

Allianz Research

Green infrastructure investment

The public sector cannot do it alone

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EXECUTIVE SUMMARY



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- **The war in Ukraine underscores that scaling up investment in climate-smart infrastructure is necessary to ensure energy and food security as we transition to a lower-carbon future.** Well-planned green infrastructure projects not only raise potential output growth and enhance resilience but can also help reduce the carbon footprint that comes with economic progress.
- **However, current public investment plans alone will not be sufficient for strategic rebalancing toward climate-friendly infrastructure.** Important investment gaps remain, especially in electricity and networks (in Europe ranging from the 1.6% and 1.3% of GDP per year in Spain and France, respectively, to 0.6% and 0.4% in Italy and Germany), where investment needs are the largest. However, public investment can be a catalyst for greater private participation, especially in green infrastructure. We estimate that a one percentage-point increase in public investment, private investment rises by 0.51pp. A green crowding-in “multiplier” is even larger.
- **Greater private sector participation in the planning, construction and operation of infrastructure can help mitigate public sector constraints in funding the green transition.** Life insurers and pension funds in particular will be critical to mobilizing private capital. Infrastructure investment can bring predictable yields and stable cash flows, providing a natural match to their long-term liabilities.
- **Mobilizing long-term finance will require creating an enabling regulatory environment for green infrastructure investment.** Our findings based on a comprehensive dataset of project loans suggest sufficient scope for lower capital charges to be applied to infrastructure investment, which have a more favorable risk profile than corporate debt. Especially “green projects” seem to default only half as often over a 10-year period as “brown projects”, with a greater difference in emerging markets relative to advanced economies. Capital charges that recognize the declining downgrade risk of infrastructure debt over time could potentially free up costly capital in an environment of monetary tightening; this would help mobilize resources to finance infrastructure—thus promoting the green transition.

The current energy crisis underscores the need to scale up green infrastructure investment

The Covid-19 crisis highlighted the need for better infrastructure to enhance socio-economic resilience.¹ Now, the implications of the war in Ukraine underscore that scaling up investment in climate-smart infrastructure is essential for energy and food security as we transition to a lower-carbon future.² As climate action remains critical over the next decade, it is important to direct infrastructure investment towards sustainable, inclusive and resilient economic outcomes amid rising geopolitical challenges.

Governments are increasingly recognizing infrastructure investment as the linchpin in defining effective green transition pathways. Infrastructure currently accounts for more than two-thirds of global greenhouse gas emissions on average. Thus, well-planned infrastructure projects with a greater focus on climate change and the broader sustainability agenda not only raise potential output growth and enhance resilience but can also help reduce the carbon footprint that comes with economic progress.

However, current public investment plans alone will not be sufficient to close the estimated green investment gap. As current plans do not cover all the sectors where green investment is needed (e.g. water, waste or buildings³), we have calculated sectorial investment gaps instead of a single one. These internal calculations allow us to identify the needs of each sector to achieve different emissions targets,⁴ and to compare them with the distribution of the new plans (Figure 1).⁵ The various infrastructure stimulus plans launched during the Covid-19 crisis seem to partially address these changes. Comparing the actual investment needs by sector to current plans, we find that the latter seem to fall short in electricity and networks, where investment needs are the largest.⁶ We estimate the largest investment gap for the green transition in public infrastructure in the US at about 1.7% per year. In Europe, the largest investment gaps are in Spain and France (1.6% and 1.3% of GDP per year, respectively), with more moderate numbers in Italy (0.6%) and Germany (0.4%)⁷. Germany can only meet estimated investment needs after considering the impulse from the “Easter Package” (Osterpaket) – provided that funds are allocated efficiently, and projects are implemented effectively (Figure 2).

¹ In our recent [report](#) on post-Covid public infrastructure investment, we estimated the investment need and potential crowding-in effect on private investment.

² For instance, according to our [assessment](#) of Germany’s Easter Package (“Osterpaket”), the planned investment in climate-friendly infrastructure remain insufficient to meet the country’s ambition in tackling climate change.

³ The new investment plans do partially cover the buildings sector, but they focus on residential rather than public buildings. To ensure consistency, as we exclude residential investment from public infrastructure investment, we have excluded those parts in our analysis.

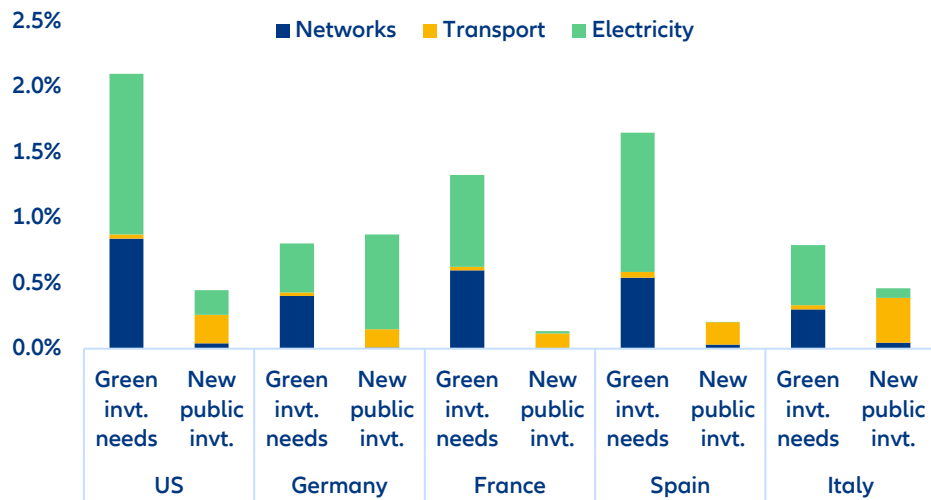
⁴ For an in-depth analysis of specific sectorial paths of emission reductions please see our reports: [buildings](#), [agriculture and forestry](#), [utilities](#), [transport](#) and [energy](#). Nonetheless, this paper uses 1.5°C as the reference climate target.

⁵ In 2017, the Global Infrastructure Hub (GIH) quantified a USD15trn investment gap until 2040 (with current estimates now placing this as high as USD40trn out to 2030 only).

⁶ As the new public initiatives do not always differentiate what part of the public investments is infrastructure, we have put the focus on those that typically are infrastructure intensive.

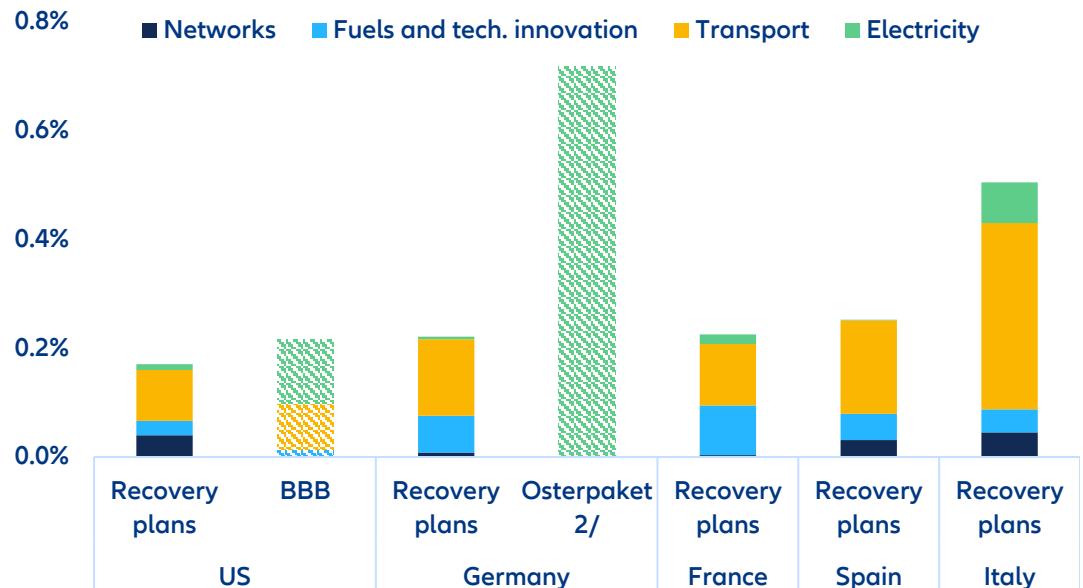
⁷ These figures are calculated by sector and then aggregated, without the possibility of offsetting a gap in one sector with an “excess investment” in another. For instance, in the case of Germany, we calculate a gap of 0.4%, mainly coming from the networks sector, even though there is a “surplus” in the electricity sector large enough to offset it.

Figure 1: Annual green public infrastructure investment (by sector, % of GDP)



Sources: IEA, Global Infrastructure Hub, Allianz Research. Note: "invt."=investment; most of the investment plans do not go beyond 2027 while the needs are calculated for the full decade until 2030 – and more for the 2031-2040.

Figure 2: Announced annual green public infrastructure investment since 2020 (% of 2021 GDP) 1/



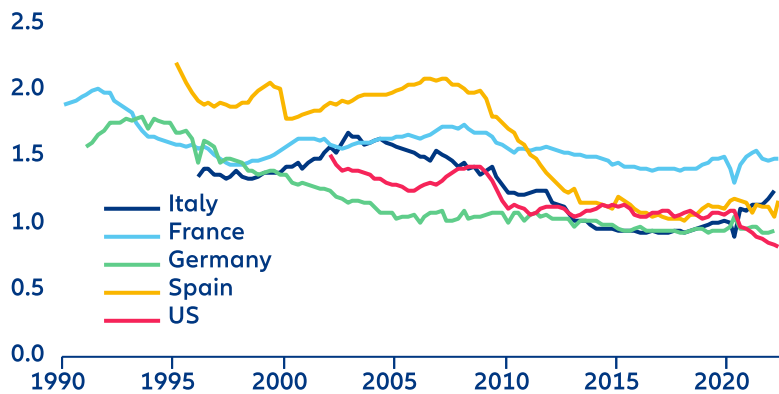
Sources: IEA, Allianz Research. Notes: BBB=U.S. Build Back Better Framework; 1/ Although the plans contain other items (e.g. social transition), we have only selected those that relate to public infrastructure including the major provisions through the Inflation Reduction Act; 2/ The German Easter Package ("Osterpaket") involves a significant investment in electricity, which is mostly public since the government will take over the renewable energy levy from the utilities companies.

Since most infrastructure represents a common good, the financial commitment to close this gap will largely fall on the public sector. However, budgeted infrastructure spending has been declining for years (Figure 3). The implications of the decades-long underinvestment in infrastructure are now painfully felt at a time when more investment in sustainable

infrastructure is essential to address climate change. Reversing this secular decline will require maximizing the positive impacts of green infrastructure investment by increasing the scale, efficiency and affordability of such investment.⁸

Given the prevailing investment gap, we need a strategic rebalancing toward climate-friendly (or “green”)⁹ infrastructure investments. Last year’s [G7 Leaders’ Summit in the UK](#) delivered a strong commitment to supporting more investment in infrastructure, and the way this can help combat climate change. This theme was continued under [Germany’s G7 Presidency](#) on achieving the Sustainable Development Goals (SDGs) of the 2030 Agenda.

Figure 3: Public infrastructure investment (% of GDP)



Sources: OECD, Refinitiv, Allianz Research.

Note: the calculation only accounts for gross fixed capital formation in “other buildings and structures”.

(Green) crowding-in effects on private investment

Public investment can be a catalyst for greater private participation, especially in green infrastructure. Our calculations show that for each percentage-point increase in public investment, private investment rises by 0.51pp. However, this multiplier varies depending on several factors, including differences in the output gap (the larger the gap, the higher the multiplier) and interest rates (the lower the rates, the higher the multiplier).¹⁰ A green crowding-in “multiplier” would be even larger. The fact that the green investment gap is larger than in other parts of the economy, and that these kinds of investments are mostly in an early stage of implementation, suggests a higher return on capital. Table 1 shows how the crowding-in effect would help narrow the investment gaps in the subset of analyzed sectors.

⁸ For instance, under the auspices of the G20, the Global Infrastructure Hub (GIH), in partnership with the OECD and the World Bank, is creating a framework to achieve these goals, which continues and complements previous G20 initiatives like [the Roadmap to Infrastructure as an Asset Class](#) and the [G20 Sustainable Finance Working Group Sustainable Finance Roadmap](#), among others.

⁹ We apply the attribute “green” in relation to the investment that would be needed to limit the temperature increase to 1.5°C above pre-industrial levels.

¹⁰ Further details on the crowding-in effect can be found in Appendix I.

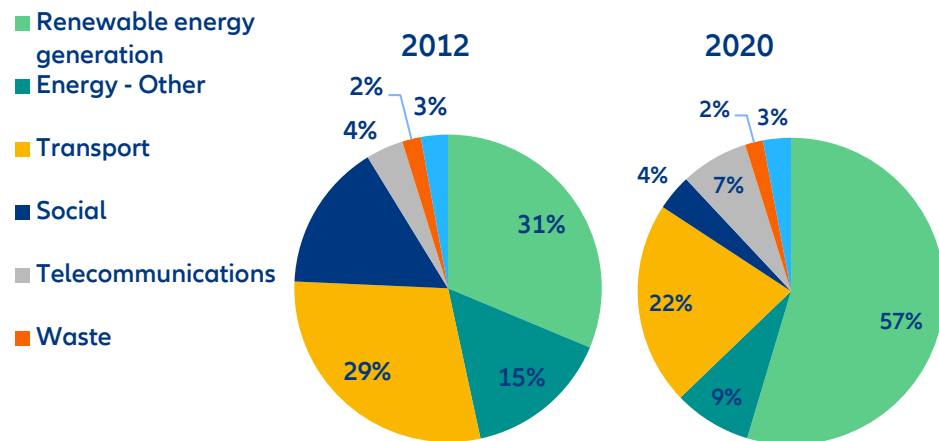
Current private participation is concentrated in the energy and transport sectors, which allows some rent extraction through price discrimination. Both sectors represent about half of the total private infrastructure investment in the Eurozone and the US—an increase of almost 20pp over the last 10 years. The largest increase of private participation in renewable energy projects was in Italy, Spain and the US, especially in solar and wind; however, there has been also an increasing rotation towards renewable energy projects in France and Germany. Representing a much smaller share – and outside our definition of green infrastructure, the telecommunications sector has seen an important relative increase of private investment (Figures 4 and 5).

Table 1: Green infrastructure investment needs vs. public plans and crowding-in effects

Country	Green investment needs (% of GDP)	Additional public investment (% of GDP)	Crowding-in private investment (% of GDP)
Germany	0.8%	0.87%	0.51%
France	1.33%	0.13%	0.08%
Italy	0.79%	0.46%	0.25%
Spain	1.65%	0.20%	0.11%
US	2.1%	0.45%	0.21%

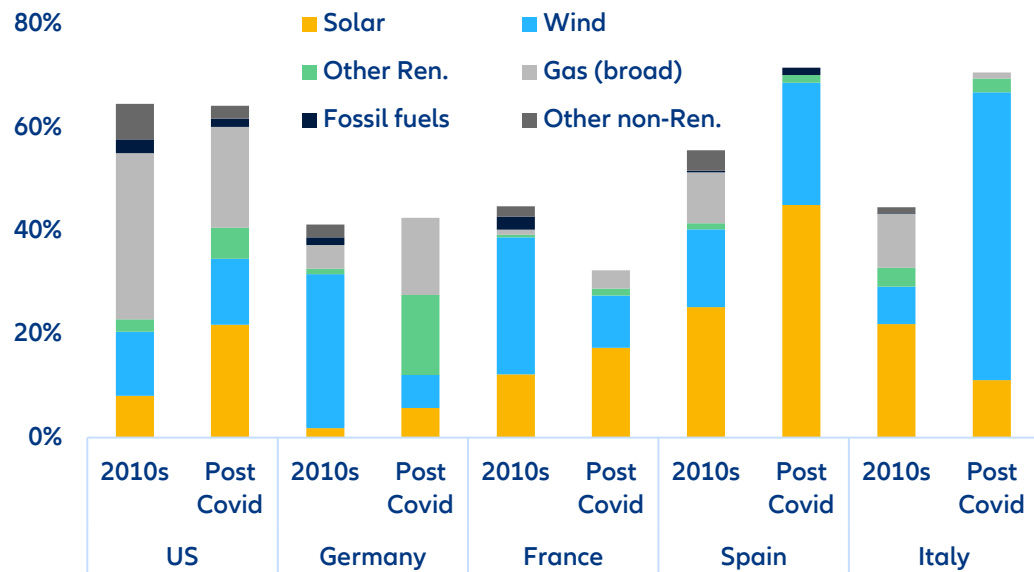
Sources: Refinitiv, Allianz Research. Note: covered sectors are transport, electricity generation and electricity networks.

Figure 4: Advanced economies—sectoral breakdown of private infrastructure



Sources: Global Infrastructure Hub, Allianz Research. Note: “advanced economies”= Germany, France, Italy, Spain (EZ-4) and US; shares calculated based on the aggregated cost of the projects.

Figure 5: Private investment in energy infrastructure (% over total private infrastructure investment)



Sources: Refinitiv, Allianz Research. Notes: "Ren." is used as abbreviation of renewables in "Other ren." and "Other non-ren"; the category "gas" includes LNG and regasification plants; the category "other renewables" includes geothermal, biomass and hydroelectric.

A strong case for more private participation in infrastructure investment

Greater private sector participation in the planning, construction and operation of infrastructure can help mitigate constraints on public budgets and investment capacity.¹¹ In this context, the concept of "quality infrastructure" is becoming ever more important, notably for institutional investors, whose risk tolerance is limited and whose willingness to assume the management of assets is low.¹²

However, increasing the availability of external finance requires transforming the financial sector so that it better aligns the financing of the economy and the liabilities-driven investment of long-term investors.¹³ More investment in climate-friendly infrastructure will invariably encourage a practice of finance that (i) fully integrates sustainability considerations into its operations, including the full costing of positive and negative externalities from climate change under comprehensive disclosure, and (ii) facilitates the allocation of savings to productive capital that directly contributes to sustainable growth for resilient societies.

Life insurers (and pension funds) will be critical to mobilizing private capital. Infrastructure investment can bring predictable yields and stable cash flows, providing a natural match to their long-term liabilities. This has provided the impetus for the [Allianz Infrastructure Debt Platform](#) to collaborate on preparing, structuring, and implementing complex infrastructure projects that no single institution could handle on its own.¹⁴

¹¹ For instance, Allianz Global Investors launched the [Emerging Market Climate Action Strategy \(EMCA\)](#) in a public-private partnership with the European Investment Bank.

¹² Quality means obtaining assets that are economically sound, are built and kept safe, and respond to sustainability requirements, providing additional layers of resilience to communities.

¹³ See also IMF (2022).

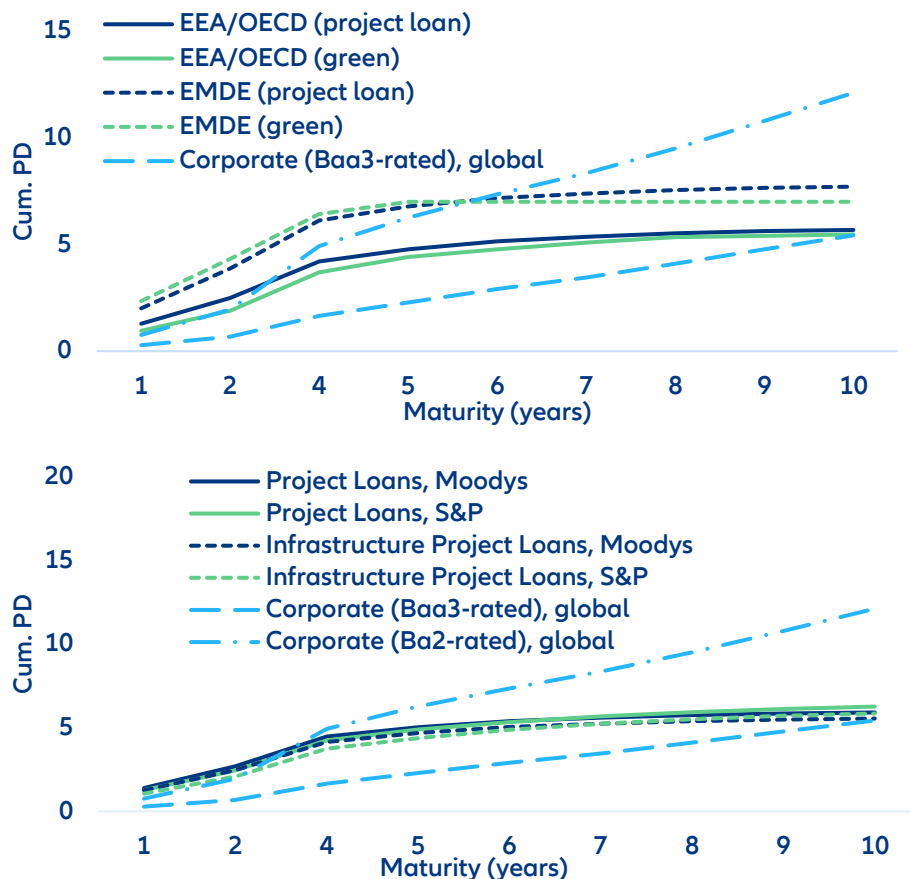
¹⁴ This initiative is also working on de-risking certain aspects of the infrastructure project life cycle.

However, the flow of private capital into infrastructure is stagnating (GIH, 2021), with infrastructure facing greater competition from other asset classes as investors demand higher risk premia for less liquid assets as financing conditions have started tightening. Unfortunately, the actual credit risk of infrastructure is often not well understood (Jobst, 2018a); in fact, the resilient credit performance of infrastructure is not reflected in most regulatory frameworks, which tend to follow the historical default experience of corporate exposures.

A more differentiated regulatory treatment of infrastructure investment

Creating an enabling regulatory environment for infrastructure investment can help mobilize long-term finance from long-term investors. Several G20 countries—and other countries with important insurance sectors—have only partial treatment, or no special treatment, for infrastructure. For instance, solvency regimes require insurers to allocate sizeable amounts of capital to cover infrastructure debt investments, especially for unrated transactions.

Figure 6. Infrastructure project loans—cumulative default probability (%)

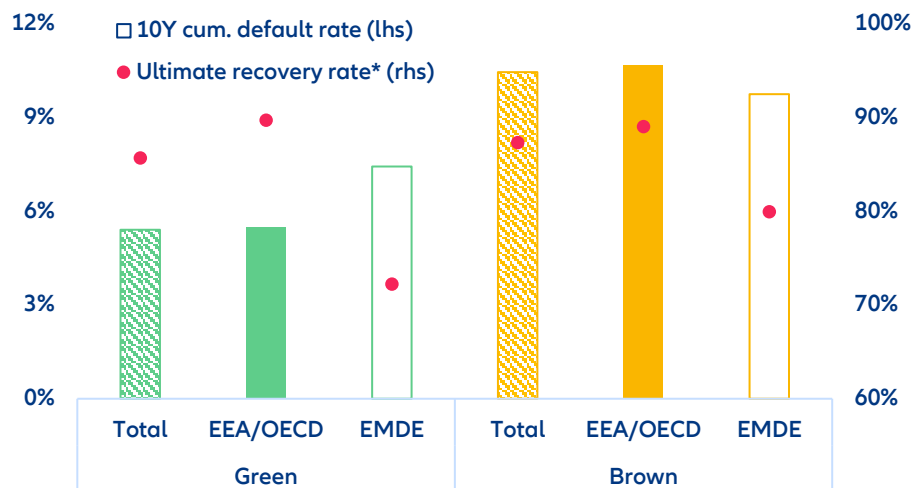


Sources: Jobst (2018a and 2018b), Jobst and Pazarbasioglu (2018), Moody's Investors Service, Standard and Poor's, Allianz Research. Note: PD= probability of default; the first chart shows data for all and only "green" infrastructure project loans whereas the second chart compares the performance of project loans in separate databases compiled by Moody's and S&P, respectively; "green" denotes project finance in industry sectors that meet the use-of-proceeds eligibility criteria of the ICMA Green Bond Principles; the sub-samples refer to (i) all EEA and OECD member countries ("EEA or OECD") and (ii) all non-high income countries ("EMDE") according to the sample selection in Moody's Investors Service (2018) over a study time period between 1995 and 2020.

So far, the lack of data on the credit performance of infrastructure projects has hindered greater comparability to corporate exposures and a more differentiated regulatory treatment. Improving the availability of performance data on infrastructure projects for governments, regulators and investors would help widen the perimeter of a more favorable regulatory treatment. Following the earlier reduction of capital requirements for qualifying infrastructure investment by European insurers, efforts are underway in other countries to extend this approach.¹⁵ This will be critical to bridging the current infrastructure investment gap, particularly in developing economies. Two reports specifically encourage the review of the regulatory treatment of infrastructure investment:

- The Financial Stability Board’s [evaluation of the impact of regulatory reforms on infrastructure finance](#). It was submitted to the G20 at the Buenos Aires Leaders’ Summit as part of its framework for the post-implementation evaluation of the G20 financial regulatory reforms.
- The [Report of the G20 Eminent Persons Group \(EPG\) on Global Financial Governance](#). It recommends reviewing the regulatory treatment of infrastructure finance for long-term institutional investors.

Figure 7. Infrastructure project loans—historical credit performance



Sources: Jobst (2018a and 2018b), Jobst and Pazarbasioglu (2018), Allianz Research. Note: */ the definition of “ultimate recovery rate” closely matches the definition of recovery rate in the Basel Accord framework for banks and Solvency II for European insurance companies; “green” denotes project finance in industry sectors that meet the use-of-proceeds eligibility criteria of the ICMA Green Bond Principles; the sub-samples refer to (i) all EEA and OECD member countries (“EEA or OECD”) and (ii) all non-high income countries (“EMDE”) according to the sample selection in Moody’s Investors Service (2018) over a study time period between 1995 and 2020.

Our findings based on new data from Moody’s Investor Services and Standard and Poor’s (Jobst, 2018a) suggest sufficient scope for lower capital charges to be applied to infrastructure investment—through project loans—without altering the current (or planned)

¹⁵ Similarly, the GIH is [currently forming a coalition of banks](#) to negotiate a risk-adjusted regulatory capital requirement for infrastructure-project finance as part of the reforms to the Basel framework.

calibration methods. While the initial default rate exceeds the level for investment-grade corporates, it steadily declines as the loans mature. After about five years, the marginal default rate is consistent with solid investment-grade credit quality, creating a distinctive “hump-shaped” risk profile (Figures 6 and 7). The recovery rate is high, comparable to that of senior secured corporate loans. This favorable credit performance is even more pronounced for projects in sectors that would fall within the scope of the [eligibility requirements for green bonds](#) (Jobst, 2018b). In fact, on a global basis, green infrastructure projects seem to default only half as often over a 10-year period as “brown” projects, with a greater difference in emerging markets relative to advanced economies. Capital charges that recognize the declining downgrade risk of infrastructure debt over time could potentially free up capital; this would help mobilize resources to finance infrastructure—thus promoting the green transition. Hence, we believe there is scope for a discussion about how solvency regimes can better reflect the special features of infrastructure to reduce the regulatory cost to long-term regulated investors.

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Appendix I. Methodology for measuring the crowding-in effect

To simplify the adjustments at country level, we take as a reference the “conjunctural factors bucket approach” by the IMF for the calculation of fiscal multipliers. For simplicity, we take the output gap and the yields of the 10Y bond as indicators of the business cycle and financing conditions. Multipliers tend to be larger when the economy is far from potential and when the credit conditions are more favorable.

Table A1.1. Crowding-in effects of public sector infrastructure investment in private sector (non-residential) infrastructure investment (1Y).

	Base coefficient	Output gap ^{1,2}	10Y Yield ³	Final coefficient
France	0.51	-2.1%	1.73	0.56
Germany		-0.3%	1.12	0.59
Italy		-2.0%	3.35	0.53
Spain		-3.8%	2.28	0.54
US		-1.2%	2.93	0.47

Sources: Refinitiv, Allianz Research. 1/ As calculated by the IMF for Q1 2022. 2/ Scores and yields are not taken directly into the model, but via z-scores relative to historical values (e.g. although Spain has a large output gap, it is smaller than it was in 2010s). 3 / as of July 15, 2022.

However, this approach does not consider the green nature of the investment. This multiplier could be therefore refined by using the green gap, and—in the case they are different—the credit conditions for green investments. Elements that would make the green crowding-in effect larger are:

- Existing infrastructure is operating under capacity. This does not only refer to the green gap, but also to the existence of labor that would be capable of working with the technology, of private savings and of facilities that are not operating at 100%;
- Government should intervene directly by financing the infrastructure that by its nature does not attract private investment and attract investments in those areas where private investor can be attracted (via tax cuts, subsidies); and
- Appealing return on investment.

These assessments are, as always, subject to the disclaimer provided below.

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