

The New Infrastructure Blueprint

BlackRock

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Key takeaways

The infrastructure investing moment is being driven by global trends



The digital future

The rise in remote work, video streaming and artificial intelligence has raised the demand for infrastructure projects that will power and enable the technologies of the digital future – for example, data centers.



Changing supply chains

Companies are bringing production closer to their customers, while countries rethink supply chains amid geopolitical changes.



Demographics

The global population is growing. Developing nations need more infrastructure, while developed nations contend with smaller tax bases for upgrades and maintenance.



The transition to a low-carbon economy

New legislation, a focus on energy security and changing consumer and investor preferences are driving low-carbon energy investments.

Investment is more necessary than ever



Governments

Global national debts have tripled since the mid-1970s,¹ making public funding harder to find for infrastructure.



Corporations

Companies require more financing partners to free up capital and resources, while managing their debt loads.



Investors

Across the capital stack, new opportunities are emerging to finance infrastructure operators and individual assets.

Source: 1. International Monetary Fund, "Global Debt Is Returning to its Rising Trend," September 13, 2023.

The infrastructure moment

Societies everywhere are grappling with major, overlapping challenges: Energy security pressures, the transition to a low-carbon economy, changing demographics and urbanization, and realigning supply chains. On the horizon is a digital revolution led by artificial intelligence.

Taken together, these forces require an enormous amount of new infrastructure, from super batteries and hyperscale data centers to natural gas transport, from modern logistics hubs to airports.

In many cases, the demands are immediate. Energy investment will increase from US\$2.2 trillion annually to US\$3.5 trillion by the end of this decade and US\$4.5 trillion by the 2040s, according to the BlackRock Investment Institute Transition Scenario; much of that capital will go into infrastructure.

Similarly, the shift from far-flung global supply chains means new production facilities and transportation infrastructure needs to be built in countries including Mexico, Malaysia and Vietnam.

But traditional funding sources such as national governments cannot meet the need alone. Large – and growing – debt levels are spurring public-private partnerships.

Meanwhile, corporations are looking for external partners to help finance and operate their infrastructure, freeing them to focus attention and resources on their core operations.

We believe that the infrastructure asset class, currently valued at US\$1 trillion, is poised to become one of the fastest-growing segments within private markets.

In the following pages we outline the major structural forces driving what's poised to be a transformational moment in infrastructure investing. We'll also detail the various ways capital can invest in the opportunities we're seeing today as well as the ones we're expecting, and how investors can incorporate the asset class into their portfolios.

Source: BlackRock, "Tracking the low-carbon transition," July 2023.



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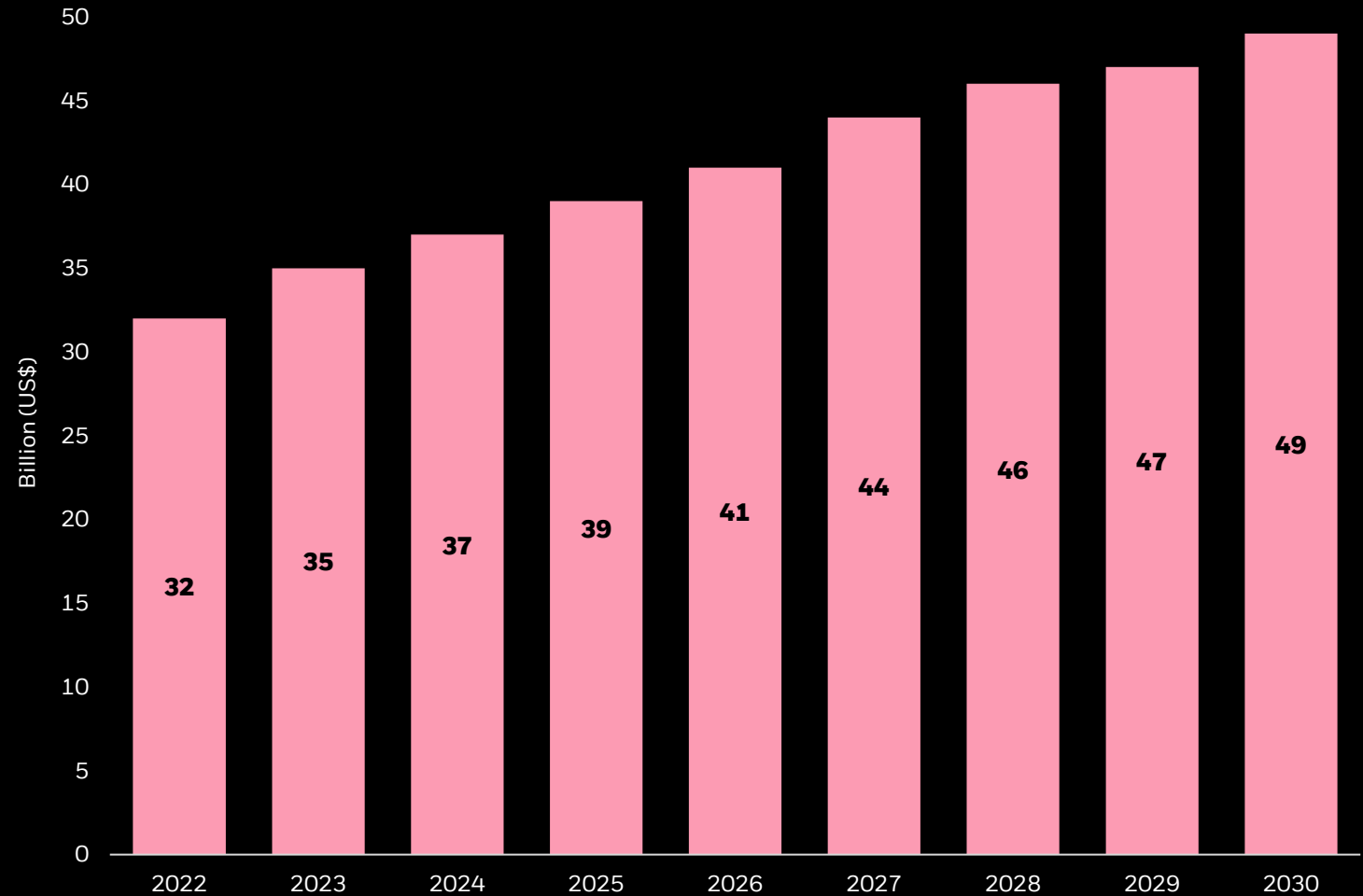


A digital transformation

Rapid technological progress in the past few decades has remade the world's economies and societies. People are producing and using ever-increasing amounts of data and the trend is set to continue, especially with the rise of artificial intelligence. Digital proliferation at this scale needs infrastructure investment – to build, for example, the data centers essential for these new technologies.

Rising demand

Global spending on the construction of data centers



Source: McKinsey analysis, January 2023, citing Synergy Research Group. Projection includes construction spending by providers, excluding enterprise spending and any other capital expenditure outside of construction (such as equipment). **There is no guarantee that any forecasts made will come to pass.**

The world continues to need more high-speed networks, cell towers and satellites. The amount of data used by the average U.S. household between 2017 and 2022 rose by 165%,¹ and the variety and number of household smart devices continues to increase.

One place that this rising demand is playing out is fiber broadband. About 70% of household broadband connections are expected to be fiber by 2026 – up from 43% in 2022.¹ But the cost of building and installing those networks is roughly US\$27,000 per mile,² an expensive outlay for a single entity to finance.

An even bigger opportunity may lie in the technology of tomorrow. Emerging applications such as AI will require far more electricity than today’s technologies. The average search using generative AI can use nearly 10 times the energy as a conventional web search.³

The International Energy Agency predicts that the energy draw from data centers, AI and other technologies could rise to 800 terawatt-hours by 2026, up from 460 TWh in 2022. At the high end, IEA projects just over 1,000 TWh of demand by

2026 – approximately the electricity consumption of Japan today.

UK power company National Grid recently predicted that the power demand of data centers in the country will grow sixfold over the next 10 years, largely due to the increased energy consumption of AI technologies.⁴

This will put pressure on our existing grid capacities and require significant investment in new sources of power generation.

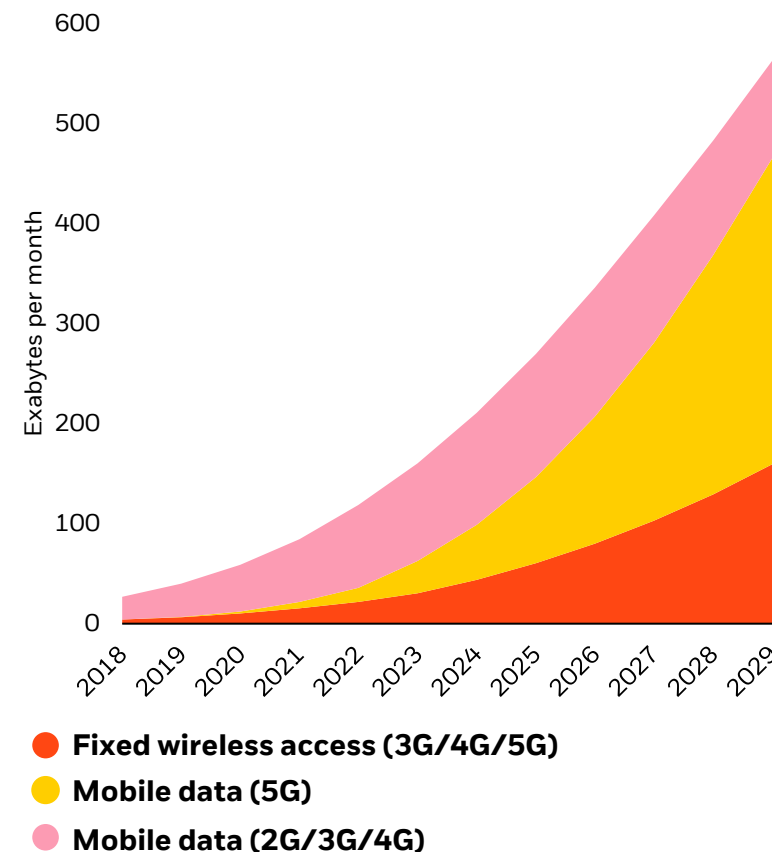
Cloud storage

Many of these transformative technologies are going into the cloud. The ability to pull data from the cloud – and enable seamless data sharing – will likely require an increasing number of data storage facilities around the world.

As cloud services become more sophisticated, accommodating everything from daily applications to advanced AI analytics, the physical infrastructure underpinning them – fiber networks and power sources – must also evolve.

Steady growth

Global data use is expected to keep climbing⁵



Sources: 1. BlackRock and Arthur D. Little, December 2022. 2. U.S. Department of Transportation, from “Raising the Minimum Fixed Broadband Speed Benchmark,” Congressional Research Service, July 12, 2021. 3. Joule, “The growing energy footprint of artificial intelligence,” October 2023. 4. BBC News, “Data centre power use ‘to surge six-fold in 10 years,’” March 27, 2024. 5. Ericsson, 2023. **Estimates are based on assumptions. There is no guarantee that they will be achieved.**

Shortening supply chains

The COVID-19 pandemic exposed the fragility and complexity of global supply chains. Rising geopolitical tensions are adding to the pressure for countries to bring networks closer to home. There's a rapid realignment in global commerce that is contributing to the need for more infrastructure.

At the heart of this transformation is the strategic shift in corporate production and supply chains, moving them closer to consumer markets – known as nearshoring. There's also a growing trend towards friendshoring, which involves aligning supply chains with countries that share friendly relations.



Many companies are seeking to reduce their dependencies on distant producers, shortening supply chains to bring them closer to their end consumers. Mexico, Vietnam and Malaysia¹ are among the nations that have benefited from this nearshoring trend.

But realigning global supply chains is not simple. New production zones and associated transportation networks need to be built. From highways, ports and railways to new logistics hubs, the global shift toward regionalization requires a range of traditional and modern infrastructure projects.

Mexico is in a prime position to grow as a manufacturing center, given its proximity to the U.S. market, and the fact that its wages are now globally competitive.² North American companies that already had Mexican operations, especially in the automotive sector, are doubling down. And new companies are moving some operations – in the first half of 2023, Mexico saw a 41% jump in foreign direct investment.³

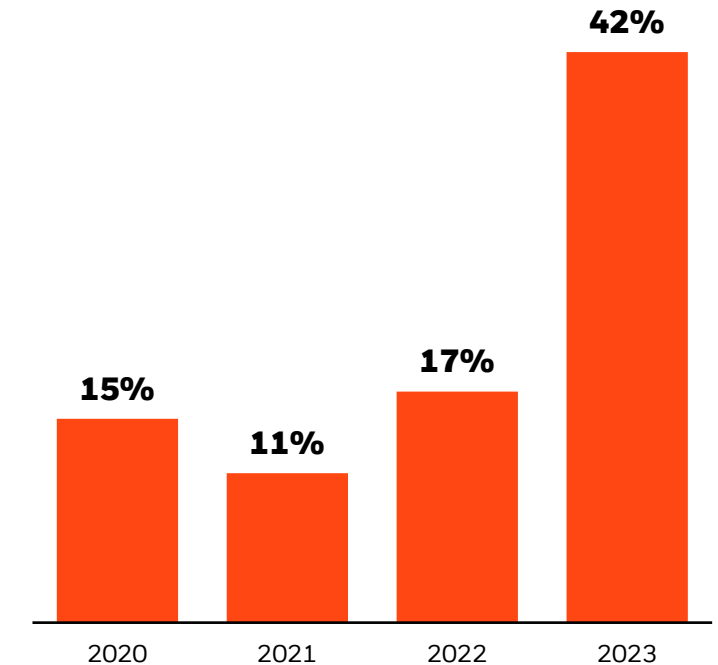
This will likely drive demand for infrastructure investment. Investment in transportation, telecommunications and logistics are all key elements as Mexico capitalizes on its nearshoring advantages, according to a recent report from Mayer Brown.⁴

Malaysia and Vietnam – two markets with an abundance of skilled labor that are taking steps to change regulations to facilitate more international business – are seeing significant growth, becoming increasingly important in the electronics and textiles industries, respectively.

As businesses and countries rewire existing supply chains and build out the supporting infrastructure, many are also considering ways to implement renewables or low-carbon technology into their production and operations – an example of how the current moment in infrastructure investing is being driven by multiple, overlapping forces.

Closer to home

A survey of companies identified by McKinsey as supply chain leaders shows that a growing number say they are nearshoring production⁵



Sources: 1. Bloomberg Law, "Nearshoring to Mexico: Opportunities & Challenges," August 2023. 2. North American Production Sharing, "Mexico vs. China Manufacturing: How the Two Countries Compare," accessed April 9, 2024. 3. Ministry of Economy, Mexico, August 9, 2023. 4. Mayer Brown, "Nearshoring in Mexico," accessed April 10, 2024. 5. McKinsey; Chart: Axios Visuals, annual surveys between 60 and 113 supply chain leaders; 2020 to 2023.

Demographic trends

By 2050, the global population will reach 9.7 billion people, up from 8 billion in 2022, according to the United Nations. This growth will not be uniform across the globe.

The coming demographic changes can be broken into two trends: A shrinking working-age population in developed markets contrasted with population growth in emerging markets. These shifts present distinct challenges and opportunities for infrastructure investment.

Developed markets

The combination of rising life expectancy and declining birth rates is leading to aging populations in developed market countries. The number of working-age individuals is expected to contract over the next two decades, presenting challenges for these economies. With fewer working individuals, tax bases are expected to narrow, leaving governments, already grappling with deficits, struggling to fund essential projects and programs.

Note: Estimates are based on assumptions. There is no guarantee that they will be achieved.

This demographic shift requires a strategic approach to infrastructure investment, focusing on efficiency and sustainability to support a smaller, older workforce in developed countries.

Emerging markets

Emerging markets are witnessing an expansion in their working-age populations. The BlackRock Investment Institute identifies India, Indonesia, Mexico and Saudi Arabia as among prime candidates for increased infrastructure investment due to their population growth.

The World Bank estimates that by 2036 India's urban areas will be home to 600 million people – 40% of the population, up from 31% in 2011. As a result of this increase, India will require an estimated US\$840 billion in infrastructure investment by 2036.

Meanwhile, energy demand is expected to surge in India by more than 60% over the next 20 years, according to the BlackRock Investment Institute.

Urbanization

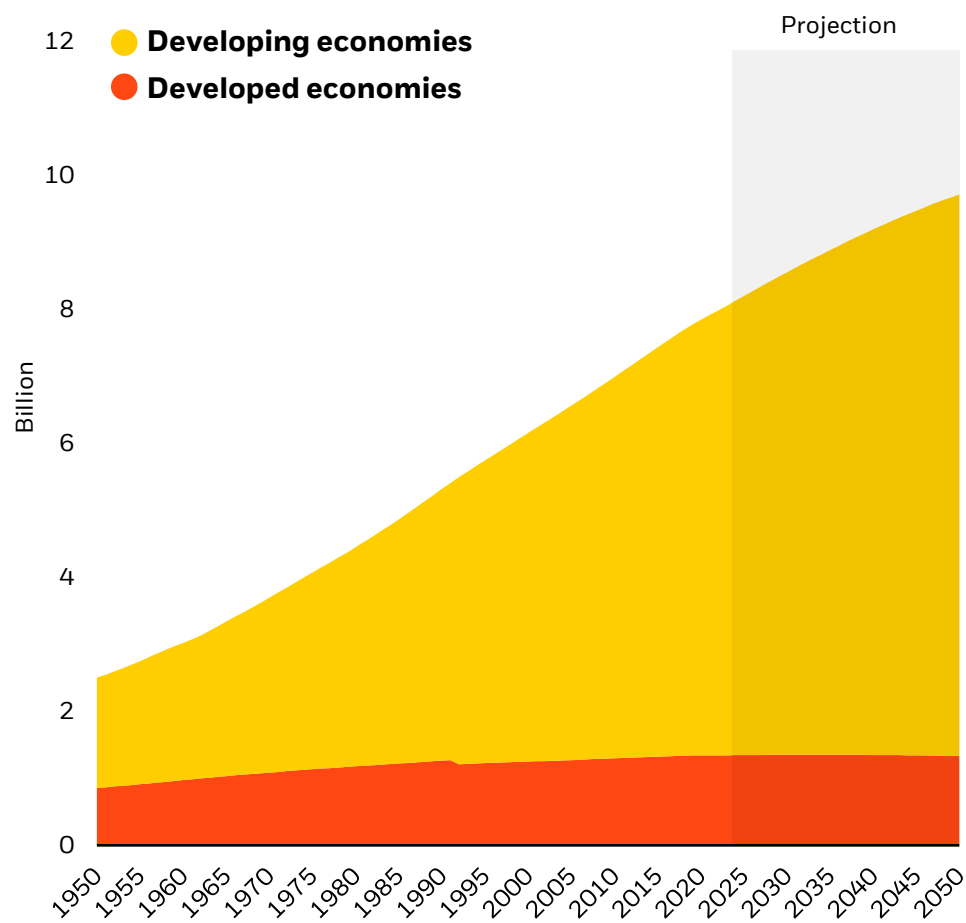
Beyond the basic demographic shifts, urbanization remains a potent force shaping infrastructure demands. Today, just over half of the world's population lives in urban areas, a figure anticipated to rise to about 70% by 2050, according to the World Bank.

Urban expansion means enhanced infrastructure across multiple sectors. Cities require more electricity, expanded telecommunications networks including cell towers and broadband, and essential water and sanitation systems.

Moreover, transportation infrastructure becomes increasingly critical in urban settings, facilitating the movement of goods and commuting for burgeoning populations. The urban shift underscores the need for comprehensive infrastructure investments ranging from ports and airports to toll roads and rail systems.

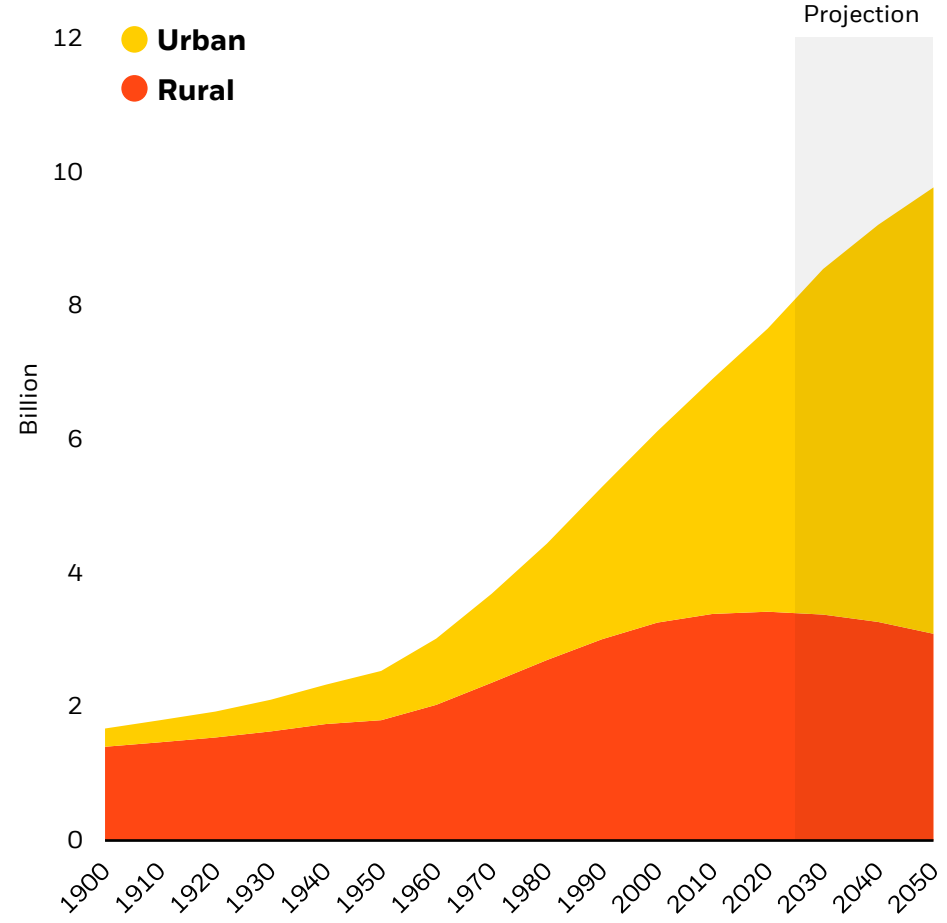
Billions more

Developing economies will see their populations grow...



Booming cities

...and many more people will be living in urban areas



Source: United Nations, Department of Economic and Social Affairs, Population Division, November 2023; UNCTAD stat based on UN DESA Population Division, World Population Prospects 2022. Note: The graph provides estimates from 1950 to 2021 and projections from 2022 to 2050 of total population. **The projections are illustrative in nature and do not express a forecast.**



The energy transition

The transition to a low-carbon economy is driving a surge in infrastructure investment. Government policies and incentives, widespread shifts in commercial priorities and practices, technology advances, and changing consumer and investor preferences are driving the transition.

The transition will entail an overhaul of energy, transportation and related infrastructure – and that overhaul is already underway, with 2023 a record year for installations in both wind and solar power generation.¹

Source: 1. International Energy Agency, "Renewables 2023," January 2024.



According to the BlackRock Investment Institute Transition Scenario, the average annual investment in the global energy system could rise from today's roughly US\$2 trillion a year to US\$4.5 trillion a year by the 2040s. Much of this investment will go into infrastructure.

Solar and wind value chains are already seeing tailwinds from new industrial policies around the world. In the U.S., for example, the Inflation Reduction Act introduced and expanded many tax credits and incentives that benefit clean-energy investors (see next page).

Beyond government action, companies are tracking their emissions more tightly and in new areas, such as their supply chains. This is driving adoption of renewable power installations and related infrastructure around the world.

The intermittent nature of wind and solar power creates new opportunities in energy storage. The global energy storage market is expected to grow 15-fold from the end of 2021 to 2030.¹ At the same time, traditional energy sources will continue to play a vital role in the global energy picture.

Natural gas is a critical fuel for the transition to a low-carbon economy, and will require more facilities for storage and transportation.

The opportunity extends to the mineral resources necessary for building solar arrays, wind turbines and grid-scale batteries.

The International Energy Agency forecasts that meeting 2050 emissions goals will require an investment in these resources of between US\$360 billion and US\$450 billion over the next few years, with copper alone accounting for 60% of the total.

Transportation is also an area where the transition is creating opportunities. The accelerating global adoption of electric vehicles is driving investment in and construction of new public charging stations.

In 2023, global deployment of public charging EV infrastructure rose by 49%, led by China.² The U.S. Bipartisan Infrastructure Law allocates funding toward a target of 500,000 public chargers nationwide by 2050.³

Sticking points: Transmission

Transmission lines are a pivotal but often overlooked factor amid the overhaul of the world's energy system. New renewable power projects, often located in remote areas, are only effective if they can connect to the grid and deliver power to major load centers. Without more transmission lines it will be difficult to connect new and growing sources of energy supply with areas where there is increasing demand.

But many transmission lines are a century old and new ones can take years to build. For example, the U.S. Energy Department estimates that America's electric grid needs to expand by two-thirds or more to meet the nation's clean energy goals by 2035.⁴

Behind-the-meter, or on-site, power solutions may help meet the demand. These technologies, such as solar panels and battery storage, are creating a distributed grid that avoids many of the challenges of connecting to transmission lines.

Sources: 1. BloombergNEF, October 12, 2022. 2. IEA, "EV Global Outlook 2024, Trends in electric vehicle charging," April 2024. 3. Whitehouse.gov Fact Sheet, February 15, 2023. 4. The New York Times "The U.S. Urgently Needs a Bigger Grid. Here's a Fast Solution," April 9, 2024. **There is no guarantee that any forecasts made will come to pass.**

U.S. tax credit changes post-IRA

Two existing tax credits expanded by the Inflation Reduction Act may be meaningful for infrastructure investors: Investment tax credits are based on a percentage of a project's dollar value, while production tax credits offer incentives correlated to the kilowatt-hours of clean energy generated.

Investment tax credit			Production tax credit		
Tax credit attributes	Pre-IRA	IRA ¹	Tax credit attributes	Pre-IRA	IRA ¹
2023 Base credit for new builds (% of rate)	22%	30% ²	2023 Base credit for new builds (% of rate)	0-60% ⁵	100%
Domestic content adder	-	+10%	Domestic content adder	-	+10%
Energy communities adder ³	-	+10%	Energy communities adder ³	-	+10%
Low-income communities/Indian lands ⁴	-	+10%/ 20%	Technology	Wind	Wind + Solar
Technology	Wind + Solar	Wind + Solar + BESS ⁶			

Sources: 1. KPMG Overview of Inflation Reduction Act –September 2022; Financial Advisor Insight; IRA technology includes any carbon neutral electric generation facilities, and is not limited to wind and solar. 2. Assumes the prevailing wage and apprenticeship requirements have been satisfied. 3. Energy communities include: (i) Brownfield sites, or (ii) areas with a high percentage of employment related to fossil fuels and a high unemployment rate, or (iii) Retired coal mine/coal-fired plants. 4. Low-Income Communities / Indian Lands requires that properties (i) located in Low-Income Communities or on Indian Lands, or (ii) Qualified Low-Income Residential Building Project or Qualified Low-Income Economic Benefit Project. 5. Prior to the IRA, wind projects that had either (i) secured transformers or other equipment or (ii) begin sufficient construction by 2021 could qualify for up to 60% of the PTC. However, completely new greenfield wind projects would not qualify for PTCs past 2022. 6. Note 'BESS' refers to battery energy storage systems. **This material does not constitute any specific legal, tax or accounting advice. Please consult with qualified professionals for this type of advice.**

Transition policy landscape

Government policy remains a significant catalyst in driving low-carbon infrastructure projects, and initiatives such as the European Green Deal and the U.S. Inflation Reduction Act are using tax incentives to stimulate private investment.

2019

EU - The European Green Deal

- Aims to make the EU climate neutral by 2050 by helping to transform member nations' economies around a greater reliance on efficient, low-carbon energy solutions.
- Its policies, regulations, and funding instruments include:¹
 - Fit for 55 package, targeting 55% emissions reduction by 2030.
 - InvestEU program, catalyzing €372 billion in investment.
 - Recovery & Resilience Facility, more than €250 billion in grants and loans.
 - Financing from the European Investment Bank.

2021

U.S. - The Infrastructure Investment and Jobs Act

- This US\$1.2 trillion infrastructure law includes funding for clean- and transition- related infrastructure, including:²
 - US\$65 billion in grid expansion and reliability improvements.
 - US\$66 billion in low-carbon public transportation infrastructure.
 - US\$42 billion to reduce emissions and upgrade infrastructure for ports and airports.
 - US\$7.5 billion to build out a national network of EV charging stations.

Source: 1. European Commission, December 11, 2019. 2. Congress.gov, November 15, 2021.



2022

U.S. - The Inflation Reduction Act

- Supports solar, wind, hydrogen, carbon capture from R&D through demonstration to deployment at scale.
- In the first full year after the legislation was enacted, the private sector deployed US\$122 billion in clean energy and manufacturing, a 67% increase from 2022.¹
- The fastest investment growth in 2023 occurred in the deployment of the emerging climate technologies of clean hydrogen, sustainable aviation fuels and carbon capture – which together increased tenfold to US\$9.1 billion – and in the manufacturing of clean technology, which saw a year-on-year rise of 153% to US\$49 billion.¹

2023

Japan - The Green Transformation Act

- US\$150 billion in government-backed energy transition bonds to generate US\$1 trillion in funding across public and private investments over the next 10 years.
- A majority of funding is dedicated to helping Japan's industrial sectors and energy supply make the transition to new technologies and lower-carbon power sources.

2023

China - Green Investment and Finance Partnership

- US\$107 billion over the next five years to finance green projects in developing countries, including:
 - A green project prep pipeline facility to identify bankable projects from the Global South.
 - Financing and technology support for projects, including feasibility studies, project design, technical capacity and risk management.

Source: 1. Clean Investment Monitor, "Q4 2023 Update," February 29, 2024. Data presented includes actual clean investment spending from Energy & Industry and Manufacturing segments, comparing the full year 2022 to 2023.

Energy security

The quest for national energy security has historically been shaped by a complex interplay of geopolitical dynamics, economic necessities, and technological innovations.

Today, rising global tensions have brought the issue to the forefront of many governments' policy agendas, while accelerating the transition to low-carbon energy sources.

Priority issue

Energy security has become an urgent priority in Europe. Since Russia's invasion of Ukraine in 2022, European nations have endured energy inflation caused by disrupted oil and gas supplies.

The UK, Norway, and the 27 EU countries have collectively spent €800 billion subsidizing energy bills.¹ Against this backdrop of energy uncertainty, Germany is building additional facilities to import from gas producers around the world.²

Since 2019, the U.S. has exported more energy than it imports. Last year, U.S. oil production reached a record 12.9 million barrels per day,³ and the country continues to add to its power capacity, both with traditional and renewable energy sources.

EU challenges

Electricity pricing significantly impacts the competitiveness of energy-intensive industries, a crucial consideration in the global quest for energy independence and renewable infrastructure development.

In 2023, industries in the EU faced electricity costs nearly double those in the U.S.⁴ This difference puts European companies at a competitive disadvantage on the global stage. Policymakers in the EU are now exploring new initiatives and financial tools such as subsidies to boost the region's industrial competitiveness.⁵

The success of these efforts will be key in determining the future of the EU's energy-intensive sectors.

Renewables' role

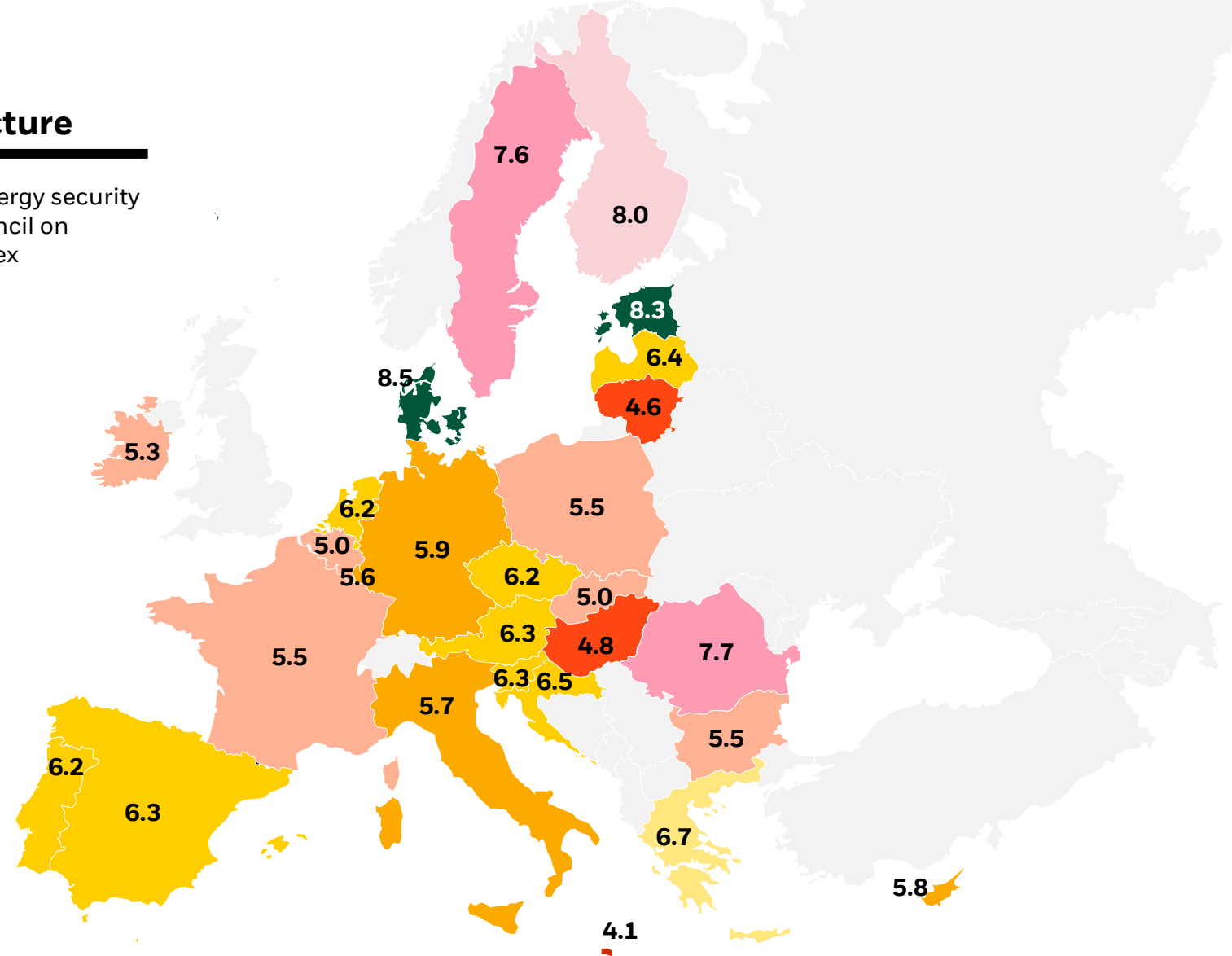
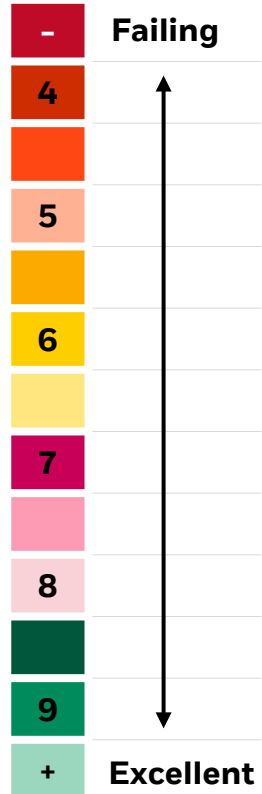
The growth of renewable energy sources such as solar and wind power also creates significant opportunities to invest in energy storage, grid infrastructure, and innovative technologies such as green hydrogen to ensure a steady and reliable energy supply.

For many countries, energy security will come in part from building out domestic renewable power. The International Energy Agency has in the past noted that the reliance on green technology brings its own supply chain questions, such as the need for the critical minerals required by many of these technologies.⁶

Sources: 1. Bruegel, "National fiscal policy responses to the energy crisis," June 26, 2023. 2. Reuters, "Europe's spend on energy crisis nears 800 billion euros," February 13, 2023. 3. U.S. Energy Information Administration, "United States produces more crude oil than any country, ever," March 11, 2024. 4. International Energy Agency, "Electricity 2024," January 24, 2024. 5. European Environment Agency, "Investments in the sustainability transition: leveraging green industrial policy against emerging constraints," November 7, 2023. 6. International Energy Agency, "The Role of Critical Minerals in Clean Energy Transitions," May 5, 2021.

The EU's energy security picture

Countries are at different stages on the energy security spectrum, according to the European Council on Foreign Relations' Energy Sovereignty Index



Source: Energy Sovereignty Index | ECFR, September 2023. A weighted average of scores in four areas provides a country's overall energy sovereignty index. Energy cleanness, energy independence, and energy efficiency each account for 30% of the overall index, while the narrative about energy sovereignty contributes 10% to the final score. In the rankings, anything up to 5.4 is "failing"; from 5.5 to 7.0 is "satisfactory"; from 7.1 to 8.4 is "good"; from 8.5 to 9.4 is "very good"; and 9.5 or above is "excellent."



Energy upgrades and replacements

Infrastructure needs constant updates and repairs. It's not just roads and bridges – power plants require regular repair, upgrades or face retirement. Planned retirements of existing power plants are a major driver of investment as they are replaced by new, and often low-carbon, sources of energy.

For example, the U.S. Energy Information Administration reports that 2022 and 2023 saw the retirement of about 10% of America's coal-fired electric generation capacity; most coal plants were built in the 1970s and 1980s and are reaching the end of their useful design life. Not only does their capacity need to be replaced, but in an era of surging energy demand, power grids will need to produce more than ever before.

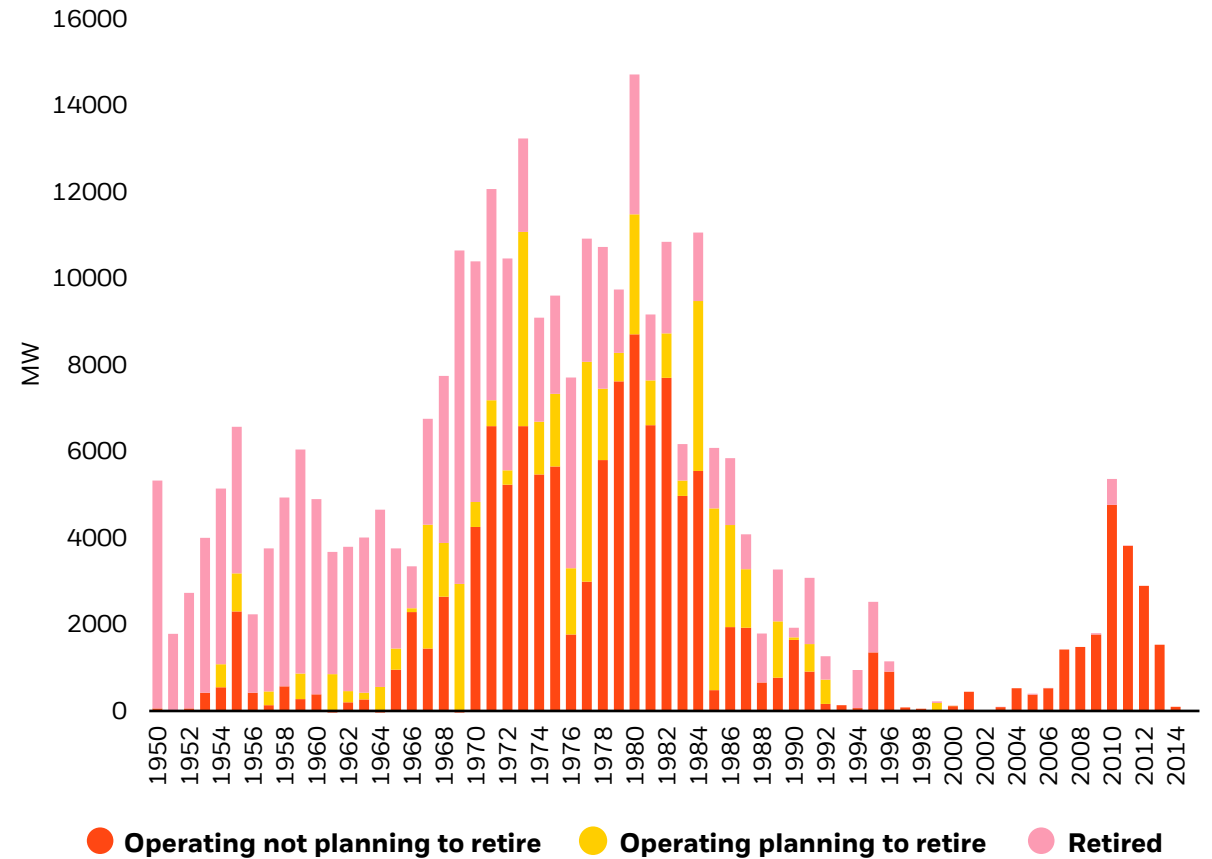


While 2024's planned retirements only account for about 1% of capacity, the prior years' pace is expected to return in 2025, according to the EIA, which estimates that U.S. coal-fired generating capacity will fall between 52% to 88% by 2050.¹

The BlackRock Investment Institute Transition Scenario expects global power demand to grow two-and-a-half-fold by 2050. In many cases, the retired coal plants are being replaced by entirely new projects, often renewable power sources such as wind and solar. Replacing on-demand power such as coal with intermittent power such as renewables requires a greater than 1:1 replacement ratio, which expands the size of the opportunity, and the need for more renewable sources of power.

Status of U.S. coal operations

Retirement is on the horizon for some coal plants built in the 1970s and 1980s⁴



Beyond power plants

The construction of transport infrastructure by the EU15 was at its peak from 1960 to 1980, and many of these projects are in need of significant repair.²

In the U.S., there's a shortfall of US\$2.59 trillion between the current levels of spending and investment and what's needed to keep the U.S. infrastructure system fit for the future, according to the American Society of Civil Engineers' (ASCE) most recent Report Card on American Infrastructure. Failing to address this shortfall could result in a potential loss of US\$10 trillion in the United States' gross domestic product by 2039, according to the ASCE.³

Sources: 1. U.S. Energy Information Administration website, accessed April 7, 2024. 2. Tilburg University, "Infrastructure Maintenance, a Necessity and Opportunity for Europe," December 2023. 3. American Society of Civil Engineers, "2021 Report Card for America." 4. U.S. Energy Information Administration, "Preliminary Monthly Electric Generator Inventory," February 2024.

Governments and infrastructure

Responsibility for building and maintaining infrastructure has historically rested squarely with governments. Funded through public expenditure, this approach worked well under economic conditions that supported expansive budget allocations for critical public works.

But the traditional model hit stumbling blocks in recent decades. It's unlikely that today's governments can pay for all the necessary infrastructure construction and maintenance on their own. That's in large part because of the debt they carry, which has tripled since the mid-1970s, and now sits at 92% of global GDP.¹

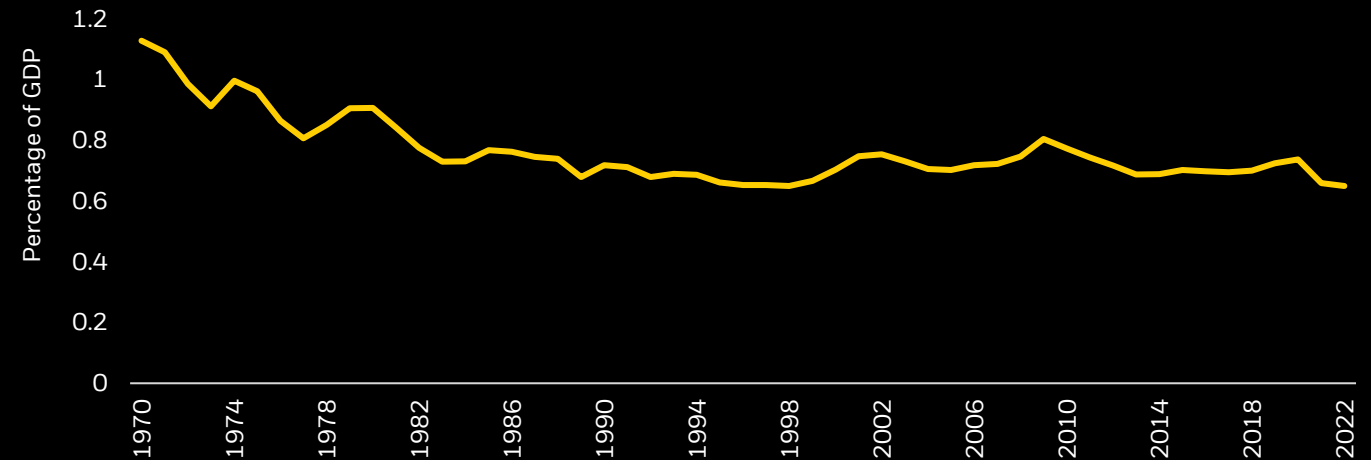
The U.S. national debt, currently at about US\$34 trillion, is projected to keep increasing in the next decade. Higher interest rates are adding to the cost of servicing this debt.

The situation across developed markets requires a strategic pivot toward private capital to bridge this funding gap.

Private investors are meeting the need, led by large pensions and sovereign wealth funds, who are attracted by the stability, long duration, high coupon, and inflation-protected potential returns of infrastructure assets.

Steady decline

U.S. government spending on infrastructure has fallen relative to GDP²



Sticking points: Permitting

While governments have traditionally been the leading funders of infrastructure, it's also true that in jurisdictions around the world investors have to navigate regulations and policies that can present obstacles for would-be projects.

One significant sticking point in the construction of renewables infrastructure in many markets is the issue of permitting. In some instances, extensive permitting requirements can bring delays or even undermine new projects in their entirety.

Sources: 1. International Monetary Fund, "Global Debt Is Returning to its Rising Trend," September 13, 2023. 2. Bureau of Economic Analysis; U.S. Treasury calculations.

These new investors have brought fresh capital to the table, stepping in to assume roles traditionally held by governments. They have acquired and managed municipal assets worldwide, with a mandate to modernize and optimize returns.

This model not only promises to reduce the financing gap but also introduces a new dimension of efficiency and innovation in infrastructure management, leveraging private sector expertise.

Today, the transformation in infrastructure financing is evident. A broad spectrum of assets, from airports to railroads to water systems, now falls under this privatized management model, opening new investment avenues and highlighting the crucial role of capital in infrastructure development.

Investors now play a significant role in maintaining the infrastructure networks vital for economic growth and societal advancement. For these investors, governments can offer a reliable partner who can share some of the risks that accompany infrastructure projects.

Public-private partnerships can take a variety of forms, such as an equity stake in an airport or an operating agreement that means long-term cashflows. Low- and middle-income countries are frequent users of the public-private structure.

Sources: 1. The World Bank PPI website, accessed April 11, 2024. 2. Bipartisan Policy Center in Washington, "Five Reasons Public-Private Partnerships Could See Big Growth Under the Bipartisan Infrastructure Bill," November 16, 2021. 3. European PPP Expertise Centre, March 2024.

From 2010 through the first half of 2023, for example, there were 744 public-private partnerships for road infrastructure, with the deals totaling US\$300 billion across 26 nations, according to the World Bank. In the natural gas sector, nine countries formed 57 partnerships with a total investment of US\$43 billion over the same period.¹

Europe saw 38 public-private partnership transactions close in 13 countries in 2023, with a total value of €13.6 billion, according to the European Investment Bank. That was a 35% rise in value compared to the previous year.

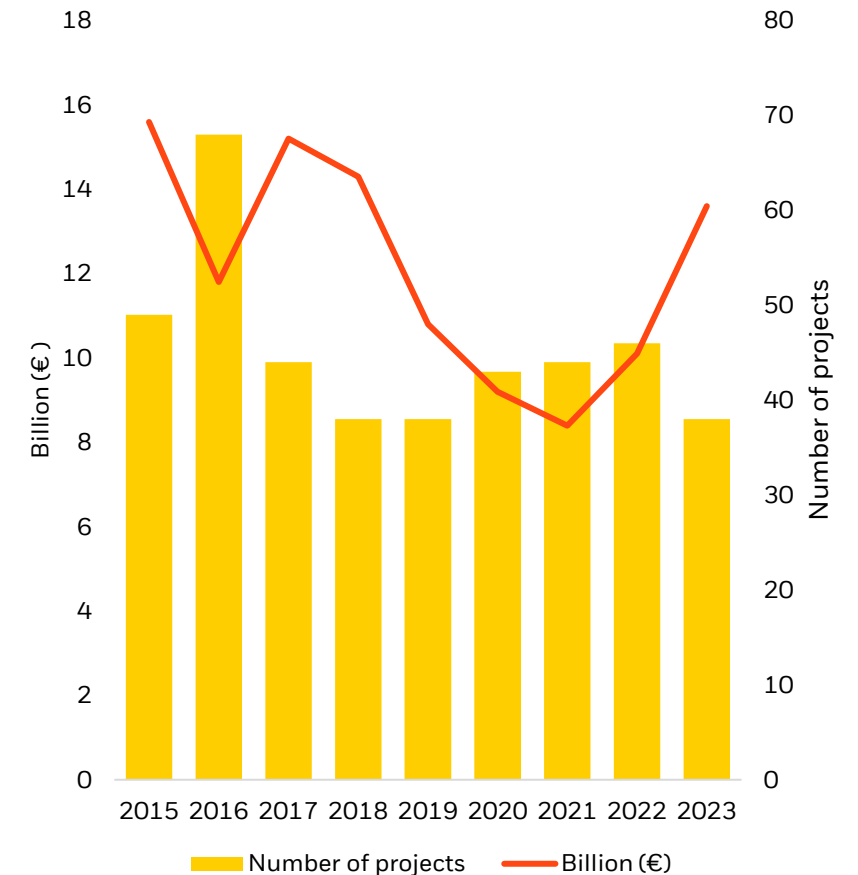
PPP in the U.S.

In the US, public-private partnerships account for just 1%-2% of infrastructure spending, compared with as much as 20% in some developed countries.² The 2021 Infrastructure Investment and Jobs Act allows private investors to come into more transportation infrastructure as operators.

It encourages public-private partnerships and includes provisions to reduce the requirements involved in partnering with the federal government.

Working together

Across Europe, there are billions in public-private partnerships every year³





Corporate capital expenditure

Every year, companies around the world spend hundreds of billions of dollars on communications, energy, transportation and other types of infrastructure. But corporate leaders face several challenges that can complicate their investment in the projects that are important to their growth.

Investing in necessary infrastructure is just one of many demands on a company's resources and is often not its core business consideration. But as the need for infrastructure investment grows, corporate managers have to find ways to pay for and maintain the assets.

We believe that partnering to fund infrastructure investments with a private capital provider will become an increasingly attractive option for corporates – especially at a time when forces such as digital transformation, the energy transition and nearshoring require greater amounts of infrastructure spending.

One way that a private investor can work with corporates is to take assets off a company's balance sheet. In many instances, even critical infrastructure can be owned, maintained and upgraded by a third party with specialist knowledge and experience.

This removes non-core assets and their servicing costs from a company's financials. It also helps focus management on strategic priorities.

Think of a chemical company, which requires a pipeline to deliver the feedstock it needs. The company's expertise – and its core business – is making chemical compounds, not delivering the

ingredients or managing the pipes. In exchange for a fixed fee, the company can simply use the pipeline and focus instead on what it does best.

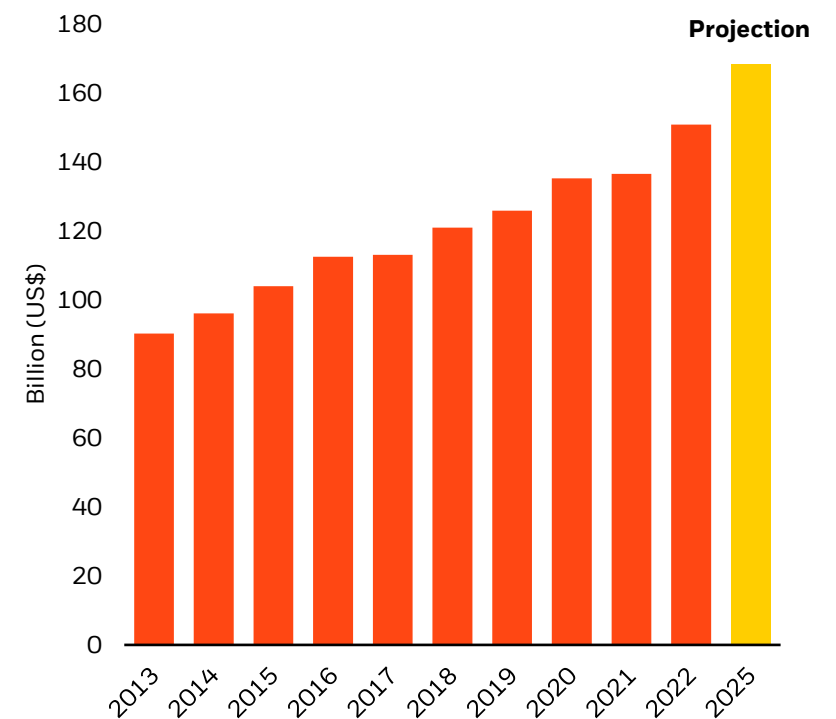
Another consideration is the cost of capital. Every corporation has finite resources, and allocating time and capital to infrastructure can come at the expense of other efforts.

For example, an energy company that uses outside investment to help pay for its pipelines can then devote its own resources to develop its gas reserves. Similarly, a technology company can bring in a financial partner to build and operate a hyperscale data center, freeing up money to invest in artificial intelligence research.

Private capital's resources, expertise and long time horizons are well-matched to the help these companies. In the following pages we look at different ways that private capital can help fund infrastructure projects.

Investment needed

Spending by public utilities companies is on the rise¹



Source: 1. EEI Finance Department, member company reports, and S&P Global Market Intelligence, July 2023. Chart represents total company spending of U.S. investor-owned electric utilities, consolidated at the parent or appropriate holding company. **The projections are illustrative in nature and do not express a forecast.**

How private capital can help

Private investors have the chance to be at the center of a transformative period for essential infrastructure. The confluence of technological advances, regulatory changes, and heightened demand is creating a fertile ground for high-growth investment opportunities.

From partnering with governments to acquiring physical assets outright, from forming joint ventures with infrastructure operators to developing bespoke debt structures, each type of investment plays a role in building and maintaining infrastructure, while offering a variety of risk-reward profiles for investors.



Laying and maintaining gas pipelines

With natural gas demand expected to rise, providers need capital to add capacity while managing existing lines.

Controlling stake

An ownership position of 50% or more in a specific asset or an operator allows experienced investors to assume greater control over strategy and development.

Joint venture

When investors and experienced operators co-own an asset, the investors can benefit from the expertise and competitive advantages of those established partners.

Mezzanine financing

This convertible structure offers investors the ability to convert debt to equity in the event of a default, with a risk profile that sits between senior debt and equity.

Getting a wind farm up and spinning

Renewable power is a prime example of the heavy capital expenditures and significant investment opportunity presented by the transition to a low-carbon economy.



Subordinated credit facility

Along with letters of credit, this can be used to fund repowering or expansion based on existing cashflows. It can offer higher yields than senior secured credit, though it's lower in repayment priority.

Equity bridge financing

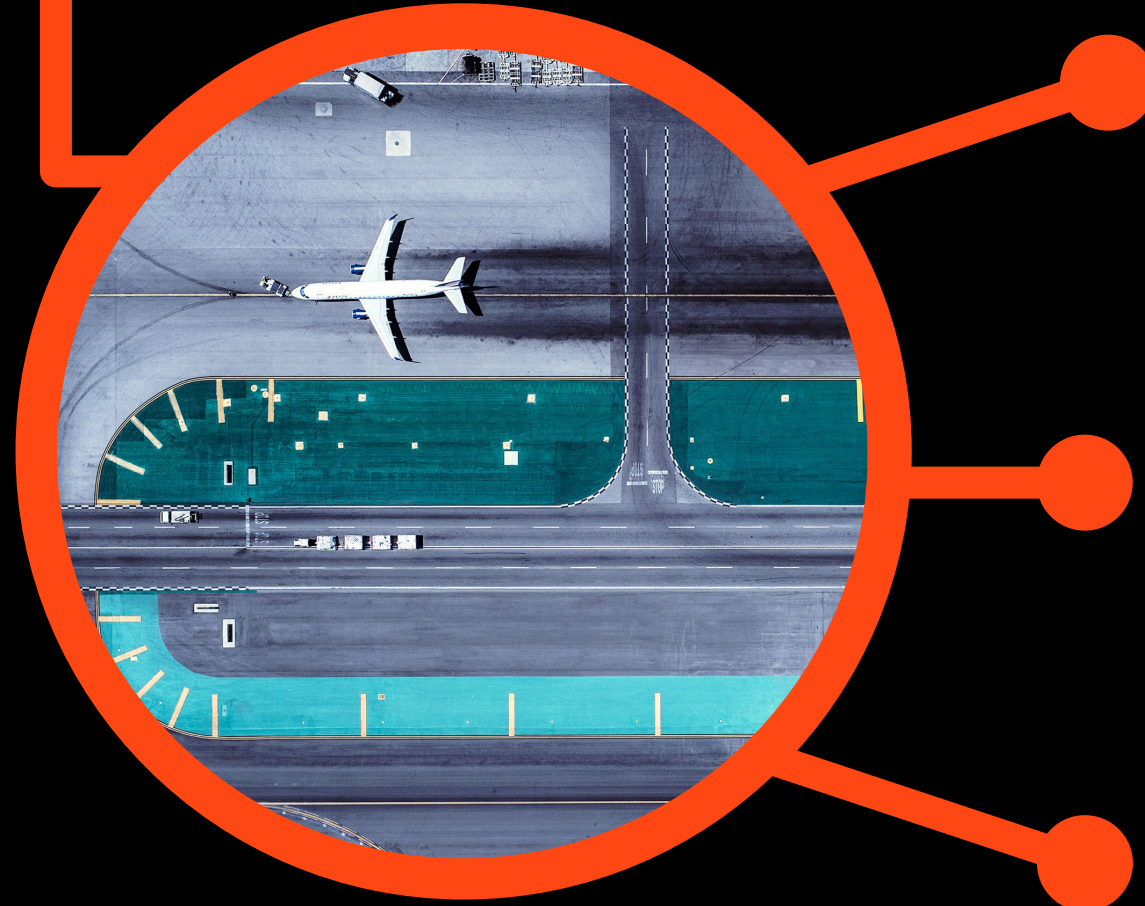
This can de-risk a project or ensure cashflow between equity commitments and final financing. Clean energy developers often take out tax-equity bridge loans, which they repay on realizing the project's federal tax credits.

Preferred equity

This structure of ownership comes with priority over common equity in receiving distributions and its participation in project profits.

Building and modernizing airports

Investors have more than one way to participate in these crucial transportation hubs.



Public-private partnership

By partnering with governments, investors offset construction and other risks with tax concessions, operating revenue, liability protection, and partial ownership of public services with near-monopoly status.

Minority ownership stake

A consortium framework among multiple investors is common for big-ticket projects, with each investor owning a stake in the asset.

Senior secured credit facility

Backed by specific collateral, such as a terminal, this can be used to fund expansion or renovations. It has priority in receiving repayments in case of default or bankruptcy.

Infrastructure in a portfolio

We believe that the infrastructure moment is a rising opportunity for investors. As the previous pages have shown, infrastructure encompasses a wide range of investment options and sectors; it's an asset class that can play a variety of roles within a portfolio.

As an asset class, infrastructure has traditionally been known for its stability. Many projects involve essential services that remain in demand regardless of economic conditions, and which generate steady, regular and predictable cash flows.

Portfolio view

The stability of infrastructure investments is underpinned by long-term contracts with reliable entities such as local or national governments or major corporations.

Contracts also typically provide for certainty of payments, offering clear visibility on future revenue streams. This all helps to make infrastructure a relatively low-volatility asset class. Another key advantage is the long duration of infrastructure assets. Physical projects such as bridges, highways, and power plants have long operational lives.

These factors provide investors with extended periods of revenue generation, making some infrastructure assets suitable for pension funds or insurance companies that have long-term liabilities, as well as for investors saving for retirement.

Infrastructure can also help diversify a portfolio. It has relatively low correlation to traditional asset classes due to its idiosyncratic characteristics – it typically doesn't move in step with economic cycles and its service contracts are often inflation-linked. This reflects in part the complexity and scale of the investments – which often involve substantial upfront capital – and the fact that they are usually disconnected from trends in financial markets.

As a result, infrastructure holdings can help in turbulent markets, where many investments have historically underperformed.

Key role

As we have seen, infrastructure plays a crucial role in many of the structural changes reshaping our world. In our view, investors in the asset class are positioned to benefit from these mega forces.

Investments in renewable energy infrastructure such as solar and wind farms are essential as the world electrifies. These investments are critical as governments and businesses strive for energy security and try to meet decarbonization goals.

They also offer substantial growth potential driven by global energy policies and increasing consumer demand for low-carbon solutions. The digital transformation further underscores the importance of infrastructure investment.

The expansion of digital services has led to an increased demand for robust digital infrastructure, including data centers and broadband networks. As technology continues to advance, the need for extensive and reliable infrastructure will continue to grow, presenting new and potentially rewarding opportunities for investors.

An inflation hedge

Infrastructure assets typically offer protection against inflation – a critical consideration for long-term investors.

The revenue streams from investments such as toll roads usually include clauses that adjust payments based on inflation indexes, ensuring that returns do not erode when prices rise. This makes infrastructure an appealing option for investors with longer time horizons.

More immediately, this characteristic also makes infrastructure attractive during periods of higher inflation, which many countries are currently experiencing. At such times, infrastructure can be a ballast in portfolios, providing an inflation hedge that is hard to find in other asset classes.



Infrastructure investment will also be key for societies experiencing demographic changes, not least in developing economies with rapidly growing populations and increasing urbanization.

Investment options

There are several ways for investors to engage with infrastructure, depending on their risk appetite, liquidity needs and product preference. As we saw on pages 24 to 27, there's a variety of investment opportunities within the asset class.

Infrastructure debt offerings range from bonds issued by project companies to specialized loans structured for infrastructure financing. Equity investments can be anything from shares in a public company to full ownership of operating assets or related businesses.

Institutional and high-net-worth investors can access the infrastructure opportunity via private funds or separately managed accounts. Secondaries, which buy and sell holdings of assets or private funds at attractive pricing while offering more liquidity, are also an option. Individual investors can buy into infrastructure mutual funds or ETFs that invest in publicly-listed companies.

Private funds can directly invest in projects, whereas public companies, such as utilities or construction firms, provide a different opportunity to benefit from the growth in infrastructure development.

We also see a broader opportunity set around public companies that will be providing the materials, the equipment and the services to enable this infrastructure moment.

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