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Do Climate Targets Affect Lending at the World Bank?

CHARLES KENNY

Abstract

The World Bank has "ambitious" climate targets that have been accompanied by a growing proportion of its lending being labeled as climate finance. At the same time, the way that finance is defined makes it difficult to know how different the World Bank's portfolio would look absent a climate finance target. Similarly, the World Bank has introduced a Shadow Price of Carbon for use in project analysis, but it does not advertise cases (if any) where the use of the SPC has changed investment choices or project design. This paper takes a brief look at the World Bank's lending portfolio as well as the economic analysis sections of recent World Bank project appraisal documents to see if they can provide any evidence on the question, do climate targets and carbon prices change the portfolio? The answer to "can they provide evidence' is 'suggestive at best." But while there is some evidence of some impact, there are also reasons to doubt it is large.

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Charles Kenny
Center for Global Development

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Accompanying data is available here.

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CENTER FOR GLOBAL DEVELOPMENT
2055 L Street, NW Fifth Floor
Washington, DC 20036

1 Abbey Gardens
Great College Street
London
SW1P 3SE

www.cgdev.org

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Introduction

The World Bank has 'ambitious' climate targets that have been accompanied by a growing proportion of its lending being labeled as climate finance. At the same time, the way that finance is defined makes it difficult to know how different the Bank's portfolio would look absent a climate finance target. Similarly, the Bank has introduced a Shadow Price of Carbon (SPC) for use in project analysis, but it does not advertise cases (if any) where the use of the SPC has changed investment choices or project design.[1] This note examines the World Bank's recent lending as well as the economic analysis sections of World Bank project appraisal documents (PADs: the reports discussed with the World Bank's board that lays out the case for financing a project) to see if they can provide any evidence on the question: do climate targets and carbon prices change the portfolio? These sources suggest some evidence of impact, but it appears that impact has been limited.

World Bank rhetoric on its role in climate finance and climate change policy can seem bifurcated. On the one hand the SPC should "inform decision-making … on whether or not to undertake a project."[2] The finance targets are "ambitious goals" that involve active deployment to both adaptation and mitigation. Every project appraisal includes a Paris Alignment Assessment where the project team must answer questions including "is the operation consistent with the country climate commitments," and "are there other means of achieving the Development Objective(s) with lower emissions." In part to support financing targets, the Bank houses a number of climate related Trust Funds designed to influence project choice and design including the Climate Investment Funds, the Energy Sector Management Assistance Program, and the Global Facility for Disaster Reduction and Recovery. Again, (until recently) the Bank has proudly proclaimed a growing share and volume of 'climate finance' in its operations.[3]

At the same time, the Bank can downplay the significance of its role.[4] It is also the case, according to the World Bank, that IBRD and IDA projects "are not climate projects." The Bank does not "finance projects that are justified only on the grounds of their global climate mitigation impacts: our projects must be justifiable based on development needs that are prioritized locally." That rhetoric suggests

1 https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099553203142424068.

2 From the guidance on SPC "The economic analysis of projects is one of the many considerations that inform decision-making by the WB and its clients on whether or not to undertake a project. [The Shadow Price of Carbon] is not intended to provide a criterion for project selection; rather, it provides a methodology to ensure that the management and the Board have the information needed to make decisions. It is possible that an emission-increasing project (e.g., new transport infrastructure) is economically beneficial from a purely domestic point of view but is not economically viable when the global (negative) carbon externality is accounted for … Consideration may be given to exploring whether lower-carbon options can have country ownership (for example, through inclusion in a country's Nationally Determined Contribution), or whether incremental costs can be covered by concessional finance. If the team nevertheless decides to retain the initial project design, it can provide more information to explain the decision, such as constraints to selecting lower-carbon alternatives and non-monetized benefits of the selected project."

3 https://www.brettonwoodsproject.org/2024/04/the-world-bank-and-climate-finance-success-story-or-a-new-era-of-green-structural-adjustment/.

4 To quote President Banga on the 50–50 mitigation adaptation target "these are just random numbers I pulled out … because I wanted the Global South to not feel that I was ignoring their desires and concerns".

the Bank finances mitigation and adaptation only where (or even because) there is no tradeoff (or where there are full synergies, if you would rather): where adaptation measures are simply 'good development planning' and low-carbon technologies are the cheapest option.

While there are surely many projects that are good for the climate and good for development, if the World Bank were going to maximize emissions reduction for a given dollar of investment as its top priority for the $20 billion in mitigation finance it said it provided in FY2024, the portfolio would look different from the past. Similarly, if the top priority of adaptation finance was adapting to climate impacts, the portfolio would look different again.[5]

But if what the Bank was doing was using lower-carbon energy generation in the energy projects it was going to finance anyway, using the low carbon energy solution because they are also low cost, or helping farmers deal better with drought risks as part of an agriculture project it was always planning to do in a particular country, then its portfolio *wouldn't* necessarily look all that different. And this is apparently what the World Bank (now) emphasizes it is doing.

How might we tell if climate finance goals and the shadow price of carbon have been ambitious or marginal in remaking the World Bank's portfolio? At a more significant level of ambition:

- Allocation of total finance across countries might be shifted towards (mitigation projects in) the largest emitters and (adaptation projects in) the most at risk.
- Sectoral allocation in the World Bank's portfolio as a whole might shift towards sectors where mitigation and adaptation responses are likely concentrated.
- Climate investments might see lower predicted rates of return (ERRs) excluding their impact on emissions.
- Projects marked as mostly mitigation finance would generate a comparatively large share of their economic return from reducing emissions.
- Projects might be clearly selected or rejected on the grounds of the SPC, and technological solutions within projects might be selected because they are lowest emitting, not lowest cost.

The next sections report on existing evidence and provide some new analysis around these potential measures of ambition, as well as providing an aside on the efficacy of mitigation spending.

Allocation across and within countries and sectors

The country portfolio of a climate-dedicated institution would look different from one focused primarily on achieving development outcomes – likely concentrated in upper-middle income countries where the mitigation challenge is greatest and the costs of zero-carbon technologies

5 See, i.a. https://www.cgdev.org/blog/climate-finance-fixable.

are lower, and more heavily focused on the poorest countries and small island states with greater adaptation needs.[6]

At the same time, we shouldn't expect to see either an impact of an SPC or climate finance targets at the country allocation level. IDA financing allocation algorithms haven't changed significantly because of climate concerns while IBRD lending is driven by client demand far more significantly than by any limits or allocation mechanism set by World Bank policies—even if various trust funds might encourage climate friendly investments.[7]

Regarding allocation of finance tagged as climate across countries, the mitigation/adaptation split has favored mitigation at every income level. Although recent data does suggest that the split is less skewed to mitigation in the poorest countries, previous CGD work has found no link between the proportion of IDA financing to a country reported as adaptation finance and a measure of the comparative risk countries face from the impacts of climate change, and that the most vulnerable countries actually received much less climate finance per capita than those with more adaptive capacity.[8] Meanwhile, absolute volumes of mitigation spending are focused in lower-middle income countries – on the basis of emissions volumes, one would expect them to be considerably focused in upper-middle income countries. World Bank mitigation finance per unit of emissions is nearly five times higher in lower middle-income countries than upper middle-income countries.[9]

Turning to sectoral allocation, a focus on climate concerns would suggest more financing for infrastructure (and in particular electricity) and agriculture.[10] But if these are the 'climate' sectors, a changed lending pattern doesn't jump out from the last ten years of data (Table 1), where the share of the most climate-relevant sectors has if anything been declining.

Rising volumes of World Bank reported climate finance since the 2015 Paris agreement have been driven by projects where less than fifty percent of finance was tagged as climate-related, and such projects appeared more often in sectors traditionally unrelated to climate finance. There was no upward trend in the number of above 50 percent mitigation or adaptation projects, but the proportion

6 See: https://www.cgdev.org/publication/crisis-climate-and-development-finance.

7 https://ida.worldbank.org/en/financing/resource-management/ida-resource-allocation-index; https://www.cgdev.org/blog/if-we-want-world-bank-solve-global-challenges-it-has-be-bigger-also-more-cuddly.

8 Guido Núñez-Mujica, Vijaya Ramachandran, and Scott Morris. 2023. "What Counts as Climate? Preliminary Evidence from the World Bank's Climate Portfolio." CGD Policy Paper 296. Washington, DC: Center for Global Development. https://www.cgdev.org/blog/world-bank-and-climate-projects-matter-definition; https://ourworldindata.org/inequality-co2; https://www.cgdev.org/blog/who-gets-world-bank-climate-money-exploration-adaptation-financing-lower-income-countries. Nancy Lee, Samuel Matthews, and James Reid. 2025. "Does World Bank Climate Adaptation Finance Go to the Most Vulnerable Countries?" CGD Policy Paper 355. Washington, DC: Center for Global Development.

9 https://www.cgdev.org/blog/world-bank-and-climate-projects-matter-definition; https://ourworldindata.org/inequality-co2.

10 The MDB climate finance report suggests about 69 percent of climate finance devoted to particular sectors went to energy agriculture water and sanitation, and transport. https://thedocs.worldbank.org/en/doc/3077331569469f690c6e82b35052766c-0020012024/original/2023-Joint-Report-on-MDB-Climate-Finance.pdf.

of projects suggesting *any* adaptation finance climbed from 7 to 86 percent 2010–2021 and *any* mitigation from 12 to 78 percent, mostly driven by projects with a less than 25 percent climate share.[11]

This could be through some combination of mainstreaming (adding adaptation and mitigation components to projects largely concerned with other activities) and working harder to find project components that could classify under the rules (scoring as climate finance activities that would previously have gone unscored).

TABLE 1. World Bank commitments by sector as a percentage of total, FY 2015–24

Sector	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24
Agriculture Fish/ Forest	7.9	5.3	6.6	8.5	8.5	6.4	6.3	10.6	11.5	6.5
Education	8.5	7.0	6.8	9.6	8.1	8.9	8.4	4.8	5.1	6.4
Energy and Extractives	11.3	16.2	15.0	15.1	14.0	9.0	9.3	9.6	14.1	17.4
Financial Sector	9.6	6.8	7.4	2.8	7.0	7.3	8.6	4.6	7.5	7.1
Health	7.3	5.2	5.8	9.1	7.6	14.2	9.7	14.9	7.4	10.1
Industry	5.6	9.1	14.8	11.5	9.6	8.4	7.8	6.0	6.3	5.4
ICTs	0.8	0.6	2.4	1.6	3.1	3.6	2.9	2.5	3.2	4.2
Public Admin	13.9	14.4	15.9	15.3	18.7	14.7	16.9	17.9	23.7	18.0
Social Protection	10.9	8.4	6.4	8.9	9.5	15.4	16.8	11.6	10.1	11.3
Transport	12.7	14.9	13.8	7.5	7.1	5.9	7.0	11.6	4.9	8.0
Water & San	11.4	11.9	9.7	10.0	7.0	6.3	6.4	5.8	6.3	5.5
Climate Sectors	***43.3***	***48.3***	***45.1***	***41.1***	***36.6***	***27.6***	***29.0***	***37.6***	***36.8***	***37.4***

Source: FY24 and FY19 World Bank annual reports.

Project selection and design – PAD details

To analyze project-level changes, I first examine World Bank project appraisal from 50 nonrandomly selected PADs, and then analyze a dataset of discount rates and economic rates of return from all World Bank projects with a climate tag in 2024.

Regarding project appraisal document language, using the World Bank's document search I examined three sets of PADs:

- First, to look at recent projects, searching for investment project financing documents containing the word 'carbon' and projects that used IBRD or IDA financing (not just Global Environment Fund or trust funds, for example). The first thirty most recent

11 Kaya, A., & Leblebicioglu, A. (2025). Understanding the World Bank's role in climate finance. *Climatic Change, 178*(9), 160.

are listed in Annex Table 1, along with excerpts from their technical and economic analysis sections.[12]

- Second, to look at IDA energy projects where there might be concern of pressure to adopt high-cost renewable options, I took the World Bank list of projects, filtered by IDA and the sector of generation – energy (hydro, wind, solar, nonrenewable, geothermal, bioenergy), limited to projects to that sector being more than one third of project value, and report on the same information for those five projects with a project appraisal document and with economic analyses in Annex Table 2. (Note the sector filter left only projects approved in 2025).
- Finally, to look at projects labeled as (close to) 100 percent climate finance, I took a sample of the fifteen listed projects with sufficient details for analysis from the 2024 World Bank climate finance report that were recorded as counting 99.5 percent or above towards climate finance, and report on the same information for those fifteen projects with a project appraisal document and with economic analyses in Annex Table 3.[13]

In the first instance, I focus on the rate of return (ERR) calculations from the economic analysis sections to see how significantly they are affected by the shadow price of carbon (SPC), because the project will either add to emissions or reduce them compared to the counterfactual.

It should be noted ERR calculations are more art than science, and easy to manipulate.[14] Looking at them as a measure for the impact of climate mitigation considerations on World Bank operations is more about what it suggests regarding intent than a necessary reflection of reality. The test applied to ERRs in the project appraisal is 'does it pass the hurdle rate?' – the minimum return on investment for a project to make sense in that country.

The green tinged projects in the tables at the end of this document had an economic analysis that reasonably clearly suggested that the project would have passed the hurdle rate of return absent shadow cost of carbon considerations, the tan tinge suggests components of the project (at least) might not. There is also quoted language (if available) comparing against alternate generation technologies.

12 This on 10/1/25. I excluded the Malawi – Accelerating Sustainable and Clean Energy Access Transformation Project, PADHI01035, because it had no stand-alone economic analysis perhaps because it was Phase 8 of a Multi-Phase Programmatic Approach (P180547) and East Asia and Pacific – Accelerating Sustainable Energy Transition Program (PAD5623) Because the PAD does not have quantitative economic analysis on the grounds that individual programs under the Multi-Phase Programmatic Approach will conduct them.

13 https://thedocs.worldbank.org/en/doc/737327d214f08db1ac7a1d655a343029-0020012024/original/World-Bank-Climate-Finance-FY24.pdf, Note I excluded the Türkiye – Accelerating the Market Transition for Distributed Energy Program as part of ECARES MPA because it had no stand-alone economic analysis, Mauritania Youth Employability Project was a follow-on project with no separate analysis. Kyrgyz Technical Assistance for Kambarata 1 Hydropower Plant Project had no project documents Accelerating Sustainable and Clean Energy Access Transformation in Somalia project and the Second Additional Financing for Kenya Water Security and Climate Resilience Project and the Second Energy Efficiency in Public Buildings under the E3 MPA had no separate PADs from their parent project.

14 Amongst the projects I looked at, the Türkiye Green Export Project is a classic of this genre, amounting to a statement that if the project has a high economic rate of return, then the project will have a high economic rate of return.

In the documentation, there is lengthy talk of compatibility with the Paris climate agreement, climate co-benefits, and emission effects. But in this set of 50 PADs, I did not see a project that would have *failed* the hurdle rate of return taking into consideration shadow cost of carbon, or a whole project that *passed* the hurdle return purely on the grounds of the shadow cost of carbon (see component exceptions below). This would be broadly consistent with the SPC potentially acting to filter out high emissions projects prior to full project appraisal (although I cannot observe that), but also with the Bank's language that projects must demonstrate local development benefits.

In components of a few projects it does appear that the SPC may be what pushes the ERR of the component over the hurdle rate. An Eswatini project with a grid reinforcement component to prevent voltage drop and reduce power interruptions had a negative ERR for that component without mitigation impact which becomes positive when the benefit of reduced emissions from lower transmission losses is included. Similarly in a Bangladesh gas project, reducing leakage from the system had a low ERR without climate benefits. (That said, reducing transmission losses has long been considered an energy sector priority, and one wonders if these projects would not have looked marginal if the economic analysis had used more creativity.)

Note that in most of the projects, discussion of alternate technologies would not have been appropriate. But those generation projects where such a discussion *would* be appropriate suggest somewhat a mixed picture. For good or ill, there is no discussion of abandoned alternate designs that involved a higher-emissions solution. But there is evidence of low-emissions investments that pass a hurdle rate, but may not be lowest cost. The Seychelles Renewable Energy Acceleration Program PAD, for example, suggests: "The grid solutions are based on proven technology with due regard to Seychelle's climate conditions. The proposed stand-alone battery technology systems are designed to optimize the mix of the technologies in the Seychelles power system having in mind the proclaimed [government] objective of reaching 15 percent of renewables in the power generation mix by 2030." Similarly in a generation project in Micronesia, the technology choice is "part of the least-cost decarbonization pathway" (this rather than necessarily the lowest cost solution).[15]

15 Again, there is the case of the Sri Lanka – Secure, Affordable, and Sustainable Energy Program (IDA $70m PADHI01242) For component One (Upgrading infrastructure to facilitate grid integration of renewable energy) "The economic analysis … counterfactual scenario assumes that if the planned renewable energy generation cannot be fully or partially dispatched due to lack of reliable transmission [that the project provides], it will be made up by the marginal thermal generator, which according to CEB's LTGEP is liquefied natural gas (LNG) … The economic rate of return (ERR) without accounting for the benefits from GHG emissions reduction is 24.6 percent at constant prices (NPV US$316 million). When GHG emissions are included at the low and high values of the shadow price of carbon, 7 the ERR increases to 34.8 percent (NPV US$508 million) and 46.8 percent (NPV US$707 million), respectively." Passing the hurdle, but still not clear if the cost is lower than not building solar or transmission and just using marginal thermal. Note also, the Bangladesh Energy Sector Security Enhancement Project demonstrates an ongoing willingness to support gas-fired electricity production while the Guinea Electricity Access mini-grid component is hybrid: "The analysis assumes that 80 percent of the demand is met through solar generation and 20 percent through diesel-based generation to cover demand during the evening based on evidence from existing mini-grids."

Choices within projects are perhaps less significant than choices between them: is the World Bank emphasizing projects where emissions reductions are more straightforward to accomplish? Some of the 50 projects, and in particular the China Green Urban Development Project, appear considerably if not primarily driven by mitigation impacts (perhaps not unexpectedly given a country partnership framework focused on global public goods). It is surely questionable if they would be a priority absent their climate impact.

At the same time, looking at the 100 percent climate sample, it is often surprising how little ERRs are affected by including a carbon price, even in projects where most of the climate co-benefit is marked as mitigation. For example, the China Low Carbon Transition of Urban project, marked as mitigation finance for $233m out of a total project value of $250m, provides mitigation benefits accounting for RMB 149m in net present value out of a total net present value of RMB 2037m. (For others the mitigation benefits are a larger part of the total net present value/ERR—in the Vietnam Southern Waterway Corridors project, for example, emissions reduction accounts for about half of the project net present value of the project).[16]

It is also worth noting some of the 100 percent *adaptation* projects have low economic returns. A Marshal Islands project finances a sea wall with an economic rate of return below two percent. It barely passes a hurdle rate set at a very low 1.4 percent "because of the low rate of economic growth in economy." Again, a Cote d'Ivoire Coastal Resilience project has a negative ERR. The West/Central Africa project backing CGIAR Climate Research has a range of forecast ERRs that also slips into the negative.

An analysis of 2024 climate finance PADs

To see if these 50 PADs reflect a broader pattern, I look at all 347 projects listed in the Bank's 2024 climate finance data, and extract ERRs and other details.[17] This exercise comes with the caveats that: (i) (again) ERRs are more art than science (apparently especially with regard to digital and governance projects, which account for the extreme positive outliers); (ii) this is an exercise in association, not causation.

16 The 100 percent climate sample does also raise some confusion as to why projects are so coded. For example, the West/Central Africa Accelerating Impacts of CGIAR Climate project claims $9m of mitigation co-benefits, having said it would have no impact on GHGs. The Cambodia Road Connectivity Improvement Project suggests "The proposed [additional finance] will cover the additional costs for climate resilient measures, in addition to financing gap from the bidding process." This second justification does not obviously qualify as climate focused. To take an example of a project not in the tables, the Ethiopia Rural Connectivity to Support Food Security Program (P1763030) is coded as providing $25m in mitigation finance even though it will raise greenhouse gas emissions by increasing fuel consumption, and the PAD is silent on mitigation benefits. This is a symptom of the lack of clarity around (any) climate benefits found in earlier analyses of the Bank's climate portfolio. https://www.cgdev.org/blog/world-bank-and-climate-projects-matter-definition. Guido Núñez-Mujica, Vijaya Ramachandran, and Scott Morris. 2023. "What Counts as Climate? Preliminary Evidence from the World Bank's Climate Portfolio." CGD Policy Paper 296. Washington, DC: Center for Global Development.

17 I combine P179631 P180547 P180575 P181328 P181341 P181494 Accelerating Sustainable and Clean Energy Access Transformation projects because they have the same underlying PAD.

Table 2 presents summary statistics. There are 148 projects with ERR data available that exclude the SPC. I focus on this subset of projects, which account for $23.5bn out of $68.7bn of total 2024 project commitments tagged as providing climate finance. One reason for this is that policy lending routinely excludes any ERR calculation as do many social sector projects. Another (less significant) reason is that PADs reporting ERRs do not always report ERRs without climate benefits. This applies to $1.8 billion of commitments in projects with a high average mitigation share (mitigation accounting for 44 percent of commitments compared to 21 percent of commitments in the sample as a whole). It may be that some of these projects would not have passed hurdle rates of return absent the SPC.[18]

There are 44 projects that provide ERRs both with and without the SPC, leaving 104 that do not report an ERR with the SPC. These 104 projects have a low reported focus on emissions–a 13 percent mitigation share on average, compared to 46 percent for projects that report ERRs both with and without the SPC. The average ERR for non-SPC-ERR reporting projects is approximately double that of projects that report on both, 40 percent as compared to 20 percent, although about half of that difference is driven by five outlier ERRs in the non-SPC-ERR sample above 100 percent. This might be because specific emissions-reducing projects see lower rates of domestic return or that the *types* of projects where it is possible to generate significant and quantifiable emissions reductions have lower returns than other projects. We will see suggestive evidence in favor of that second interpretation.

TABLE 2. Summary data, 2024 World Bank climate projects

	Total	With ERR Ex-Climate	ERR Ex & With Climate	No ERR Ex-Climate
Climate Finance (Ave %)	39%	43%	68%	64%
Adaptation ($M)	10,281	4,517	1,742	17
Mitigation ($M)	20,679	8,195	5,613	684
Total Commitment ($M)	68,763	23,575	9,998	1,808
% Adaptation (Ave)	18%	21%	22%	20%
% Mitigation (Ave)	21%	23%	46%	44%
Hurdle Rate (Ave)		8	7	
ERR ex climate (Ave)		34	20	
ERR With Climate (Ave)			28	
Obs	347	148	44	26

18 The table also notes average hurdle rates. The institution has moved from what guidance labels a 'descriptive' social discount rate (which looks at investments in the real world and finds results in the 8–12 percent rate, leading to a traditional 'hurdle rate' of 10 percent) to favoring 'prescriptive' rates based on estimates of future growth. These generate discount rates of between two percent for countries at the 25th percentile of historical growth rates to 10 percent for countries at the 75th percentile. But in this set of projects more than that is going on: hurdle rates/discount rates vary even within same country (The Jamaica Social Protection for Increased Resilience and Opportunity project and the Jamaica Education Project use rates of 5 and 10 percent, for example. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099610503022315638.)

Figures 1 and 2 report mitigation and adaptation share and ERRs absent SPC. What relationship does appear is negative. Take out ERRs over 50 percent and run a regression against mitigation and adaptation percentages and there is no significant relationship with mitigation. The share of adaptation finance is still negatively and significantly associated with lower ERRs.

FIGURE 1. Non-SPC rates of return versus reported adaptation share

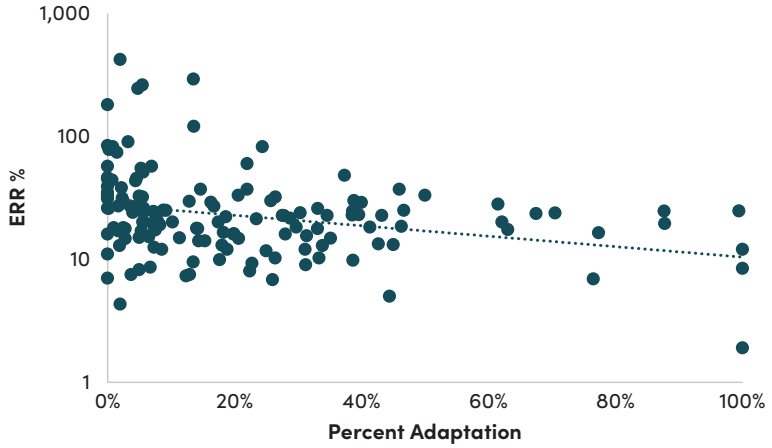
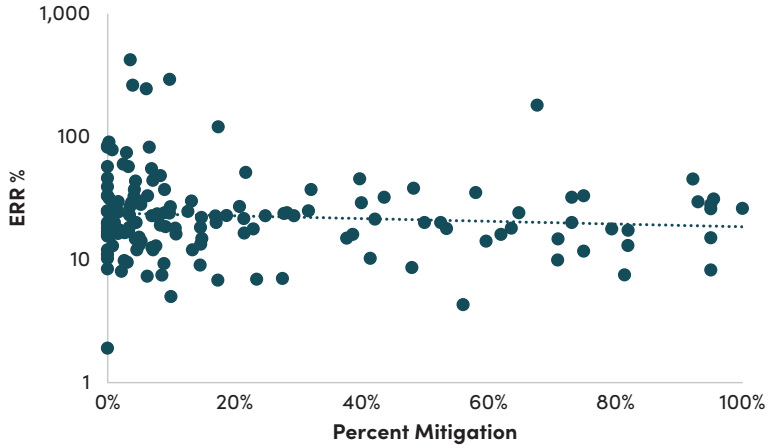


FIGURE 2. Non-SPC rates of return versus reported mitigation share



Looking at energy sector projects involving generation (see Annex Table 4), the considerable majority provide evidence of a technology comparison against alternates – either the existing generation mix or fossil fuels. It is not always clear this comparison excludes climate benefits and in one case which does compare (Shanxi energy generation) the comparison makes clear gas is the cheaper option. Note the World Bank Group has pushed private sector generation solutions, and it might be that the bigger problem within the institution is not IBRD or IDA financing of public sector generation but subsidies of various kinds offered by host governments to back IFC energy projects (often subsidies provided without competitive approaches to their minimization).[19]

19 https://www.cgdev.org/blog/ifc-and-descaling-solar.

The efficacy of mitigation spending

Of the 62 projects that are classified 50 percent mitigation finance or more, 21 do not report ERRs, two do not report an overall project ERR, and 12 only report ERRs including the SPC. Of the 27 that report a non-SPC ERR, 21 also report an SPC ERR. In that sample, the median ERR without SPC is 23 percent, and with the SPC it is 31 percent. This compares to 20 and 28 percent for the full sample of projects with both SPC and non-SPC ERRs. The results both suggest little evidence that a high mitigation share is connected with lower ERRs but also a limited relationship between mitigation share and the share of ERRs generated by the SPC.

Adding the SPC considerably increases average ERRs in this sample, but there is no strong pattern that a higher reported mitigation finance share is associated with a higher increase in the ERR when accounting for the SPC (Figure 3), nor that a higher increase in an ERR from the SPC is strongly associated with a lower ERR *excluding* the SPC.[20] This matches previous evidence regarding both World Bank projects and dedicated climate funds that cost effectiveness in terms of GHG reduction per 'mitigation dollar' varies dramatically across projects, but also repeats suggestive evidence that low-return projects are at least infrequently prioritized on the grounds of their impact on emissions reductions.[21]

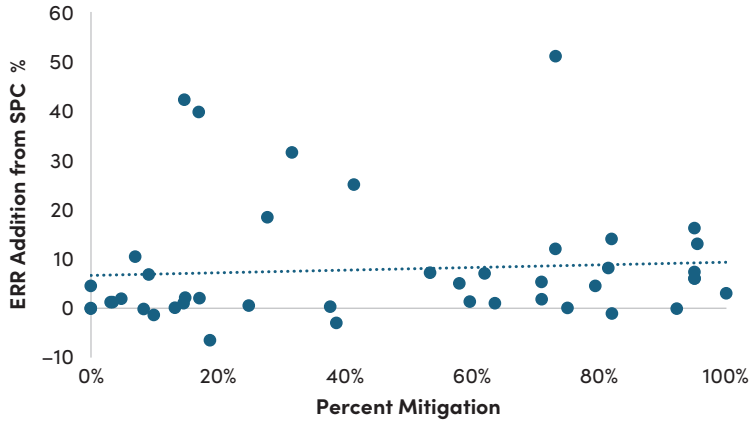
Further to this point, the World Bank tracks net greenhouse gas emissions as part of its scorecard exercise, and lists the projects contributing to the goal of reducing them. The outstanding World Bank portfolio as a whole is expected to achieve an annual 216 MtCO2 equivalent in GHG reductions. The top ten projects in portfolio contribute 107 MtCO2 equivalent to that goal (about one half of it) while accounting for only $2.1 billion in commitments, or about one tenth of 2024 commitments (alone) labeled as mitigation finance.[22] This suggests the link between reported mitigation finance and (even) forecast mitigation outcomes is likely tenuous. Related analysis by Euan Ritchie suggests most World Bank mitigation projects do not (even) track impact on GHG emissions as a performance metric.

20 Looking through a number of projects with a high mitigation share, they do not present a ERR without climate impact and that does raise the concern that they might not pass a hurdle rate without it, including the Southern Waterway Corridors and Logistics Development Project P169954, Shaanxi Energy Transition and Innovation Demonstration in the Heating Sector, P177841 Integrated Sustainable Mobility Project in the Foz do Rio Itajaí Region P178557. I use the high SCP where available for the analysis.

21 Matt Juden and Ian Mitchell, 2021. "Cost-Effectiveness and Synergies for Emissions Mitigation Projects in Developing Countries." CGD Policy Paper 204. Euan Ritchie. 2025. "World Bank Climate Mitigation: What Gets Measured and What Gets Missed." CGD Policy Paper 369. Note also concerns over the quality of analysis regarding potential emissions reductions.

22 https://scorecard.worldbank.org/en/data/result-details/CSC_RES_GHG_EMS_YEAR?orgCode=ALL&refareatype=REGION&refareacode=ACW&age=_T&disability=_T&sex=_T.

FIGURE 3. Rate of return increase from adding SPC versus reported mitigation share



Conclusion

This analysis echoes earlier studies that World Bank Group reporting on climate finance is often inadequate: PADs that do little to justify a project's designation as a climate project, PADs that do not present data on emissions avoided or on economic returns with and without emissions impacts that would allow for fully verifying development returns and/or SPC additionality, PADs that are not always clear on alternate technologies considered. The increased attention paid to outcomes reflected in the World Bank's scorecard measures around emissions and the number of people with 'enhanced resilience' may help in clarifying the picture, although it will likely raise similar concerns over the quality of measurement and causality associated with the financing data.[23]

With that significant caveat around data quality and availability, this exercise suggests it is probably possible to believe:

- There are limits to how different the Bank's portfolio looks specifically because of the focus on climate, not least it has had little apparent effect at the sectoral or country level, and it is not obvious that shadow-pricing carbon is widely affecting project choice.
- The Bank's portfolio may still look different at the margin because of the focus on climate, including because: it may sometimes finance lower-return zero – emissions technologies because they are zero-emission (perhaps only in furtherance of client stated objectives); it potentially sometimes chooses emissions-related projects within country-sectors over projects not related to emissions to fund (at least sometimes in furtherance of client stated objectives); and that it potentially sometimes focuses on (lower-return) investments within sectors that have greater adaptation impacts.

23 https://scorecard.worldbank.org/en/outcomes/green-and-blue-planet-and-resilient-populations.

- Usually (nearly always?) the mitigation-coded projects the Bank finances would pass hurdle rates of return absent consideration of emissions (the institution is largely focused on funding technological solutions toward the left hand side of the McKinsey Cost Curve which are both lowest cost and low carbon).[24]

It isn't possible from the outside (or indeed very plausibly from the inside at the aggregate level) to know *how* different the portfolio looks because of the focus on climate, nor (with any confidence) what is the impact of that on the average local economic return to World Bank investments, nor the impact on emissions. And the 'climate finance' numbers only appear to help at the very margin in any of those regards.

Overall the 'unambitious' (or if you would rather, 'synergistic') version of the institution's rhetoric on climate appears closer to the truth, perhaps conveniently for the World Bank at the moment. It is one more reason to think that, if the institution is to make a significant difference in the climate arena compared to business as usual, it would (and perhaps should) take a dedicated capital increase to get it there.[25]

24 https://www.cgdev.org/publication/technology-and-cheap-finance-global-fight-against-climate-change.
25 https://www.cgdev.org/publication/climate-dedicated-capital-increase-world-bank-and-ifc.

Annex Table 1: Recent IDA and IBRD investment projects

Second Transforming Landscapes for Resilience and Development in Zambia Project IDA $100m (+ TFs) PADHI01133	The 30-year CBA indicates that the project is economically viable but financially unviable. The economic internal rate of return (IRR) is 21%, well above the recommended 5% discount rate, with a corresponding benefit-cost ratio (BCR) of 3.0. In contrast, the financial IRR is 9%, falling below the 12% opportunity cost of capital, and the financial BCR is 0.8 – indicating a negative return from a purely financial standpoint. The strong economic performance is primarily driven by global public goods such as carbon sequestration, increased household incomes from alternative livelihoods, and improved agricultural gross margins.
Brazil – Private-Delivered Metro Sao Paulo Line 4 Third Phase Extension IBRD $400m PADHI00713	The CBA confirms the Project's feasibility with a positive Economic Net Present Value (ENPV) and a good Economic Internal Rate of Return (EIRR). The positive ENPV results from an EIRR of 6.76 percent, higher than the Social Discount Rate of 3.35 percent … . The Project's benefits are multifaceted, deriving primarily from travel time savings and reductions in operating costs, …
Guinea – Second Phase of the Electricity Access Scale Up Project IDA 132m PADHI01230	The economic analysis of GNEAP-2 uses a standard cost-benefit methodology in line with World Bank guidelines and confirms that the project is economically viable. The project has a net present value (NPV) of US$260 million and an economic rate of return (ERR) of 19 percent (Table 2). The NPV increases to US$369 million using the low shadow price of carbon and US$478 million using a high shadow price of carbon. Incremental benefits include (i) new grid or mini-grid access for previously unconnected consumers; (ii) reduction in deadweight loss from regularized connections; and (iii) a net reduction in GHG emissions.
China – Green Urban Development Project IBRD $250m PADHI01047	The cost-benefit analysis shows an economic internal rate of return of 7.53 percent, adopting a discount rate of 6 percent. Sensitivity analysis assuming a 10 percent increase in project costs and/or 10 percent decrease in project benefits indicates robust economic returns despite potential cost increases or benefit decreases (see tables below). The net present value remains positive after accounting for both low and high values of Shadow Price of Carbon [frankly from way PAD is written hard to imagine this project wasn't primarily motivated by GHGs – two of the first three paragraphs of the PAD are about the country's GHG emissions and strategies to respond]
Bangladesh – Clean Air Project IDA $290m PADHI01060	Component 1 thus has a net present value (NPV) of US$373 million and an economic internal rate of return (EIRR) of 57 percent. These conservative estimates exclude additional benefits to the rest of Bangladesh and neighboring countries due to data limitations. 65. For Component 2, the estimated EIRR is 40 percent without CO2 emissions reductions benefits and 42–44 percent with CO2 reductions benefits
Senegal – Dakar Sustainable Urban Mobility Project IDA $100m PADHI01156	To gauge the project's economic viability throughout its lifespan (2025 to 2045), the Economic Internal Rate of Return (EIRR) and Net Present Value (NPV) were calculated using the country discount rate of 9 percent, in accordance with the recommendations of the Planning Department of the Ministry of the Economy, Finance and Planning, comparing the two scenarios and using the Shadow price of Carbon (SPC). The results indicate that the project is economically beneficial and displays a positive NPV and an EIRR above the country discount rate. [EIRR without SPC: 23%]

(Continued)

Seychelles – Renewable Energy Acceleration Program using the Multiphase Programmatic Approach including First Phase Loan for Renewable Energy Acceleration Project IBRD $8m PADHI01076	The grid solutions are based on proven technology with due regard to Seychelle's climate conditions. The proposed stand-alone battery technology systems are designed to optimize the mix of the technologies in the Seychelles power system having in mind the proclaimed GoS's objective of reaching 15 percent of renewables in the power generation mix by 2030 … . The economic internal rate of return (EIRR) is estimated to be 12.3 percent before considering the expected reduction in greenhouse gas (GHG) emissions compared to the counterfactual scenario. This EIRR is higher than the discount rate of 5.2 percent for Seychelles21. The economic net present value (ENPV) in this case is projected to be US$44.5 million. The positive economic feasibility is driven from savings of LFO and HFO consumption, estimated at over 7.2 and 6.4 million liters per year, respectively. The proposed investments under the proposed project will also reduce GHG emissions by about 898,599 metric tons of CO2 equivalent between 2027 and 2050. Once this is considered, the EIRR increases to 16.6 percent, and the ENPV is projected to be US$77.6 million, considering the low values of the shadow price of carbon
Gambia, The – Infrastructure Project IDA $53m PADHI00696	This model uses time savings, vehicle operating cost savings, and road crash data as their measure of benefits and road construction and maintenance costs, as well as incremental costs for climate change adaptation, **increase** [bold added] in GHG emissions, road safety interventions, E&S mitigation and expropriation costs. Cost-benefit analysis for the project roads indicates that the Economic Internal Rate of Return (EIRR) is 6.3 percent. The Net Present Value (NPV) is US$6.9 million at a discount rate of 6 percent, indicating that the project is marginally economically justified. However, the benefits of increased accessibility to markets, schools, and medical or other services have not been included. For rural and urban last mile connector roads such as those included in this project, these wider economic benefits could be expected to increase the EIRR by up to 50 percent (e.g., an EIRR between 9–10 percent) … . The main benefit of improved rural grid connectivity was assessed as 45 percent lower energy costs for the newly connected households against counterfactual diesel use. The additional benefits of reduced local emissions and indoor pollution from domestic wood and charcoal burning were not included as the extent of use of each of these is unknown. An EIRR of 11.7 percent and a NPV of US$6.3 million at a 6 percent discount rate is observed for rural energy access. Evaluation of enhancing the GBA grid resilience considered the benefits of reduced outages, transmission losses, and reduced T&D maintenance costs. The estimated EIRR was 6.2 percent and the NPV US$0.09 million at a 6 percent discount rate. The weighted average EIRR of these two subcomponents is 8.2 percent and the NPV is US$4.5 million.
Uzbekistan – National Irrigation and Energy Efficiency Improvement Project IDA $200m PADHI00554	The overall EIRR is estimated to be 18.8 percent and the Economic Net Present Value (ENPV), using a 6 percent discount rate, is estimated at around US$324 million. As compared to the financial analysis, which only considered monetized costs and benefits realizable to farmers, the broader economic analysis attempted to cover, in addition, the evaluated benefits from reduced water consumption, emissions reductions and increased food security more broadly [not clear, but sounds like it would pass hurdle w/out emissions]
Uzbekistan – Geospatial Infrastructure for Sustainable Territorial Development Project IDA $35m PADHI01036	The economic and financial analysis of the Project focuses on estimating three key benefits: (i) reduction in resilience upgrade needs of infrastructure assets in Uzbekistan; (ii) land value increases due to titling of informal land; and (iii) cost savings from improved service delivery of land administration. The analysis demonstrates the Project's economic viability, with benefits estimated to be approximately six times higher than the costs
Armenia – Tourism and Regional Infrastructure Project (English) IBRD $100m PADHI00414	Overall, the implementation of the project will yield net economic benefits over and above the project costs, as well as the cost of complementary investments in additional tourism enterprises to be financed by private sector investors. The net present value (NPV), financial internal rate of return (FIRR), and economic internal rate of return (EIRR) were calculated for the next 15 years from 2025 up to 2039, including about 5 years of project implementation period. [no evidence of carbon pricing at all]

(Continued)

Mozambique – Accelerating Sustainable and Clean Energy Access Transformation in Mozambique Project IDA $100m PADHI01033	Economic Analysis: Total for all Project components Economic Internal Rate of Return (%) Without GHG Benefits 30.7% With GHG Benefits (low) 35.7% With GHG Benefits (high) 41.0%
Brazil – Green and Resilient São Paulo Metro Line 2 Extension Project IBRD $250m	The positive ENPV results from an Economic Internal Rate of Return (EIRR) of 6.82 percent, higher than the Social Discount Rate of 3.35 percent, which estimation was based on current World Bank guidance. The Project's benefits are multifaceted, deriving from travel time savings, reductions in vehicle operating costs, and reduced externalities from improved emissions and road safety
Brazil – Sergipe Efficient Digital Acceleration Project IBRD $54m PADHI00408	The economic analysis conducted delivers positive results for conservative and bold scenarios, resulting in a Net Present Value (NPV) that ranges between US$2,815 million and US$7,510 million, and an Economic Rate of Return (ERR) of between 38 percent and 48 percent in 10 years [no use of SPC]
Belize – Blue Cities and Beyond Project IDA $23m PADHI00255	For the WWTP upgrade, an EIRR of 12 percent has been calculated … The South San Pedro water network expansion The World Bank Belize Blue Cities and Beyond Project (P181064) Page 15 investment has an EIRR of 15 percent [No evidence of use of SPC. A carbon market readiness component was not subject to an ERR]
Eswatini – Accelerating Sustainable and Clean Energy Access Transformation in Eswatini Project IDA 39m, IBRD 51m PADHI01083	ASCENT Eswatini Without GHG benefits 14.4 With GHG benefits (low) 16.5 42.0 With GHG benefits (high) 18.6 On-grid electrification Without GHG benefits 36.1 With GHG benefits (low) 38.3 With GHG benefits (high) 40.6 **Grid reinforcement Without GHG benefits [negative] (1.1) With GHG benefits (low) 1.8 With GHG benefits (high) 4.3** Off-grid SHS Without GHG benefits 38 With GHG benefits (low) 46 With GHG benefits (high) 55
Zambia – Tanzania Interconnector Project IDA 245m PADHI01012	The project generates a net present value (NPV) of US$743.0 million and an economic internal rate of return (EIRR) of 25.2 percent before considering GHG emission savings. After accounting for absolute GHG emissions, the NPV marginally decreases to US$740.7 million at the low SPC trajectory, and US$738.5 million at the high SPC trajectory [although intriguingly] The project is expected to help reduce GHG emissions. Based on EPM results, around 6.0 million tCO2 will be avoided between 2027 and 2050 in scenarios with the interconnector compared to without one
India – Kerala Climate Resilient Agri-Value Chain Modernization (KERA) Project IBRD $200m PAD00058	The economic net present value ranges from US$216 million (without carbon benefits) to US$232 million (with carbon benefits and a high social price of carbon). The economic internal rate of return ranges from 19.9 percent to 20.6 percent in these respective scenarios
Chad – Digital Transformation Project IDA 92m PAD00070	[No ERR analysis, no mention of SPC, safe to assume not driven by SCP considerations]
Jamaica – Kingston Waterfront Improvement Project IBRD $12m PAD5304	[only one component calculated an ERR, for training, with a rate of return estimated at 83 percent, no evidence of use of SCP]

(Continued)

Europe and Central Asia – Scaling Up Energy Efficiency Including Phase 1 Loans to Türkiye and Moldova IBRD $350m (?)PAD00193	Public building renovations component Without GHG benefits 6.1% to 31.5% With GHG benefits, low SPC 7.7% to 38.6% With GHG benefits, high SPC 9.3% to 45.5% District heating upgrades component Without GHG benefits 28.6% With GHG benefits, low SPC 33.8% With GHG benefits, high SPC 39.2%
Brazil – Integrated Sustainable Mobility Project IBRD $90m PAD5121	the Project is economically viable with an economic internal rate of return (EIRR) of 10.8 percent … [hurdle 6%] The expected or potential benefits from the Project total US$528 million The implementation of the Project results in a decrease of GHG emissions with a benefit is US$84.82 million over the life of the project. [appears removing SPC would still mean outcome positive but not certain]
Kazakhstan – Digital Acceleration for an Inclusive Economy IBRD 92m PAD00202	The CBA suggests that the project is feasible and delivers the net present value (NPV) of benefits to society worth US$ 8.99 million, with internal rate of return (IRR) of 20% [Nothing about SPC]
Tanzania – Second Phase of the Dar Es Salaam Metropolitan Development IDA $385m PAD00087	Overall, the Economic Rate of Return (ERR) is 24 percent [only one component evaluated using SPC, Solid Waste, with low SPC 26% High SPC 32%, suggests although doesn't conclusively demonstrate no component justified on grounds of SPC]
Cabo Verde – Improving Connectivity and Urban Infrastructure IDA $40m PAD5265	The economic analysis the economic rate of return of the urban component is estimated at 30.6 percent. Results. Using the RED Model, the Modified Internal Rate or Return (MIRR) was estimated, as well as the net present value for each project that involve either the improvement or upgrading of a road … The results indicate that from the thirty-three projects evaluated only two have MIRRs above the thresholds of 6 percent or 12 percent. The NPV and MIRR for the two "first mover" roads, without consideration of the SPC, is US$0.5 million and 2.9 percent, respectively. With the low-SPC, the NPV of the two 'first mover' road projects is US$0.4 million and the MIRR is 2.8 percent, while in the high-SPC scenario the corresponding figures are US$0.3 million and 3.2 percent, respectively. [Component not justified on ERR grounds, but would be even less justified accounting for SPC, suggesting SPC not relevant to decision]
Pacific Islands – Forum Fisheries Agency IDA 9m PAD5113	The overall economic internal rate of return (IRR) estimated at the end of the Project (five years) is 20 percent, rising to 31 percent after ten years without further investment. [no evidence of use of SPC]
Bangladesh – Gas Sector Efficiency Improvement and Carbon Abatement Project IDA $200m PAD5268	The economic internal rate of return (EIRR) for the base case [for gas metering] was 25.8 percent overall, 26.4 percent for PGCL, and 25.7 percent for TGTDCL. When the value of avoided carbon emissions was included (at an average of the low and high SPCs), the Project NPVs virtually doubled to US$1.197 billion under the base case, ranging from US$746 million to US$1.647 billion under the low and high consumption cases, and the base case EIRR rises to 42 percent. For subcomponent 1.2 [reinforced monitoring and upgraded distribution infrastructure] the 'break even' NPV was zero and the EIRR was 6 percent. When the benefits of avoided CH4 emissions were included, NPV rises to US$68 million and the EIRR to 74 percent. [6 percent appears to be hurdle?]

(Continued)

Congo, Democratic Republic of – Forest and Savanna Restoration Investment Program IDA 290m PAD5377	The overall economic net present value (NPV) of the project over 25 years, without accounting for carbon and road-related benefits, is estimated to be US$167.0 million with a 6 percent discount rate. Subcomponent 3.2 (Support for transition to more efficient energy and cleaner cooking solutions) has a [low] economic NPV of US$0.89 million and an EIRR of 7.7 percent [just passing the hurdle rate] … when considering the shadow price of carbon … The clean cooking component also shows a higher NPV and EIRR when accounting for GHG mitigation benefits. Using the low shadow price with an annual increase of 2.25 percent, the NPV of subcomponent 3.2 is US$ 151.1 million with an EIRR of 129.1 percent.
Türkiye – Green Industry Project IBRD $450m PAD5349	The Project Net Present Value (NPV) is estimated at US$345 million at a 12 percent discount rate, and the Economic Rate of Return (ERR) at 26 percent based on the total project investments … In addition to [these benefits] the Project is expected to result in social and climate-related benefits. These include more efficient and less use of energy among project beneficiaries, increased uptake of renewable energy as a result of the demonstration effect of project beneficiaries, reduced waste creation, better ESG practices, and wider growth of the Turkish entrepreneurial ecosystem.
Angola – Accelerating Economic Diversification and Job Creation Project IBRD $300m PAD5296	The total project net present value (NPV) is estimated at US$57 million at a 15 percent discount rate, and the economic rate of return (ERR) is estimated at 24 percent [no mention of SCP]

Annex Table 2: Recent IDA energy generation projects

Malawi – Mpatamanga Hydropower Storage Project IDA $350m P165704	Using standard cost-benefit analysis assessed through Net Present Value (NPV) and Economic Internal Rate of Return (EIRR), the evaluation follows World Bank guidelines with a six percent social discount rate. It draws on power system planning results comparing scenarios with and without MHSP to determine Malawi's least-cost expansion plan. Economic costs include relevant capital (EPC) and O&M costs, excluding taxes and transfer payments. Table 2 shows that MHSP yields an NPV of over US$530 million and an EIRR of 13.9 percent before factoring in GHG emission reductions. With GHG savings from displacing diesel generation, the NPV rises to between US$570 million and US$611 million, depending on the Shadow Price of Carbon (SPC) [so least cost]
P181253 Federated States of Micronesia – Access and Renewable Increase for Sustainable Energy Project IDA $42m : PADHI00711	The renewable energy technology selected in the Project is solar PV systems because of state power utilities higher exposure with this technology and lack of robust data on other renewable sources such as wind … The integration of the medium-speed diesel generation (which are the most energy efficient diesel generation at the time of purchase) is part of the least-cost decarbonization pathway modeled for the grid as part of the development of FSM Energy Master Plan.
Bangladesh – Energy Sector Security Enhancement IDA $350m P181811	The Project provides annual direct financial benefits to Bangladesh of approximately US$7.5 million p.a.13 due to lower financing cost and an additional US$320 million p.a.14 on average as a result of facilitating the shift from procurement of LNG cargoes under MSPAs (spot contracts) to SPAs (long-term contracts). In addition, the Project directly supports the annual import of about 37–41 LNG cargoes with an approximate value between US$1.22 billion and 1.35 billion,16 which helps to plug Bangladesh's gas shortages in the country and contributes to economic growth … To estimate the downstream benefits of increased gas supply in the power sector, a least-cost power system planning exercise was employed … The additional gas is expected to displace liquid fuel generation, which is the most expensive source of generation in Bangladesh's power system … Based on the results of the least-cost power system planning exercise, the Project will enable additional gas supply to the power sector, displacing high speed diesel (HSD) and heavy furnace oil (HFO) generation, resulting in fuel cost savings and associated emissions benefits. [Not full analysis but does not appear to depend on SPC]
Uzbekistan – Small Hydropower Development Project IDA $150m P509250	Economic costs include the relevant capex to develop SHPP and recurring O&M costs.18 The key economic benefits quantified in the economic analysis include avoided fuel and operation costs of power displaced by the Project and avoided costs of associated GHG emissions. Avoided operation costs are estimated assuming a simplified counterfactual scenario. In this scenario, the absence of the Project would result in increased dispatch of an efficient combined cycle gas turbine (CCGT) running on natural gas, delivering the same amount of yearly energy as the SHPPs … The results for the economic analysis … demonstrate that the sample projects are each economically viable before considering GHG emission savings. The ENPV across the sample SHPPs ranges from US$70,931.6 to US$757,673.5 and the EIRR ranges from 10.0 percent to 11.6 percent before considering GHG emission savings. [including SPC raises ERR by 1–3%]
Africa – M300 Patient Capital Facility Project IDA $25m PADHI01214	Economic viability was assessed through a cost benefit model covering: Mini grids, SHS, as well as DRE solutions for productive use appliances, C&I clients and social infrastructure. Costs include capital expenditure, operating and maintenance, household connection fees and equipment replacements. Benefits comprise of (i) avoided diesel and kerosene expenditure; and (ii) monetized GHG reductions using World Bank shadow price. Overall, the PCF demonstrates economic viability, with an Economic Internal Rate of Return (EIRR) of 27 percent [excluding emissions, with emissions 37–48%. Would not say demonstrates least cost.]

Annex Table 3: 99.5–100 percent climate projects in 2024

Vietnam – Southern Waterway Corridors and Logistics Development Project IDA $107m PAD3257 (Mitigation $94m)	Transport cost benefits for both corridors total US$243 million, Safety benefits total US$4 million and GHG emissions reduction benefits total US$101 million. Discounted Costs are $102 million. [positive net benefit excluding climate, although it is halved]
China – Low Carbon Transition of Urban Mobility in Yichang IBRD $250m PAD5092 (mitigation $233m)	The Program has an EIRR in the BAU case of 23 percent and a Net Present Value (NPV), discounted at 6 percent to 2023 of RMB 2037 million. A series of sensitivity tests show the project is robust with respect to changes in capital cost and the projected increase in patronage (as most of the economic benefits accrue to existing passengers) but is sensitive to changes in the vehicle travel time reduction. In RMB million Investment – 1806 User benefits 3123 Operating costs (net) 62 Accident reduction 510 GHG 149 Total NPV 2037.
Viet Nam – Binh Duong Province's Water Environment Improvement Project IBRD $231m PAD4134 (mitigation $173m)	Total Net Benefits without GHG Benefits NPV: 87.69 ERR: 11.68 Total Net Benefits with High Shadow Price of GHG NPR 88.06 ERR 11.70
Namibia – Transmission Expansion and Energy Storage Project IBRD $100m PAD5484 (mitigation $95m)	ERR without GHG 15% ERR GHG low 18% ERR GHG high 21% NPV without GHG $133m NPV GHG low 192m NPV GHG high $259m (~50 percent of NPV at high GHG is from GHGs).
Türkiye – Green Finance Project IBRD $155m PAD5380 (mitigation $155m)	Since the pipeline of TGF is tentative and yet to be identified, a simplified cost-benefit analysis was carried out for two sample models … a wind power plant in a prime area (Project Sun) and a greening plasticizer manufacturer (Project Polaris) in Türkiye, both yield positive economic returns, even before accounting for the positive local and global externalities they would bring.
Türkiye Flood and Drought Management Project IBRD $600m PADHI00259 (mitigation $25m)	Annualized benefits: $121m Annualized costs: $47m, BCR 2.57 [GHG abatement marginal, carried out in comparison to alternate flood control measures]
China Sustainable Fodder Production and Low Methane Livestock Development IBRD $200m (mitigation $164m)	The ERR with GHG reductions is estimated at 20 percent with low carbon shadow price; 27 percent with high carbon shadow price; and ERR without GHG reductions at 13 percent, which indicates that the supported technology solutions are economically viable on their own
West/Central Africa Accelerating Impacts of CGIAR Climate Research for Africa Additional Financing IDA $40m (mitigation $9.4m)	The impacts evaluated are made up of three elements: (i) the direct yield benefits arising from the adoption of CSA technologies; (ii) the yield losses avoided from the use of CIS; and (iii) an additional benefit arising from the operation of a new regional hub for fertilizers and soil-health. Investment criteria to 2030 using a discount rate of 5 percent for different plausible yield benefits and adoption rates per year for maize in the mixed crop-livestock systems –2.3 percent to 41% [no GHG calculation] On mitigation, none of the activities are significant greenhouse gas (GHG) emitters, and they otherwise do not expect to have a negative impact on any of the target countries' low-GHG emissions pathways

(Continued)

Pakistan Second Additional Financing for Dasu Hydropower Stage I Project IDA $800m IBRD $200m (mitigation $1000m)	The updated economic analysis shows a return of around 25 percent without any positive externalities and 28 percent with local and global environmental benefits from DHP-I. The returns on DHP-I and DHP-II, assessed together, increases to 26 percent and 29 percent, without and with positive externalities. (ERR + local externalities 26.2% ERR + local and global externalities: 29.3%)
Uzbekistan Solar and Renewable Energy Storage Project 185099-UZ IBRD $12m (mitigation $11.4m)	The economic rate of return (ERR) for the Bukhara solar power plant combined with BESS is 11.8 percent per year if emissions are valued at the low SPCs, 15.5 percent per year for the high scenario, and 8.2 percent per year if emissions are not valued at all. The country-specific economic discount rate is at 8 percent per year. NPV (including GHG impact, high carbon price, in thousand US$) 130,109 NPV (including GHG impact, low carbon price, in thousand US$) 75,422 NPV (excluding GHG impact, in thousand US$) 20,477 [very close to marginal absent GHGs] [although the counterfactual in the ERR is gas production]
Türkiye – Green Export Project 187456-TR IBRD $655m ($622m mitigation)	The benefits are modelled as (i) growth in firms' value added assuming a 10 percent rate of return for investment loans and a 5 percent rate of return for working capital; and (ii) a total of 500 thousand metric tons of CO2 emissions reductions per annum as a result of more efficient production techniques financed through CBAM-related investment loans … ERR Investments w/o carbon emissions 28% with carbon emissions 34%
Vanuatu Climate Resilient Transport Project Additional Financing II IDA $30m PAD5641 ($0 mitigation)	The overall economic internal rate of return (EIRR) of the project is 8.4 percent, and the net present value (NPV) is US$20.1 million, corresponding to the benefit-cost ratio of 1.2. These are down from the EIRR of 9.8 percent, the NPV of US$32.3 million, and the benefit-cost ratio of 1.4 at the AF-I, due mainly to the increase of construction costs. Normal traffic benefits account for 80.4 percent of the project benefits, generated traffic benefits for 20.1 percent, road safety benefits for 1.1 percent, and CO2 emissions benefits for –1.6 percent.
Marshall Islands – Second Additional Financing for the Pacific Resilience Project IDA $15m PAD5635 ($0 mitigation)	The discount rate used was 1.4 percent. While low for conventional infrastructure BCA in many countries, this discount rate (a social discount rate) reflects the low rate of economic growth in RMI. [!] The project's development impact is the reduction in tangible and intangible losses that would result from the destructive impact of major weather events through the construction of a 1,800m long revetment. The NPV under RCP1.9 is estimated at US$8.9 million, with an Economic Internal Rate of Return (EIRR) of 2.2 percent. An increase in investment costs to US$48 million sees smaller but still positive NPV of US$6 million and EIRR of 1.9 percent under RCP1.9.
Côte d'Ivoire – West Africa Coastal Areas Resilience Investment Project : Additional Financing IDA $7m PAD5629 ($0 mitigation)	Following the added financing, the economic analysis of the project has been revisited and remains positive, considering the increase in project costs. Although the results remain positive, the Internal Rate of Return (IRR) of the total project has been reduced slightly from an IRR of 14 percent to 12 percent due to the additional costs in finalizing the works in Côte d'Ivoire. The Net Present Value (NPV) benefits are slightly negative for the Côte d'Ivoire project due to the additional project costs in finalizing the works as no new additional project beneficiaries are added [not clear if ERR changes with SPC, but no reason to believe so]
Cambodia – Road Connectivity Improvement Project : Additional Financing IDA $35m PAD5563 (Mitigation $0)	The major economic benefits of the project arise from (a) reduced VOCs, (b) travel time savings, (c) avoided emergency maintenance costs in the without-project scenario, and (d) improved road safety. The project cost which would occur under OPBRC without additional concessional financing is assumed with the standard conversion factor of 0.90. The EIRR for the AF is estimated to be 24.7 percent and the NPV, US$95.54 million.

Annex Table 4: Energy generation projects in 2024

Project ID	Name	Alternate Tech Analysis
P176769	Inclusive Development through Electricity Access	No (appears diesel only used as a counterfactual for emissions)
P177841	Shaanxi Energy Transition and Innovation Demonstration in the Heating Sector	Yes, but ex-climate gas is cheaper
P179380	National Energy Advancement and Transformation Program	Adheres to 'least cost plan'
P178136	Cameroon Power Sector Reform Program	Solar plus existing diesel "an economical configuration"
P179845	Dominica Geothermal Risk Mitigation II Project	Yes – against oil (not clear this excludes climate benefits)
P180027	Bolivia Improving Sustainable Access to Electricity Project (IDTR III)	Yes – but did not exclude carbon benefits
P180465	Kenya Green and Resilient Expansion of Energy (GREEN) Program Phase 2 Project	"Aligned with the country's LCPDP and GoK plan to lower electricity prices and improve supply quality"
P179631 P180547 P180575 P181328 P181341 P181494	Accelerating Sustainable and Clean Energy Access Transformation	Yes compared to diesel gensets
P174576	Guinea-Bissau: Solar Energy Scale-up and Access Project	Yes (diesel – avoided cost)
P179687	Nigeria Distributed Access through Renewable Energy Scale-up Project	Yes – against generators
P177328	Transmission Expansion and Energy Storage Project	Yes – imports from SA, but is part of the 'least cost scenario'(?)
P181423	Second Additional Financing for Dasu Hydropower Stage I Project	Yes versus average cost
P181410	Additional Financing for the BI-Jiji and Mulembwe Hydropower	Yes versus diesel
P181434	Uzbekistan Solar and Renewable Energy Storage Project	Yes versus weighted-average electricity-purchase cost of NEGU from state-owned power plants
P180498	Liberia Electricity Sector Strengthening and Access Project (LESSAP) Phase 2	Yes, diesel gensets