S., the 2022 Inflation Reduction Act (IRA) and the 2021 Infrastructure Investment and Jobs Act (IIJA); in Europe, the 2024 Net Zero Industry Act; in Asia, Japan's 2020 Green Transformation Basic Policy, to name a few.

The IRA included several new and enhanced tax credits available for businesses, organizations, and state and local government entities to encourage investment in clean energy projects. These tax credits are generally classified as Production Tax Credits, which provide incentives for the generation of clean and renewable energy, Investment Tax Credits, which encourage capital investments in renewable projects, or credits for investment in alternative fueling property. While tax incentives to invest in clean and renewable energy have existed for years, the IRA also added provisions to help entities monetize these credits. Certain taxpayers may now monetize their tax credits, even if they do not have a tax liability, by selling the credits to an unrelated purchaser in exchange for cash. By providing additional sources of liquidity for project developers, this is intended to accelerate the development of energy infrastructure, and in turn the adoption of renewable energy.

Purchasers of renewable energy tax credits will be subject to the passive activity rules when determining eligibility to use a purchased credit. In general, the rules provide that for taxpayers including individuals, estates, trusts and closely held C corporations, credits may only be used to the extent that a taxpayer has passive income to offset. Passive income is either income from a business that the taxpayer doesn't materially participate in, or rental income. Taxpayers subject to these rules would therefore only be eligible to offset income from passive businesses or rental activities with these credits. An individual with only earned income or income from an investment portfolio (such as interest, dividends and capital gains) would not benefit from purchasing these credits.

Transportation, clean energy, energy efficiency, electric grid, industrial cable, negative emissions infrastructure and more stand to gain from this fundamental re-shaping of the global economy as it helps further lower the cost base and scale distribution of renewables. Important to note, however, that government leaders are pragmatic about this transition: They recognize that the future energy mix will still need to include fossil fuels, albeit less over time—specifically, 2027 is estimated to be the year of peak potential oil for transportation.[3] Whether a corporation strives to manage input costs and margins, or a government confronts geopolitical risks, the benefits of adding renewables to the energy mix are compelling.

WHAT DOES REAL ENERGY SECURITY LOOK LIKE?

The International Energy Agency defines energy security as the "uninterrupted availability of energy sources at an affordable price."

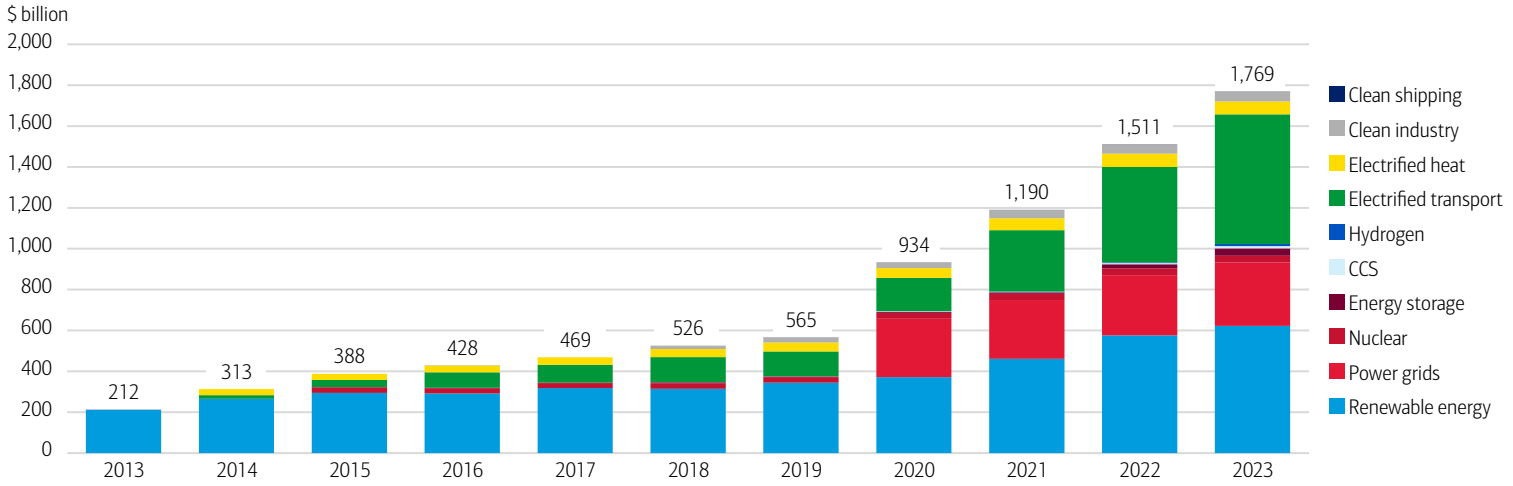
"*A future energy mix, dominated by low-carbon energy systems, such as solar, wind, hydrogen and biomass, is more likely to have a national or regional footprint, implying that a convergence of energy security and sustainability could be possible.*"

Source: World Economic Forum, *Fostering Effective Energy Transition 2022*, May 11, 2022.

[2] International Renewable Energy Agency, *Renewables Competitiveness Accelerates, Despite Cost Inflation*, August 29, 2023.

[3] Bloomberg as of June 2023.

Exhibit 1: Global Energy Transition Investment by Sector.



Source: Bloomberg New Energy Finance (NEF) Energy Transition Investment Trends 2024, January 30, 2024. Start years differ by sector but all sectors are present from 2020 onwards; most notably, nuclear figures start in 2015 and power grids in 2020. "Clean industry" was previously called "sustainable materials." CCS refers to carbon capture and storage.

Since the Apollo 11 mission, computer processing power has increased one trillion times, while cost per calculation is down 99.9999%.[4] It is no wonder we live in an increasingly digital world. **Digitalization** remains a long-term global trend that requires more infrastructure support than meets the eye. Our real time connection to data, people and things is powered by massive, energy-intensive data centers and telecom towers running 24/7. Data centers that power generative artificial intelligence (AI) computations demand more energy and water than cloud computing—those under construction in the U.S. are expected to use the equivalent of more than 50% of the current power used by these centers.[5] Over the next decade, the growth in power demand in the U.S. is projected to be 2.1% to 2.8%, after a decade of 0.4% growth, thanks in part to digitalization.[6] Energy availability, especially for hub data center markets, remains a near- and long-term challenge—utility companies must adapt quickly to meet growing energy demand. Global data demand, additionally, is poised to more than double by 2027 compared to estimated 2023 levels[7] due to the demands of cloud computing, 5G and AI, making data centers an underappreciated area of exposure to AI. Our mobile 5G+ lives likewise require additional critical infrastructure like cellular towers and satellites, since global mobile traffic is projected to more than triple by 2029.[8]

Investors should not underappreciate the opportunity to **upgrade and modernize existing infrastructure**. Globally, $94 trillion is needed to meet infrastructure needs by 2040, according to the Global Infrastructure Hub, creating a $15 trillion investment gap.[9] The U.S. infrastructure base, given its highest grade of C- in 2021, faces a $2.6 trillion gap in public and private investment for upgrades and replacements through 2030, risking economic losses and decreases in quality of life.[10] And to add insult to injury, the global population is projected to reach 10 billion in 2058.[11] In an effort to address this, the IIJA committed $266 billion in new spending on core infrastructure such as power infrastructure, grid automation, water infrastructure, and broadband and resiliency, and provides $284 billion in new spending on transportation—think roads, bridges, public transit, rail, airports, ports and waterways, and electric vehicle (EV) infrastructure.[12]

We believe that both public and private markets are well positioned to take advantage of the opportunities presented above, across decarbonization, digitalization, and aging infrastructure.

[4] Ibid.

[5] BofA Global Research, "BofA FAQs – Issue #8: Powering the AI revolution," April 17, 2024.

[6] BofA Global Research RIC Report "Scale up, or power down" May 14, 2024.

[7] Worldwide IDC Global DataSphere Forecast, 2023-2027, April 2023.

[8] Ericsson Mobility Report, November 2023

[9] Global Infrastructure Hub, 2018. Latest data available.

[10] American Society of Civil Engineers, March 3, 2021. Grade released every 4 years, assessed across 17 categories.

[11] Our World in Data based on HYDE, UN, and UN Population Division 2022 revision.

[12] Infrastructure Investment and Jobs Act of 2021, H.R. 3684, 117th Congress.

Following the Bipartisan Infrastructure Law (BIL), the IRA committed funding to the Department of Energy's Loan Program Office for a new program of up to $250 billion to upgrade, repurpose or replace energy infrastructure.[13] We strongly note, however, that while subsidies are supportive for proven and promising technologies in their earlier stages of development, they are not required for compelling returns.

What is the role of infrastructure in a portfolio, and how has it evolved?
Traditionally, the role of infrastructure in a portfolio, as with other real assets, has been to produce stable income. Infrastructure is often supported by regulated or monopolistic structures, which support consistent yield for the asset class. It also provides critical solutions to an economy or society, making demand resilient and more stable during economic downturns. Even more, infrastructure displays lower correlation and volatility to other asset classes, and therefore can help diversify a portfolio and potentially increase risk-adjusted returns.

Another major reason for portfolio inclusion is the potential for inflation-protected income, as many infrastructure projects have inflation indexation mechanisms embedded in their contracts or regulated pricing structures. While public infrastructure's relationship to inflation is not a key driver of our conviction in this market environment, there is a compelling potential opportunity in traditional infrastructure's need to upgrade, with a potential for growth despite higher financing cost due to elevated interest rates.

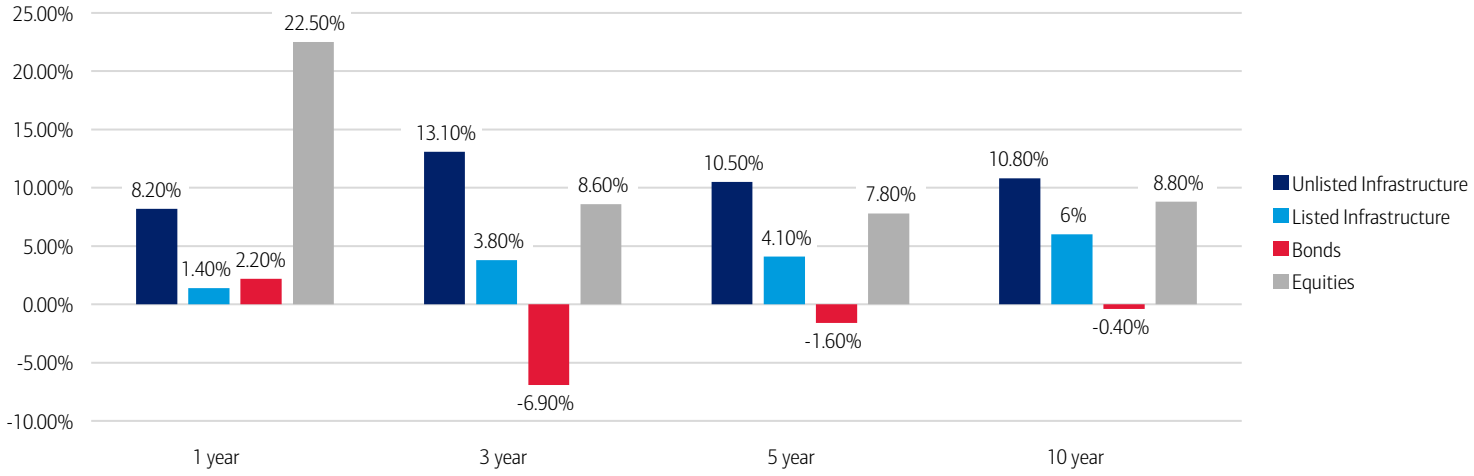
Listed infrastructure tended to outperform global Equities in an environment of above- average inflation and decelerating growth,[14] while private infrastructure has outperformed in environments of above average inflation regardless of above- or below-average growth.[15] Should inflation remain at elevated levels, listed core infrastructure could be poised to benefit from stronger pull-through of revenue. However, if it reaccelerates, yield-oriented infrastructure investments will likely rerate downward as interest rates rise. Likewise, longer-duration Equity investments will likely underperform. As we have stated in recent guidance, we are still far from contemplating that scenario.

The $15 trillion traditional infrastructure opportunity spans public and private market strategies, including the need for:

- Improved energy efficiency
- Energy storage and distribution
- Grid modernization, including smart grids, power transmission and connections
- EV charging
- Reliable, fast internet for rural and low-income communities
- Data centers and cell towers

Source: WorldBank, "Sustainable Infrastructure Finance" March 25, 2024.

Exhibit 2: Infrastructure, Bonds and Equities Annualized Total Returns.



Sources: Refinitive, Factset. (Unlisted from Q2 2023; listed, bonds & equities from Q3 2023). Unlisted infrastructure: Cambridge Associates Global Infrastructure Index in USD, net of fees as of Q2 2023. Listed infrastructure: FTSE Global Core Infrastructure 50/50 index in USD as of Q3 2023. Bonds: Bloomberg Global Aggregate Fixed Income index in USD as of Q3 2023. Equities: MSCI World index in USD as of Q3 2023. **For illustrative purposes only.** Current market conditions differ from prior market conditions; including during prior periods of stress and dislocation. There can be no assurance any prior trends will continue. **Indexes are unmanaged and do not take into account fees or expenses. It is not possible to invest directly in an index. Past performance is no guarantee of future results.**

[13] McKinsey & Co, "The Inflation Reduction Act: Here's what's in it" October 2022.

[14] Principal Global Investors, LLC. As of September 30, 2023.

[15] KKR Capital Markets LLC. Bloomberg, Standard & Poor's, Burgiss, KKR GBR Analysis, Bureau of Economic Analysis, Bureau of Labor Statistics. Analysis conducted on annual data between 2001 and 2022.

As described earlier, the forward-looking set of infrastructure investments needed to transform our society and economy are different from the infrastructure opportunity set of the past. Certainly, while the opportunity to upgrade and increase the efficiency of assets can be found in the public markets, investors cannot fully access the opportunity for growth in infrastructure without access to the private markets. While these are less liquid strategies and, depending on the strategy, could be assets that are smaller or earlier in their development or life cycle, the need for private capital to develop, mature and scale these new areas leads to a potentially significant growth opportunity (hence widening the risk/return range for private market investments).

As with every investment opportunity, a balanced view of risks is warranted. We highlight a few key risks to infrastructure below:

- **Stranded asset risk.** Ever present across growing economies, this is the risk that an asset will lose value in a changing market environment,[16] or become obsolete before the end of its useful life. This could occur in traditional energy assets as renewables gain a stronger foothold over time—coal is a timely example: Power plant operators plan to retire 23% of the 2023 operational coal fleet by 2030.[17] As infrastructure continues to evolve, this risk should be front of mind for investors.

- **Policy risk.** The IRA and BIL have been specifically targeted and can be interfered with across several levers. That said, private sector commitment and the strong economics of renewables still hold up our conviction for infrastructure, despite an altered environment should these policies suffer to any extent. Likewise, asset managers should be aware of potential changes in policy at a state level.

- **Interest rate risk.** Some areas of infrastructure, such as those that have hefty upfront costs and therefore rely more on borrowing for funding, are more sensitive to interest rates.

A common misperception is that some infrastructure projects are too reliant on subsidies and/or taking significant technology risk. Over time, a number of these infrastructure areas have been the recipient of subsidies, which is a historically common way to develop emerging industries. However, it should be noted that many of these technologies and energy sources are very mature, providing stable cash flows and capital appreciation. When the CIO looks to select infrastructure investment, it ensures that the return is not dependent on any subsidy (subsidies can potentially enhance return, but we look for strong returns regardless of the existence of a subsidy) and also favors investments with low technology risk.

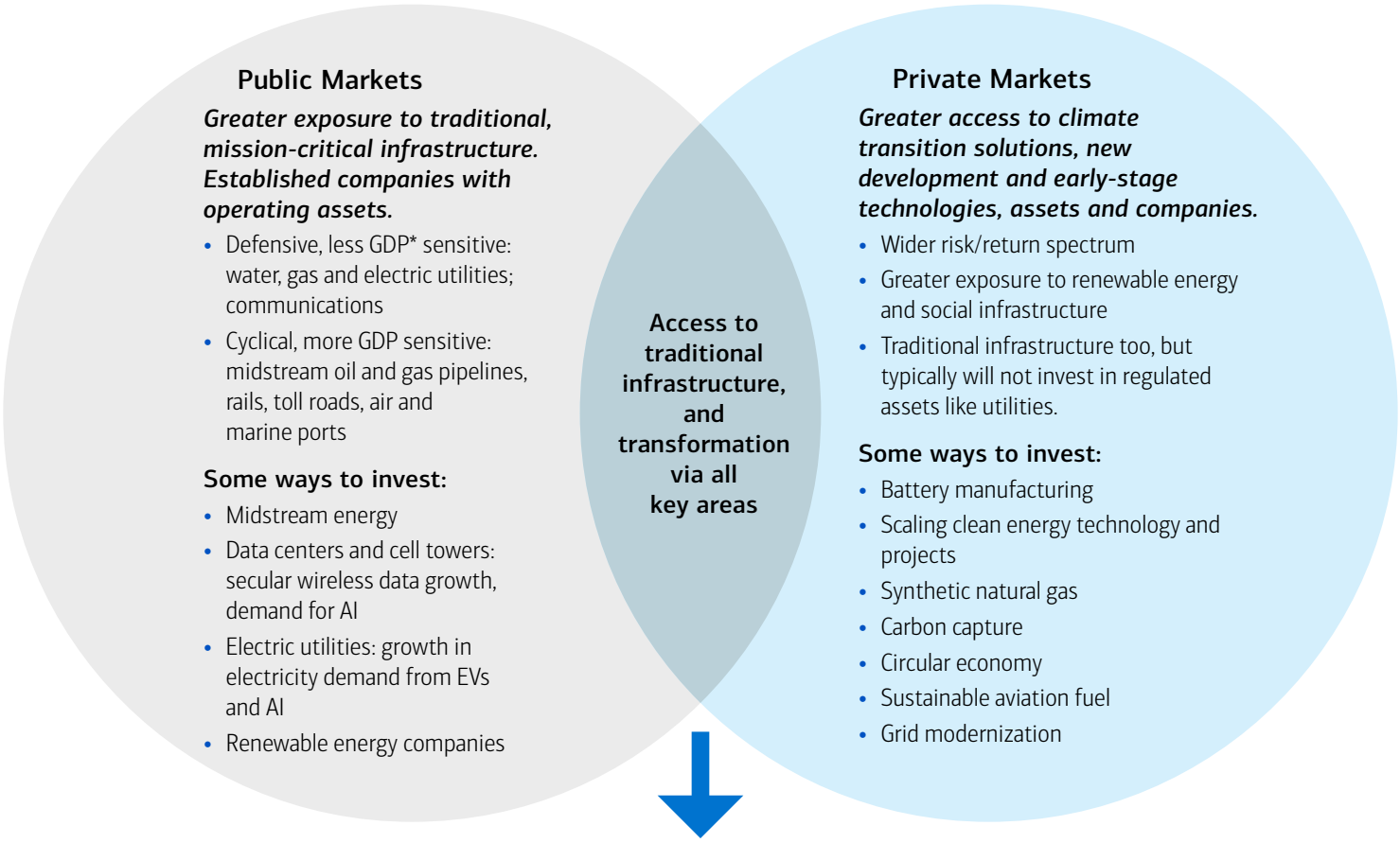
Private Markets Infrastructure Opportunities

- New solar projects
- Early-stage midstream oil and gas
- Data center construction
- Carbon capture development/ scaling
- Scaled green fertilizer
- Sustainable aviation fuel
- EV charging infrastructure
- Synthetic natural gas
- Battery storage
- Smart grid

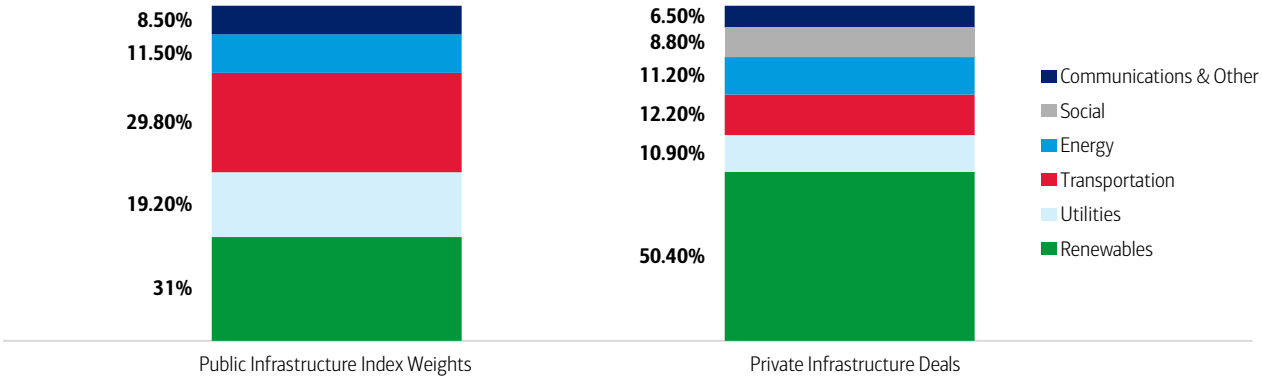
[16] Corporate Governance Institute as of May 2023.

[17] U.S. Energy Information Administration (EIA) as of November 2022. Latest available.

Exhibit 3: Implementation Infrastructure Considerations Across Public and Private Markets.



Exposure to these categories can look different in public vs. private markets



*gross domestic product. Source: Prequin Global Report 2023: Infrastructure. Public Infrastructure Index Weights reflect the market capitalization weights by sector as a snapshot in time on June 30, 2023. Source: FactSet as of June 30, 2023. Private Infrastructure Deals reflect the share of the number of deals by sector from full calendar year 2013 through the end of Q3 2022. Source: Prequin Global Report 2023: Infrastructure. Public Infrastructure Index Weights reflect the market capitalization weights by sector as a snapshot in time on June 30, 2023. Source: FactSet as of June 30, 2023.

The infrastructure investment opportunity, in our view, is wide and deep. Additionally, it is more growth-oriented than in decades past. We continue to expect potential opportunities to develop in the coming years in both public and private markets. As rapid change and innovation are becoming more linked to economic and consumer trends, the opportunities in infrastructure-related assets are expected to become even more important in the years ahead.

Index Definitions

Securities indexes assume reinvestment of all distributions and interest payments. Indexes are unmanaged and do not take into account fees or expenses. It is not possible to invest directly in an index. Indexes are all based in U.S. dollars.

Unlisted Infrastructure/Cambridge Associates Global Infrastructure Index represents a horizon calculation based on data compiled from infrastructure funds, including fully liquidated partnerships, formed beginning in 1993.

Listed Infrastructure/FTSE Global Core Infrastructure 50/50 Index employ capping methodology to the parent FTSE Core Infrastructure Indices to ensure exposure to core infrastructure remains diverse and balanced. It includes the listed stocks of companies that meet FTSE Russell's definition of core infrastructure. To be included in the index, companies must derive a minimum of 65% of their revenue from FTSE Russell-defined core infrastructure activities.

Bonds/Bloomberg Global Aggregate Fixed Income Index is a broad base, market capitalization-weighted bond market index representing intermediate term investment grade bonds traded in the United States.

Equities/MSCI World Index is a stock market index that tracks the performance of large and mid-cap stocks across 23 developed countries worldwide.

S&P 500 sub-sectors and industry groups Global Industry Classification Standard (GICS®) including Information Technology Total Return (TR) USD; Consumer Discretionary TR USD; Industrials TR USD; Real Estate TR USD; Communication Services TR USD; Materials TR USD; Financials TR USD; Consumer Staples TR USD; Utilities TR USD; Energy TR USD; Healthcare TR USD.

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Alternative investments are speculative and involve a high degree of risk.

Alternative investments are intended for qualified investors only. Alternative Investments such as derivatives, hedge funds, private equity funds, and funds of funds can result in higher return potential but also higher loss potential. Changes in economic conditions or other circumstances may adversely affect your investments. Before you invest in alternative investments, you should consider your overall financial situation, how much money you have to invest, your need for liquidity, and your tolerance for risk.

Nonfinancial assets, such as closely-held businesses, real estate, fine art, oil, gas and mineral properties, and timber, farm and ranch land, are complex in nature and involve risks including total loss of value. Special risk considerations include natural events (for example, earthquakes or fires), complex tax considerations, and lack of liquidity. Nonfinancial assets are not in the best interest of all investors. Always consult with your independent attorney, tax advisor, investment manager, and insurance agent for final recommendations and before changing or implementing any financial, tax, or estate planning strategy.

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